



## DATA SHEET

# CISCO MDS 9216 MULTILAYER FABRIC SWITCH

## HIGHLIGHTS

The Cisco MDS 9216 Multilayer Fabric Switch is designed for building mission-critical enterprise storage area networks (SANs) where scalability, multilayer capability, resiliency, robust security, and ease-of-management are imperative. The Cisco MDS 9216 offers the following key features:

- **Compelling Economics**—A modular design provides a 3 rack unit (RU) base system consisting of sixteen 2-Gbps Fibre Channel (FC) ports and can be expanded with a variety of optional switching modules to up to 48 total Fibre Channel ports.
- **Cost-Effective Design**—The Cisco MDS 9216 offers advanced management tools for overall lower total cost of ownership (TCO). It introduces virtual SAN (VSAN) technology for hardware-enforced isolated environments within a single physical fabric for secure sharing of physical infrastructure, further decreasing TCO.
- **Multiprotocol and Multitransport**—The multilayer architecture of the Cisco MDS 9216 helps enable a consistent feature set over a protocol-independent switch fabric, and easily integrates Fibre Channel, Small Computer System Interface over IP (iSCSI), and Fibre Channel over IP (FCIP) in one system. Flexible architecture allows integration of future storage protocols.
- **Industry's Highest-Performance Inter-Switch Links (ISLs)**—Supports up to sixteen 2-Gbps Fibre Channel links in a single PortChannel. Links may span any port on any module within a chassis for added scalability and resiliency.
- **Intelligent Network Services**—Uses VSAN technology for hardware-enforced, isolated environments within a single physical fabric; 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 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), 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.
- **Open Platform for Network-Hosted Storage Applications**—The Cisco MDS 9216 provides an open platform for hosting intelligent storage services such as network-based virtualization and replication. Storage services modules can be installed in any Cisco MDS 9500 Series or Cisco MDS 9200 Series chassis to provide scalable, distributed application intelligence in the fabric.

## PRODUCT OVERVIEW

### Scalable 16-Port Multilayer Fabric Switch

The Cisco MDS 9216 Multilayer Fabric Switch (Figure 1) brings new capability and investment protection to the fabric switch market. Sharing a consistent architecture with the Cisco MDS 9500 Series, the Cisco MDS 9216 combines multilayer intelligence with a modular chassis, making it the industry's most intelligent and flexible fabric switch. Starting with sixteen 2-Gbps Fibre Channel ports, the expansion slot on the Cisco MDS 9216 allows for the addition of any current Cisco MDS 9000 Family module for up to 48 total ports. As the storage network expands further, Cisco MDS 9000 Family modules can be removed from Cisco MDS 9216 and migrated into Cisco MDS 9500 Series Multilayer Directors, providing smooth migration, common sparing, and outstanding investment protection.

**Figure 1.** Cisco MDS 9216 Multilayer Fabric Switch



**Note:** Shown with optional 32-port Fibre Channel Switching Module

## KEY FEATURES AND BENEFITS

### Introducing the VSAN

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 segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

To provide fabric isolation, the Cisco MDS 9216 supports Inter-VSAN Routing, the industry's first routing function for Fibre Channel. Inter-VSAN Routing allows selective transfer of data traffic between specific initiators and targets on different VSANs while maintaining isolation of control traffic within each VSAN. Using Inter-VSAN Routing, data can transit VSAN boundaries while maintaining control plane isolation, thereby maintaining fabric stability and availability.

### Multiprotocol Intelligence for Investment Protection

The unique architecture of the Cisco MDS 9216 allows seamless integration of new transport protocols for maximum flexibility. Beginning with Fibre Channel, iSCSI, FCIP, and FICON the Cisco MDS 9216 is a robust multi-protocol platform designed for deployment of cost-optimized storage networks. Today, users can implement 2-Gbps Fibre Channel for high-performance applications, iSCSI over Ethernet for cost-effective connectivity to shared storage pools, FCIP for connectivity between data centers, and FICON for mainframe connectivity. The Cisco MDS 9216 is designed to support future storage protocols so that users can seamlessly migrate to new technologies while retaining a consistent set of features, services, and management tools.

### ADVANCED TRAFFIC MANAGEMENT FOR HIGH-PERFORMANCE, RESILIENT FABRICS

The following advanced traffic-management capabilities integrated into the Cisco MDS 9216 simplify deployment and optimization of large-scale fabrics.

- Virtual Output Queuing ensures line rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- 255 buffer-to-buffer credits are assigned to each 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 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, 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.

## **INDUSTRY'S MOST 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 the industry's most advanced analysis and diagnostic tools. Power-on self test (POST) and online diagnostics provide proactive health monitoring. The Cisco MDS 9216 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. With the Cisco MDS 9000 Family, Cisco Systems® delivers the most comprehensive tool set for troubleshooting and analysis of storage networks.

## **COMPREHENSIVE SOLUTION FOR ROBUST SECURITY**

Addressing the need for airtight security in storage networks, the Cisco MDS 9216 offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The Cisco MDS 9216 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.

This functionality, in conjunction with management access and control plane security, makes the Cisco MDS 9000 Family the most secure platform of its kind.

## **EASE OF MANAGEMENT**

Delivering SAN capabilities means delivering management capabilities. To meet the needs of all users, the Cisco MDS 9216 provides three principal modes of management: Cisco MDS 9000 Family Command Line Interface (CLI), Cisco Fabric Manager, and integration with third-party storage management tools.

The Cisco MDS 9216 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 third-party management applications. Cisco provides an extensive API for integration with third-party and user developed management tools.

## ADVANCED SOFTWARE PACKAGES

The Cisco MDS 9216 can be further enhanced through additional software packages that offer advanced intelligence and functionality. Currently available software packages include the following:

- **Cisco Enterprise Package**—The Cisco Enterprise Package includes a set of traffic engineering and advanced security features like Inter-VSAN Routing, QoS, Switch-Switch and Host-Switch Authentication, LUN Zoning, and Read-Only Zones that are recommended for all enterprise SANs.
- **SAN Extension over IP Package**—The Cisco SAN Extension over IP Package provides an integrated, cost-effective, and reliable business continuance solution that leverages IP infrastructure by offering FCIP for remote SAN extension, along with a variety of advanced features to optimize the performance and manageability of FCIP links.
- **Cisco Mainframe Package**—The Cisco Mainframe Package is a comprehensive collection of features required for using the Cisco MDS 9500 Series and MDS 9200 Series switches in mainframe storage networks, including FICON protocol, CUP management, switch cascading, fabric binding, and intermixing.
- **Cisco Fabric Manager Server Package**—The Cisco Fabric Manager Server (FMS) Package extends Cisco Fabric Manager by providing historical performance monitoring for network traffic hot-spot analysis, centralized management services, and advanced application integration.

## VERSATILE EXPANSION

The modular design of the Cisco MDS 9216 gives it the ability to support current Cisco MDS 9000 Family switching or services module. Currently available modules include the following:

- 16-port and 32-port 2-Gbps Fibre Channel switching modules.
- The IP Services Module supporting iSCSI and FCIP over both four and eight ports of Gigabit Ethernet.
- The Multiprotocol Services Module supporting 14 ports of 2-Gbps Fibre Channel, and iSCSI and FCIP over two ports of Gigabit Ethernet.
- The Advanced Services Module and Caching Services Module supporting integrated network-hosted application services.

Optionally configurable, these modules give the Cisco MDS 9216 unparalleled functionality and versatility.

### Fibre Channel Switching Modules

The Cisco MDS 9216 supports 16-port and 32-port Fibre Channel switching modules (Figure 2), for maximum configuration flexibility. Each module also supports hot-swappable, Small Form-Factor Pluggable (SFP), LC interfaces. Modules can be configured with either short or long wavelength SFPs for connectivity up to 500 meters and 10 kilometers, respectively. All interfaces are 2-Gbps compatible. Up to 255 buffer credits per port are supported for maximum extensibility without the requirement for additional licensing. Additionally each port can be configured to operate in the following modes: E\_Port, F\_Port, FL\_Port, SD\_Port, TE\_Port, and TL\_Port.

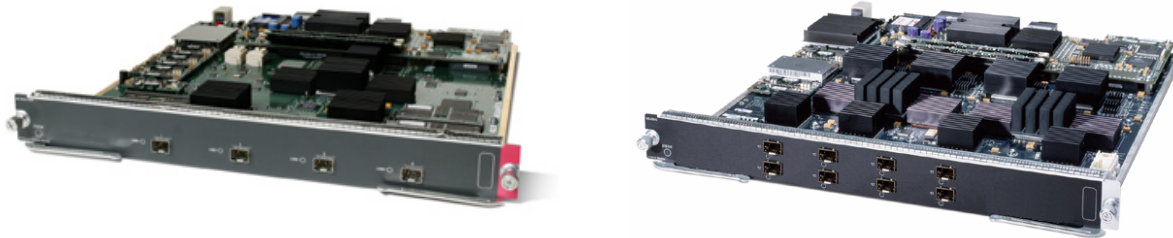
**Figure 2.** Cisco MDS 9000 Family 16-Port and 32-Port Fibre Channel Switching Modules



### IP Storage Services Modules

The Cisco MDS 9216 Multilayer Fabric Switch supports 4-port and 8-port IP Services Modules (Figure 3), allowing easy integration of Fibre Channel and IP storage environments. Multiprotocol storage networks allow for cost optimization, with iSCSI connectivity for midrange applications and Fibre Channel connectivity for high-end applications. The Cisco MDS 9000 Family IP Services Modules provide either four or eight ports of iSCSI and FCIP routing. Each port connection is via a Gigabit Ethernet SFP interface. Individual ports are user-configurable for iSCSI and FCIP for cost-effective data center and wide area connectivity.

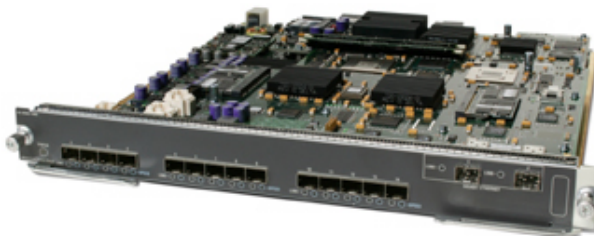
**Figure 3.** Cisco MDS 9000 Family 4-Port and 8-Port IP Storage Services Modules



### Multiprotocol Services Module

The Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module (Figure 4) delivers the intelligence and advanced features required to make multilayer SANs a reality, by integrating in a single module the functions offered by the Cisco 16-Port Fibre Channel Switching Module and the Cisco IP Storage Services Module. The Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module nearly doubles the Fibre Channel port density of the Cisco MDS 9216 when used in the expansion slot, while at the same time providing IP connectivity.

**Figure 4.** Cisco MDS 9000 Family Multiprotocol Storage Services Module



### Advanced Services Modules

The Cisco MDS 9000 Family 32-port Fibre Channel Advanced Services Module (Figure 5) facilitates pooling of heterogeneous storage for increased storage usage, simplified storage management, and reduced TCO. The Cisco Advanced Services Module incorporates all the capability of the Cisco MDS 9000 Family Fibre Channel Switching Module and also provides scalable, in-band storage virtualization services. Using highly integrated VERITAS Storage Foundation for Networks software available from VERITAS and a highly distributed processing architecture, the Cisco Advanced Services Module delivers best-in-class virtualization performance, which can be scaled by simply adding modules anywhere in the fabric to meet the performance needs of even the largest enterprises.

**Figure 5.** Cisco MDS 9000 Family Advanced Services Module



### Caching Services Module

Cisco has teamed with IBM to offer a network-based storage-management solution, which provides customers the ability to securely virtualize their storage from within the network. The Cisco MDS 9000 Family Caching Services Module (Figure 6) integrates two high-performance processing nodes that, when combined with IBM TotalStorage SAN Volume Controller Storage Software for the Cisco MDS 9000 Family, deliver network-hosted virtualization and replication services. Each Caching Services Module includes 8 GB of local cache. Multiple caching services modules can be clustered within the fabric to provide additional scalability and availability.

**Figure 6.** Cisco MDS 9000 Family Caching Services Module



### Storage Services Module

The Cisco MDS 9000 Family Storage Services Module (Figure 7) incorporates all the capabilities of the Cisco MDS 9000 Family 32-Port Fibre Channel Switching Module, introducing in addition a variety of innovative storage services. Taking advantage of the high-speed inline SCSI processing performed by dedicated application-specific integrated circuits (ASICs), the Cisco Storage Services Module allows users to dramatically enhance the performance of synchronous data replication deployments through Fibre Channel Write Acceleration or to enable more efficient and reliable serverless backup solutions, lowering the overall TCO and ensuring investment protection for the existing backup infrastructure. Introducing

the Cisco MDS 9000 Family SAN Tap protocol, the Cisco Storage Services Module enables to seamlessly integrate a variety of appliance-based storage services in the existing SAN without compromising its integrity and availability. Based on the standard Fabric Application Interface Standard (FAIS) and empowered by a unique distributed processing architecture, network-hosted storage applications reside on the Cisco Storage Services Module to provide high-performing, ready to scale virtualization solutions.

**Figure 7.** Cisco MDS 9000 Family Storage Services Module



## PRODUCT SPECIFICATIONS

Table 1 lists the product specifications for the Cisco MDS 9216.

**Table 1.** Product Specifications

Feature	Description
<b>Product Compatibility</b>	<ul style="list-style-type: none"> <li>• Cisco MDS 9000 Family</li> </ul>
<b>Software Compatibility</b>	<ul style="list-style-type: none"> <li>• Cisco MDS SAN-OS Release 1.0(1) or later</li> </ul>
<b>Protocols</b>	<ul style="list-style-type: none"> <li>• Fibre Channel standards               <ul style="list-style-type: none"> <li>– FC-PH, Revision 4.3 (ANSI/INCITS 230-1994)</li> <li>– FC-PH, Amendment 1 (ANSI/INCITS 230-1994/AM1-1996)</li> <li>– FC-PH, Amendment 2 (ANSI/INCITS 230-1994/AM2-1999)</li> <li>– FC-PH-2, Revision 7.4 (ANSI/INCITS 297-1997)</li> <li>– FC-PH-3, Revision 9.4 (ANSI/INCITS 303-1998)</li> <li>– FC-PI, Revision 13 (ANSI/INCITS 352-2002)</li> <li>– FC-FS, Revision 1.9 (ANSI/INCITS 373-2003)</li> <li>– FC-AL, Revision 4.5 (ANSI/INCITS 272-1996)</li> <li>– FC-AL-2, Revision 7.0 (ANSI/INCITS 332-1999)</li> <li>– FC-AL-2, Amendment 1 (ANSI/INCITS 332-1999/AM1-2003)</li> <li>– FC-SW-2, Revision 5.3 (ANSI/INCITS 355-2001)</li> <li>– FC-SW-3, Rev. 6.6 (ANSI/INCITS 384-2004)</li> <li>– FC-GS-3, Revision 7.01 (ANSI/INCITS 348-2001)</li> <li>– FC-GS-4, Rev. 7.91 (ANSI/INCITS 387-2004)</li> <li>– FC-BB, Revision 4.7 (ANSI/INCITS 342-2001)</li> <li>– FC-BB-2, Rev. 6.0 (ANSI/INCITS 372-2003)</li> <li>– FCP, Revision 12 (ANSI/INCITS 269-1996)</li> </ul> </li> </ul>

Feature	Description
	<ul style="list-style-type: none"> <li>– FCP-2, Revision 8 (ANSI/INCITS 350-2003)</li> <li>– FC-SB-2, Revision 2.1 (ANSI/INCITS 349-2001)</li> <li>– FC-SB-3, Revision 1.6 (ANSI/INCITS 374-2003)</li> <li>– FC-VI, Revision 1.84 (ANSI/INCITS 357-2002)</li> <li>– FC-FLA, Revision 2.7 (INCITS TR-20-1998)</li> <li>– FC-PLDA, Revision 2.1 (INCITS TR-19-1998)</li> <li>– FC-Tape, Revision 1.17 (INCITS TR-24-1999)</li> <li>– FC-MI, Revision 1.92 (INCITS TR-30-2002)</li> <li>– FC-SP, Revision 1.6</li> <li>– FC-DA, Revision 3.1</li> <li>• IP over Fibre Channel (RFC 2625)</li> <li>• Extensive IETF-standards based TCP/IP, SNMPv3, and Remote Monitoring (RMON) MIBs</li> <li>• Class of Service: Class 2, Class 3, Class F</li> <li>• Fibre Channel standard port types: E, F, FL, B</li> <li>• Fibre Channel enhanced port types: SD, ST, TE, TL</li> </ul>
<b>Cards, Ports, Slots</b>	<ul style="list-style-type: none"> <li>• Base: 16 fixed auto-sensing 1 /2-Gbps Fibre Channel ports</li> <li>• Expansion: 1 empty expansion slot</li> </ul>
<b>Features and Functions</b>	<ul style="list-style-type: none"> <li>• Fabric services <ul style="list-style-type: none"> <li>– Name server</li> <li>– Internet Storage Name Server (iSNS)</li> <li>– Registered State Change Notification (RSCN)</li> <li>– Login services</li> <li>– Fabric Configuration Server (FCS)</li> <li>– Private loop</li> <li>– Public loop</li> <li>– Translative loop</li> <li>– Broadcast</li> <li>– In-order delivery</li> </ul> </li> <li>• Advanced Functionality <ul style="list-style-type: none"> <li>– VSAN</li> <li>– Inter-VSAN Routing</li> <li>– PortChannel with Multipath Load Balancing</li> <li>– QoS—flow-based, zone-based</li> <li>– Fibre Channel Congestion Control</li> <li>– Extended Buffer-To-Buffer Credits</li> <li>– FC Write Acceleration</li> <li>– Network-accelerated serverless backups</li> <li>– Network-assisted applications through SANTap</li> <li>– Network-hosted applications through FAIS-based Intelligent Storage Application Programmatic Interface (ISAPI)</li> </ul> </li> </ul>

Feature	Description
	<ul style="list-style-type: none"> <li>• Diagnostics and troubleshooting tools <ul style="list-style-type: none"> <li>– Power-on-self-test (POST) diagnostics</li> <li>– Online diagnostics</li> <li>– Internal port loopbacks</li> <li>– SPAN and Remote SPAN</li> <li>– Fibre Channel Traceroute</li> <li>– Fibre Channel Ping</li> <li>– Fibre Channel Debug</li> <li>– Cisco Fabric Analyzer</li> <li>– Syslog</li> <li>– Online system health</li> <li>– Port-level statistics</li> <li>– Real Time Protocol Debug</li> </ul> </li> <li>• Network security <ul style="list-style-type: none"> <li>– VSANs</li> <li>– Access Control Lists</li> <li>– Per-VSAN role-based access control</li> <li>– Fibre Channel Zoning <ul style="list-style-type: none"> <li>N_Port WWN</li> <li>N_Port FC-ID</li> <li>Fx_Port WWN</li> <li>Fx_Port WWN and interface index</li> <li>Fx_Port domain ID and interface index</li> <li>Fx_Port domain ID and port number</li> <li>LUN</li> <li>Read-only</li> <li>Broadcast</li> </ul> </li> <li>– iSCSI zoning <ul style="list-style-type: none"> <li>iSCSI name</li> <li>IP address</li> </ul> </li> <li>– Fibre Channel Security Protocol (FC-SP) <ul style="list-style-type: none"> <li>DH-CHAP switch-switch authentication</li> <li>DH-CHAP host-switch authentication</li> </ul> </li> <li>– Port Security and Fabric Binding</li> <li>– IPSec for FCIP and iSCSI</li> <li>– IKEv1 and IKEv2</li> <li>– Management access <ul style="list-style-type: none"> <li>SSH v2 implementing AES</li> <li>SNMPv3 implementing AES</li> <li>SFTP</li> </ul> </li> </ul> </li> </ul>

Feature	Description																																				
	<ul style="list-style-type: none"> <li>• Serviceability               <ul style="list-style-type: none"> <li>– Configuration file management</li> <li>– Call Home</li> <li>– Power-management LEDs</li> <li>– Port beaconing</li> <li>– System LED</li> <li>– SNMP traps for alerts</li> <li>– Network boot</li> </ul> </li> </ul>																																				
<b>Performance</b>	<ul style="list-style-type: none"> <li>• Port speed: 1 /2-Gbps auto-sensing, optionally configurable</li> <li>• Buffer credits: Up to 255 per port</li> <li>• Ports per chassis: 16 to 48 1 /2-Gbps Fibre Channel ports, up to eight 1-Gbps Ethernet ports</li> <li>• Ports per rack: Up to 672</li> <li>• PortChannel: Up to sixteen 2-Gbps ports</li> <li>• Supported optics, media, and transmission distances:               <table border="1" data-bbox="435 884 1317 1339" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th data-bbox="435 884 748 911">Optics</th> <th data-bbox="753 884 1170 911">Media</th> <th data-bbox="1175 884 1317 911">Distance</th> </tr> </thead> <tbody> <tr> <td data-bbox="435 911 748 938">1-Gbps—SW, LC SFP</td> <td data-bbox="753 911 1170 938">50/125 micron multimode</td> <td data-bbox="1175 911 1317 938">500 m</td> </tr> <tr> <td data-bbox="435 938 748 966">1-Gbps—SX, LC SFP</td> <td data-bbox="753 938 1170 966">50/125 micron multimode</td> <td data-bbox="1175 938 1317 966">550 m</td> </tr> <tr> <td data-bbox="435 966 748 993">1-Gbps—SW, LC SFP</td> <td data-bbox="753 966 1170 993">62.5/125 micron multimode</td> <td data-bbox="1175 966 1317 993">300 m</td> </tr> <tr> <td data-bbox="435 993 748 1020">1-Gbps—SX, LC SFP</td> <td data-bbox="753 993 1170 1020">62.5/125 micron multimode</td> <td data-bbox="1175 993 1317 1020">275 m</td> </tr> <tr> <td data-bbox="435 1020 748 1047">1-Gbps—LW, LC SFP</td> <td data-bbox="753 1020 1170 1047">9/125 micron single-mode</td> <td data-bbox="1175 1020 1317 1047">10 km</td> </tr> <tr> <td data-bbox="435 1047 748 1075">1-Gbps—LX/LH, LC SFP</td> <td data-bbox="753 1047 1170 1075">9/125 or 10/125 micron single-mode</td> <td data-bbox="1175 1047 1317 1075">10 km</td> </tr> <tr> <td data-bbox="435 1075 748 1102">1-Gbps—CWDM, LC SFP</td> <td data-bbox="753 1075 1170 1102">9/125 micron single-mode</td> <td data-bbox="1175 1075 1317 1102">Up to 100 km</td> </tr> <tr> <td data-bbox="435 1102 748 1129">2-Gbps—SW, LC SFP</td> <td data-bbox="753 1102 1170 1129">50/125 micron multimode</td> <td data-bbox="1175 1102 1317 1129">300 m</td> </tr> <tr> <td data-bbox="435 1129 748 1157">2-Gbps—SW, LC SFP</td> <td data-bbox="753 1129 1170 1157">62.5/125 micron multimode</td> <td data-bbox="1175 1129 1317 1157">150 m</td> </tr> <tr> <td data-bbox="435 1157 748 1184">2-Gbps—LW, LC SFP</td> <td data-bbox="753 1157 1170 1184">9/125 micron single-mode</td> <td data-bbox="1175 1157 1317 1184">10 km</td> </tr> <tr> <td data-bbox="435 1184 748 1211">2-Gbps—CWDM, LC SFP</td> <td data-bbox="753 1184 1170 1211">9/125 micron single-mode</td> <td data-bbox="1175 1184 1317 1211">Up to 100 km</td> </tr> </tbody> </table> </li> </ul>	Optics	Media	Distance	1-Gbps—SW, LC SFP	50/125 micron multimode	500 m	1-Gbps—SX, LC SFP	50/125 micron multimode	550 m	1-Gbps—SW, LC SFP	62.5/125 micron multimode	300 m	1-Gbps—SX, LC SFP	62.5/125 micron multimode	275 m	1-Gbps—LW, LC SFP	9/125 micron single-mode	10 km	1-Gbps—LX/LH, LC SFP	9/125 or 10/125 micron single-mode	10 km	1-Gbps—CWDM, LC SFP	9/125 micron single-mode	Up to 100 km	2-Gbps—SW, LC SFP	50/125 micron multimode	300 m	2-Gbps—SW, LC SFP	62.5/125 micron multimode	150 m	2-Gbps—LW, LC SFP	9/125 micron single-mode	10 km	2-Gbps—CWDM, LC SFP	9/125 micron single-mode	Up to 100 km
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<b>Reliability and Availability</b>	<ul style="list-style-type: none"> <li>• Hot-swappable, 1+1 redundant power supplies</li> <li>• Hot-swappable fan tray with integrated temperature and power management</li> <li>• Hot-swappable SFP optics</li> <li>• Hot-swappable switching module</li> <li>• Passive backplane</li> <li>• Stateful process restart</li> <li>• Any module, any port configuration for PortChannels</li> <li>• Fabric-based multipathing</li> <li>• Per-VSAN fabric services</li> <li>• Port tracking</li> <li>• Virtual Routing Redundancy Protocol (VRRP) for management and FCIP or iSCSI connections</li> <li>• Online diagnostics</li> </ul>																																				
<b>Network Management</b>	<ul style="list-style-type: none"> <li>• Access methods               <ul style="list-style-type: none"> <li>– Out-of-band 10/100 Ethernet port</li> </ul> </li> </ul>																																				

Feature	Description
	<ul style="list-style-type: none"> <li>– RS-232 serial console port</li> <li>– In-band IP-over-Fibre Channel</li> <li>– DB-9 COM port</li> <li>• Access protocols <ul style="list-style-type: none"> <li>– CLI—via console and Ethernet ports</li> <li>– SNMPv3—via Ethernet port and in-band IP-over-Fibre Channel access</li> <li>– Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S)</li> </ul> </li> <li>• Distributed Device Alias service</li> <li>• Network security <ul style="list-style-type: none"> <li>– Per-VSAN role-based access control using RADIUS and TACACS+ based authentication, authorization, and accounting (AAA) functions</li> <li>– SFTP</li> <li>– SSH v2 implementing AES</li> <li>– SNMPv3 implementing AES</li> </ul> </li> <li>• Management applications <ul style="list-style-type: none"> <li>– Cisco MDS 9000 Family CLI</li> <li>– Cisco Fabric Manager</li> <li>– Cisco Device Manager</li> <li>– CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)</li> </ul> </li> </ul>
<b>Programming Interfaces</b>	<ul style="list-style-type: none"> <li>• Scriptable CLI</li> <li>• Fabric Manager GUI</li> <li>• Device Manager GUI</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>• Temperature, ambient operating <ul style="list-style-type: none"> <li>– 32° to 104°F (0° to 40°C)</li> </ul> </li> <li>• Temperature, ambient non-operating and storage <ul style="list-style-type: none"> <li>– 40°F to 158°F (-40°C to 75°C)</li> </ul> </li> <li>• Relative humidity, ambient (non-condensing) operating <ul style="list-style-type: none"> <li>– 10 to 90 percent</li> </ul> </li> <li>• Relative humidity, ambient (non-condensing) non-operating and storage <ul style="list-style-type: none"> <li>– 10 to 95 percent</li> </ul> </li> <li>• Altitude, operating <ul style="list-style-type: none"> <li>– -197 to 6500 feet (-60 to 2000 meter)</li> </ul> </li> </ul>
<b>Physical Dimensions</b>	<ul style="list-style-type: none"> <li>• Dimensions in inches (H x W x D) <ul style="list-style-type: none"> <li>– 5.25 x 17.32 x 22.66 inches (13.34 x 43.99 x 57.56 cm), 3 Rack Units (RU)</li> <li>– All units rack mountable in standard 19 inch EIA rack</li> </ul> </li> <li>• Weight <ul style="list-style-type: none"> <li>– Fully configured chassis with optional Switching Module: 70 lbs (32 kg)</li> </ul> </li> </ul>
<b>Power and Cooling</b>	<ul style="list-style-type: none"> <li>• Power supply (845W AC) <ul style="list-style-type: none"> <li>– AC input characteristics</li> <li>– 100 to 240 VAC (10% range)</li> </ul> </li> </ul>

Feature	Description
	<ul style="list-style-type: none"> <li>– 50-60Hz (nominal)</li> <li>• Airflow <ul style="list-style-type: none"> <li>– 200 linear feet per minute (lfm) through system fan assembly</li> <li>– Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4cm) between walls and the chassis air vents and a minimum horizontal separation of 6 inches (15.2 cm) between two chassis to prevent overheating.</li> </ul> </li> </ul>
<b>Approvals and Compliance</b>	<ul style="list-style-type: none"> <li>• <b>Safety Compliance</b> <ul style="list-style-type: none"> <li>– CE Marking</li> <li>– UL 60950</li> <li>– CAN/CSA-C22.2 No. 60950</li> <li>– EN 60950</li> <li>– IEC 60950</li> <li>– TS 001</li> <li>– AS/NZS 3260</li> <li>– IEC60825</li> <li>– EN60825</li> <li>– 21 CFR 1040</li> </ul> </li> <li>• <b>EMC Compliance</b> <ul style="list-style-type: none"> <li>– FCC Part 15 (CFR 47) Class A</li> <li>– ICES-003 Class A</li> <li>– EN 55022 Class A</li> <li>– CISPR 22 Class A</li> <li>– AS/NZS 3548 Class A</li> <li>– VCCI Class A</li> <li>– EN 55024</li> <li>– EN 50082-1</li> <li>– EN 61000-6-1</li> <li>– EN 61000-3-2</li> <li>– EN 61000-3-3</li> </ul> </li> </ul>

## ORDERING INFORMATION

Table 2 lists ordering information for the Cisco MDS 9216.

**Table 2.** Ordering Information

Part Number	Product Name
DS-C9216-K9	Cisco MDS 9216 Multilayer Fabric Switch
<b>Optional Switching Modules, SFPs</b>	
DS-X9016	Cisco MDS 9000 Family 16-port 1 /2-Gbps Fibre Channel Module, SFP/LC
DS-X9032	Cisco MDS 9000 Family 32-port 1 /2-Gbps Fibre Channel Module, SFP/LC

Part Number	Product Name
DS-X9308-SMIP	Cisco MDS 9000 Family 8-port 1-GE IP Storage Services Module
DS-X9304-SMIP	Cisco MDS 9000 Family 4-port 1-GE IP Storage Services Module
DS-X9302-14K9	Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module
DS-X9032-SMV	Cisco MDS 9000 Family 32-port Advanced Services Module
DS-X9560-SMC	Cisco MDS 9000 Family Caching Services Module
DS-X9032-SSM	Cisco MDS 9000 Family 32-port Storage Services Module
DS-SFP-FC-2G-SW	Cisco MDS 9000 Family 1 /2-Gbps Fibre Channel-SW, SFP, LC
DS-SFP-FC-2G-LW	Cisco MDS 9000 Family 1 /2-Gbps Fibre Channel-LW, SFP, LC
DS-SFP-FCGE-SW	Cisco MDS 9000 Family Gigabit Ethernet, 1 /2-Gbps Fibre Channel-SW, SFP, LC
DS-SFP-FCGE-LW	Cisco MDS 9000 Family Gigabit Ethernet, 1 /2-Gbps Fibre Channel-LW, SFP, LC
<b>Advanced Software Packages</b>	
M9200EXT12K9	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module
M9200EXT1K9	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 8-port 1-GE IP Storage Services Module
M9200EXT14K9	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 4-port 1-GE IP Storage Services Module
M9200ENT1K9	Cisco MDS 9200 Series Enterprise Package
M9200FMS1K9	Cisco MDS 9200 Series Fabric Manager Server Package
M9200FIC1K9	Cisco MDS 9200 Series Mainframe Package
M9200SSE1K9	Cisco MDS 9200 Storage Services Enabler Package for the Cisco MDS 9000 Family Advanced Services Module or the Cisco MDS 9000 Family Storage Services Module
<b>Spare Components</b>	
DS-2SLOT-FAN=	Cisco MDS 9200 Fan Module, Spare
DS-CAC-845W=	Cisco MDS 9200 AC power supply—845 W, spare
DS-X9016=	Cisco MDS 9000 Family 16-port 1 /2-Gbps Fibre Channel Module, SFP/LC, Spare
DS-X9032=	Cisco MDS 9000 Family 32-port 1 /2-Gbps Fibre Channel Module, SFP/LC
DS-X9308-SMIP=	Cisco MDS 9000 Family 8-port 1GE IP Storage Services Module, Spare
DS-X9304-SMIP=	Cisco MDS 9000 Family 4-port 1GE IP Storage Services Module, Spare
DS-X9302-14K9=	Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module, Spare
DS-X9032-SMV=	Cisco MDS 9000 Family 32-port Advanced Services Module, Spare
DS-X9560-SMC=	Cisco MDS 9000 Family Caching Services Module, Spare
DS-X9032-SSM=	Cisco MDS 9000 Family 32-port Storage Services Module, Spare
DS-SFP-FC-2G-SW=	Cisco MDS 9000 Family 1 /2-Gbps Fibre Channel-SW, SFP, LC, Spare
DS-SFP-FC-2G-LW=	Cisco MDS 9000 Family 1 /2-Gbps Fibre Channel-LW, SFP, LC, Spare

Part Number	Product Name
DS-SFP-FCGE-SW=	Cisco MDS 9000 Family 1-Gbps Ethernet, 1 /2-Gbps Fibre Channel-SW, SFP, LC, Spare
DS-SFP-FCGE-LW=	Cisco MDS 9000 Family 1-Gbps Ethernet, 1 /2-Gbps Fibre Channel-LW, SFP, LC, Spare
M9200EXT12K9=	Cisco MDS 9200 SAN Extension over IP Package for MDS 9216i
M9200EXT12K9=	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 14/2-port Multiprotocol Services Module, Spare
M9200EXT1K9 =	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 8-port 1-GE IP Storage Services Module, Spare
M9200EXT14K9=	Cisco MDS 9200 SAN Extension over IP Package for Cisco MDS 9000 Family 4-port 1-GE IP Storage Services Module, Spare
M9200ENT1K9=	Cisco MDS 9200 Series Enterprise Package, Spare
M9200FMS1K9=	Cisco MDS 9200 Series Fabric Manager Server Package, Spare
M9200FIC1K9=	Cisco MDS 9200 Series Mainframe Package, Spare
M9200SSE1K9=	Cisco MDS 9200 Storage Services Enabler Package for the Cisco MDS 9000 Family Advanced Services Module or the Cisco MDS 9000 Family Storage Services Module, 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

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## FOR MORE INFORMATION

For more information about the Cisco MDS 9216, visit <http://www.cisco.com/en/US/products/hw/ps4159/ps4358/index.html> or contact your local account representative.

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