Cisco MDS 9710 Multilayer Director

Product Overview

The Cisco® MDS 9710 Multilayer Director (Figure 1) is a director-class SAN switch designed for deployment in large-scale storage networks to enable enterprise clouds and business transformation. Layering a comprehensive set of intelligent features onto a high-performance, protocol-independent switch fabric, the Cisco MDS 9710 addresses the stringent requirements of large virtualized data center storage environments: uncompromising high availability, security, scalability, ease of management, and transparent integration of new technologies for extremely flexible data center SAN solutions. Sharing the same operating system and management interface with other Cisco data center switches, the Cisco MDS 9710 enables seamless deployment of unified fabrics with high-performance Fibre Channel, IBM Fibre Connectivity (FICON), and Fibre Channel over Ethernet (FCoE) connectivity to achieve low total cost of ownership (TCO).

Figure 1. Cisco MDS 9710 Multilayer Director

Product Highlights

The Cisco MDS 9710 offers the following main features:

- Outstanding SAN performance: The combination of the 16-Gbps Fibre Channel switching module and the Fabric-1 crossbar switching modules enables up to 1.5 Tbps of front-panel Fibre Channel throughput between modules in each direction for each of the eight Cisco MDS 9710 payload slots. This per-slot bandwidth is twice the bandwidth needed to support a 48-port 16-Gbps Fibre Channel module at full line rate. Cisco MDS 9710 architecture, based on central arbitration and crossbar fabric, provides 16-Gbps line-rate, nonblocking, predictable performance across all traffic conditions for every port in the chassis.

- High availability: The Cisco MDS 9710 provides outstanding availability and reliability. The Cisco MDS 9710 is the industry's first director-class switch to enable redundancy on all major components, including the fabric card. It provides grid redundancy on the power supply and 1+1 redundant supervisors. Users can add additional fabric card to enable N+1 fabric redundancy. The Cisco MDS 9710 combines nondisruptive software upgrades, stateful process restart and failover, and full redundancy of all major components for best-in-class availability.
- Industry-leading scalability: With up to 24 terabits per second (Tbps) of Fibre Channel system bandwidth and 384 2/4/8-Gbps, 4/8/16-Gbps or 10-Gbps full line-rate autosensing Fibre Channel ports in a single chassis or up to 1152 Fibre Channel ports in a single rack, the Cisco MDS 9710 leads the industry in scalability and is designed to meet the requirements of the largest data center storage environments.
- Intelligent network services: VSAN technology, access control lists (ACLs) for hardware-based intelligent frame processing, and fabric wide quality of service (QoS) enable migration from SAN islands to enterprisewide storage networks.
    - Integrated hardware-based VSANs and Inter-VSAN Routing (IVR): Integration of VSANs into port-level hardware allows any port in a system or fabric to be partitioned to 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.
    - Intelligent storage services: The Cisco MDS 9710 interoperates with intelligent service capabilities on other Cisco MDS 9000 Family platforms and the intelligent services switch to provide services such as acceleration of storage applications for data replication and backup and data migration to hosts and targets attached to the Cisco MDS 9710.
    - Smart zoning: When the Smart Zoning feature is enabled, Cisco MDS 9700 Series multi-protocol Director fabrics provision the hardware access control entries specified by the zone set more efficiently, avoiding the superfluous entries that would allow servers (initiators) to talk to other servers, or allow storage devices (targets) to talk to other storage devices. This feature makes larger zones with multiple initiators and multiple targets feasible without excessive consumption of hardware resources. Thus, smart zones can correspond to applications, application clusters, hypervisor clusters, or other data center entities, saving the time that administrators previously spent creating many small zones, and enabling the automation of zoning tasks.
- Virtual machine transparency: The Cisco MDS 9700 Series provides deterministic hardware performance and a comprehensive feature set that allows virtual machines to have the same SAN attributes as a physical server. On a per-virtual machine basis, the Cisco NX-OS Software offers VSANs, QoS policies, access control, performance monitoring, and data protection to promote the scalability and mobility of virtual machines. Cisco Prime Data Center Network Manager provides end-to-end visibility all the way from the virtual machine down to the storage, with resource allocation, performance measurements, and predictions available on a per-virtual machine basis to enable rapid troubleshooting in mission-critical virtualized environments.
- Comprehensive security: In addition to support for services such as VSANs, hardware-enforced zoning, ACLs, per-VSAN role-based access control (RBAC), and Cisco TrustSec® [1] Fibre Channel link encryption, the Cisco MDS 9700 Series supports a comprehensive security framework consisting of RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP) [1], Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, and Simple Network Management Protocol Version 3 (SNMPv3). Cisco TrustSec Fibre

Channel link encryption delivers transparent, hardware-based 16-Gbps line-rate encryption of Fibre Channel data on 16-Gbps Fibre Channel switching modules in addition to 10-Gbps line-rate encryption.

- Unified SAN management: The Cisco MDS 9700 Series includes built-in storage network management with all features available through a command-line interface (CLI) or Cisco Prime Data Center Network Manager (DCNM), a centralized management tool that simplifies management of unified fabrics. Cisco DCNM supports integration with third-party storage management applications to allow seamless interaction with existing management tools. Cisco DCNM supports federation of up to 10 Cisco DCNM servers to manage up to 150,000 devices using a single management pane.
- Sophisticated diagnostics: The Cisco MDS 9710 provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated Cisco Call Home capability for added reliability, faster problem resolution, and reduced service costs. Starting with Cisco MDS 9000 NX-OS 6.2, the powerful Cisco Generic Online Diagnostics (GOLD) framework replaces the Cisco Online Health Management System (OHMS) diagnostic framework on the new Cisco MDS 9700 Series Multilayer Director chassis. Cisco GOLD is a suite of diagnostic facilities to verify that hardware and internal data paths are operating as designed. Boot-time diagnostics, continuous monitoring, standby fabric loopback tests, and on-demand and scheduled tests are part of the Cisco GOLD feature set. This industry-leading diagnostics subsystem enables the rapid fault isolation and continuous system monitoring critical in today's continuously operating environments.
- Multiprotocol architecture: The multilayer architecture of the Cisco MDS 9700 Series enables a consistent feature set over a protocol-independent switch fabric. The Cisco MDS 9710 transparently integrates Fibre Channel, FCoE[1] and FICON[1].
  - 2/4/8-Gbps, 4/8/16-Gbps, 10-Gbps Fibre Channel and 10 Gigabit Ethernet: The Cisco MDS 9710 supports 2/4/8/16-Gbps and 10 Gbps ports on the Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Switching Module for deployment in both open systems and FICON environments. The Cisco MDS 9710 also supports 10 Gigabit Ethernet clocked optics carrying Fibre Channel traffic.
  - FICON[1]: The Cisco MDS 9710 is mainframeready, with full support for IBM System z FICON and Linux environments.
  - Multihop FCoE [1]: The Cisco MDS 9710 supports multihop FCoE, extending connectivity from FCoE and Fibre Channel fabrics to FCoE and Fibre Channel storage devices.

Main Benefits

Lower TCO with SAN Consolidation

With the exponential growth of data in today’s business environment, organizations need to deploy large-scale SANs in the most efficient and cost-effective ways. To meet scalability requirements while managing TCO, the Cisco MDS 9710 offers industry-leading port densities of up to 384 16-Gbps Fibre Channel ports per chassis, multihop FCoE, 1.5-Tbps front-panel Fibre Channel performance per slot, up to 24-Tbps front-panel Fibre Channel line rate nonblocking system-level switching, unparalleled functionality with intelligent fabric services, VSANs for consolidating individual physical SAN islands while maintaining logical boundaries, 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, thus reducing the hardware footprint and associated capital and operational expenses. For unified fabric deployments that have converged LAN and SAN using lossless Ethernet, the Cisco MDS 9710 provides multihop FCoE capability to protect the organizations investment in existing storage infrastructure with any to-any connectivity across multiple protocols.

Enterprise-Class Availability

The Cisco MDS 9710 is designed from the beginning for high availability. In addition to meeting the basic requirements of nondisruptive software upgrades and redundancy of all critical hardware components, the Cisco MDS 9710 software architecture offers outstanding availability. The Cisco MDS 9700 Series Supervisor Modules automatically restart failed processes, making the Cisco MDS 9710 exceptionally robust. In the rare event that a supervisor module is reset, complete synchronization between the active and standby supervisor modules helps ensure stateful failover with no disruption of traffic.

The Cisco MDS 9710 provides the industry's first redundancy on all major hardware components, as detailed in Table 1.

Table 1. Redundancy Details for Cisco MDS 9710

Component	Redundancy
Supervisors	1+1
Power supplies	Grid redundancy
Fabrics	N+1 redundancy

High availability is implemented at the fabric level using robust and high-performance Inter-Switch Links (ISLs). The PortChannel capability allows users to aggregate up to 16 physical links into one logical bundle. The bundle can consist of any speed-matched ports in the chassis, helping ensure that the bundle can remain active in the event of a port, application-specific integrated circuit (ASIC), or module failure. ISLs in a PortChannel can have significantly different lengths. This capability is valuable in campus and metropolitan area network (MAN) environments, because logical links can now be spread over multiple physical paths, helping ensure uninterrupted connectivity even if one of the physical paths is disrupted. The Cisco MDS 9710 provides outstanding high availability, helping ensure that solutions exceed the 99.999 percent uptime requirements of today's most demanding environments.

Business Transformation with Enterprise Cloud Deployment

Enterprise clouds provide organizations with elastic computing and network capabilities, enabling IT to scale resources up or down as needed in a quick and cost-efficient manner. Cisco MDS 9710 provides the industry-leading scalability and pay-as-you-grow flexibility to meet the scalability needs of enterprise clouds, multihop FCoE required to provision storage in a multiprotocol unified fabric, robust security required for multitenancy cloud applications, predictable high performance required to meet stringent service-level agreements (SLAs), resilient connectivity required for always-on cloud infrastructure, and advanced traffic management capabilities such as QoS to quickly and cost-efficiently allocate elastic network capabilities to cloud applications. Furthermore, Cisco DCNM provides resource monitoring and capacity planning on a per-virtual machine basis, enabling efficient, consolidated enterprise cloud deployments, federation of up to 10 Cisco DCNM servers for ease of management of large-scale clouds, and resource use information through Storage Management Initiative Specification (SMI-S)-based developer APIs to deliver IT as a service.

Advanced Traffic Management

Advanced traffic management capabilities integrated into the Cisco MDS 9710 simplify deployment and optimization of large-scale fabrics:

- Virtual output queue (VOQ): 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: Using extended credits, allows up to 4095 buffer credits from a pool of more than 6000 buffer credits for a module to be allocated to ports as needed to greatly extend the distance for Fibre Channel SANs; alternatively, 4095 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, and the Cisco MDS 9000 Family switch architecture helps ensure that frames can never be reordered within a switch
- Fabric Shortest Path First (FSPF)-based multipathing: Provides the intelligence to load balance across up to 16 Fibre Channel or FCoE 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

Ease of Management

To meet the needs of all users, the Cisco MDS 9710 provides three principal modes of management: the Cisco MDS 9000 Family CLI, Cisco Prime DCNM, and integration with third-party storage management tools.

The Cisco MDS 9710 presents the user with a consistent, logical CLI. Adhering to the syntax of the widely known Cisco IOS® Software CLI, the Cisco MDS 9000 Family CLI is easy to learn and delivers broad management capabilities. The Cisco MDS 9000 Family CLI is an extremely efficient and direct interface designed to provide optimal capabilities to administrators in enterprise environments. Using the CLI, customers can enable debugging modes for each switch feature and view a real-time updated activity log of control protocol exchanges. Each log entry is time-stamped and listed in chronological order.

Cisco Prime Data Center Network Manager (DCNM) is the network's industry's first converged SAN and LAN management solution. Cisco DCNM can manage all Cisco NX-OS devices, including the Cisco MDS 9000 Family and Cisco Nexus® Family products. The intuitive GUI simplifies day-to-day operations of Cisco unified fabrics in today's highly virtualized data center environments.

The main functions that Cisco DCNM supports include:

- Monitoring of events and performance historically and at scale
- Wizard- and template-based provisioning of Cisco NX-OS technologies and services
- Cisco VMpath analytics, with dynamic topology views with extended visibility into virtual infrastructure
- Resource management through trend analysis of inventory and performance
- Rule-based event notification and filtering
- Role Based Access Control to provide separation between the network and storage teams

The solution is designed to scale to large enterprise deployments through scale-out server architecture with automated failover capability. These capabilities provide a resilient management system that centralizes infrastructure and path monitoring across geographically dispersed data centers. The Cisco DCNM base management function is available at no charge, and advanced features are unlocked with a license. The Cisco DCNM application can be installed on Linux and Microsoft Windows operating systems and supports both PostgreSQL and Oracle databases.

Comprehensive Solution for Robust Security

Addressing the need for fool-proof security in storage networks, the Cisco MDS 9710 offers an extensive security framework to protect the highly sensitive data crossing today's enterprise networks. The Cisco MDS 9710 employs intelligent packet inspection at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced port-security features. VSANs are used to achieve greater security and stability by providing complete isolation of devices that are connected to the same physical SAN. IVR enables controlled sharing of resources between VSANs. In addition, FC-SP[1] provides switch-to-switch and host-to-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. Cisco TrustSec® [1] Fibre Channel link encryption, available in the Cisco MDS 9700 Series 16-Gbps modules, allows you to transparently encrypt ISLs at up to line-rate speeds, providing an additional layer of protection for traffic within and between data centers.

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 9710 integrates advanced analysis and debuggin tools. The power-on self test (POST) and online diagnostics provide proactive health monitoring. The Cisco MDS 9710 provides the integrated functions required to implement diagnostic capabilities such as Fibre Channel traceroute for identifying the exact path and timing of flows and Switched Port Analyzer (SPAN) and Remote SPAN (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 SLA accounting. With the Cisco MDS 9710, Cisco delivers a comprehensive tool set for troubleshooting and analysis of storage networks.

Convergence with Multihop FCoE (Supported in a Future Software Release)[1]

FCoE allows an evolutionary approach to network and I/O convergence by preserving all Fibre Channel constructs, maintaining the latency, security, and traffic management attributes of Fibre Channel and preserving investments in Fibre Channel tools, training, and SANs. Sharing the same operating system and management plane as the Cisco Nexus switches, the Cisco MDS 9710 provides seamless coexistence in a unified fabric with any-to-any connectivity for Fibre Channel and FCoE.

Integrated Mainframe Support (Supported in a Future Software Release)[1]

The Cisco MDS 9710 is mainframe ready, with full support for IBM System z FICON and Linux environments. The Cisco MDS 9710 supports transport of the FICON protocol in both cascaded and noncascaded fabrics, as well as an intermix of FICON and open systems Fibre Channel Protocol traffic on the same switch. Cisco Control Unit Port (CUP) support enables in-band management of Cisco MDS 9000 Family switches from mainframe management applications. The Cisco MDS 9710 supports a fabric-binding feature that helps ensure that ISLs are enabled only between specified switches in the fabric-binding configuration.

Product Specifications

Table 2 lists the product specifications for the Cisco MDS 9710 Multilayer Director.

Table 2. Technical Specifications

Feature	Description
Product compatibility	Cisco MDS 9000 Family
Software compatibility	Cisco MDS SAN-OS Software Release 6.2.1 or later
Indicators	Power supply LED FAN LED Supervisor LED Fabric LED Line card module LED
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-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 2b (ANSI INCITS 481-2011) ◦ 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) ◦ 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) ◦ FC-SP-2, Revision 2.71 (ANSI INCITS 496-2012) ◦ FAIS, Revision 1.03 (ANSI INCITS 432-2007) ◦ FAIS-2, Revision 2.23 (ANSI INCITS 449-2008)

<table>
<tr><th>Feature</th><th>Description</th></tr>
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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-MI-3, Revision 1.03 (INCITS TR-48-2012)
FC-DA, Revision 3.1 (INCITS TR-36-2004)
FC-DA-2, Revision 1.06 (INCITS TR-49-2012)
FC-MSQS, Revision 3.2 (INCITS TR-46-2011)

Fibre Channel classes of service: Class 2, Class 3, and Class F
Fibre Channel standard port types: E, F, FL, and B
Fibre Channel enhanced port types: SD, ST, and TE
FCoE standard port types: VE and VF
IEEE 802.1Qbb-2011: Priority-based flow control (PFC)
IEEE 802.3db-2011: MAC address control frame for priority-based flow control
IEEE 802.1Qaz-2011: Enhanced transmission selection for bandwidth sharing between traffic classes (ETS and DCBX)
IP over Fibre Channel (RFC 2625)
IPv6, IPv4, and Address Resolution Protocol (ARP) over Fibre Channel (RFC 4338)
Extensive IETF-standards-based TCP/IP, SNMPv3, and remote monitoring (RMON) MIBs

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<tr><td>Chassis slot configuration</td><td>

Line-card slots: 8
Supervisor slots: 2
Crossbar switching fabric slots: 6*
Fan trays: 3 fan trays at the back of the chassis
Power supply bays: 8

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<tr><td>Switching capability per fabric</td><td>
<table>
<tr><th>Number of Fabric Cards</th><th>Front Panel Fibre Channel Bandwidth per Slot</th><th>FCoE Bandwidth per Slot</th></tr>
<tr><td>1</td><td>256 Gbps</td><td>220 Gbps</td></tr>
<tr><td>2</td><td>512 Gbps</td><td>440 Gbps</td></tr>
<tr><td>3</td><td>768 Gbps</td><td>660 Gbps</td></tr>
<tr><td>4</td><td>1024 Gbps</td><td>880 Gbps</td></tr>
<tr><td>5</td><td>1280 Gbps</td><td>1100 Gbps</td></tr>
<tr><td>6</td><td>1536 Gbps</td><td>1320 Gbps</td></tr>
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<tr><td>Performance and scalability</td><td>

Up to 24-Tbps front-panel Fibre Channel switching bandwidth and 21Tbps of FCoE bandwidth
Supported Fibre Channel port speeds

2/4/8-Gbps autosensing; optionally configurable
4/8/16-Gbps autosensing; optionally configurable
10-Gbps Fibre channel

Buffer credits: 48-port line-rate 16-Gbps advanced Fibre Channel modules:

Up to 500 per port (dedicated-mode ports) standard
Up to 4095 on an individual port (dedicated-mode ports with optional Cisco MDS 9700 Enterprise Package license activated)

Ports per chassis

Up to 384 2/4/8-Gbps, 4/8/16-,Gbps or 10-Gbps Fibre Channel ports

Ports per rack

Up to 1152 2/4/8-Gbps, 4/8/16-Gbps, or 10-Gbps Fibre Channel ports

PortChannel: Up to 16 ports (the channel can span any speed-matched port on any module in the chassis)

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Feature	Description
Features and Functions	
Fabric Services	• Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Broadcast • In-order delivery
Advanced Functionality	• VSAN • IVR • PortChannel with multipath load balancing • QoS-flow-based, zone-based • 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 RBAC • Fibre Channel zoning ◦ N_Port Worldwide Name (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 • FC-SP[1] ◦ DH-CHAP switch-switch authentication ◦ DH-CHAP host-switch authentication • Port security and fabric binding • Management access ◦ SSHv2 implementing Advanced Encryption Standard (AES) ◦ SNMPv3 implementing AES ◦ SFTP • Cisco TrustSec Fibre Channel Link Encryption[1]
FICON[1]	• FC-SB-3 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel FCP traffic • FICON CUP management interface
Serviceability	• Configuration file management • Nondisruptive software upgrades for Fibre Channel interfaces • Cisco Call Home • Power-management LEDs • Port beaconing • System LEDs • SNMP traps for alerts • Network boot

<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td>Reliability and Availability</td><td>

Online, nondisruptive software upgrades
Stateful nondisruptive supervisor module failover
Hot-swappable redundant supervisor modules
Hot-swappable redundant Fabric modules*
Hot-swappable 2N redundant power
Hot-swappable fan trays with integrated temperature and power management
Hot-swappable Enhanced Small Form-Factor Pluggable (SFP+) optics (2/4/8/10/16-Gbps Fibre Channel and 10 Gigabit Ethernet)
Hot-swappable switching modules
Stateful process restart
Any module, any port configuration for PortChannels
Fabric-based multipathing
Per-VSAN fabric services
Online diagnostics
Port tracking
Virtual Routing Redundancy Protocol (VRRP) for management

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<tr><td>Network Management</td><td>

Access methods through Cisco MDS 9700 Series Supervisor-1 Module

Out-of-band 10/100/1000 Ethernet port
RS-232 serial console port
In-band IP over Fibre Channel

Access methods through Cisco MDS 9700 Series Fibre Channel switching module

In-band FICON CUP over Fibre Channel

Access protocols

CLI using console and Ethernet ports
SNMPv3 using Ethernet port and in-band IP over Fibre Channel access
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 Prime DCNM

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<tr><td>Programming Interface</td><td>

Scriptable CLI
Cisco Prime Data Center Network Manager web services API
Cisco Prime DCNM GUI

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<tr><td>Power and Cooling</td><td>

Power supplies (3000W AC)

Input: 100 to 240V AC nominal (±10% for full range); 16A nominal; 50 to 60 Hz nominal (±3 Hz for full range)
Output: 1451W 50V ±4%/28A, 3.4V ±4%/15A (100 to 120V AC input), 3051W 50V ±4%/60A, and 3.4V ±-4%/15A (200 to 240V AC input)

Airflow
The Cisco MDS 9710 provides 700 linear feet per minute (LFM) average system velocity, and between 40 and 160 cubic feet per minute (CFM) total flow through each line-card slot depending on the line-card type and fan-speed setting.
With the Cisco MDS 9710 using front-to-back cold-aisle and hot-aisle air flow, Cisco recommends that you maintain a minimum air space of 7 inches (17.78 cm) between walls, such as in a cabinet, and the chassis front and back air vents.

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<tr><td>Power consumption (typical)</td><td>
<table>
<tr><th colspan="2">Cisco MDS 9710 with 3 Fabrics (Watts [W])</th></tr>
<tr><th>Ports</th><th>Watts</th></tr>
<tr><td>192</td><td>2695</td></tr>
<tr><td>288</td><td>3655</td></tr>
<tr><td>384</td><td>4615</td></tr>
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Feature	Description
Environmental	• Temperature, ambient operating: 32 to 104℉ (0 to 40℃) • Temperature, ambient nonoperating and storage: -40 to 158℉ (-40 to 70℃) • 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 (H x W x D)	• Chassis dimensions (14 rack units [14RU]): 24.35 x 17.3 x 34.0 in. (61.9 x 43.9 x 86.4 cm) • Cisco MDS 9700 48-Port 16-Gbps Fibre Channel Line Card: 1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm) • Power supply (3000W AC): 22.04 x 3.95 x 1.6 in. (55.98 x 10.03 x 4.06 cm) • Power supply (3000W DC): 23.54 x 3.95 x 1.6 in. (59.79 x 10.03 x 4.06 cm) • Fabric-1 module: 18.09 x 2.02 x 9.22 in. (45.95 x 5.13 x 23.42 cm) • Supervisor-1 module: 2.04 x 7.5 x 21.8 in. (5.18 x 19.05 x 55.37 cm) • Fan tray: 23.54 x 5.15 x 4.09 in. (59.79 x 13.08 x 10.39 cm) • SFP+: 0.49 x 0.54 x 2.22 in. (1.25 x 1.36 x 5.65 cm)
Weight per	• Chassis (includes fans): 185.5 lb (84.2 kg) • 48-port 16-Gbps Fibre Channel line card: 17 lb (7.71 kg) • Power supply (3000W AC): 6 lb (2.7 kg) • Fabric-1 module: 11 lb (5.0 kg) • Supervisor-1 module: 7 lb (3.2 kg) • Fan tray: 8.5 lb (3.86 kg) • Supervisor blank cover: 1.25 lb (0.57 kg) • Line card blank cover: 4.5 lb (2.04 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 • FIPS certified • FIPS 140-2 Level 2

* A minimum of three fabrics are needed to support a fully populated chassis with eight Cisco MDS 9700 48-Port 16-Gbps Fibre Channel cards; four fabrics are needed to provide N+1 redundancy.

Ordering Information

Table 3 provides ordering information for the Cisco MDS 9710 Multilayer Director.

Table 3. Ordering Information

Part Number	Product Description
MDS 9700 Component	
DS-C9710	MDS 9710 Chassis, No Power Supplies, Fans Included
DS-X97-SF1-K9	MDS 9700 Series Supervisor-1
DS-X9710-FAB1	MDS 9710 Crossbar Switching Fabric-1 Module
DS-CAC97-3KW	MDS 9700 3000W AC power supply
DS-CDC97-3KW	MDS 9700 3000W DC power supply
DS-X9448-768K9	48-Port 16-Gbps Fibre Channel Switching Module
DS-C9710-1K9	MDS 9710 Base Config: Chassis, 2 Sup-1, 3 Fabric-1, 6 3K AC
DS-C9710-1EK9	MDS 9710 Enhanced Config: Chassis, 2 Sup-1, 6 Fabric-1, 8 3K AC
DS-C9710-4BSK9	MDS 9710 Bundle Config Chassis Sup-1 3 Fab-1 3 PS AC 3K 4 Modules 16G SFP+ Licenses Enterprise
DS-C9710-4B8K9	MDS 9710 Bundle Config Chassis Sup-1 3 Fab-1 3 PS AC 3K 4 Modules 8G SFP+ Licenses Licenses Enterprise
DS-SFP-FC16G-SW	16 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC16G-LW	16 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC10G-SW	10 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC10G-LW	10 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC8G-SW	8 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC8G-LW	8 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC8G-ER	8 Gbps Fibre Channel Extended Reach SFP+, LC
SFP-10G-SR	10GBASE-SR SFP Module
SFP-10G-LR	10GBASE-LR SFP Module
SFP-10G-ER	10GBASE-ER SFP Module
CAB-9K16A-AUS	Power cord 250VAC 16A, Australia, source plug AU20S3
CAB-9K16A-CH	Power cord 250VAC 16A, China, source plug GB16C
CAB-9K16A-EU	Power cord 250VAC 16A, Europe, source plug CEE 7/7
CAB-9K16A-INT	Power cord 250VAC 16A, international, source plug IEC 309
CAB-9K16A-ISR	Power cord 250VAC 16A, Israel, source plug SI16S3
CAB-9K16A-SA	Power cord 250VAC 16A, South Africa, source plug EL 208, SABS 164-1
CAB-9K16A-SW	Power cord 250VAC 16A, Switzerland, source plug SEV 5934-2 Type 23
CAB-9K16A-US1	Power cord 250VAC 16A, United States/Japan, source plug NEMA 6-20
CAB-9K16A-US2	Power cord 250VAC 16A, United States/Japan, source plug NEMA L6-20
CAB-9K20A-NA	Power Cord, 125VAC 20A NEMA 5-20 Plug, North America/Japan
CAB-9K16A-KOR	Power Cord 250VAC 16A, Korea, Src Plug
CAB-9K16A-ARG	Power Cord 250VAC 16A, Argentina, Src Plug IR2073-C19
CAB-9K16A-BRZ	Power Cord 250VAC 16A, Brazil, Src Plug EL224-C19
CAB-C19-CBN	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors
DS-C9710-FD-MB	MDS 9710 - Front Door Kit

Part Number	Product Description
Licensed Software	
M97ENTK9	Enterprise package license for 1 MDS9700 switch
DCNM-SAN-M97-K9	DCNM for SAN License for MDS 9700
Spare Component	
DS-C9710=	MDS 9710 Chassis, Spare, No Power Supplies, Fans Included
DS-X97-SF1-K9=	MDS 9700 Series Supervisor-1
DS-X9710-FAB1=	MDS 9710 Crossbar Switching Fabric-1 Module
DS-CAC97-3KW=	MDS 9700 3000W AC power supply
DS-CDC97-3KW=	MDS 9700 3000W DC power supply
DS-C9710-FAN=	MDS 9710 FAN Tray
DS-X9448-768K9=	48-Port 16-Gbps Fibre Channel Switching Module
DS-X9448768B8K9=	MDS 9700 48-port 16Gbps FC Module + 48 8-Gbps SW SFP+, Spare
DS-X9448768BSK9=	MDS 9700 48-port 16Gbps FC Module + 48 16-Gbps SW SFP+, Spare
DS-SFP-FC16G-SW=	16 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC16G-LW=	16 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC10G-SW=	10 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC10G-LW=	10 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC8G-SW=	8 Gbps Fibre Channel SW SFP+, LC
DS-SFP-FC8G-LW=	8 Gbps Fibre Channel LW SFP+, LC
DS-SFP-FC8G-ER=	8 Gbps Fibre Channel Extended Reach SFP+, LC
SFP-10G-SR=	10GBASE-SR SFP Module
SFP-10G-LR=	10GBASE-LR SFP Module
SFP-10G-ER=	10GBASE-ER SFP Module
CAB-9K16A-AUS=	Power cord 250VAC 16A, Australia, source plug AU20S3
CAB-9K16A-CH=	Power cord 250VAC 16A, China, source plug GB16C
CAB-9K16A-EU=	Power cord 250VAC 16A, Europe, source plug CEE 7/7
CAB-9K16A-INT=	Power cord 250VAC 16A, international, source plug IEC 309
CAB-9K16A-ISR=	Power cord 250VAC 16A, Israel, source plug SI16S3
CAB-9K16A-SA=	Power cord 250VAC 16A, South Africa, source plug EL 208, SABS 164-1
CAB-9K16A-SW=	Power cord 250VAC 16A, Switzerland, source plug SEV 5934-2 Type 23
CAB-9K16A-US1=	Power cord 250VAC 16A, United States/Japan, source plug NEMA 6-20
CAB-9K16A-US2=	Power cord 250VAC 16A, United States/Japan, source plug NEMA L6-20
CAB-9K20A-NA=	Power Cord, 125VAC 20A NEMA 5-20 Plug, North America/Japan
CAB-9K16A-KOR=	Power Cord 250VAC 16A, Korea, Src Plug
CAB-9K16A-ARG=	Power Cord 250VAC 16A, Argentina, Src Plug IR2073-C19
CAB-9K16A-BRZ=	Power Cord 250VAC 16A, Brazil, Src Plug EL224-C19
CAB-C19-CBN=	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors
DS-C9710-FD-MB=	MDS 9710 - Front Door Kit

Part Number	Product Description
Licensed Software	
M97ENTK9=	Enterprise package license for 1 MDS9700 switch
L-M97ENTK9=	E-delivery Enterprise package license for 1 MDS9700 switch
DCNM-SAN-M97-K9=	DCNM for SAN License for MDS 9700
L-DCNM-S-M97-K9=	E-delivery DCNM for SAN Package Advanced Edition for MDS 9700

[1] This feature will be supported in a future software release.

Service and Support

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For More Information

For detailed information about supported optics, see Cisco MDS 9000 Family Pluggable Transceivers.

For more information about the Cisco MDS 9710, visit http://www.cisco.com/go/storage or contact your local account representative.

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