

Cisco MDS 9509 Multilayer Director

Cisco MDS 9509 Highlights

- **High availability director:** The Cisco MDS 9509 combines non-disruptive software upgrades, stateful process restart/failover, and full redundancy of all major components for a new standard in director-class availability; supports up to 224 1/2-Gbps auto-sensing Fibre Channel ports in a single chassis and up to 672 Fibre Channel ports in a single rack—1.44 Tbps of internal system bandwidth ensures smooth integration of future 10-Gbps modules.
- **TCO driven design:** The Cisco MDS 9509 offers advanced management tools for overall lowest total cost of ownership (TCO). 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/multitransport:** The multilayer architecture of the Cisco MDS 9509 enables a consistent feature set over a protocol agnostic switch fabric; seamlessly integrates Fibre Channel, iSCSI, and FCIP in one system. Flexible architecture allows integration of future storage protocols.
- **Intelligent network services:** The Cisco MDS 9509 introduces 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 QoS to enable migration from SAN islands to multilayer storage networks.
- **Open platform for network-hosted storage applications:** The Cisco MDS 9509 provides an open platform for hosting intelligent storage services such as network-based virtualization and replication. Storage services modules can be installed in any MDS 9500 Series or MDS 9200 Series chassis to provide scalable distributed application intelligence in the fabric.
- **Comprehensive security framework:** The Cisco MDS 9509 supports RADIUS authentication, SNMPv3, role-based access control, SSH, SFTP, FC-SP, VSANs, hardware-enforced zoning, and ACLs.
- **Sophisticated diagnostics:** Provides industry-first 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.
- **Unified storage management:** The Cisco MDS 9509 includes built-in storage network management with all features available via CLI or Cisco Fabric Manager, a centralized management tool that simplifies management of multiple switches and fabrics.

Figure 1

The Cisco MDS 9509 Multilayer Director—Layering Intelligent Features onto a High Performance Core to Provide Uncompromising High Availability, Security, Scalability, Ease of Management and Seamless Integration of New Technologies





- Industry's highest performance Inter Switch Links (ISLs): The Cisco MDS 9509 supports up to sixteen 2-Gbps links in a single PortChannel—links may span any port on any module within a chassis for added scalability and resilience.
- Flexibility and investment protection: The MDS 9509 shares common switching modules across all Cisco MDS 9500 Series products as well as the MDS 9216 Multilayer Fabric Switch.

Cisco MDS 9509—Defining the Multilayer Director

Part of the Cisco MDS 9500 Series, the Cisco MDS 9509 Multilayer Director elevates the standard for director-class switches. Providing industry-leading availability, scalability, security, and management, the Cisco MDS 9509 allows you to deploy high performance storage-area networks with lowest total cost of ownership. Layering a rich set of intelligent features onto a high performance, protocol agnostic switch fabric, the Cisco MDS 9509 Multilayer Directors addresses the stringent requirements of large data center storage environments: uncompromising high availability, security, scalability, ease of management, and seamless integration of new technologies.

High Availability

The Cisco MDS 9509 Multilayer Director was designed from the ground up for high availability. Beyond meeting the basic requirements of non-disruptive software upgrades and redundancy of all critical hardware components, the Cisco MDS 9509 software architecture offers an unparalleled level of availability. The Cisco MDS 9500 Supervisor Module has the unique ability to automatically restart failed processes, making it exceptionally robust. In the rare event that a Supervisor Module is reset, complete synchronization between the active and standby Supervisor Modules ensures stateful failover with no disruption to traffic.

High availability is implemented at the fabric level via the industry's most robust and highest performance ISLs. PortChannel capability allows users to aggregate up to 16 physical links into one logical bundle. The bundle can consist of any port in the chassis, ensuring that the bundle remains active in the event of a port, ASIC, or module failure. The bundle can sustain the failure of any physical link without causing a reset. Additionally, Fabric Shortest Path First (FSPF) multipathing provides the intelligence to load balance across up to 16 equal cost paths and, in the event of a switch failure, to dynamically reroute traffic. The Cisco MDS 9509 takes high availability to a new level, ensuring ultra-high availability solutions that exceed the 99.999 percent uptime requirements of today's most demanding environments.

Scalable Expansion with Maximum Investment Protection

Leveraging Cisco MDS 9000 Family switching modules, the Cisco MDS 9509 supports from 16 to 224 1/2-Gbps auto-sensing Fibre Channel ports and from 8 to 48 1-Gbps Ethernet ports (user configurable for iSCSI or FCIP) in a 9-slot modular chassis. The Cisco MDS 9509 Multilayer Director provides up to 672 Fibre Channel ports in a single rack. With 1.44 Tbps of internal bandwidth, the Cisco MDS 9509 is ready for future 10-Gbps integration.

The Cisco MDS 9509 Multilayer Director provides the highest possible level of system commonality. The Cisco MDS 9509 power supplies can be migrated between Cisco MDS 9500 Series chassis using the power management feature. All Cisco MDS 9000 Family switching modules are compatible with each Cisco MDS 9500 Series Multilayer Director. Designed to grow with your storage environment, the Cisco MDS 9509 provides smooth migration, common sparing, and outstanding investment protection.



Introducing the VSAN

Another industry first for the Cisco MDS 9509 Multilayer Directors, VSANs allow more efficient SAN utilization by creating hardware-based isolated environments within a single SAN fabric. 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 assuring absolute segregation and security of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

Multiprotocol Intelligence for Investment Protection

The Cisco MDS 9509 Multilayer Directors' unique architecture allows seamless integration of new transport protocols for maximum flexibility. Beginning with Fibre Channel, iSCSI, and FCIP, the Cisco MDS 9509 is a robust multiprotocol 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, and FCIP for connectivity between data centers. The Cisco MDS 9509 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.

Open Platform for Network-Hosted Storage Applications

The Cisco MDS 9000 platform provides the open platform that delivers the intelligence and advanced features required to make multilayer intelligent storage area networks a reality, including hardware-enabled innovations that dramatically improve scalability, availability, security, and manageability of storage networks—resulting in increased utility and lower total cost of ownership (TCO).

Comprehensive Security

Recognizing the need for airtight security in storage networks, the Cisco MDS 9509 Multilayer Director applies extensive security measures at all possible points of attack. SSH, RADIUS, SNMPv3, and Role Based Access Control are employed against unauthorized management access. To guard against compromising control traffic, Fibre Channel Security Protocol is employed. FC-SP provides data origin authentication. Data plane traffic is secured with VSANs, guaranteeing segregation of traffic across shared fabrics, and with zoning to satisfy traffic segregation requirements within a VSAN. Hardware-based ACLs provide further granularity for advanced security options. The Cisco MDS 9509 leverages Cisco's experience securing the world's most sensitive data networks to deliver the industry's most secure storage networking platform.

Advanced Diagnostics and Troubleshooting Tools

Multilayer intelligence within the Cisco MDS 9509 Multilayer Director includes advanced network analysis and debug tools. For fault management in large-scale storage networks, the Cisco MDS 9509 delivers commands such as FC Traceroute for detailing the exact path and timing of flows and uses Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN) to efficiently capture network traffic. Once traffic has been captured, it can then be analyzed with Cisco Fabric Analyzer, an embedded Fibre Channel analyzer. In addition, integrated Call Home capability is provided for added reliability, faster problem resolution, and reduced service costs. With the Cisco MDS 9509 Multilayer Director, Cisco delivers the most comprehensive toolset for troubleshooting and analysis of an organization's storage network.



Ease-of-Management

Delivering on the promise of SANs means delivering on management capabilities. To meet the needs of all users, the Cisco MDS 9509 Multilayer Director 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 9509 presents the user with a consistent, logical CLI. Adhering to the syntax of widely known Cisco IOS[®] CLI, the Cisco MDS 9000 Family CLI is easy to learn and delivers broad management functionality. 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, which enables 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.

Specifications

Availability

- Online, non-disruptive software upgrades
- Stateful Supervisor Module failover
- Hot swappable redundant Supervisor Module
- Hot swappable 1+1 redundant power
- Hot-swappable fan tray with integrated temperature and power management
- Hot swappable small form-factor pluggable (SFP) optics
- Hot swappable switching modules
- Stateful process restart
- Any module, any port configuration for PortChannels
- Fabric-based multipathing
- Per VSAN fabric services
- Passive backplane
- Online diagnostics

Performance/Scalability

- Port speed: 1/2-Gbps auto-sensing, optionally configurable
- Buffer credits: Up to 255 per port
- Ports per chassis: 16 to 224 1/2-Gbps FC ports, up to 48 1-Gbps Ethernet ports
- Ports per rack: 672 1/2-Gbps Fibre Channel ports
- PortChannel: Up to 16 2-Gbps ports (the channel can span any port on any module in the chassis)
- Supported optics, media, and transmission distances:

Optics	Media	Distance
1-Gbps—SW, LC SFP	50/125 micron multimode	500 m
1-Gbps—SW, LC SFP	62.5/125 micron multimode	300 m
1-Gbps—LW, LC SFP	9/125 micron single-mode	10 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

Security

- Virtual SANs (VSANs)
- Zoning
 - N_Port worldwide name (WWN)
 - N_Port FC-ID
 - Fx_Port WWN
 - LUN
 - Read/Write Privilege
- Fibre Channel Security Protocol (FC-SP)
- Management access
 - SSH v2
 - SNMP v3
 - Compatibility
- Fibre Channel Protocols
 - FC-PH, Revision 4.3
 - FC-PH-2, Revision 7.4
 - FC-PH-3, Revision 9.4
 - FC-GS-2, Revision 5.3
 - FC-GS-3, Revision 7.01
 - FC-FLA, Revision 2.7
 - FC-FG, Revision 3.5
 - FC-SW-2, Revision 5.3
 - FC-AL, Revision 4.5
 - FC-AL-2, Revision 7.0
 - FC-PLDA, Revision 2.1
 - FC-VI, Revision 1.61
 - FCP, Revision 12
 - FCP-2, Revision 7a
 - FC-SB-2, Revision 2.1
 - FC-BB, Revision 4.7
 - FC-FS, Revision 1.7
 - FC-PI, Revision 13
- FC-MI, Revision 1.99
- FC-Tape, Revision 1.17
- IP over Fibre Channel (RFC 2625)
- Extensive IETF-standards based TCP/IP, SNMP v3, and RMON MIBs
- Class of service: Class 2, Class 3, Class F
- Fibre Channel standard port types: E, F, FL
- Fibre Channel enhanced port types: SD, TE, TL

Fabric Services

- Name server
- Registered State Change Notification (RSCN)
- Login services
- Private loop
- Public loop
- Translative loop
- Broadcast
- In-order delivery
- Name server zoning

Diagnostics and Troubleshooting Tools

- Power-on-self-test (POST) diagnostics
- Online diagnostics
- Internal loopbacks
- SPAN, RSPAN
- FC Traceroute
- FC Ping
- FC Debug
- Cisco Fabric Analyzer
- Syslog
- Online system health
- Port-level statistics

Management

- Access methods
 - Out-of-band 10/100 Ethernet port
 - RS-232 serial console port
 - In-band IP-over-FC
 - DB-9 COM port
- Access protocols
 - CLI—via console and Ethernet ports
 - SNMPv3—via Ethernet port and in-band IP-over-FC access

Security

- Role-based access control using RADIUS based AAA functions
- SSHv2
- SNMPv3
- Management Applications
 - Cisco MDS 9000 Family CLI
 - Cisco Fabric Manager
 - CiscoWorks 2000 Resource Manager Essentials
- One Compact Flash drive per Supervisor Module for onboard storage of management files

Serviceability

- Non-disruptive software upgrades
- Configuration file management
- Call Home
- Power management
- Port beaconing
- System LEDs
- SNMP traps for alerts
- Network boot

Environmental

- Temperature, ambient operating
 - 32 F (0 C) to 104 F (40 C)
- Temperature, ambient non-operating and storage
 - -40 F (-40 C) to 158 F (70 C)
- Humidity (RH), ambient (non-condensing) operating
 - 10% to 90%
- Humidity (RH), ambient (non-condensing) non-operating and storage
 - 5% to 95%
- Altitude, operating
 - -197 to 6500 ft (-60 to 2000 m)

Physical Characteristics

- Dimensions (H x W x D)
 - 24.5 x 17.25 x 18.4 in. (62.3 x 43.9 x 46.8 cm)—14 RU
 - Chassis depth including cable guide is 21.64 in. (55.0 cm). All units rack mountable in standard 19 inch EIA rack
- Weight
 - Chassis only: 55 lb (25 kg)
 - Chassis fully configured with 2 supervisor/fabric modules, 7 switching modules, and (2) 2500W power supplies: 170 lb (78kg)

Power and Cooling

- Power Supplies (2500W AC)
 - Input: 100-240V AC nominal (10% for full range)
 - 16A maximum
 - 50-60Hz nominal (3 Hz for full range)
 - Output: 1300W (100V AC @ 16A)
2500W (200V AC @ 16A)
- Power Supplies (2500W DC)
 - Input: -48 to -60V DC continuous @ 80A
 - Output: 2500W (-48 to -60V DC)
- Airflow
 - 300 lfm¹ through system fan assembly
 - 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.

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



Ordering Information

Part Number	Description
DS-C9509	MDS 9509 chassis
DS-X9530-SF1-K9	MDS 9500 Supervisor 1
DS-CAC-2500W	MDS 9500 Power Supply, 2500W AC
DS-CDC-2500W	MDS 9500 Power Supply, 2500W DC
Switching Modules, SFPs	
DS-X9016	Cisco MDS 9000 Family 16-port 1/2-Gbps FC Module, SFP/LC
DS-X9032	Cisco MDS 9000 Family 32-port 1/2-Gbps FC Module, SFP/LC
DS-X9032-SMV	Cisco MDS 9000 Advanced Services Module
DS-X9560-SMC	Cisco MDS 9000 Caching Services Module
DS-SFP-FC-2G-SW	1/2-Gbps Fibre Channel-SW, Small Form Factor Pluggable, LC
DS-SFP-FC-2G-LW	1/2-Gbps Fibre Channel-LW, Small Form Factor Pluggable, LC
DS-X9308-SMIP	Cisco MDS 9000 Family 8-port 1-Gbps IP Storage Services Module, SFP/LC
DS-SFP-FCGE-SW	1-Gbps Ethernet and 1/2-Gbps Fibre Channel-SW, Small Form Factor Pluggable, LC
DS-SFP-FCGE-LW	1-Gbps Ethernet and 1/2-Gbps Fibre Channel-LW, Small Form Factor Pluggable, LC
CWDM-SFP-1470-2G	1470 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1490-2G	1490 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1510-2G	1510 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1530-2G	1530 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1550-2G	1550 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1570-2G	1570 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1590-2G	1590 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
CWDM-SFP-1610-2G	1610 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP
Spare Components	
DS-C9509=	MDS 9509 Chassis (spare)
DS-X9530-SF1-K9=	MDS 9500 supervisor 1 (spare)
DS-9SLOT-FAN=	MDS 9509 Fan Module (spare)
DS-CAC-2500W=	MDS 9509 Power Supply, 2500W AC (spare)
DS-CDC-2500W=	MDS 9509 Power Supply, 2500W DC (spare)
DS-X9016=	Cisco MDS 9000 Family 16-port 1/2-Gbps FC Module, SFP/LC (spare)
DS-X9032=	Cisco MDS 9000 family 32-port 1/2-Gbps FC Module, SFP/LC (spare)
DS-X9032-SMV=	Cisco MDS 9000 Advanced Services Module (spare)

Part Number	Description
DS-X9560-SMC=	Cisco MDS 9000 Caching Services Module (spare)
DS-SFP-FC-2G-SW=	1/2-Gbps Fibre Channel-SW, Small Form Factor Pluggable, LC (spare)
DS-SFP-FC-2G-LW=	1/2-Gbps Fibre Channel-LW, Small Form Factor Pluggable, LC (spare)
DS-X9308-SMIP=	Cisco MDS 9000 Family 8-port 1-Gbps IP Storage Services Module, SFP/LC (spare)
DS-SFP-FCGE-SW=	1 Gbps Ethernet and 2 Gbps Fibre Channel-SW, Small Form Factor Pluggable, LC (spare)
CWDM-SFP-1470-2G=	1470 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1490-2G=	1490 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1510-2G=	1510 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1530-2G=	1530 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1550-2G=	1550 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1570-2G=	1570 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1590-2G=	1590 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)
CWDM-SFP-1610-2G=	1610 NM CWDM Gigabit Ethernet and 2 Gbps Fibre Channel SFP (spare)



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the

Cisco Web site at www.cisco.com/go/offices

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia
Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland
Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland
Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden
Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

All contents are Copyright © 1992–2003 Cisco Systems, Inc. All rights reserved. CCIP, CCSP, the Cisco Arrow logo, the Cisco *Powered* Network mark, Cisco Unity, Follow Me Browsing, FormShare, and StackWise are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn, and iQuick Study are service marks of Cisco Systems, Inc.; and Aironet, ASIST, BPX, Catalyst, CCDA, CCDP, CCIE, CCNA, CCNP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, the Cisco IOS logo, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Empowering the Internet Generation, Enterprise/Solver, EtherChannel, EtherSwitch, Fast Step, GigaStack, Internet Quotient, IOS, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, LightStream, MGX, MICA, the Networkers logo, Networking Academy, Network Registrar, *Packet*, PIX, Post-Routing, Pre-Routing, RateMUX, Registrar, ScriptShare, SlideCast, SMARTnet, StrataView Plus, Stratm, SwitchProbe, TeleRouter, The Fastest Way to Increase Your Internet Quotient, TransPath, and VCO are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company.
(0304R) ETMG 203154—LSK 10/03