Cisco MDS 9506 Multilayer Director

Product Overview

The Cisco® MDS 9506 Multilayer Director provides industry-leading availability, scalability, security, and management. The Cisco MDS 9506 (Figure 1) allows you to deploy high-performance storage-area networks (SANs) with lowest total cost of ownership (TCO). Layering a rich set of intelligent features onto a high-performance, protocol-independent switch fabric, the Cisco MDS 9506 addresses the stringent requirements of large data center storage environments: uncompromising high availability, security, scalability, ease of management, and transparent integration of new technologies. Compatible with first, second, and third generation Cisco MDS 9000 Family switching modules, the Cisco MDS 9506 provides advanced functionality and unparalleled investment protection, allowing the use of any Cisco MDS 9000 Family switching module in this compact system.

Figure 1. Cisco MDS 9506 Multilayer Director

Features and Benefits

The Cisco MDS 9506 offers the following benefits:

- **Scalability and Availability:** The Cisco MDS 9506 combines nondisruptive software upgrades, stateful process restart/failover, and full redundancy of all major components for best-in-class availability. Supporting up to 192 Fibre Channel ports in a single chassis, up to 1152 Fibre Channel ports in a single rack, the Cisco MDS 9506 is designed to meet the requirements of large data center storage environments.
- **Compact design:** The Cisco MDS 9506 provides high port density in a small footprint, saving valuable data center floor space. The seven-rack-unit chassis allows up to six Cisco MDS 9506 multilayer directors in a standard rack, maximizing the number of available Fibre Channel ports.
- **1/2/4/8-Gbps and 10-Gbps Fibre Channel:** Supports new 8-Gbps as well as existing 10-Gbps, 4-Gbps, and 2-Gbps MDS Fibre Channel switching modules.
- **Flexibility and investment protection:** Supports mix of mix of new, second, and first generation Cisco MDS 9000 Family modules providing forward and backward compatibility and unparalleled investment protection.
- **TCO driven design:** The Cisco MDS 9506 offers advanced management tools for overall lowest TCO. It includes VSAN technology for hardware-enforced, isolated environments within a single physical fabric for secure sharing of physical infrastructure, further decreasing TCO.

- **Multiprotocol:** The multilayer architecture of the Cisco MDS 9000 Family enables a consistent feature set over a protocol-independent switch fabric. The Cisco MDS 9506 transparently integrates Fibre Channel, IBM Fiber Connection (FICON), Small Computer System Interface over IP (iSCSI), and Fibre Channel over IP (FCIP) in one system.
- **Intelligent network services:** Provides integrated support for VSAN technology, access control lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic-management features such as Fibre Channel Congestion Control (FCC) and fabric-wide quality of service (QoS) to enable migration from SAN islands to enterprise-wide storage networks.
- **Integrated Cisco Storage Media Encryption (SME) as distributed fabric service:** Supported on the Cisco MDS 18/4-Port Multiservice Module, Cisco SME encrypts data at rest on heterogeneous tape drives and virtual tape libraries (VTLs) in a SAN environment using secure IEEE standard Advanced Encryption Standard (AES) 256-bit algorithms. Cisco MDS 18/4-Port Multiservice Module helps ensure ease of deployment, scalability, and high availability by using innovative technology to transparently offer Cisco SME capabilities to any device connected to the fabric without the need for reconfiguration or rewiring. Cisco SME provisioning is integrated into the Cisco Fabric Manager; no additional software is required. Cisco SME key management can be provided by either the Cisco Key Management Center (KMC) or with RSA Key Manager for the Datacenter from RSA, the Security Division of EMC.
- **Open platform for intelligent storage applications:** Provides the intelligent services necessary for hosting and/or accelerating storage applications such as network-hosted volume management, data migration and backup.
- **Integrated hardware-based VSANs and Inter-VSAN Routing (IVR):** Enables deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port within a system or fabric to be partitioned into any VSAN. Integrated hardware-based inter-VSAN routing provides line-rate routing between any ports within a system or fabric without the need for external routing appliances
- **Advanced FICON services:** Supports 1/2/4-Gbps FICON environments, including cascaded FICON fabrics, VSAN-enabled intermix of mainframe and open systems environments, and N_Port ID virtualization for mainframe Linux partitions. CUP (Control Unit Port) support enables in-band management of Cisco MDS 9000 Family switches from the mainframe management console.
- **Comprehensive security framework:** Supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN role-based access control.
- **Sophisticated diagnostics:** Provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated Call Home capability for added reliability, faster problem resolution, and reduced service costs.
- **Unified SAN management:** The Cisco MDS 9000 Family includes built-in storage network management with all features available through a command-line interface (CLI) or Cisco Fabric Manager, a centralized management tool that simplifies management of multiple switches and fabrics. Integration with third party storage management platforms allows seamless interaction with existing management tools.
- **Cisco TrustSec Fibre Channel Link Encryption:** Delivers transparent, hardware-based, line-rate encryption of Fibre Channel data between any Cisco MDS 9000 Family 8-Gbps modules.

High Availability

The Cisco MDS 9506 Multilayer Director was designed from the beginning for high availability. Beyond meeting the basic requirements of nondisruptive software upgrades and redundancy of all critical hardware components, the Cisco MDS 9506 software architecture offers an unparalleled level of availability. The Cisco MDS 9500 Series 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 using robust and high-performance ISLs. PortChannel capability allows users to aggregate up to 16 physical links into one logical bundle. The bundle can consist of any speed-matched port in the chassis, ensuring that the bundle can remain active in the event of a port, ASIC, or module failure. The Cisco MDS 9506 takes high availability to a new level, ensuring ultrahigh-availability solutions that exceed the 99.999 percent uptime requirements of today's most demanding environments.

Scalable Expansion with Maximum Investment Protection

The Cisco MDS 9506 is designed to make optimal use of valuable data center floor space. It is just 12.25 inches tall (seven rack units), with single-side connection management for both interface and power terminations. This space-efficient design allows deployment of up to six Cisco MDS 9506 multilayer directors per standard 7-foot rack (42 rack unit), maximizing the number of available Fibre Channel ports per rack.

Using Cisco MDS 9000 Family Switching Modules, the Cisco MDS 9506 supports from 24 to 192 1/2/4/8-Gbps auto-sensing Fibre Channel ports, from 4 to 16 10-Gbps Fibre Channel ports, and from 4 to 52 1-Gbps Ethernet ports in a 6-slot modular chassis. The Cisco MDS 9506 provides up to 1152 Fibre Channel ports in a single rack.

The Cisco MDS 9506 provides a very high level of system commonality. All Cisco MDS 9000 Family Fibre Channel Switching Modules are compatible with each Cisco MDS 9500 Series Multilayer Director. Designed to grow with your storage environment, the Cisco MDS 9506 provides smooth migration, common sparing, and outstanding investment protection.

Virtual Machine Transparency

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

Virtual SANs

Ideal for efficient, secure SAN consolidation, VSANs allow more efficient storage network utilization by creating hardware-based isolated environments with a single physical SAN fabric or switch. Each VSAN can be zoned as a typical SAN and maintains its own fabric services for added scalability and resilience. VSANs allow the cost of SAN infrastructure to be shared among more users, while ensuring absolute segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

Integrated SAN Routing

In another step toward deploying efficient, cost-effective, consolidated storage networks, the Cisco MDS 9506 Multilayer Director supports IVR, the industry's first routing functionality for Fibre Channel. IVR allows selective transfer of data between specific initiators and targets on different VSANs while maintaining isolation of control traffic within each VSAN. With IVR, data can transit VSAN boundaries while maintaining control plane isolation, thereby

maintaining fabric stability and availability. Integrated IVR eliminates the need for external routing appliances, greatly increasing routing scalability while delivering line-rate routing performance, simplifying management, and eliminating the challenges associated with maintaining separate systems. Integrated IVR means lower total cost of SAN ownership.

Multiprotocol Intelligence

As with all Cisco MDS 9500 Series Multilayer Directors, the MDS 9506 architecture enables multilayer and multiprotocol functionality, allowing it to transparently integrate multiple transport technologies for maximum flexibility. Beginning with Fibre Channel, FICON, iSCSI, and FCIP, the Cisco MDS 9506 is a robust multiprotocol platform designed for deployment of cost-optimized storage networks. Users can implement up to 10-Gbps Fibre Channel or FICON for high-performance applications, iSCSI over Ethernet for cost-effective connectivity to shared storage pools, and FCIP for connectivity between data centers.

Cisco Storage Media Encryption

The services provided by Cisco Storage Media Encryption (SME) are mandatory in today's storage area networks as a result of enactment of recent regulations that require companies to store and protect data at rest for a specified number of years while publicly disclosing security breaches. Cisco SME enables data on tapes and VTLs to be compressed, encrypted, and authenticated for centralized security management and data management and recovery. Cisco SME is supported on the Cisco MDS 9000 16-Port Gigabit Ethernet Storage Services Node (SSN) and the Cisco MDS 9000 18/4-Port Multiservice Module (MSM). Cisco SME services employ clustering technology to create a highly available solution. The cryptographic cluster formed enhances reliability and availability, provides automated load balancing and failover capabilities, and simplifies provisioning as a single SAN fabric service rather than as individual switches or modules. The Cisco Key Management Center (KMC) provides comprehensive key management for Cisco SME, with support for single- and multiple-site deployments. Cisco KMC provides essential features such as key archival, secure export and import and translation for distribution, and key shredding. Cisco SME can also be combined with RSA Key Manager for the Datacenter from RSA, the Security Division of EMC, to provide a highly capable offering for securing data on tape.

Cisco Data Mobility Manager

The Cisco Data Mobility Manager (DMM) is a fabric-based data migration solution that transfers block data nondisruptively across heterogeneous storage volumes and across distances, whether the host is online or offline. This data-center class solution helps minimize the challenges experienced in migrating data, such as downtime, the need to add data migration software to servers, and the potential for data loss and corruption. Enabling the Cisco DMM feature on the Cisco MDS 9000 18/4-Port Multiservice Module or the Cisco MDS 9000 32-Port Storage Services Modules (SSMs) located anywhere in the SAN allows data migration to be configured without host agents, without rewiring, with minimal effect on performance, and without downtime.

Open Platform for Intelligent Storage Applications

The Cisco MDS 9506 multilayer director provides an open platform that delivers the intelligence and advanced features required to make multilayer intelligent SANs a reality, including hardware-enabled innovations to host or accelerate applications for data migration, data replication, serverless backup, network-hosted volume management and more. Hosting and/or accelerating these applications in the network can dramatically improve scalability, availability, security and manageability of the storage environment-resulting in increased utility and lower total cost of ownership (TCO).

Integrated Mainframe Support

The Cisco MDS 9506 multilayer director is mainframe-ready with full support for IBM System z FICON and Linux environments. Qualified by IBM for attachment to all FICON-enabled devices in an IBM System z operating environment, the Cisco MDS 9506 multilayer director supports transport of the FICON protocol in both cascaded and non-cascaded fabrics, as well as intermix of FICON and open systems Fibre Channel Protocol traffic on the same switch. Virtual SANs simplify intermix of SAN resources between z/OS, mainframe Linux, and open systems environments, allowing for increased SAN utilization and simplified SAN management. VSAN-based intermix mode eliminates the uncertainty and instability often associated with zoning-based intermix techniques. VSANs also eliminate the possibility of a misconfiguration or component failure in one VSAN affecting operation in other VSANs. VSAN-based management access control simplifies partitioning of SAN management responsibilities between mainframe and open systems environments, enhancing security. FICON VSANs can be managed using the integrated Cisco Fabric Manager; Cisco CLI; or IBM CUP-enabled management tools, including SA/390, Resource Measurement Facility (RMF), or Dynamic Channel Path Management (DCM). Extended Remote Copy (XRC) acceleration improves performance and bandwidth utilization over WAN links for IBM z/OS Global Mirror dynamic updates.

Advanced Traffic Management

Advanced traffic management capabilities integrated into the Cisco MDS 9506 Multilayer Director simplify deployment and optimization of large-scale fabrics.

- **Virtual output queuing:** Helps ensure line-rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- **Up to 4095 buffer-to-buffer credits:** Can be assigned to an individual port for optimal bandwidth utilization across distance.
- **PortChannels:** Allow users to aggregate up to 16 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links. The bundle can consist of any speed-matched ports from any module in the chassis, ensuring that the bundle can remain active even in the event of a module failure.
- **FSPF-based multipathing:** Provides the intelligence to load balance across up to 16 equal cost paths and, in the event of a switch failure, dynamically reroute traffic.
- **QoS:** Can be used to manage bandwidth and control latency to prioritize critical traffic.
- **Fibre Channel Congestion Control (FCC):** An end-to-end feedback-based congestion control mechanism that augments the Fibre Channel buffer-to-buffer credit mechanism to provide enhanced traffic management.
- **Port Bandwidth Reservation:** Allows users to define dedicated bandwidth on a per port basis.

Advanced Diagnostics and Troubleshooting Tools

Management of large-scale storage networks requires proactive diagnostics, tools to verify connectivity and route latency, and mechanisms for capturing and analyzing traffic. The Cisco MDS 9506 integrates advanced analysis and debug tools. Power-on self test (POST) and online diagnostics provide proactive health monitoring. The Cisco MDS 9506 provides the integrated functionality required to implement diagnostic capabilities such as Fibre Channel Traceroute for detailing the exact path and timing of flows, and Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN) to intelligently capture network traffic. After traffic has been captured, it can then be analyzed with the Cisco Fabric Analyzer, an embedded Fibre Channel analyzer. Comprehensive port-based and flow-based statistics enable sophisticated performance analysis and service-level agreement (SLA) accounting. With the Cisco MDS 9506, Cisco delivers a comprehensive toolset for troubleshooting and analyzing storage networks.

Comprehensive Solution for Robust Security

Addressing the need for failproof security in storage networks, the Cisco MDS 9506 offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The Cisco Fibre Channel switching modules employ intelligent packet inspection at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced Port Security features. Extended zoning capabilities are enabled to ensure that logical unit numbers (LUNs) are accessible only by specific hosts (LUN zoning), to limit SCSI read 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. IVR enables controlled sharing of resources between VSANs. 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 help ensure that only authorized devices access protected storage networks. Cisco TrustSec Fibre Channel Link Encryption, available on the Cisco MDS 9000 Family 8-Gbps modules, allows you to transparently encrypt ISLs, providing an additional layer of protection for traffic within and between data centers.

Ease of Management

To meet the needs of all users, the Cisco MDS 9506 provides three principal modes of management: Cisco MDS 9000 Family CLI, Cisco Fabric Manager, and integration with third-party storage management tools.

The Cisco MDS 9506 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. This extremely efficient and direct interface provides 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 helps 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 facilitates remote management from any location.

Cisco Fabric Manager can 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.

Product Specifications

Table 1 lists the product specifications for the Cisco MDS 9506 Multilayer Director.

Table 1. Product Specifications

Technical Specifications	
Product compatibility	• Cisco MDS 9000 Family
Software compatibility	• Cisco MDS 9000 SAN-OS Release 1.1 or later

Protocols	• Fibre Channel standards ◦ FC-PH, Revision 4.3 (ANSI INCITS 230-1994) ◦ FC-PH, Amendment 1 (ANSI INCITS 230-1994/AM1-1996) ◦ FC-PH, Amendment 2 (ANSI INCITS 230-1994/AM2-1999) ◦ FC-PH-2, Revision 7.4 (ANSI INCITS 297-1997) ◦ FC-PH-3, Revision 9.4 (ANSI INCITS 303-1998) ◦ FC-PI, Revision 13 (ANSI INCITS 352-2002) ◦ FC-PI-2, Revision 10 (ANSI INCITS 404-2006) ◦ FC-PI-4, Revision 8 (ANSI INCITS 450-2008) ◦ FC-FS, Revision 1.9 (ANSI INCITS 373-2003) ◦ FC-FS-2, Revision 1.01 (ANSI INCITS 424-2007) ◦ FC-FS-2, Amendment 1 (ANSI INCITS 424-2007/AM1-2007) ◦ FC-FS-3, Revision 0.5 ◦ FC-LS, Revision 1.62 (ANSI INCITS 433-2007) ◦ FC-AL, Revision 4.5 (ANSI INCITS 272-1996) ◦ FC-AL-2, Revision 7.0 (ANSI INCITS 332-1999) ◦ FC-AL-2, Amendment 1 (ANSI INCITS 332-1999/AM1-2003) ◦ FC-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 9.21 ◦ FC-BB, Revision 4.7 (ANSI INCITS 342-2001) ◦ FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003) ◦ FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006) ◦ FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008) ◦ FC-IFR, Revision 1.03 • FCP, Revision 12 (ANSI INCITS 269-1996) ◦ FCP-2, Revision 8 (ANSI INCITS 350-2003) ◦ FCP-3, Revision 4 (ANSI INCITS 416-2006) ◦ FC-SB-2, Revision 2.1 (ANSI INCITS 349-2001) ◦ FC-SB-3, Revision 1.6 (ANSI INCITS 374-2003) ◦ FC-SB-3, Amendment 1 (ANSI INCITS 374-2003/AM1-2007) ◦ FC-VI, Revision 1.84 (ANSI INCITS 357-2002) ◦ FC-SP, Revision 1.8 (ANSI INCITS 426-2007) ◦ FAIS, Revision 1.03 (ANSI INCITS 432-2007) ◦ FAIS-2, Revision 2.23 (ANSI INCITS 449-2008) ◦ FC-FLA, Revision 2.7 (INCITS TR-20-1998) ◦ FC-PLDA, Revision 2.1 (INCITS TR-19-1998) ◦ FC-Tape, Revision 1.17 (INCITS TR-24-1999) ◦ FC-MI, Revision 1.92 (INCITS TR-30-2002) ◦ FC-MI-2, Revision 2.6 (INCITS TR-39-2005) ◦ FC-DA, Revision 3.1 (INCITS TR-36-2004) • Class of Service: Class 2, Class 3, Class F • Fibre Channel standard port types: E, F, FL, B • Fibre Channel enhanced port types: SD, ST, TE • IP over Fibre Channel (RFC 2625) • IPv6, IPv4 and ARP over FC (RFC 4338) • Extensive IETF-standards based TCP/IP, SNMPv3, and remote monitoring (RMON) MIBs

Protocols (continued)	• IP standards ◦ RFC 791 IPv4 ◦ RFC 793, 1323 TCP ◦ RFC 894 IP/Ethernet ◦ RFC 1041 IP/802 ◦ RFC 792, 950, 1256 ICMP ◦ RFC 1323 TCP performance enhancements ◦ RFC 2338 VRRP ◦ RFC 2460, 4291 IPv6 ◦ RFC 2463, 4443 ICMPv6 ◦ RFC 2461, 2462 IPv6 neighbor discovery and stateless auto-configuration ◦ RFC 2464 IPv6/Ethernet ◦ RFC 3270, 3980 iSCSI ◦ RFC 3643, 3821 FCIP • Ethernet standards ◦ IEEE Std 802.3-2005 Ethernet ◦ IEEE Std 802.1Q-2005 VLAN • IPsec ◦ RFC 2401, 4301 security architecture for IP ◦ RFC 2403, 2404 HMAC ◦ RFC 2405, 2406, 2451, 4303 IP ESP ◦ RFC 2407, 2408 ISAKMP ◦ RFC 2412 OAKLEY Key Determination Protocol ◦ RFC 3566, 3602, 3686 AES • Internet Key Exchange (IKE) ◦ RFC 2409 IKEv1 • RFC 4306 IKEv2
Chassis slot configuration	• Module slots: 4 • Supervisor slots: 2 • Fan tray: front fan tray • Power supply bays: 2
Performance and scalability	• Supported Fibre Channel port speeds ◦ 1/2/4/8-Gbps auto-sensing ◦ 1/2/4-Gbps auto-sensing ◦ 1/2-Gbps auto-sensing ◦ 10-Gbps fixed rate • Supported Ethernet port speeds ◦ 1-Gbps fixed rate • Buffer credits: 24-port and 48-port 8G Fibre Channel modules: ◦ 32 per port (shared-mode ports) ◦ Up to 500 per port (dedicated-mode ports) standard ◦ Up to 4095 on an individual port (dedicated-mode ports with optional Cisco MDS 9000 Enterprise Package license activated) • Buffer credits: 4/44-port 8G Fibre Channel module: ◦ 32 per port (shared-mode ports) ◦ Up to 250 per port (dedicated-mode ports) standard ◦ Up to 4095 on an individual port (dedicated-mode ports with optional Cisco MDS 9000 Enterprise Package license activated) • Buffer credits: 12-port, 24-port and 48-port 4G Fibre Channel modules, 18/4-port Multiservice Module: ◦ 16 per port (shared-mode ports) ◦ Up to 250 per port (dedicated-mode ports) standard ◦ Up to 4095 on an individual port (dedicated-mode ports with optional Cisco MDS 9000 Enterprise Package license activated)

	• Ports per chassis:
	  ◦ 24 to 192 1/2/4/8-Gbps Fibre Channel ports
	  ◦ 12 to 192 1/2/4-Gbps Fibre Channel ports
	  ◦ 16 to 128 1/2-Gbps Fibre Channel ports
	  ◦ 4 to 16 10-Gbps Fibre Channel ports
	  ◦ 4 to 52 1-Gbps Ethernet ports
	• Ports per rack:
	  ◦ Up to 1152 1/2/4/8-Gbps Fibre Channel ports
	  ◦ Up to 1152 1/2/4-Gbps Fibre Channel ports
	  ◦ Up to 896 1/2-Gbps Fibre Channel ports
	  ◦ Up to 96 10-Gbps FC ports
	  ◦ Up to 192 1-Gbps Ethernet ports
	• PortChannel: Up to 16 ports (the channel can span any speed-matched port on any module in the chassis)

Features and Functions	
Fabric services	• Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Public loop • Broadcast • In-order delivery
Advanced functionality	• VSAN • Inter-VSAN Routing • PortChannel with Multipath Load Balancing • QoS: flow-based, zone-based • Fibre Channel Congestion Control • N_Port ID Virtualization
Diagnostics and troubleshooting tools	• Power-on-self-test (POST) diagnostics • Online diagnostics • Internal port loopbacks • Switch Port Analyzer (SPAN) and Remote SPAN (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 • Access Control Lists • Per-VSAN role-based access control • Fibre Channel Zoning ◦ N_Port WWN ◦ N_Port FC-ID ◦ Fx_Port WWN ◦ Fx_Port WWN and interface index ◦ Fx_Port domain ID and interface index ◦ Fx_Port domain ID and port number ◦ LUN ◦ Read-only ◦ Broadcast • Fibre Channel Security Protocol (FC-SP) ◦ DH-CHAP switch-switch authentication ◦ DH-CHAP host-switch authentication • Port Security and Fabric Binding • Management access ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES ◦ SFTP • Cisco TrustSec Fibre Channel Link Encryption
FICON	• FC-SB-3 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel FCP traffic • CUP management interface
Serviceability	• Configuration file management • Non-disruptive software upgrades for Fibre Channel interfaces • Call Home • Power-management LEDs • Port beaconing • System LED • SNMP traps for alerts • Network boot
Reliability and availability	• Online, nondisruptive software upgrades • Stateful nondisruptive supervisor module failover • Hot-swappable redundant supervisor modules • 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 Enhanced small form-factor pluggable (SFP+) optics • Hot-swappable small pluggable (X2) optics (10-Gbps) • 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

Network management	• Access methods through Cisco MDS 9500 Series Supervisor Module • Out-of-band 10/100 Ethernet port (Supervisor-1 Module) • Out-of-band 10/100/1000 Ethernet port (Supervisor-2 Module) • RS-232 serial console port • In-band IP-over-Fibre Channel • DB-9 COM port • Access methods through Cisco MDS 9000 Family Fibre Channel switching module • In-band FICON-CUP over-Fibre Channel • Access protocols • CLI: via console and Ethernet ports • SNMPv3: via Ethernet port and in-band IP over-Fibre Channel access • Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S) • FICON CUP • Distributed Device Alias service • Network security • Per-VSAN role-based access control using RADIUS and TACACS+ based authentication, authorization, and accounting (AAA) functions • SFTP • SSHv2 implementing AES • SNMPv3 implementing AES • Management applications • Cisco MDS 9000 Family CLI • Cisco Fabric Manager • Cisco Device Manager • CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)
Programming interfaces	• Scriptable CLI • Fabric Manager GUI • Device Manager GUI
Power and cooling	• Power supplies (1900W AC) ◦ Input: 100-240V AC nominal (±10% for full range); 12A maximum; 50-60 Hz nominal (±3 Hz for full range) ◦ Output: 1050W (100V AC at 12A); 1900W (200V AC at 12A) • Airflow ◦ 300 linear feet per minute (lfm) through system fan assembly • Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4 cm) between walls and the chassis air vents and a minimum horizontal separation of 6 inches (15.2 cm) between two chassis to prevent overheating.
Power Consumption	**Cisco MDS 9506**

Ports	**Typical (Watts)**	**Max (Watts)**
192-ports	1,093	1,234

Environmental	• Temperature, ambient operating: 32 to 104°F (0 to 40°C) • Temperature, ambient non-operating and storage: -40 to 167°F (-40 to 75°C) • Relative humidity, ambient (non-condensing) operating: 10 to 90% • Relative humidity, ambient (non-condensing) non-operating and storage: 10 to 95% • Altitude, operating: -197 to 6500 feet (-60 to 2000m)
Physical dimensions	• Dimensions (H x W x D) • 12.25 x 17.37 x 21.75 in (31.1 x 44.1 x 55.25 cm) -7 RU • Chassis depth including cable guide is 26.75 in. (67.9 cm). All units rack mountable in standard 19 inch EIA rack
Weight	• Chassis (includes fan tray): 46 lb (20.9 kg) • Chassis fully configured with two supervisor/fabric modules, four switching modules, and two 1900W power supplies: 124 lb (56 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

Ordering Information

Table 2 provides ordering information for the Cisco MDS 9506 Multilayer Director.

Table 2. Ordering Information

Part Number	Product Description
Cisco MDS 9506 Components	
DS-C9506	Cisco MDS 9506 Chassis
DS-X9530-SF2-K9	Cisco MDS 9500 Series Supervisor/Fabric-2
DS-X9224-96K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 24-Port Fibre Channel Module
DS-X9248-96K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 48-Port Fibre Channel Module
DS-X9248-48K9	Cisco MDS 9000 Family 1/2/4/8-Gbps 4/44-Port Host-Optimized Fibre Channel Module
DS-X9112	Cisco MDS 9000 Family 1/2/4-Gbps 12-Port Fibre Channel Switching Module
DS-X9124	Cisco MDS 9000 Family 1/2/4-Gbps 24-Port Fibre Channel Switching Module
DS-X9148	Cisco MDS 9000 Family 1/2/4-Gbps 48-Port Fibre Channel Switching Module
DS-X9304-18K9	Cisco MDS 9000 Family 18/4-Port Multiservice Module
DS-X9316-SSNK9	Cisco MDS 9000 Family 16-Port GE Storage Services Node
DS-X9032-SSM	Cisco MDS 9000 Family 32-Port Storage Services Module
DS-X9704	Cisco MDS 9000 Family 10-Gbps 4-port Fibre Channel switching module
DS-SFP-FC4G-SW	1/2/4-Gbps Fibre Channel: Shortwave, Small Form-Factor Pluggable (SFP), LC (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-FC4G-MR	1/2/4-Gbps Fibre Channel: Longwave, SFP, LC (4-km reach) (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-FC4G-LW	1/2/4-Gbps Fibre Channel: Longwave, SFP, LC (10-km reach) (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-X2-FC10G-SR	10-Gbps Fibre Channel: Shortreach X2, SC (Supported only with 10-Gbps FC ports)
DS-X2-FC10G-LR	10-Gbps Fibre Channel: Longreach X2, SC (Supported only with 10-Gbps FC ports)
DS-X2-FC10G-ER	10-Gbps Fibre Channel-ER X2, SC (Supported only with 10-Gbps FC ports)

DS-SFP-FCGE-SW	1-Gbps Ethernet and 1/2-Gbps Fibre Channel: Shortwave SFP, LC
DS-SFP-FCGE-LW	1-Gbps Ethernet and 1/2-Gbps Fibre Channel: Longwave SFP, LC
DS-SFP-GE-T	Gigabit Ethernet Copper SFP, RJ-45
DS-CAC-1900W	Cisco MDS 9506 1900W AC Power Supply
MEM-MDS-FLD512M	Cisco MDS 9500 Supervisor Compact Flash Disk, 512 MB
Advanced Software Packages	
M9500EXT1AK9	SAN Extension Over IP package for one 18/4-Port Multiservice Module in Cisco MDS 9500 Series
M9500EXT1K9	Cisco MDS 9500 Series SAN Extension over IP Package for Cisco MDS 9000 Family 8-Port 1-GE IP Storage Services Module
M9500SSE1K9	Cisco MDS 9500 Series Storage Services Enabler Package for the Cisco MDS 9000 Family Advanced Services Module or the Cisco MDS 9000 Family Storage Services Module
M9500ENT1K9	Cisco MDS 9500 Series Enterprise Package
M9500FMS1K9	Cisco MDS 9500 Series Fabric Manager Server Package
M9500FIC1K9	Cisco MDS 9500 Series Mainframe Package
M95DMMS1K9	MDS 9500 Data Mobility Manager (DMM) License for one SSM
M95DMMTS1K9	MDS 9500 Data Mobility Manager (DMM) License for one SSM for 180 Days
M9500SME1MK9	Storage Media Encryption package for one 18/4-port Multiservice Module
CAB-C19-CBN	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors
CAB-1900W-CH	Power Cord, 250VAC, 16A GB1002 Plug, China
CAB-1900W-EU	Power Cord 250VAC 16A, Europe, Src Plug CEE 7/7
CAB-1900W-INT	Power Cord 250VAC 16A, International, Src Plug IEC 309
CAB-1900W-ISR	Power Cord 250VAC 16A, Israel, Src Plug SI16S3
CAB-1900W-KOR	Power Cord, 250VAC, Korea
CAB-1900W-SA	Power Cord 250VAC 16A, South Africa, Src Plug EL 208, SABS 1661
CAB-1900W-SW	Power Cord 250VAC 16A, Switzerland, Src Plug SEV 1011
CAB-1900W-TWN	Power Cord, 250VAC, CNS10917-2, Taiwan
CAB-1900W-UK	Power Cord 250VAC 13A, United Kingdom, Src Plug BS1363 (13A fuse)
CAB-1900W-US1	Power Cord 250VAC 20A, U.S./Japan, Src Plug NEMA 6-20
CAB-1900W-US2	Power Cord 250VAC 20A, U.S./Japan, Src Plug NEMA L6-20
Spare Components	
DS-C9506=	Cisco MDS 9506 Chassis, Spare
DS-X9530-SF2-K9=	Cisco MDS 9500 Series Supervisor/Fabric-2, Spare
DS-X9224-96K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 24-Port Fibre Channel Module, Spare
DS-X9248-96K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 48-Port Fibre Channel Module, Spare
DS-X9248-48K9=	Cisco MDS 9000 Family 1/2/4/8-Gbps 4/44-Port Host-Optimized Fibre Channel Module, Spare
DS-X9112=	Cisco MDS 9000 Family 1/2/4-Gbps 12-Port Fibre Channel Switching Module, Spare
DS-X9124=	Cisco MDS 9000 Family 1/2/4-Gbps 24-Port Fibre Channel Switching Module, Spare
DS-X9148=	Cisco MDS 9000 Family 1/2/4-Gbps 48-Port Fibre Channel Switching Module, Spare
DS-X9304-18K9=	Cisco MDS 9000 Family 18/4-Port Multiservice Module, Spare
DS-X9316-SSNK9=	Cisco MDS 9000 Family 16-Port GE Storage Services Node, Spare
DS-X9032-SSM=	Cisco MDS 9000 Family 32-Port Storage Services Module, Spare
DS-X9704=	Cisco MDS 9000 Family 10-Gbps 4-port Fibre Channel switching module, Spare
DS-SFP-FC8G-SW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, Spare (Supported only with 1/2/4/8-Gbps FC ports)
DS-SFP-8G-SW-4=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, Four Pack, Spare (Supported only with 1/2/4/8-Gbps FC ports)
DS-SFP-FC8G-LW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km reach), Spare (Supported only with 1/2/4/8-Gbps FC ports)

DS-SFP-4G-SW=	1/2/4-Gbps Fibre Channel: Shortwave, SFP, LC, Spare (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-4G-SW-4=	1/2/4-Gbps Fibre Channel: Shortwave, SFP, LC, Four Pack, Spare (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-FC4G-MR=	1/2/4-Gbps Fibre Channel: Longwave, SFP, LC (4 Km reach), Spare (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-FC4G-LW=	1/2/4-Gbps Fibre Channel: Longwave, SFP, LC (10 Km reach), Spare (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-X2-FC10G-SR=	10-Gbps Fibre Channel: Shortreach X2, SC, Spare (Supported only with 10-Gbps FC ports)
DS-X2-FC10G-LR=	10-Gbps Fibre Channel: Longreach X2, SC , Spare (Supported only with 10-Gbps FC ports)
DS-X2-FC10G-ER=	10-Gbps Fibre Channel-ER X2, spare (Supported only with 10-Gbps FC ports)
DS-X2-E10G-SR=	10-Gbps Ethernet-SR X2, spare (Supported only with 10-Gbps FC ports)
DS-SFP-FCGE-SW=	1-Gbps Ethernet and 1/2-Gbps Fibre Channel: Shortwave, SFP, LC, Spare
DS-SFP-FCGE-LW=	1-Gbps Ethernet and 1/2-Gbps Fibre Channel: Longwave, SFP, LC, Spare
DS-SFP-GE-T=	Gigabit Ethernet Copper SFP, RJ-45, Spare
DS-CWDM-XXXX=	Cisco XXXX NM CWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare (where XXXX=1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610)
DS-CWDM4GXXXX=	Cisco XXXX NM CWDM 4-Gbps Fibre Channel SFP, spare (where XXXX=1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610)
DWDM-SFP-XXXX=	Cisco 15XX.XX NM DWDM 1/2-Gbps Fibre Channel SFP, spare (where XXXX=6061, 5979, 5898, 5817, 5655, 5575, 5494, 5413, 5252, 5172, 5092, 5012, 4851, 4772, 4692, 4612, 4453, 4373, 4294, 4214, 4056, 3977, 3898, 3819, 3661, 3582, 3504, 3425, 3268, 3190, 3112, 3033)
DWDM-X2-YY.YY=	10GBASE-DWDM 15YY.YY nm X2, spare (100-GHz ITU grid) (where YYYY=6061, 5979, 5898, 5817, 5655, 5575, 5494, 5413, 5252, 5172, 5092, 5012, 4851, 4772, 4692, 4612, 4453, 4373, 4294, 4214, 4056, 3977, 3898, 3819, 3661, 3582, 3504, 3425, 3268, 3190, 3112, 3033)
DS-C9506-CL=	Cisco MDS 9506 Clock Module, Spare
DS-6SL0T-FAN=	Cisco MDS 9506 Fan Tray, Spare
DS-CAC-1900W=	Cisco MDS 9506 1900W AC Power Supply, Spare
MEM-MDS-FLD512M=	Cisco MDS 9500 Supervisor Compact Flash Disk, 512MB, Spare
DS-SCR-K9=	Cisco MDS 9000 Family Smart Card Reader, Spare
DS-SC-K9=	Cisco MDS 9000 Family Smart Cards, Spare
CAB-C19-CBN=	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors, Spare
CAB-1900W-CH=	Power Cord, 250VAC, 16A GB1002 Plug, China, Spare
CAB-1900W-EU=	Power Cord 250VAC 16A, Europe, Src Plug CEE 7/7, Spare
CAB-1900W-INT=	Power Cord 250VAC 16A, International, Src Plug IEC 309, Spare
CAB-1900W-ISR=	Power Cord 250VAC 16A, Israel, Src Plug SI16S3, Spare
CAB-1900W-KOR=	Power Cord, 250VAC, Korea, Spare
CAB-1900W-SA=	Power Cord 250VAC 16A, South Africa, Src Plug EL 208, SABS 1661, Spare
CAB-1900W-SW=	Power Cord 250VAC 16A, Switzerland, Src Plug SEV 1011, Spare
CAB-1900W-TWN=	Power Cord, 250VAC, CNS10917-2, Taiwan, Spare
CAB-1900W-UK=	Power Cord 250VAC 13A, United Kingdom, Src Plug BS1363 (13A fuse) , Spare
CAB-1900W-US1=	Power Cord 250VAC 20A, U.S./Japan, Src Plug NEMA 6-20, Spare
CAB-1900W-US2=	Power Cord 250VAC 20A, U.S./Japan, Src Plug NEMA L6-20, Spare
M9500ENT1K9=	Cisco MDS 9500 Enterprise Package license for 1 Cisco MDS 9500 switch, Spare
M9500FMS1K9=	Cisco MDS 9500 Fabric Manager Server license for 1 Cisco MDS 9500 switch, Spare
M9500FIC1K9=	Cisco MDS 9500 Mainframe Package license for 1 Cisco MDS 9500 switch, Spare
M9500XRC=	Cisco MDS 9500 XRC Accel for IBM, Spare
M9500EXT1AK9=	SAN Extension over IP package for one 18/4-Port Multiservice Module in Cisco MDS 9500 Series, Spare
M95EXTSSNK9=	SAN Extension License (1 engine) for the SSN-16 module in Cisco MDS 9500, spare
M9500EXT14K9=	Cisco MDS 9500 SAN Extension over IP license for 1 IPS-4 module, Spare
M9500EXT1K9=	Cisco MDS 9200 SAN Extension over IP license for 1 IPS-8 module, Spare

M95IOASSN=	Cisco I/O Accelerator License (1 engine) for the SSN-16 in Cisco MDS 9500, spare
M9500SSE1K9=	Cisco MDS 9000 Storage Services Enabler Package for 1 Cisco MDS 9500 switch, Spare
M95DMMS1K9=	Cisco MDS 9500 Data Mobility Manager (DMM) License for one SSM, Spare
M95DMMTS1K9=	Cisco MDS 9500 Data Mobility Manager (DMM) License for one SSM for 180 Days, Spare
M9500SME1MK9=	Storage Media Encryption package for one MPS 18/4-port, Spare
M95SMESSNK9=	Storage Media Encryption License (1 engine) for one the SSN-16 in Cisco MDS 9500, spare
M95DMM184K9=	Cisco MDS 9500 Data Mobility Manager (DMM) License for one 18/4-Port Multiservice Module, Spare
M95DMM184TSK9=	Cisco MDS 9500 Data Mobility Manager (DMM) License for 18/4-Port Multiservice Module for 180 days, Spare

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

Service and Support

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For More Information

For more information about the Cisco MDS 9506, visit http://www.cisco.com/en/US/products/hw/ps4159/ps4358/index.html or contact your local account representative.

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