Cisco MDS 9513 Multilayer Director

Product Overview

The Cisco® MDS 9513 Multilayer Director 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 9513 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 9513 enables seamless deployment of unified fabrics with high-performance Fibre Channel and Fibre Channel over Ethernet (FCoE) connectivity to achieve low total cost of ownership (TCO). Compatible with all generations of Cisco MDS 9000 Family switching modules, the Cisco MDS 9513 continues to provide outstanding investment protection.

Figure 1. Cisco MDS 9513 Multilayer Director

Product Highlights

The Cisco MDS 9513 offers the following main features:

- **Industry-leading scalability:** The Cisco MDS 9513 combines non-disruptive software upgrades, stateful process restart and failover, and full redundancy of all major components for best-in-class availability. With 8.4 terabits per second (Tbps) of system bandwidth and up to 528 1/2/4/8-Gbps autosensing Fibre Channel ports in a single chassis or up to 1584 Fibre Channel ports in a single rack, the Cisco MDS 9513 leads the industry in scalability and is designed to meet the requirements of the largest data center storage environments. Furthermore, Cisco MDS 9513 supports all generations of Cisco MDS 9000 Family switching modules, providing outstanding investment protection.

- **Multiprotocol architecture:** The multilayer architecture of the Cisco MDS 9000 Family enables a consistent feature set over a protocol-independent switch fabric. The Cisco MDS 9513 transparently integrates Fibre Channel, FCoE, IBM Fiber Connectivity (FICON), Internet Small Computer System Interface (iSCSI), and Fibre Channel over IP (FCIP) in one system.
  - **1/2/4/8-Gbps and 10-Gbps Fibre Channel:** The Cisco MDS 9513 supports both 1/2/4/8-Gbps and 10-Gbps ports on the new 8-Gbps Advanced Fibre Channel switching modules as well as existing 10-Gbps and 8-Gbps Cisco MDS 9000 Family Fibre Channel switching modules for deployment in both open systems and FICON environments.
  - **10-Gbps Multihop FCoE:** The Cisco MDS 9513 supports multihop FCoE, extending connectivity from FCoE/Fibre Channel fabrics to FCoE/Fibre Channel storage devices. With 10-Gbps Multihop FCoE switching modules, the Cisco MDS 9513 supports extension of a Fibre Channel SAN to devices that are connected using FCoE protocol over Ethernet, thereby extending the rich capabilities of intelligent services to unified fabric deployments.
  - **1/2/4/8-Gbps and 10-Gbps FICON:** The Cisco MDS 9513 supports advanced FICON services including cascaded FICON fabrics, VSAN-enabled intermix of mainframe and open systems environments, and N_Port ID virtualization (NPIV) for mainframe Linux partitions. Cisco Control Unit Port (CUP) support enables in-band management of Cisco MDS 9000 Family switches from mainframe management applications.
- **Outstanding SAN Performance:** The combination of the 8-Gbps Advanced Fibre Channel switching modules and the Fabric3 Crossbar switching modules enables 256 Gbps of throughput between modules in each direction for each of the eleven MDS 9513 payload slots. This allows every port on the 32-port Advanced module to run at full line rate. The arbitrated local switching capability described below extends the throughput of the 48-port Advanced module up to a maximum of 384 Gbps in each direction when some of the traffic can be switched locally between ports on a single module.
- **Intelligent network services:** VSAN technology, access control lists (ACLs) for hardware-based intelligent frame processing, and fabricwide quality of service (QoS) enable migration from SAN islands to enterprisewide storage networks. Furthermore, Cisco Arbitrated Local Switching feature provides high-performance, predictable, fair switching between all hosts attached to the same 8-Gbps Advanced Fibre Channel switching module and their associated storage devices.
  - **Smart Zoning:** When the Smart Zoning feature is enabled, Cisco MDS 9000 Family 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.
  - **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.

- **Arbitrated local switching:** The Cisco Arbitrated Local Switching feature provides line-rate switching across all ports on the same module without degrading performance or increasing latency for traffic to and from other modules in the chassis. This capability is achieved through Cisco MDS 9500 Series Multilayer Directors crossbar architecture with a central arbiter arbitrating fairly between local traffic and traffic to and from other modules.

- **Platform for intelligent storage applications:** The Cisco MDS 9513 serves as a platform for intelligent services such as acceleration of storage applications for data replication and backup, storage media encryption for tapes and disks, data migration, and third-party applications such as continuous data protection and remote replication.
  - **I/O Accelerator (IOA):** Cisco IOA is a transport- and speed-agnostic traffic acceleration service capable of mitigating the effects of distance (and hence latency) on application throughput, thereby bringing flexibility to the choice of the data center location. IOA is supported on the Cisco MDS 9000 18/4-Port Multiservice Module (MSM) and 16-Port Storage Services Node (SSN-16).
  - **Cisco Storage Media Encryption (SME):** Cisco SME services offer solutions that enable companies to address Payment Card Industry (PCI) Data Security Standards (DSS) 2.0 compliance and other legislative regulations such as the Health Insurance Portability and Accountability Act (HIPAA), which require companies to store and protect data at rest for a specified number of years while publicly disclosing security breaches. Cisco SME is a fabric-based service and so is scalable and non-disruptive and addresses heterogeneous server and storage environments. Cisco SME enables data on disk arrays, on tapes, and in virtual tape libraries (VTLs) to be compressed, encrypted, and authenticated for centralized security management and data management and recovery. 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 Data Mobility Manager (DMM):** Cisco DMM is a fabric-based data migration solution that transfers block data non-disruptively across heterogeneous storage volumes and across distances, whether the host is online or offline. This data center-class solution helps address 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 Cisco MDS 9000 18/4-Port Multiservice Modules located anywhere in the SAN allows data migration to be configured without host agents, without rewiring, with minimal effect on performance, and without downtime.
- **Virtual machine transparency:** The Cisco MDS 9000 Family 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 MDS 9000 NX-OS Software offers VSANs, QoS policies, access control, performance monitoring, and data protection to promote the scalability and mobility of virtual machines. Cisco Data Center Network Manager for SAN (DCNM-SAN) provides end-to-end visibility all the way from the virtual machine down to 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), Cisco SME for tapes and disks, and Cisco TrustSec® Fibre Channel link encryption, the Cisco MDS 9000 Family supports a comprehensive security framework consisting of 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). Cisco TrustSec Fibre Channel link encryption delivers transparent, hardware-based 8-Gbps line-rate encryption of Fibre Channel data on both generations of 8-Gbps Fibre Channel switching modules in addition to 10-Gbps line-rate encryption on 8-Gbps Advanced Fibre Channel Switching modules.

- **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 Data Center Network Manager (DCNM, formerly called Cisco Fabric Manager), 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 9513 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.

Main Benefits

Business Transformation with Enterprise Cloud Deployment

Enterprise clouds provide organizations with elastic compute and network capabilities, enabling IT to scale up or scale down resources on an as needed basis in a quick and cost efficient manner. Cisco MDS 9513 provides 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 multi-tenancy 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 and Port Bandwidth Reservation to quickly and cost efficiently allocate elastic network capabilities to cloud applications. Furthermore, Cisco DCNM-SAN 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 usage information through Storage Management Initiative Specification (SMI-S)-based developer APIs to deliver IT as a service.

Convergence with Multihop FCoE

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. With multihop FCoE connectivity, Cisco MDS 9513 extends advanced fabric services to unified fabric deployments attached to Cisco Nexus® Family data center switches. Sharing the same operating system and management plane as the Cisco Nexus switches, the Cisco MDS 9513 provides seamless coexistence in a unified fabric with any-to-any connectivity for Fibre Channel, FCoE, iSCSI, and network-attached (NAS) storage.

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, Cisco MDS 9513 offers industry-leading port densities of up to 528 8-Gbps or 264 10-Gbps Fibre Channel ports per chassis, multihop FCoE, high per-slot performance, unparalleled functionality with intelligent fabric services, VSANs for consolidating individual physical SAN islands while maintaining logical delineations, 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 9513 provides multihop FCoE capability to protect your investment in existing storage infrastructure with any-to-any connectivity across multiple protocols.

Outstanding Investment Protection

The Cisco MDS 9513 provides a very high level of system commonality. All Cisco MDS 9000 Family Fibre Channel switching modules are compatible with all Cisco MDS 9500 Series Multilayer Directors. Designed to grow with your storage environment, the Cisco MDS 9513 provides smooth migration, common sparing, and outstanding investment protection.

Enterprise-Class Availability

The Cisco MDS 9513 was designed from the beginning for high availability. Beyond meeting the basic requirements of non-disruptive software upgrades and redundancy of all critical hardware components, the Cisco MDS 9513 software architecture offers an outstanding level of availability. The Cisco MDS 9500 Series Supervisor Modules automatically restart failed processes, making the Cisco MDS 9513 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 to traffic.

High availability is implemented at the fabric level using robust and high-performance Inter-Switch Links (ISLs). 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 9513 takes high availability to a new level, helping ensure that solutions exceed the 99.999 percent uptime requirements of today's most demanding environments.

Integrated Mainframe Support

The Cisco MDS 9513 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 9513 supports transport of the FICON protocol in both cascaded and non-cascaded fabrics, as well as an intermix of FICON and open systems Fibre Channel Protocol traffic on the same switch. VSANs simplify an 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 mis-configuration 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 Data Center Network Manager; the 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. FICON Tape Acceleration (FTA) improves read and write performance of physical and virtual tape applications across WAN links.

Advanced Traffic Management

Advanced traffic management capabilities integrated into the Cisco MDS 9513 simplify deployment and optimization of large-scale fabrics:

- **Virtual output queuing:** Helps ensure line-rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- **Up to 4095 buffer-to-buffer credits:** Can be assigned to an individual port for optimal bandwidth utilization across distance.
- **PortChannels:** Allow users to aggregate up to 16 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links. The bundle can consist of any speed-matched ports from any module in the chassis, helping ensure that the bundle can remain active even in the event of a module failure.
- **FSPF-based multipathing:** Provides the intelligence to load balance across up to 16 FC 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.
- **Port bandwidth reservation:** Allows users to define dedicated bandwidth on a per port basis.

Ease of Management

To meet the needs of all users, the Cisco MDS 9513 provides three principal modes of management: the Cisco MDS 9000 Family CLI, Cisco DCNM, and integration with third-party storage management tools.

The Cisco MDS 9513 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.

Cisco DCNM (formerly Cisco Fabric Manager) is an easy-to-use application that simplifies management across multiple switches and converged fabrics. Focused on supporting efficient operations and management of virtual machine-aware fabrics, Cisco DCNM provides a robust framework and rich feature set that meet the routing, switching, and storage administration needs of present and future virtualized data centers. Cisco DCNM streamlines provisioning of the unified fabric and proactively monitors the LAN and SAN components. Cisco DCNM can be licensed for managing a combination of SAN and LAN environments.

Cisco DCNM 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.

Comprehensive Solution for Robust Security

Addressing the need for fool-proof security in storage networks, the Cisco MDS 9513 offers an extensive security framework to protect the highly sensitive data crossing today's enterprise networks. The Cisco MDS 9513 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 higher security and greater stability by providing complete isolation among devices that are connected to the same physical SAN. IVR enables controlled sharing of resources between VSANs. In addition, FC-SP provides switch-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 Fibre Channel link encryption, available on the Cisco MDS 9000 Family 8-Gbps modules, allows you to transparently encrypt ISLs at up to line-rate 10-Gbps 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 9513 integrates advanced analysis and debug tools. Power-on self test (POST) and online diagnostics provide proactive health monitoring. The Cisco MDS 9513 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 9513, Cisco delivers a comprehensive toolset for troubleshooting and analysis of storage networks.

Product Specifications

Table 1 lists the product specifications for the Cisco MDS 9513 Multilayer Director.

Table 1. Technical Specifications

Feature	Description
Product Compatibility	Cisco MDS 9000 Family
Software Compatibility	Cisco MDS SAN-OS Software Release 3.0(1) or later Note: MDS 9513 Crossbar Switching Fabric3 Module requires Cisco NX-OS Software Release 5.2 or beyond
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)

Feature	Description
	◦ 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 2 ◦ 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) ◦ FAIS, Revision 1.03 (ANSI INCITS 432-2007) ◦ FAIS-2, Revision 2.23 (ANSI INCITS 449-2008) ◦ 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-DA, Revision 3.1 (INCITS TR-36-2004) • Class 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 • T11 standards-compliant FC-BB-5 Revision 2.0 • T11 FCoE Initialization Protocol (FIP) (FC-BB-5) • Fibre Channel forwarding (FCF) • Fibre Channel enhanced port types: VE, TE and VF • IP over Fibre Channel (RFC 2625) • IPv6, IPv4, and ARP over Fibre Channel (RFC 4338) • Extensive IETF-standards-based TCP/IP, SNMPv3, and remote monitoring (RMON) MIBs

Feature	Description
Protocols (continued)	• IP standards ◦ RFC 791 IPv4 ◦ RFC 793 and 1323 TCP ◦ RFC 894 IP/Ethernet ◦ RFC 1041 IP/802 ◦ RFC 792, 950, and 1256 ICMP ◦ RFC 1323 TCP performance enhancements ◦ RFC 2338 VRRP ◦ RFC 2460 and 4291 IPv6 ◦ RFC 2463 and 4443 ICMPv6 ◦ RFC 2461 and 2462 IPv6 neighbor discovery and stateless autoconfiguration ◦ RFC 2464 IPv6/Ethernet ◦ RFC 3270 and 3980 iSCSI ◦ RFC 3643 and 3821 FCIP • Ethernet standards ◦ IEEE 802.3-2005 Ethernet ◦ IEEE 802.1Q-2005 VLAN • IPsec ◦ RFC 2401 and 4301 security architecture for IP ◦ RFC 2403 and 2404 HMAC ◦ RFC 2405, 2406, 2451, and 4303 IP ESP ◦ RFC 2407 and 2408 ISAKMP ◦ RFC 2412 OAKLEY Key Determination Protocol ◦ RFC 3566, 3602, and 3686 AES • Internet Key Exchange (IKE) ◦ RFC 2409 IKEv1 ◦ RFC 4306 IKEv2 • CEE DCB ◦ Priority flow control (PFC) ◦ Data Center Bridging Exchange (DCBX) ◦ Enhanced transmission selection (ETS)
Chassis Slot Configuration	• Line-card slots: 11 • Supervisor slots: 2 • Crossbar switching fabric slots: 2 • Fan trays: front fan tray and rear fan tray • Power supply bays: 2 • Clock module slots: 2
Performance/Scalability	• 8.4-Tbps internal switching bandwidth • Supported Fibre Channel port speeds ◦ 1/2/4/8-Gbps autosensing, optionally configurable ◦ 1/2/4-Gbps autosensing, optionally configurable ◦ 10-Gbps fixed rate • Supported FCoE port speeds ◦ 10-Gbps fixed rate • Supported Ethernet port speeds ◦ 1-Gbps fixed rate • Buffer credits: 32- and 48-port 8-Gbps Advanced 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: 24- and 48-port 8-Gbps 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

Feature	Description
	Package license activated) • Buffer credits: 4/44-port 8-Gbps 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: 18/4-port MSM: ◦ 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 ◦ Up to 528 1/2/4/8-Gbps Fibre Channel ports ◦ Up to 264 10-Gbps Fibre Channel ports ◦ Up to 88 10-Gbps FCoE ports ◦ Up to176 1-Gbps Ethernet ports • Ports per rack ◦ Up to 1584 1/2/4/8-Gbps Fibre Channel ports ◦ Up to 792 10-Gbps Fibre Channel ports ◦ Up to 264 10-Gbps FCoE ports ◦ Up to 528 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 • 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

Feature	Description
Network Security	• VSANs • ACLs • Per-VSAN RBAC • 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 • 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 • FICON tape read and write acceleration • XRC Acceleration for IBM z/OS Global Mirror
Serviceability	• Configuration file management • Nondisruptive software upgrades for Fibre Channel interfaces • Call Home • Power-management LEDs • Port beaconing • System LED • SNMP traps for alerts • Network boot
Reliability and Availability	• Online, nondisruptive software upgrades • Stateful nondisruptive supervisor module failover • Hot-swappable redundant supervisor modules • Hot-swappable redundant crossbar modules • Hot-swappable redundant clock modules • Hot-swappable 1+1 redundant power • Hot-swappable fan trays with integrated temperature and power management • Hot-swappable Small Form-Factor Pluggable (SFP) optics (1/2/4 Gbps) • Hot swappable Enhanced SFP (SFP+) optics (2/4/8/10 Gbps) • 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

<table>
<tr><th>Feature</th><th>Description</th></tr>
<tr><td>Network Management</td><td>

Access methods through Cisco MDS 9500 Series Supervisor-2A Module

Out-of-band 10/100/1000 Ethernet port
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-using console and Ethernet ports
SNMPv3-using Ethernet port and in-band IP over Fibre Channel access
Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S)
FICON CUP

Distributed Device Alias service
Network security

Per-VSAN role-based access control using RADIUS-based and TACACS+-based authentication, authorization, and accounting (AAA) functions
SFTP
SSHv2 implementing AES
SNMPv3 implementing AES

Management applications

Cisco MDS 9000 Family CLI
Cisco Data Center Network Manager
Cisco Device Manager
CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)

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

Scriptable CLI
Data Center Network Manager web services API
Device manager GUI

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

Power supplies (6000W AC)

Input: 100-240V AC nominal (±10% for full range); 16A maximum; 50-60 Hz nominal (±3 Hz for full range)
Output: 2900W (100V AC at 16A); 6000W (200V AC at 16A)

Airflow

300 linear feet per minute (lfm) through system fan assembly

Cisco recommends that you maintain a minimum air space of 6 inches (15 cm) between walls and the chassis air vents and a minimum horizontal separation of 12 inches (30.5 cm) between two chassis to prevent overheating

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<tr><td>Power Consumption</td><td>
<table>
<tr><th colspan="2">Cisco MDS 9513</th></tr>
<tr><th>Ports</th><th>Typical (Watts)</th></tr>
<tr><td>192-ports</td><td>1,765</td></tr>
<tr><td>384-ports</td><td>2,833</td></tr>
<tr><td>528-ports</td><td>3,634</td></tr>
</table>
</td></tr>
<tr><td>Environmental</td><td>

Temperature, ambient operating: 32 to 104℉ (0 to 40℃)
Temperature, ambient nonoperating and storage: 40 to 167℉ (-40 to 75℃)
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)

</td></tr>
<tr><td>Physical Dimensions</td><td>

Dimensions (H x W x D): 24.5 x 17.37 x 28.0 in. (62.3 x 44.1 x 71.1 cm)
14 RU

</td></tr>
<tr><td>Weight</td><td>

Chassis (includes fans and clock modules): 100.0 pounds (45.4 kg)
Power supply (6000W AC): 32.5 pounds (14.7 kg)
Fabric module: 5.75 pounds (2.6 kg)
Cisco MDS 9500 Series Supervisor-2 and Supervisor-2A Module: 7.2 pounds (3.3 kg)

</td></tr>
</table>

Feature	Description
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 9513 Multilayer Director.

Table 2. Ordering Information

Part Number	Product Description
MDS 9513 Component	
DS-C9513	Cisco MDS 9513 chassis
DS-C9513-4AK9	Cisco MDS 9513 Base Config: Chassis, 2 Sup2A, 2 Fabric3, 2 6K AC PS
DS-C9513-3AK9	MDS 9513 Base Config: Chassis, 2 Sup-2A, 2 Fabric2, 2 6K AC PS
DS-X9530-SF2AK9	Cisco MDS 9500 supervisor/fabric-2A
DS-X9232-256K9	Cisco MDS 9000 Family 32-Port 8-Gbps Advanced Fibre Channel Switching Module
DS-X9248-256K9	Cisco MDS 9000 Family 48-Port 8-Gbps Advanced Fibre Channel Switching Module
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-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-X9704	Cisco MDS 9000 Family 10-Gbps 4-port Fibre Channel switching module
DS-X9708-K9	Cisco MDS 9000 10-Gbps 8-Port FCoE Module
SFP-10G-SR	10GBASE-SR SFP+ Module (supported only with DS-X9708-K9)
SFP-10G-LR	10GBASE-LR SFP+ Module (supported only with DS-X9708-K9)
SFP-H10GB-CU1M	10GBASE-CU SFP+ Cable 1 Meter, passive (supported only with DS-X9708-K9)
SFP-H10GB-CU3M	10GBASE-CU SFP+ Cable 3 Meter, passive (supported only with DS-X9708-K9)

Part Number	Product Description
SFP-H10GB-CU5M	10GBASE-CU SFP+ Cable 5 Meter, passive (supported only with DS-X9708-K9)
SFP-H10GB-ACU7M	10GBASE-CU SFP+ Active Copper Cable 7 Meter (supported only with DS-X9708-K9)
SFP-H10GB-ACU10M	10GBASE-CU SFP+ Active Copper Cable 10 Meter (supported only with DS-X9708-K9)
DS-SFP-FC10G-SW	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Shortwave, SFP+, LC (Supported only with DS-X9232-256K9 and DS-X9248-256K9)
DS-SFP-FC10G-LW	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Longwave, SFP+, LC (Supported only with DS-X9232-256K9 and DS-X9248-256K9)
DS-SFP-FC8G-SW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC
DS-SFP-FC8G-LW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km reach)
DS-SFP-FC8G-ER	2/4/8-Gbps Fibre Channel Extended Reach SFP+, LC (40km Reach)
DS-SFP-FC4G-SW	Cisco MDS 9000 Family 1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC (Supported only with 1/2/4-Gbps and 1/2/4/8-Gbps FC ports)
DS-SFP-FC4G-LW	Cisco MDS 9000 Family 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-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-X2-FC10G-SR	10-Gbps Fibre Channel-Shortreach X2, SC (Supported only with DS-X9704)
DS-X2-FC10G-LR	10-Gbps Fibre Channel-Longreach X2, SC (Supported only with DS-X9704)
DS-X2-FC10G-ER	10-Gbps Fibre Channel-ER X2, SC (Supported only with DS-X9704)
DS-SFP-GE-T	Gigabit Ethernet Copper SFP, RJ-45
DS-13SLT-FAB2	Cisco MDS 9513 fabric2 module
DS-13SLT-FAB3	MDS 9513 Crossbar Switching Fabric3 Module
DS-CAC-6000W	6000W AC power supply
MEM-MDS-FLD512M	Cisco MDS 9500 supervisor compact Flash disk, 512 MB
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-C19-CBN	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors
Licensed Software	
M9500EXT1AK9	SAN Extension Over IP package for one 18/4-Port Multiservice Module in Cisco MDS 9500 Series
M95EXTSSNK9	SAN Extension License (1 engine) for the SSN-16 module in MDS 9500
M9500ENT1K9	Cisco MDS 9500 Series Enterprise Package
DCNM-SAN-M95-K9	DCNM for SAN Advanced Edition for MDS 9500
DCNM-S-PAK-M95-K9	DCNM for SAN Advanced Edition for MDS 9500 configurable PAK (part of DCNM-SAN-PAK=)
L-DCNM-S-M95-K9	E-Delivery DCNM for SAN Advanced Edition for MDS 9500 PAK (part of L-DCNM-S-PAK=)
M9500FIC1K9	Cisco MDS 9500 Series Mainframe Package
M95DMM184K9	MDS 9500 Data Mobility Manager (DMM) License for one 18/4

Part Number	Product Description
M9500SME1MK9	Storage Media Encryption package for one 18/4-port Multiservice Module
M95SMESSNK9	Storage Media Encryption package for one service engine on SSN-16 on MDS 9500
M95IOA184	Cisco I/O Accelerator License for MSM-18/4 on MDS 9500, Spare
M95IOASSN	Cisco I/O Accelerator License (1 engine) for SSN-16 on MDS 9500
Spare Component	
DS-C9513=	Cisco MDS 9513 chassis, Spare
DS-X9232-256K9=	Cisco MDS 9000 Family 32-Port 8-Gbps Advanced Fibre Channel Switching Module, Spare
DS-X9248-256K9=	Cisco MDS 9000 Family 48-Port 8-Gbps Advanced Fibre Channel Switching Module, Spare
DS-X9530-SF2AK9=	Cisco MDS 9500 supervisor/fabric-2A, 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-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-X9704=	Cisco MDS 9000 Family 10-Gbps 4-port Fibre Channel switching module, Spare
DS-X9708-K9=	Cisco MDS 9000 10-Gbps 8-Port FCoE Module, Spare
DS-C9513-CL=	Cisco MDS 9513 clock module, Spare
DS-13SLT-FAN-F=	Cisco MDS 9513 front fan tray, Spare
DS-13SLT-FAN-R=	Cisco MDS 9513 rear fan tray, Spare
DS-13SLT-FAB2=	Cisco MDS 9513 fabric2 module, Spare
DS-13SLT-FAB3=	MDS 9513 Crossbar Switching Fabric3 Module, Spare
DS-CAC-6000W=	6000W AC power supply, Spare
MEM-MDS-FLD512M=	Cisco MDS 9500 supervisor compact Flash disk, 512 MB, Spare
SFP-10G-SR=	10GBASE-SR SFP+ Module, Spare (supported only with DS-X9708-K9)
SFP-10G-LR=	10GBASE-LR SFP+ Module, Spare (supported only with DS-X9708-K9)
SFP-H10GB-CU1M=	10GBASE-CU SFP+ Cable 1 Meter, passive, spare (supported only with DS-X9708-K9)
SFP-H10GB-CU3M=	10GBASE-CU SFP+ Cable 3 Meter, passive, spare (supported only with DS-X9708-K9)
SFP-H10GB-CU5M=	10GBASE-CU SFP+ Cable 5 Meter, passive, spare (supported only with DS-X9708-K9)
SFP-H10GB-ACU7M=	10GBASE-CU SFP+ Active Copper Cable 7 Meter, Spare (supported only with DS-X9708-K9)
SFP-H10GB-ACU10M=	10GBASE-CU SFP+ Active Copper Cable 10 Meter, Spare (supported only with DS-X9708-K9)
DS-SFP-FC10G-SW=	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Shortwave, SFP+, LC, Spare (Supported only with DS-X9232-256K9 and DS-X9248-256K9)
DS-SFP-FC10G-LW=	Cisco MDS 9000 Family 10-Gbps Fibre Channel-Longwave, SFP+, LC, Spare (Supported only with DS-X9232-256K9 and DS-X9248-256K9)
DS-SFP-FC8G-ER=	2/4/8-Gbps Fibre Channel Extended Reach SFP+, LC, Spare (40km Reach)
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-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)

Part Number	Product Description
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)
ONS-SC-4G-xx.x=	Cisco 4-Gbps DWDM SFP Transceiver, Spare (where xxx = 50.1, 50.9, 51.7, 52.5, 54.1, 54.9, 55.7, 56.5, 58.1, 58.9, 59.7, 60.6, 30.3, 31.1, 31.9, 32.6, 33.4, 34.2, 35.0, 35.8, 36.6, 37.4, 38.1, 38.9, 39.7, 40.5, 41.3, 42.1, 42.9, 43.7, 44.5, 45.3, 46.1, 46.9, 47.7, 48.5, 49.3, 53.3, 57.3, 61.4)
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-SCR-K9=	Cisco MDS 9000 Family Smart Card Reader, Spare
DS-SC-K9=	Cisco MDS 9000 Family Smart Cards, Spare
CAB-9K16A-AUS	Power cord 250VAC 16A, Australia, source plug AU20S3
CAB-9K16A-CH=	Power cord 250VAC 16A, China, source plug GB16C, Spare
CAB-9K16A-CH=	Power cord 250VAC 16A, China, source plug GB16C, Spare
CAB-9K16A-EU=	Power cord 250VAC 16A, Europe, source plug CEE 7/7, Spare
CAB-9K16A-INT=	Power cord 250VAC 16A, international, source plug IEC 309, Spare
CAB-9K16A-ISR=	Power cord 250VAC 16A, Israel, source plug SI16S3, Spare
CAB-9K16A-SA=	Power cord 250VAC 16A, South Africa, source plug EL 208, SABS 164-1, Spare
CAB-9K16A-SW=	Power cord 250VAC 16A, Switzerland, source plug SEV 5934-2 Type 23, Spare
CAB-9K16A-US1=	Power cord 250VAC 16A, United States/Japan, source plug NEMA 6-20, Spare
CAB-9K16A-US2=	Power cord 250VAC 16A, United States/Japan, source plug NEMA L6-20, Spare
CAB-9K20A-NA=	Power Cord, 125VAC 20A NEMA 5-20 Plug, North America/Japan, Spare
CAB-9K16A-KOR=	Power Cord 250VAC 16A, Korea, Src Plug, Spare
CAB-C19-CBN=	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors, Spare
M9500ENT1K9=	Cisco MDS 9500 Enterprise Package license for 1 MDS 9500 switch, Spare
DCNM-SAN-M95-K9=	DCNM SAN License for Cisco MDS 9500 switch, Spare
M9500FIC1K9=	Cisco MDS 9500 Mainframe Package license for 1 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
L-M95EXTSSNK9=	SAN Extension License (1 engine) for the SSN-16 module in MDS 9500, spare
M95IOA184=	Cisco I/O Accelerator License for MSM-18/4 on MDS 9500, Spare
M95IOASSN=	Cisco I/O Accelerator License (1 engine) for the SSN-16 in Cisco MDS 9500, spare
L-M95IOASSN=	Cisco I/O Accelerator License (1 engine) for SSN-16 on MDS 9500, Spare, E-delivery
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

Part Number	Product Description
L-M95SMESSNK9=	Cisco Storage Media Encryption License (1 engine) for SSN-16 on MDS 9500, spare (E-delivery)
M95DMM184K9=	MDS 9500 Data Mobility Manager (DMM) License for one 18/4-Port Multiservice Module, Spare
M95DMM184TSK9=	MDS 9500 Data Mobility Manager (DMM) License for 18/4-Port Multiservice Module for 180 days, Spare
L-M95IOA184=	Cisco I/O Accelerator License for MSM-18/4 on MDS 9500, Spare, E-delivery
L-M95DMM184K9=	MDS 9500 Data Mobility Manager (DMM) License for one 18/4, E-delivery
L-M95DMM184TSK9=	MDS 9500 Data Mobility Manager (DMM) License for 18/4 for 180 days, E-delivery
M9500SSE184K9=	Storage Services Enabler License for MSM-18/4 on MDS 9500, spare
L-DCNM-S-PAK=	E-Delivery DCNM for SAN Advanced Edition configurable PAK
DCNM-SAN-PAK=	DCNM for SAN Advanced Edition e-delivery configurable PAK
L-DCNM-S-M95-K9=	E-Delivery DCNM for SAN Advanced Edition MDS 9500 spare
DCNM-SAN-M95-K9=	DCNM for SAN Advanced Edition for Cisco MDS 9500 spare

For More Information

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

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco services help you protect your network investment, optimize network operations, and prepare the network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, see Cisco Technical Support Services or Cisco Advanced Services.

For More Information

For more information about the Cisco MDS 9513, visit http://www.cisco.com/en/US/products/ps6780/index.html or contact your local account representative.

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