Cisco MDS 9000 24/10-Port SAN Extension Module for Cisco MDS 9700 Series Multilayer Directors

Contents

Product overview

The Cisco MDS 9000 24/10-Port SAN Extension Module provides a high-performance, flexible, unified platform for deploying enterprise-class disaster-recovery and business-continuance SAN extension solutions (Figure 1).

Figure 1.
Cisco MDS 9000 24/10-Port SAN Extension Module

The MDS 9000 24/10-Port SAN Extension Module is supported on Cisco MDS 9700 Series Multilayer Directors. With 24 line-rate 2-, 4-, 8-, 10-, and 16-Gbps Fibre Channel ports and eight 1 and 10 Gigabit Ethernet Fibre Channel over IP (FCIP) ports, this module enables large and scalable deployment of SAN extension solutions. The SAN extension module has two independent service engines that can each be individually and incrementally enabled to scale as business requirements expand. The SAN extension module supports the full range of services available on other Cisco MDS 9000 Family Fibre Channel switching modules, including virtual SAN (VSAN), security, and traffic management services. The FCIP module uses Cisco expertise and knowledge of IP networks to deliver outstanding SAN extension performance, reducing latency for disk and tape operations with FCIP acceleration features, including FCIP write acceleration and FCIP tape write and read acceleration. Hardware-based encryption helps secure sensitive traffic with IP Security (IPsec), and hardware-based compression dramatically enhances performance for both high- and low-speed links, enabling immediate cost savings in expensive WAN infrastructure. Multiple FCIP interfaces within a single engine or across service engines can be grouped into a port channel of up to 16 links for high availability and increased aggregate throughput.

Main features and benefits

The MDS 9000 24/10-Port SAN Extension Module is designed for mission-critical enterprise storage networks that require secure, robust, cost-effective business-continuance services. The SAN extension module offers the following main features:

- **FCIP for remote SAN extension**

  The Cisco SAN Extension over IP functionality is offered as standard on the eight fixed 1/10 Gigabit Ethernet IP storage services ports, enabling features such as Fibre Channel over IP (FCIP) and compression on the module without the need for additional licenses. The functionality provides the following benefits:

  - Simplifies data-protection and business-continuance strategies by enabling backup, remote replication, and other disaster-recovery services over WAN distances using open standards FCIP tunneling.

- Optimizes utilization of WAN resources for backup and replication by enabling hardware-based compression, hardware-based encryption, FCIP write acceleration, and tape read and write acceleration for both FCIP and FICON over IP. The SAN extension module will support 3 tunnels per interface and can scale up to 24 tunnels (3 tunnels x 8 1/10GE ports).
- Preserves MDS 9000 Family enhanced capabilities, including VSANs, advanced traffic management, and security, across remote connections.

- **I/O Accelerator Services**

  Cisco MDS 9000 IOA functionality can be deployed in conjunction with disk data replication solutions to extend the distance between data centers or reduce the effects of latency on application performance due to slower disk or tape devices or low speed links. Cisco MDS 9000 IOA functionality can also be used to enable remote tape backup and restore operations without significant throughput degradation when compared to local tapes. The capability to accelerate tape traffic over Fibre Channel, and not just over FCIP, is unique in the industry. The main features of Cisco MDS 9000 IOA functionality include:

  - Transport and Speed-independent acceleration that accelerates Disk and Tape traffic over any 2/4/8/16G Fibre Channel port on the director and 1/10GE FCIP ISLs
  - Unified solution for disk and tape I/O acceleration over Metropolitan Area Networks (MANs) and WANs
  - Extension of acceleration as a fabric service to any port in the fabric, regardless of where it is attached
  - Transport Independent Write Acceleration (WA) of Disk Replication traffic and Tape Acceleration (TA) of Tape Replication Traffic
  - Data compression in conjunction with FCIP ISLs.
  - High availability using Port-Channels with acceleration over Fibre Channel and FCIP ISLs

  Cisco MDS 9000 IOA capability is available on MDS 9700 series directors from NX-OS 8.2(1) release and can be enabled using the I/O acceleration package license which is available to configure separately on a module. A module can be configured either for IOA or SAN extension over IP functionality at any time.

- **Integrated IP storage services in a high-density form factor:** The module supports eight 1 and 10 Gigabit Ethernet ports. Individual ports can be configured with hot-swappable shortwave and longwave Small Form-Factor Pluggable (SFP) connections.
- **Integrated hardware-based VSANs and Inter-VSAN Routing (IVR):** The module enables deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port in a system or fabric to be partitioned into 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. Cisco MDS Enterprise License is required to support IVR.
- **Intelligent network services:** The module uses VSAN technology for hardware-enforced, isolated environments in a single physical fabric, Access Control Lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic management features such as fabric wide Quality of Service (QoS) to facilitate migration from SAN islands to enterprise wide storage networks.

- **Sophisticated diagnostics:** The module provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated Cisco Call Home capability for greater reliability, faster problem resolution, and reduced service costs.
- **Comprehensive network security framework:** The module supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, Simple Network Management Protocol Version 3 (SNMPv3) implementing the Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN Role-Based Access Control (RBAC). RBAC provides separate control over management functions and access on a per-VSAN basis, enabling separation of duties among administrators on the same physical switch. Gigabit Ethernet ports support IPsec authentication, data integrity, and hardware-assisted data encryption.
- **IP Version 6 (IPv6) support:** The module supports IPv6 as mandated by the U.S. Department of Defense (DoD), Japan, and China. IPv6 support is provided for FCIP and for management traffic routed in band and out of band.

Integrated FCIP for Remote SAN and Mainframe Channel Extension

Data-distribution, data-protection, and business-continuance services are significant components of today's information-centered businesses. The capability to efficiently replicate critical data on a global scale helps ensure a higher level of data protection for valuable corporate information, and it also increases utilization of backup resources and lowers total cost of storage ownership. The MDS 9000 24/10-Port SAN Extension Module uses the open-standards FCIP protocol to extend the distance of current Fibre Channel and FICON solutions, enabling interconnection of SAN islands over extended distances. FICON support will be available in a future date.

Advanced SAN Extension features

The MDS 9000 24/10-Port SAN Extension Module supports hardware-based FCIP compression to increase the effective WAN bandwidth of SAN extension solutions. The module can deliver compression ratios in the range of 4:1 to 5:1 over a wide variety of data sources.

The SAN extension module supports AES 256 IPsec encryption for secure transmission of sensitive data over extended distances. Hardware enablement of IPsec helps ensure line-rate throughput. Together, hardware-based compression and hardware-based encryption provide a high-performance, highly secure SAN extension capability.

Additionally, the SAN extension module supports FCIP write acceleration, a feature that can significantly improve application performance when storage traffic is extended across long distances. When FCIP write acceleration is enabled, WAN throughput is optimized by reducing the latency of command acknowledgments.

VSANs

Well suited for efficient, secure SAN consolidation, ANSI T11-standard VSANs enable 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 maintained with its own fabric services for greater scalability and resilience. VSANs allow the cost of SAN infrastructure to be shared among more users, while helping ensure segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

Integrated SAN Routing

In another step toward deployment of efficient, cost-effective, consolidated storage networks, the MDS 9000 24/10-Port SAN Extension Module supports IVR, the industry's first and most efficient routing function 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. 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. IVR reduces the total cost of SAN ownership. Cisco MDS Enterprise License is required to support IVR.

Advanced Traffic Management

The advanced traffic management capabilities integrated into the MDS 9000 24/10-Port SAN Extension Module 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
- **Port channels:** Allow users to aggregate up to 16 FCIP 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
- **Fabric Shortest Path First (FSPF)–based multipathing:** Provides the intelligence to load-balance traffic across up to 16 equal-cost paths and, in the event of a switch failure, dynamically reroute traffi**c**
- **QoS:** Can be used to manage bandwidth and control latency, to prioritize critical traffic
- **Shaper:** Rate limits the WAN bandwidth according to the maximum bandwidth configured for the FCIP tunnel

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 MDS 9000 Family integrates the industry's most advanced analysis and diagnostic tools. Power-On Self-Test (POST) and online diagnostics provide proactive health monitoring. The MDS 9000 24/10-Port SAN Extension Module implements diagnostic capabilities such as Fibre Channel Traceroute to detail the exact path and timing of flows and Cisco Switched Port Analyzer (SPAN) to intelligently capture network traffic. The module also supports the SAN Extension Tuner (SET) tool, which helps you optimize FCIP performance by generating either direct-access (for magnetic disks) or sequential-access (for magnetic tape) Small Computer System Interface (SCSI) I/O commands and directing this traffic to a specific virtual target. You can specify the size of the test I/O transfers and the number of concurrent or serial I/O operations to generate while testing. The SET tool reports the resulting I/O operations per second (IOPS) and I/O latency, which helps you determine the number of concurrent I/O operations needed to get the best FCIP throughput.

After traffic has been captured, it can be analyzed with the Cisco Fabric Analyzer, an embedded Fibre Channel analyzer. Comprehensive port-based and flow-based statistics facilitate sophisticated performance analysis and Service-Level Agreement (SLA) accounting. With the MDS 9000 Family, Cisco delivers a comprehensive tool set for troubleshooting and analyzing storage networks.

Comprehensive Solution for Robust Network Security

Addressing the need for fail-proof security in storage networks, the MDS 9000 24/10-Port SAN Extension Module offers an extensive security framework to protect highly sensitive data moving in today's enterprise networks. The module employs intelligent frame inspection at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced port security features.

- Extended zoning capabilities restrict broadcasts to only the selected zones (broadcast zones).
- VSANs are used to achieve greater security and stability by providing complete isolation among devices that are connected to the same physical SAN.
- FC-SP provides switch-to-switch and host-to-switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication supporting RADIUS and TACACS+, to help ensure that only authorized devices can access protected storage networks.

Product specifications

Table 1 lists the product specifications for the MDS 9000 24/10-Port SAN Extension Module.

Table 1. Product specifications

Feature	Description
Product compatibility	Cisco MDS 9000 Family
Software compatibility	Cisco MDS 9000 NX-OS Software 7.3(0)DY(1)
Protocols	Fibre Channel standards • FC-PH, Revision 4.3 (ANSI INCITS 230-1994) • FC-PH, Amendment 1 (ANSI INCITS 230-1994/AM1-1996) • FC-PH, Amendment 2 (ANSI INCITS 230-1994/AM2-1999) • FC-PH-2, Revision 7.4 (ANSI INCITS 297-1997) • FC-PH-3, Revision 9.4 (ANSI INCITS 303-1998) • FC-PI, Revision 13 (ANSI INCITS 352-2002) • FC-PI-2, Revision 10 (ANSI INCITS 404-2006) • FC-PI-3, Revision 4 (ANSI INCITS 460-2011) • FC-PI-4, Revision 8 (ANSI INCITS 450-2008) • FC-PI-5, Revision 6 (ANSI INCITS 479-2011) • FC-FS, Revision 1.9 (ANSI INCITS 373-2003) • FC-FS-2, Revision 1.01 (ANSI INCITS 424-2007) • FC-FS-2, Amendment 1 (ANSI INCITS 424-2007/AM1-2007) • FC-FS-3, Revision 1.11 (ANSI INCITS 470-2011) • FC-LS, Revision 1.62 (ANSI INCITS 433-2007) • FC-LS-2, Revision 2.21 (ANSI INCITS 477-2011) • FC-SW-2, Revision 5.3 (ANSI INCITS 355-2001) • FC-SW-3, Revision 6.6 (ANSI INCITS 384-2004) • FC-SW-4, Revision 7.5 (ANSI INCITS 418-2006) • FC-SW-5, Revision 8.5 (ANSI INCITS 461-2010) • FC-GS-3, Revision 7.01 (ANSI INCITS 348-2001) • FC-GS-4, Revision 7.91 (ANSI INCITS 387-2004)

Feature	Description
	• FC-GS-5, Revision 8.51 (ANSI INCITS 427-2007) • FC-GS-6, Revision 9.4 (ANSI INCITS 463-2010) • FCP, Revision 12 (ANSI INCITS 269-1996) • FCP-2, Revision 8 (ANSI INCITS 350-2003) • FCP-3, Revision 4 (ANSI INCITS 416-2006) • FCP-4, Revision 2b (ANSI INCITS 481-2011) • FC-SB-2, Revision 2.1 (ANSI INCITS 349-2001) • FC-SB-3, Revision 1.6 (ANSI INCITS 374-2003) • FC-SB-3, Amendment 1 (ANSI INCITS 374-2003/AM1-2007) • FC-SB-4, Revision 3.0 (ANSI INCITS 466-2011) • FC-SB-5, Revision 2.00 (ANSI INCITS 485-2014) • FC-BB-6, Revision 2.00 (ANSI INCITS 509-2014) • FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003) • FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006) • FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008) • FC-BB-5, Revision 2.0 (ANSI INCITS 462-2010) • FC-VI, Revision 1.84 (ANSI INCITS 357-2002) • FC-SP, Revision 1.8 (ANSI INCITS 426-2007) • FC-SP-2, Revision 2.71 (ANSI INCITS 496-2012) • FAIS, Revision 1.03 (ANSI INCITS 432-2007) • FAIS-2, Revision 2.23 (ANSI INCITS 449-2008) • FC-IFR, Revision 1.06 (ANSI INCITS 475-2011) • FC-FLA, Revision 2.7 (INCITS TR-20-1998) • FC-PLDA, Revision 2.1 (INCITS TR-19-1998) • FC-Tape, Revision 1.17 (INCITS TR-24-1999) • FC-MI, Revision 1.92 (INCITS TR-30-2002) • FC-MI-2, Revision 2.6 (INCITS TR-39-2005) • FC-MI-3, Revision 1.03 (INCITS TR-48-2012) • FC-DA, Revision 3.1 (INCITS TR-36-2004) • FC-DA-2, Revision 1.06 (INCITS TR-49-2012) • FC-MSQS, Revision 3.2 (INCITS TR-46-2011) • Fibre Channel classes of service: Class 2, Class 3, and Class F • Fibre Channel standard port types: E, F, FL, and B • Fibre Channel enhanced port types: SD, ST, and TE • IP over Fibre Channel (RFC 2625) • IPv6, IPv4, and Address Resolution Protocol (ARP) over Fibre Channel (RFC 4338) • Extensive IETF-standards based TCP/IP, SNMPv3, and remote monitoring (RMON) MIBs IP standards • RFC 791 IPv4 • RFC 793 and 1323 TCP • RFC 894 IP/Ethernet • RFC 1041 IP/802 • RFC 792, 950, and 1256 Internet Control Message Protocol (ICMP) • RFC 1323 TCP performance enhancements • RFC 2338 Virtual Router Redundancy Protocol (VRRP)

Feature	Description
	• RFC 2460 and 4291 IPv6 • RFC 2463 ICMPv6 • RFC 2461 and 2462 IPv6 neighbor discovery and stateless autoconfiguration • RFC 2464 IPv6/Ethernet • RFC 3643 and 3821 FCIP Ethernet standards • IEEE 802.3z Gigabit Ethernet • IEEE 802.1Q VLAN IPsec standards • RFC 2401 Security Architecture for IP • RFC 2403 and 2404 Hash Message Authentication Code (HMAC) • RFC 2405, 2406, and 2451 IP Encapsulating Security Payload (ESP) • RFC 2407 and 2408 Internet Security Association and Key Management Protocol (ISAKMP) • RFC 2412 OAKLEY Key Determination Protocol • RFC 3566, 3602, and 3686 AES Internet Key Exchange (IKE) standards • RFC 2409 IKEv1 • IKEv2, draft
Cards, ports, and slots	24 x fixed 2/4/8/10/16-Gbps Fibre Channel ports, 8 x 1/10 Gigabit Ethernet ports, 2 x 40 Gigabit Ethernet port[1]
Features and Functions	
Fabric services	• Name server • Registered State Change Notification (RSCN) • Login services • Cisco Fabric Configuration Server (FCS) • Private loop • Public loop • Translative loop • Broadcast • In-order delivery
Advanced functions	• VSAN • IVR • Port channel with multipath load balancing • Flow-based and zone-based QoS • Hardware-based compression for MAN and WAN data • Hardware-based encryption • Hardware-based data integrity • FCIP disk write acceleration • FCIP tape read and write acceleration

[1] Requires the Director switch running at NX-OS version 9.3(1) or higher

Feature	Description
Diagnostics and troubleshooting tools	• POST diagnostics • Online diagnostics • Internal port loopbacks • SPAN and remote SPAN • Fibre Channel Traceroute • Fibre Channel Ping • Fibre Channel Debug • Cisco Fabric Analyzer • Syslog • Online system health • Port-level statistics • Real-Time Protocol (RTP) debug
Network security	• VSANs • ACLs • Per-VSAN RBAC • Fibre Channel zoning ◦ N-port worldwide name (WWN) ◦ N-port FC-ID ◦ Fx-port WWN ◦ Fx-port WWN and interface index ◦ Fx-port domain ID and interface index ◦ Fx-port domain ID and port number ◦ Logical Unit Number (LUN) ◦ Read-only ◦ Broadcast • FC-SP ◦ DH-CHAP switch-to-switch authentication ◦ DH-CHAP host-to-switch authentication • Port security and fabric binding • IPsec for FCIP • IKEv1 and v2 • Management access ◦ SSH v2 implementing AES ◦ SNMPv3 implementing AES ◦ SFTP
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

Feature	Description		
Performance	• Port speed: Fibre Channel 2/4/8/10/16 Gbps; FCIP 1/10 Gigabit Ethernet • Port channels: Up to 16 FCIP links • FCIP tunnels: Up to 3 per port		
Supported Cisco optics, media, and transmission distances (Ethernet transceivers for Gigabit Ethernet ports)	Speed • 1-Gbps SX, LC SFP • 1-Gbps SX, LC SFP • 1-Gbps SX, LC SFP • 1-Gbps LX/LH, LC SFP • 1-Gbps 1000-BASE-T • 10-Gbps SR • 10-Gbps SR • 10-Gbps LR • 10-Gbps ER • 10-Gbps DWDM	Media • 62.5/125-micron multimode fiber (OM1) • 50/125-micron multimode fiber (OM2) • 50/125-micron multimode fiber (OM3) • 9/125-micron single-mode fiber • Category 5 or 5E • 50/125-micron multimode fiber (OM3) • 50/125-micron multimode fiber (OM4) • 9/125-micron single-mode fiber • 9/125-micron single-mode fiber • 9/125-micron single-mode fiber	Distance • 275m • 550m • 1000m • 10 km • 100m • 300m • 400m • 10 km • 40 km • 80 km
Supported Cisco optics, media, and transmission distances	For detailed information about all supported transceivers, see Cisco MDS 9000 Family pluggable transceivers.		
Reliability and availability	• Hot-swappable module • Hot-swappable SFP optics • Online diagnostics • Stateful process restart • Nondisruptive supervisor failover • Any module, any port configuration for port channels • Fabric-based multipathing • Per-VSAN fabric services • Port tracking • VRRP for management and FCIP		
Network management	• Access methods through Cisco MDS 9700 Series Supervisor Module ◦ Out-of-band 10/100/1000 Ethernet port (Supervisor-1 Module) ◦ Out-of-band 10/100/1000 Ethernet port (Supervisor-2 Module) ◦ RS-232 serial console port (RJ45 form factor) ◦ In-band IP-over-Fibre Channel • Access protocols ◦ Command-Line Interface (CLI) through console and Ethernet ports ◦ SNMPv3 through Ethernet port and in-band IP-over-Fibre Channel access ◦ Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S) • Distributed device alias service • Network security ◦ Per-VSAN RBAC using RADIUS- and TACACS+-based Authentication, Authorization, and Accounting (AAA) functions ◦ SFTP ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES		

Feature	Description
	• Management applications ◦ Cisco MDS 9000 Family CLI ◦ Cisco Data Center Network Manager ◦ Cisco Device Manager
Programming interfaces	• Cisco Data Center Network Manager GUI • Cisco Device Manager GUI
Environmental	• Temperature, ambient operating: 32 to 104°F (0 to 40°C) • Temperature, ambient nonoperating and storage: -40 to 158°F (-40 to 70°C) • Relative humidity, ambient (noncondensing) operating: 5 to 90% • Relative humidity, ambient (noncondensing) nonoperating and storage: 5 to 95% • Altitude, operating: -197 to 6500 ft (-60 to 2000m)
Physical dimensions	• Dimensions (H x W x D): 1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm) Occupies one slot in a Cisco MDS 9700 Series • Weight: 17 lb (7.71 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

Ordering information

Table 2 provides ordering information for the MDS 9000 24/10-Port SAN Extension Module.

Table 2. Ordering information

Part Number	Product Description
DS-X9334-K9	Cisco MDS 9000 Family 24/10 SAN Extension Module
DS-SFP-GE-T	Gigabit Ethernet Copper SFP, RJ-45
SFP-10G-SR	10GBASE-SR SFP Module, (300m) (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-SR-S	10GBASE-SR SFP Module, (300m) Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-LR	10GBASE-LR SFP Module (10km), (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-LR-S	10GBASE-LR SFP Module (10km), Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-ER	10GBASE-ER SFP Module, (40km), (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-ER-S	10GBASE-ER SFP Module (40km), Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
QSFP-40G-SR4	40GBASE-SR4 QSFP Transceiver Module with MPO Connector
QSFP-40G-CSR4	QSFP 4x10GBASE-SR transceiver module, MPO, 300M
QSFP-40G-LR4-S	QSFP 40GBASE-LR4 Trnscvr Mod, LC, 10km, Enterprise-Class
QSFP-40G-LR4-S	QSFP 40GBASE-LR4 Trnscvr Mod, LC, 10km, Enterprise-Class
QSFP-40/100-SRBD	100G and 40GBASE SR-BiDi QSFP transceiver, LC, 100m OM4 MMF
DS-SFP-FC8G-SW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC (Supported only on FC ports)
DS-SFP-FC8G-LW	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km reach) (Supported only on FC ports
DS-SFP-FC8G-ER	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel ER SFP+, LC (40-km reach) (Supported only on FC ports)
DS-SFP-FC10G-SW	10 Gbps Fibre Channel SW SFP+, LC (Supported only on FC ports)
DS-SFP-FC10G-LW	10 Gbps Fibre Channel LW SFP+, LC (Supported only on FC ports)
DS-SFP-FC16G-SW	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Shortwave, SFP+, LC (Supported only on FC ports)
DS-SFP-FC16G-LW	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Longwave, SFP+, LC (10km) (Supported only on FC ports)

Part Number	Product Description
DS-SFP-FC16GELW	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Longwave, SFP+, LC (25km) (Supported only on FC ports)
Licenses	
M97IOA2410	Cisco IOA License for 24/10 module on MDS 9700
M97IOA24102X	Cisco IOA License pack for 24/10 module on MDS 9700
Spare Components	
DS-X9334-K9=	Cisco MDS 9000 Family 24/10 SAN Extension Module, spare
DS-SFP-GE-T=	Gigabit Ethernet Copper SFP, RJ-45
SFP-10G-SR= **DS-SFP-10GE-SR=**	10GBASE-SR SFP Module, (300m) (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-SR-S=	10GBASE-SR SFP Module, (300m) Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-LR= **DS-SFP-10GE-LR=**	10GBASE-LR SFP Module, (10km) (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-LR-S=	10GBASE-LR SFP Module, (10km) Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-ER=	10GBASE-ER SFP Module, (40km) (Supported only with 10 Gigabit Ethernet ports)
SFP-10G-ER-S=	10GBASE-ER SFP Module, (40km) Enterprise-Class (Supported only with 10 Gigabit Ethernet ports)
DWDM-SFP10G-xxxx=	10G DWDM Module (80km) (Supported only with 10 Gigabit Ethernet ports)
SFP-H10GB-CUxx=	10GBASE-CU SFP+ cable
SFP-H10GB-ACUxx=	Active Twinax cable assembly
DS-SFP-FC8G-SW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC (Supported only on FC ports)
DS-SFP-FC8G-LW=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC (10-km reach) (Supported only on FC ports
DS-SFP-FC8G-ER=	Cisco MDS 9000 Family 2/4/8-Gbps Fibre Channel ER SFP+, LC (40-km reach) (Supported only on FC ports)
DS-CWDM8G-xxxx=	Cisco MDS CWDM 2/4/8-Gbps Fibre Channel SFP+ (40km)
DS-SFP-FC10G-SW=	10 Gbps Fibre Channel SW SFP+, LC (Supported only on FC ports)
DS-SFP-FC10G-LW=	10 Gbps Fibre Channel LW SFP+, LC (Supported only on FC ports)
QSFP-40G-SR4=	40GBASE-SR4 QSFP Transceiver Module with MPO Connector, Spare

Part Number	Product Description
QSFP-40G-CSR4=	QSFP 4x10GBASE-SR transceiver module, MPO, 300M, Spare
QSFP-40G-LR4-S=	QSFP 40GBASE-LR4 Trnscvr Mod, LC, 10km, Enterprise-Class, Spare
QSFP-40G-LR4-S=	QSFP 40GBASE-LR4 Trnscvr Mod, LC, 10km, Enterprise-Class, Spare
QSFP-40/100-SRBD=	100G and 40GBASE SR-BiDi QSFP transceiver, LC, 100m OM4 MMF, Spare
DS-SFP-FC16G-SW=	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Shortwave, SFP+, LC (Supported only on FC ports)
DS-SFP-FC16G-LW=	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Longwave, SFP+, LC (10km) (Supported only on FC ports)
DS-SFP-FC16GELW=	Cisco MDS 9000 Family 4/8/16-Gbps Fibre Channel-Longwave, SFP+, LC (25km) (Supported only on FC ports)

For a complete list of supported optics, see Cisco MDS 9000 Family Pluggable Transceivers. For 10-Gbps Dense Wavelength-Division Mulitiplexing (DWDM) optics see Cisco 10GBASE DWDM SFP+ Modules.

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 and Cisco Advanced Services.

Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.

For more information

For more information about the MDS 9000 24/10-Port SAN Extension Module, visit https://www.cisco.com/go/storage or contact your local account representative.

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