# Cisco MDS 9700 48-Port 10-Gbps Fibre Channel over Ethernet Module

Product Overview

Multiprotocol storage networking is central to Cisco® Unified Fabric, providing a networking platform for IT departments to achieve lower total cost of ownership (TCO), enhanced resiliency, and greater agility. Cisco Unified Fabric unifies storage and data networking with the data center operating system to deliver convergence, scalability, and network intelligence. With the Cisco MDS 9700 48-Port 10-Gbps Fibre Channel over Ethernet (FCoE) Module (Figure 1), the Cisco MDS 9700 Series Multilayer Directors platform now offers both 16-Gbps Fibre Channel and 10-Gbps FCoE capabilities, providing multiprotocol flexibility for SANs. Now you can extend the benefits of FCoE beyond the access layer to the data center core with a full line-rate FCoE module for the Cisco MDS 9700 Series.

Save money, simplify management, reduce power and cooling requirements, and improve flexibility by deploying FCoE, while protecting your Fibre Channel SAN investment with the Cisco MDS 9700 10-Gbps 48-Port FCoE Module. FCoE allows an evolutionary approach to I/O consolidation by preserving all Fibre Channel constructs. It maintains the latency, security, and traffic management attributes of Fibre Channel, as well as your investment in Fibre Channel tools, training, and SANs. FCoE also extends Fibre Channel SAN connectivity; now 100 percent of your network servers can be attached to the SAN.

Figure 1.   Cisco MDS 9700 48-Port 10-Gbps FCoE Module
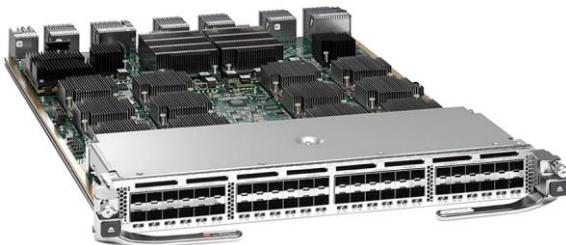
Main Features

The main features of the Cisco MDS 9700 10-Gbps 48-Port FCoE Module include:

- High performance: Cisco MDS 9700 Series architecture, based on central arbitration and crossbar fabric, provides 10-Gbps line-rate, nonblocking, predictable performance across all traffic conditions for every FCoE port in the chassis.

- Efficient encoding: FCoE takes advantage of the more efficient encoding mechanisms of 10-Gbps Ethernet to provide 50 percent more bandwidth than 8-Gbps Fibre Channel (the actual throughput of 8-Gbps Fibre Channel is 6.8 Gbps). Therefore, you need fewer 10 Gigabit Ethernet links to achieve the same bandwidth as with multiple 8-Gbps links.

- High availability: Cisco MDS 9700 Series directors provide outstanding availability and reliability. These are the industry's first director-class switches that offer redundancy on all major components, including the fabric card. They provide grid redundancy on the power supply and 1+1 redundant supervisors. Users can also can add fabric cards to enable N+1 fabric redundancy.
- Scalability: The Cisco MDS 9700 48-Port 10-Gbps FCoE Module provides up to 384 10-Gbps, full line-rate, autosensing ports in a single 9710 chassis or up to 192 10-Gbps full line-rate ports in a single Cisco MDS 9706 Multilayer Director chassis.
- Resilient high-performance Inter-Switch Links (ISLs): FCoE ISLs can be grouped into PortChannels with up to 16 physical links, creating massive 160-Gbps logical links. When you connect to Cisco Nexus® 7000 Series Switches populated with Cisco Nexus 7000 Series 10 Gigabit Ethernet modules, you can easily scale the number of director-class FCoE ports to meet the needs of the most demanding data center environments.
- 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.
- Sophisticated diagnostics: The Cisco MDS 9700 48-Port 10-Gbps FCoE Module provides intelligent diagnostics, protocol decoding, network analysis tools, and integrated Cisco Call Home capability for greater reliability, faster problem resolution, and reduced service costs.

Main Benefits

As server workloads increase, converged networks can reduce complexity and lower data center power consumption, extending the lifecycle of existing assets. Converged networks also improve SAN attachment rates to simplify virtual machine mobility.

Bring the benefits of I/O consolidation at the access layer to the data center core with the Cisco MDS 9700 10-Gbps 48-Port FCoE Module.This approach offers three important benefits:

- Investment protection: FCoE is an evolutionary technology with the same management model as Fibre Channel. With FCoE, you can preserve your investments in Fibre Channel tools, training, and SANs. The Cisco MDS 9700 FCoE module provides investment protection for existing Fibre Channel storage by transparently bridging the gap between FCoE SANs (traffic originating from server-side networks) and Fibre Channel SANs (traffic heading toward storage arrays), as shown in Figure 2.

Figure 2.   MDS 9700 Interconnects FCoE and Fibre Channel SANs
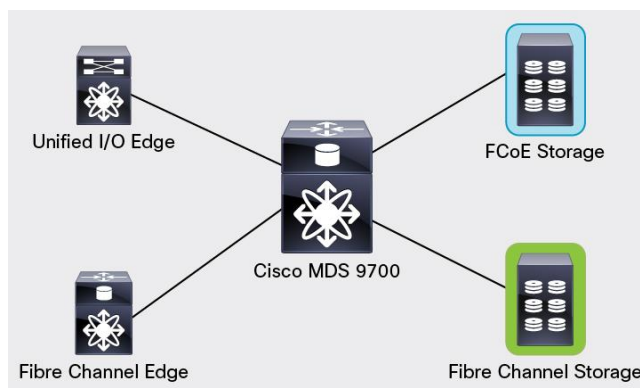
- Agility: Over time, a converged network uses network capacity more efficiently in both LAN and SAN deployments. Higher bandwidth capacity also improves responsiveness for all traffic types. The end-to-end benefits of FCoE include the capability to set up, move, and change both physical and virtual assets with greater speed and fewer points of failure.
- Simplification: Through consolidation, a converged network can reduce complexity and provide a greater return on investment (ROI).

This module also supports connectivity to FCoE initiators and targets that send only FCoE traffic, thus providing a way to deploy a dedicated FCoE SAN without requiring any convergence.

Product Specifications

Table 1 lists the specifications for the Cisco MDS 9700 48-Port 10-Gbps FCoE Module.

Table 1.   Product Specifications

Item	Specification
Product compatibility	Cisco MDS 9700 Series Multilayer Directors
Software compatibility	Requires Cisco MDS NX-OS Software Release 6.2(7) or later
Fibre Channel and FCoE protocols	Fibre Channel standards: • FC-BB-5, Revision 2.0 (ANSI INCITS 462-2010) • FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008) • FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006) • FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003) • FC-FS-3, Revision 1.11 (ANSI INCITS 470-2011) • FC-FS-2, Revision 1.01 (ANSI INCITS 424-2007) • FC-FS-2, Amendment 1 (ANSI INCITS 424-2007/AM1-2007) • FC-FS, Revision 1.9 (ANSI INCITS 373-2003) • FC-LS-2, Revision 2.21 (ANSI INCITS 477-2011) • FC-LS, Revision 1.62 (ANSI INCITS 433-2007) • FC-SW-5, Revision 8.5 (ANSI INCITS 461-2010) • FC-SW-4, Revision 7.5 (ANSI INCITS 418-2006) • FC-SW-3, Revision 6.6 (ANSI INCITS 384-2004) • FC-SW-2, Revision 5.3 (ANSI INCITS 355-2001) • FC-GS-6, Revision 9.4 (ANSI INCITS 463-2010) • FC-GS-5, Revision 8.51 (ANSI INCITS 427-2007) • FC-GS-4, Revision 7.91 (ANSI INCITS 387-2004) • FC-GS-3, Revision 7.01 (ANSI INCITS 348-2001) • FCP-4, Revision 2 • FCP-3, Revision 4 (ANSI INCITS 416-2006) • FCP-2, Revision 8 (ANSI INCITS 350-2003) • FCP, Revision 12 (ANSI INCITS 269-1996) • FC-SB-4, Revision 3.0 (ANSI INCITS 466-2011) • FC-SB-3, Revision 1.6 (ANSI INCITS 374-2003) • FC-SB-3, Amendment 1 (ANSI INCITS 374-2003/AM1-2007) • FC-SB-2, Revision 2.1 (ANSI INCITS 349-2001) • FC-VI, Revision 1.84 (ANSI INCITS 357-2002) • FC-SP, Revision 1.8 (ANSI INCITS 426-2007) • FAIS-2, Revision 2.23 (ANSI INCITS 449-2008) • FAIS, Revision 1.03 (ANSI INCITS 432-2007) • FC-IFR, Revision 1.06 (ANSI INCITS 475-2011) • FC-MI-2, Revision 2.6 (INCITS TR-39-2005) • FC-MI, Revision 1.92 (INCITS TR-30-2002) • FC-DA, Revision 3.1 (INCITS TR-36-2004) • FC-FLA, Revision 2.7 (INCITS TR-20-1998)

Item	Specification
	• FC-PLDA, Revision 2.1 (INCITS TR-19-1998) • FC-Tape, Revision 1.17 (INCITS TR-24-1999) Fibre Channel features: • T11 standards-compliant FCoE • T11 FCoE Initialization Protocol (FIP) • FCoE Forwarder (FCF) • Multihop FCoE with virtual E (VE) port support • Converged Enhanced Ethernet (CEE) interoperability • Direct attachment of FCoE targets • Class of service: Class 2, Class 3, and Class F • Fibre Channel enhanced port types: VE, TE, and VF • F-port trunking • F-port channeling • VSANs • Fibre Channel PortChannel • VSAN trunking • Fabric Device Management Interface (FDMI) • Fibre Channel ID (FCID) persistence • Distributed device alias services • In-order delivery • Port tracking • N-port virtualization (NPV) • N-port ID virtualization (NPIV) • Fabric services: Name server, registered state change notification (RSCN), login services, and name-server zoning • Per-VSAN fabric services • Cisco Fabric Services • Fabric Shortest Path First (FSPF) • Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) and Fibre Channel Security Protocol (FC-SP) • Host-to-switch and switch-to-switch FC-SP authentication • Fabric binding for Fibre Channel • Port security • Standard zoning • Domain and port zoning • Enhanced zoning • Cisco Fabric Analyzer • Fibre Channel traceroute • Fibre Channel ping • Fibre Channel debugging • Cisco Fabric Manager support • Storage Management Initiative Specification (SMI-S)
Ethernet protocols	• IEEE 802.3, Carrier Sense Multiple Access/Collision Detect (CSMA/CD) access method and physical layer (phy) specifications • IEEE 802.1Q, MAC address bridges and virtual bridged LANs • IEEE 802.1Qbb, priority-based flow control (PFC) • IEEE 802.1Qaz, enhanced transmission selection (ETS) • IEEE 802.1Qaz, Data Center Bridging Exchange Protocol (DCBX)
Ports	• 48 fixed autosensing 10-Gbps FCoE ports
Slots	• Can be used in any and all of 8 payload slots of the Cisco MDS 9710 Multilayer Director • Can be used in any and all of 4 payload slots of the Cisco MDS 9706 Multilayer Director

Item	Specification
Features and Functions	
Fabric services	• Name server • RSCN • Login services • Cisco Fabric Configuration Server (FCS) • Public loop • Broadcast • In-order delivery
Advanced capabilities	• VSAN • PortChannel with multipath load balancing • QoS: Flow based and zone based
Diagnostics and troubleshooting tools	• Power-on self-test (POST) diagnostics • Online diagnostics • Fibre Channel ping • Fibre Channel debug • Cisco Fabric Analyzer • Syslog • Online system health • Port-level statistics • Real-Time Transport Protocol (RTP) debug • Online Health Monitoring System (OHMS) or Cisco Generic Online Diagnostics (GOLD) • Enhanced Small Form-Factor Pluggable (SFP+) digital diagnostics

Security	• VSANs
	• ACLs
	• Per-VSAN role-based access control (RBAC)
	• Fibre Channel zoning
	• Port security and fabric binding
	• Cisco Switched Port Analyzer (SPAN)
	• Management access
	  ◦ Secure Shell (SSH) Protocol Version 2 (v2) implementing Advanced Encryption Standard (AES)
	  ◦ Simple Network Management Protocol (SNMP) Version 3 implementing AES
	  ◦ Secure FTP (SFTP)

Serviceability	• Nondisruptive, concurrent code load and activation • Configuration file management • Nondisruptive software upgrades • Cisco Call Home • Power-management LEDs • Port beaconing • System LED • SNMP traps for alerts • Network boot
Performance	• Port speed: 10-Gbps fixed bandwidth • PortChannel: Up to 16 ports
Reliability and availability	• Hot-swappable module • Hot-swappable SFP optics • Online diagnostics • Stateful process restart • Nondisruptive supervisor failover • Any module, any port configuration for PortChannels • Fabric-based multipathing • Per-VSAN fabric services • Port tracking

Item	Specification
Network management	• Access methods through Cisco MDS 9700 Series supervisor module: 　◦ Out-of-band 10/100/1000 Ethernet port (Supervisor-2A) 　◦ RS-232 serial console port 　◦ In-band IPFC 　◦ DB-9 COM port • Access protocols 　◦ Command-line interface (CLI) by console and Ethernet ports 　◦ SNMPv3 by Ethernet port and in-band IPFC access 　◦ Storage Networking Industry Association (SNIA) SMI-S • Network security 　◦ Per-VSAN RBAC 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 (DCNM) for SAN 　◦ Cisco Device Manager 　◦ CiscoWorks Resource Manager Essentials (RME) and Device Fault Manager (DFM)
Programming interfaces	• Scriptable CLI • Cisco DCNM for SAN 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 chassis • Weight: 17.0 lb (7.7 kg)
Power	• Typical: 400 watts (W)
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 　◦ KN22 Class A 　◦ CNS13438 Class A 　◦ CISPR24 　◦ EN 55024 　◦ EN 50082-1

Item	Specification
	◦ EN 61000-6-1
	◦ EN 61000-3-2
	◦ EN 61000-3-3
	◦ EN300 386

Ordering Information

Table 2 provides ordering information for the Cisco MDS 9700 48-Port 10-Gbps FCoE Module.

Table 2.   Ordering Information

Description	Part Number
Cisco MDS 9700 10-Gbps 48-Port FCoE Module	DS-X9848-480K9
Cisco MDS 9700 10-Gbps 48-Port FCoE Module, spare	DS-X9848-480K9=
10GBASE-SR SFP+ Module	DS-SFP-10GE-SR SFP-10G-SR
10GBASE-SR SFP+ Module, spare	DS-SFP-10GE-SR= SFP-10G-SR=
10GBASE-LR SFP+ Module	DS-SFP-10GE-LR SFP-10G-LR
10GBASE-LR SFP+ Module, spare	DS-SFP-10GE-LR= SFP-10G-LR=
10GBASE-DWDM SFP+	DWDM-SFP10G-xx.xx[1]
10GBASE-CU SFP+ cable 1 meter	SFP-H10GB-CU1M
10GBASE-CU SFP+ cable 1 meter, spare	SFP-H10GB-CU1M=
10GBASE-CU SFP+ cable 3 meter	SFP-H10GB-CU3M
10GBASE-CU SFP+ cable 3 meter, spare	SFP-H10GB-CU3M=
10GBASE-CU SFP+ cable 5 meter	SFP-H10GB-CU5M
10GBASE-CU SFP+ cable 5 meter	SFP-H10GB-CU5M=
10GBASE-CU SFP+ active copper cable 7 meter	SFP-H10GB-ACU7M
10GBASE-CU SFP+ active copper cable 7 meter, spare	SFP-H10GB-ACU7M=
10GBASE-CU SFP+ active copper cable 10 meter	SFP-H10GB-ACU10M
10GBASE-CU SFP+ active copper cable 10 meter, spare	SFP-H10GB-ACU10M=

[1] Forty different wavelengths are offered. See the dense wavelength-division multiplexing (DWDM) SFP optics data sheet for additional product numbers and information:
http://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/data_sheet_c78-711186.html.

Service and Support

Using the Cisco Lifecycle Services approach, Cisco and its partners provide a broad portfolio of end-to-end services and support that can help increase your network's business value and ROI. This approach defines the minimum set of activities needed, by technology and by network complexity, to help you successfully deploy and operate Cisco technologies and optimize their performance throughout the lifecycle of your network.

For More Information

For more information about the Cisco MDS 9700 Family Fibre Channel switching modules, visit http://www.cisco.com/go/storage or contact your local account representative.

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