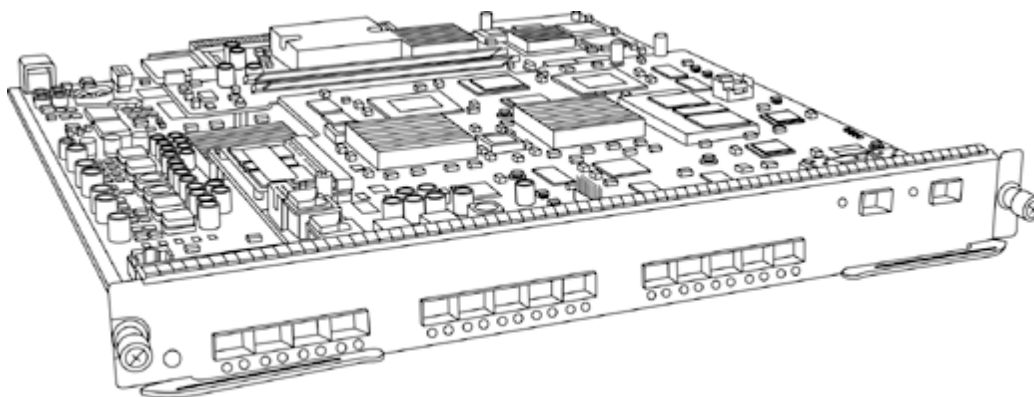


Overview

Cisco MDS 9000 Family Multiprotocol Services Module

The Cisco MDS 9000 Family Multiprotocol Services Module delivers the intelligence and advanced features required to make multilayer storage area networks a reality. Supported in the Cisco MDS 9200 Series and Cisco MDS 9500 Series and offering fourteen Fibre Channel ports and two Gigabit Ethernet ports, the module enables FCIP for long distance SAN extension and iSCSI for IP-enabled servers without sacrificing Fibre Channel port density. The Cisco Multiprotocol Services Module includes hardware-enabled innovations designed to dramatically improve scalability, availability, network security, and manageability of storage networks, resulting in increased utility and lower total cost of ownership (TCO). Hardware-assisted compression and encryption on the Gigabit Ethernet ports ensure optimal utilization of available IT infrastructure and highly reliable and secure data exchange.



Models

Cisco MDS 9000 14/2 Port Multiprotocol Services Module	A7559A
MDS 9500 FCIP Services 2 Port Software License	T3679A
MDS 9200 FCIP Services 2 Port Software License	T3678A
MDS 9000 Family 2/1 Gbps Fibre Channel SW SFP, LC	A7278A
MDS 9000 Family 2/1 Gbps Fibre Channel LW SFP, LC	A7488A
1GB-E/2FC SW SFFPLG-LC (Short Wave optical module, SFP,LC)	A7487A
1GB-E/2FC LW SFFPLG-LC (Long Wave optical module, SFP,LC)	A7488A

Overview

Key Features and Benefits

- Integrated Fibre Channel and IP Storage Services in an optimized form factor-Supports fourteen 2-Gbps Fibre Channel interfaces for high performance SAN connectivity and two Gigabit Ethernet ports for Fibre Channel over IP (FCIP) and Small Computer System Interface over IP (iSCSI) storage services.
- Industry's highest performance Inter-Switch Links (ISLs)-Supports up to sixteen 2-Gbps Fibre Channel links in a single PortChannel-links may span any port on any module within a chassis for added scalability and resilience. Up to 3500 buffer-to-buffer credits can be assigned to a single Fibre Channel port to extend storage networks over unprecedented distances.
- Intelligent network services-Uses virtual SAN (VSAN) technology for hardware-enforced, isolated environments within a single physical fabric; access control lists (ACLs) for hardware-based intelligent frame processing; and advanced traffic management features such as Fibre Channel Congestion Control (FCC) and fabric-wide quality of service (QoS) to facilitate migration from SAN islands to enterprise-wide storage networks.
- Comprehensive network security framework-Supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH), and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN role-based access control. Additionally, the Gigabit Ethernet ports offer IP security (IPsec) authentication, data integrity, and hardware-assisted data encryption for FCIP and iSCSI.
- Sophisticated diagnostics-Provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated Call Home capability for added reliability, faster problem resolution, and reduced service costs.
- FCIP for remote SAN extension:
 - Simplifies data protection and business continuance strategies by enabling backup, remote replication, and other disaster recovery services over WAN distances using open-standard FCIP tunneling.
 - Optimizes utilization of WAN resources for backup and replication by tunneling up to three virtual ISLs on a single Gigabit Ethernet port, and enabling hardware-based compression, FCIP Write Acceleration, and FCIP Tape Acceleration.
 - Preserves Cisco MDS 9000 Family enhanced capabilities including VSANs, advanced traffic management, and security across remote connections.
- iSCSI for extension of SAN to Ethernet attached servers:
 - Extends the benefits of Fibre Channel SAN-based storage to Ethernet attached servers at a lower cost than possible using Fibre Channel interconnect alone.
 - Increases storage utilization and availability through consolidation of IP and Fibre Channel block storage.
 - Transparent operation preserves the capability of existing management storage applications.

Integration with Cisco MDS 9000 Family Switching Services

The Multiprotocol Services Module integrates seamlessly into the Cisco MDS 9000 Family of Multilayer Directors and Fabric Switches. Traffic can be routed between any IP storage port and any other port on a Cisco MDS 9000 Family switch. The Cisco MDS 9000 Family Multiprotocol Services Module supports the full range of services available on other MDS 9000 Family Switching Modules including VSANs, security, and traffic management.

Overview

Benefits of Multiprotocol Services Module

CONTROLLABLE:

- Manageable: provides embedded Fabric Manager support and integration with CiscoWorks RME
- Serviceable: delivers embedded diagnostics (Fibre Channel ping, traceroute and protocol analyzer)

RESILIENT:

- High Reliability: hot swappable components
- Secure: supports VSANs, hardware-enforced zoning, role-based access control, FC-SP

EXTENSIBLE:

- Flexible: Virtual SANs (VSANs) for consolidation of isolated SAN islands on a single physical fabric
- Interoperable: offers compatibility with a broad range of HP servers and operating systems, as well as disk and tape storage devices

Product Family Models Supported:

- Cisco MDS 9216 Multilayer Fabric Switch - Intelligent, multi-protocol modular Fabric Switch with up to 48 auto-sensing 2/1 Gb Fibre Channel ports or 16 ports of Fibre Channel connectivity with 8 ports of 1Gb Ethernet.
- Cisco MDS 9216A Multilayer Fabric Switch - Intelligent, multi-protocol modular Fabric Switch with up to 48 auto-sensing 2/1 Gb Fibre Channel ports or 16 ports of Fibre Channel connectivity with 8 ports of 1Gb Ethernet.
- Cisco MDS 9216i Multilayer Fabric Switch - With fourteen 2-Gbps Fibre Channel ports, two Gigabit Ethernet IP Storage Services ports, and a modular expansion slot, the Cisco MDS 9216i is ideally suited for enterprise storage networks that require high performance SAN extension or cost-effective IP Storage connectivity.
- Cisco MDS 9506 Multilayer Director - Intelligent, multi-protocol, modular, 6 slot Director switch with up to 128 auto-sensing 2/1 Gb Fibre Channel ports.
- Cisco MDS 9509 Multilayer Director - Intelligent, multi-protocol, modular, 9 slot Director switch with up to 224 auto-sensing 2/1 Gb Fibre Channel ports.

Configuration Support

Please refer to the SAN design guide at the following URL: <http://h18000.www1.hp.com/products/storageworks/san/>

Product Highlights

Multiprotocol Connectivity To Cisco MDS 9500 and 9200 Series Switches

Integral switch component providing 2 ports of multiprotocol connectivity for 1Gb Ethernet to 2/1-Gb Fibre Channel ports allowing IP connections using FCIP and iSCSI.

High Performance SAN Extension with Compression and FCIP Write Acceleration

The Cisco MDS 9000 Family Multiprotocol Services Module supports hardware-based FCIP compression to maximize the effective WAN bandwidth of SAN extension solutions. The Cisco Multiprotocol Services Module achieves up to a 30:1 compression ratio, with typical ratios of 2:1 over a wide variety of data sources.

The Cisco Multiprotocol Services module also supports FCIP Write Acceleration, a feature that can significantly improve application performance when storage traffic is extended across distance. When FCIP Write Acceleration is enabled, WAN throughput is optimized by reducing the latency of command acknowledgements. Similarly, the Cisco Multiprotocol Services module supports FCIP Tape Acceleration, which significantly improves throughput over WAN links for remote tape backup operations.

Together, FCIP Compression, FCIP Write Acceleration, and FCIP Tape Acceleration enable optimal performance of business continuance services.

iSCSI for Cost-Effective Extension of SAN Storage to IP-Enabled Servers

Many IT managers have been hesitant to extend SAN access beyond their mission-critical applications to midrange data center applications because of the complexity and cost involved in upgrading large numbers of midrange servers to Fibre Channel. The Cisco MDS 9000 Family Multiprotocol Services Module addresses these limitations by enabling IT organizations to extend their storage networks using cost-effective Ethernet infrastructure. All the benefits of SAN, including increased storage utilization, centralized backups, easier addition of incremental storage capacity, management simplification, and reduced overall total cost of ownership (TCO), can be extended to a new range of applications. Because the Cisco Multiprotocol Services Module is an integral component of the Cisco MDS 9000 Family, Ethernet attached servers will enjoy the same SAN scalability, availability, manageability, and intelligent services as those servers connected using Fibre Channel, while maintaining the cost and ease-of-use benefits of Ethernet and IP.

Comprehensive Solution for Robust Network Security

Addressing the need for airtight security in storage networks, the Cisco MDS 9000 Multiprotocol Services Module offers an extensive security framework to protect highly sensitive data crossing today's enterprise networks. The Cisco Multiprotocol Services Module employs intelligent packet inspection at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced Port Security features.

Extended zoning capabilities are enabled to ensure that LUNs are accessible only by specific hosts (LUN zoning), to limit SCSI read command for a certain zone (read-only zoning), and to restrict broadcasts to only the selected zones (broadcast zones). VSANs are used to achieve higher security and greater stability by providing complete isolation among devices that are connected to the same physical SAN. In addition, Fibre Channel Security Protocol (FC-SP) provides switch-switch and host switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication supporting RADIUS or TACACS+, to ensure that only authorized devices access protected storage networks. Finally, for both FCIP and iSCSI deployments, the comprehensive IPsec protocol suite delivers secure authentication, data integrity, and hardware-based encryption.

Product Highlights

Virtual SANs (VSANs)	VSANs are Hardware-enforced, isolated environments within a single physical fabric for secure sharing of physical infrastructure. VSANs allow the cost of SAN infrastructure to be shared among more users, while assuring absolute segregation, security of traffic, and retaining independent control of configuration on a VSAN-by-VSAN basis.
Comprehensive Security Framework	Supports role-based access control, VSANs, hardware-enforced zoning, FC-SP, ACLs, RADIUS authentication, SNMPv3, SSH, and SFTP.
Integrated Management	Integrated storage network management with all features available via CLI or Cisco Fabric Manager. This centralized management simplifies management of multiple switches and multiprotocol fabric environments. Also provides integration with HP OV-SAM and Cisco Resource Manager Essentials (RME).
Interoperability	Offers compatibility with a broad range of HP servers and operating systems, as well as disk and tape storage devices; see current compatibility matrix.
Serviceability	Hot-swappable switching modules provides shorter mean time to repair.
Advanced Traffic Management for High-Performance, Resilient Fabrics	<p>The following advanced traffic management capabilities integrated into every Cisco MDS 9000 Family Multiprotocol Services Module simplify deployment and optimization of large-scale fabrics.</p> <ul style="list-style-type: none">• Virtual Output Queuing ensures line rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.• 255 buffer-to-buffer credits are assigned to each port for optimal bandwidth utilization across distance. When extended distances are required, up to 3500 credits can be allocated to a single port within a group of four Fibre Channel ports.• 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 port from any module in the chassis, ensuring that the bundle remains active even in the event of a module failure.• Fabric Shortest Path First (FSPF)-based multipathing provides the intelligence to load balance across up to 16 equal cost paths and, in the event of a switch failure, dynamically reroute traffic.• Quality of service can be used to manage bandwidth and control latency, to prioritize critical traffic.• Fibre Channel Congestion Control (FCC), an end-to-end, feedback-based congestion control mechanism, augments the Fibre Channel's buffer-to-buffer credit mechanism to provide enhanced traffic management.

Software Components

FCIP Services Software FCIP Services Software License is required for each IP module using this feature. Licenses are available for MDS 9200 and MDS 9500 series switches.

iSCSI Services Software Right to use this feature is included with the IP module hardware. Feature is embedded in SAN-OS.

Product Highlights

Product Service Options Installation service; SAN Solution service; SAN-Environmental Support service; SAN Architecture service; Proactive 24 For more information on these and other service options, please contact any of our worldwide sales offices or visit our Web site at: <http://www.hp.com/hps/support>.

Warranty (1-1-1) Hardware Warranty; 1-year parts; 1-year on-site (8x5, next business day response) and 1-year labor.

NOTE: The hardware warranty covers firmware and embedded non-saleable software. Saleable software carries its own warranty.

HP's Limited Software Warranty; the software media will be free of physical defects for a period of ninety (90) days from delivery. EXCLUSIVE REMEDY. The entire liability of HP and its suppliers and your exclusive remedy for software that does not conform to this Limited Warranty shall be the repair or replacement of the defective media. This warranty and remedy are subject to your returning the defective media during the warranty period to HP in the country in which you obtained the software.

Hardware or Software product installation is not included in the warranty, but is available and highly recommended.

Warranty and support options The basic hardware warranty service can be enhanced and/or HP Installation services can be purchased.

Support options with various response time and durations are available, including:

- Warranty upgrade to 3-3-3
- Various support response times (same/next day, 24x7)
- various support coverage periods (M - F, 24x7, 1 yr, 3 yr)
- 6-hr Call-To-Repair

To ensure you receive assistance on your software, support options include:

- Software support coverage periods (13x5, 24x7, 1 yr, 3 yr)
- License to Use and SW Updates (1 yr, 3 yr)

<http://www.hp.com/hps/storage/>

Options Supported

MDS 9500 FCIP 2 Port Software License	FCIP Services Software License for use with MDS 9509 and MDS 9506 Fabric Switches	T3679A
MDS 9200 FCIP 2 Port Software License	FCIP Services Software License To Use for MDS 9216A and 9216i fabric Switch	T3678A
Short Wave Transceiver	1GB-Ethernet to 1 or 2Gb Fibre Channel, Short Wave, Optical Transceivers, Small-Form-Factor-Pluggable, Short Wave	A7487A
Long Wave Transceiver	1GB-Ethernet to 1 or 2Gb Fibre Channel, Long Wave, Optical Transceivers, Small-Form-Factor-Pluggable, Long Wave	A7488A

Recommended Cables *Optical Cables*

LC-LC for between two 2 Gb devices

2m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
5m LC-LC Multi-Mode Fibre Channel Cable	221692-B22
15m LC-LC Multi-Mode Fibre Channel Cable	221692-B23
30m LC-LC Multi-Mode Fibre Channel Cable	221692-B26
50m LC-LC Multi-Mode Fibre Channel Cable	221692-B27

LC-SC for between a 1 Gb/s and a 2 Gb/s device

2m LC-LC Multi-Mode Fibre Channel Cable	221691-B21
5m LC-LC Multi-Mode Fibre Channel Cable	221691-B22
15m LC-LC Multi-Mode Fibre Channel Cable	221691-B23
30m LC-LC Multi-Mode Fibre Channel Cable	221691-B26
50m LC-LC Multi-Mode Fibre Channel Cable	221691-B27

Configuration Information

The MDS 9000 Family Multiprotocol Services Module is designed to plug into expansion slots in the MDS 9200 and MDS 9500 series switches. Please refer to the SAN design guide for the latest supported configuration information. The SAN design guide can be accessed on the Worldwide Web at: <http://www.hp.com/go/san>.

Step 1 – Base Configuration

Select one:

Model Number	Model Description	Part Number
Cisco MDS 9000 Family Multiprotocol Services Module	14 Fibre Channel ports & 2 Ethernet port services module. Module comes preconfigured, fully populated with Short Wave SFPs.	A7559A

Step 2 - Required Options

Select each required option with quantities specified:

Description with Parts Shipped	Quantity	Part Number
MDS 9500 FCIP 2 Port Software License To Use (required for FCIP operation on MDS 9506 & MDS 9509)	1 per module	T3679A
MDS 9200 FCIP 2 Port Software License To Use (required for FCIP operation on MDS 9216A or MDS 9216i)	1 per module	T3678A
MDS 9000 Family 2/1 Gbps Fibre Channel SW SFP, LC	Spares	A7428A
MDS 9000 Family 2/1 Gbps Fibre Channel LW SFP, LC	Up to 14 per module	A7429A
Tri Rate Transceiver, 1 Gbit Ethernet to 1 or 2 Gbit Fibre Channel Short Wave Small Form Factor Pluggable Transceiver	Spares	A7487A
Tri Rate Transceiver, 1 Gbit Ethernet to 1 or 2 Gbit Fibre Channel Long Wave Small Form Factor Pluggable Transceiver	1-2	A7488A

NOTE: 1Gb Ethernet ports on the MDS 9000 Multiprotocol Storage Services Module may be configured to accept either Short Wave SFP or Long Wave SFP transceivers. Module comes preconfigured, fully populated with Short Wave SFPs.

For more information on HP SAN switches, contact any of our worldwide sales offices or visit our Web site at:

<http://www.hp.com/go/san>.

Technical Specifications

Protocol Support

- 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-FS, Revision 1.9 (ANSI/INCITS 373-2003) [the final revision is 1.9, not 1.7]
 - FC-AL, Revision 4.5 (ANSI/INCITS 272-1996)
 - FC-AL-2, Revision 7.0 (ANSI/INCITS 332-1999)
 - FC-AL-2, Amendment 1 (ANSI/INCITS 332-1999/AM1-2003)
 - FC-SW-2, Revision 5.3 (ANSI/INCITS 355-2001)
 - FC-SW-3, Rev. 6.6 (ANSI/INCITS 384-2004)
 - FC-GS-3, Revision 7.01 (ANSI/INCITS 348-2001)
 - FC-GS-4, Rev. 7.91 (ANSI/INCITS 387-2004)
 - FC-BB, Revision 4.7 (ANSI/INCITS 342-2001)
 - FC-BB-2, Rev. 6.0 (ANSI/INCITS 372-2003)
 - FCP, Revision 12 (ANSI/INCITS 269-1996)
 - FCP-2, Revision 8 (ANSI/INCITS 350-2003)
 - FC-SB-2, Revision 2.1 (ANSI/INCITS 349-2001)
 - FC-SB-3, Revision 1.6 (ANSI/INCITS 374-2003)
 - FC-VI, Revision 1.84 (ANSI/INCITS 357-2002)
 - 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-SP, Revision 1.6
 - FC-DA, Revision 3.1
- IP over Fibre Channel (RFC 2625)
- Extensive IETF-standards based TCP/IP, SNMPv3, and Remote Monitoring (RMON) MIBs
- Class of Service: Class 2, Class 3, Class F
- Fibre Channel standard port types: E, F, FL, B
- Fibre Channel enhanced port types: SD, ST, TE, TL
- IP standards
 - RFC 791 IPv4
 - RFC 793, 1323 TCP
 - RFC 894 IP/Ethernet
 - RFC 1041 IP/802
 - RFC 792, 950, 1256 ICMP
 - RFC 1323 TCP performance enhancements
 - RFC 2338 VRRP
- Ethernet standards
 - IEEE 802.3z Gigabit Ethernet
 - IEEE 802.1Q VLAN
- IPsec
 - RFC 2401 Security Architecture for IP
 - RFC 2403, 2404 HMAC
 - RFC 2405, 2406, 2451 IP ESP
 - RFC 2407, 2408 ISAKMP
 - RFC 2412 OAKLEY Key Determination Protocol
 - RFC 3566, 3602, 3686 AES
- Internet Key Exchange (IKE)
 - RFC 2409 IKEv1

Technical Specifications

Features and functions

- IKEv2, draft
- Fabric services
 - Name server
 - Internet Storage Name Server (iSNS)
 - Registered State Change Notification (RSCN)
 - Login services
 - Fabric Configuration Server (FCS)
 - Private loop
 - Public loop
 - Translative loop
 - Broadcast
 - In-order delivery
- Advanced Functionality
 - VSAN
 - Inter-VSAN Routing
 - PortChannel with Multipath Load Balancing
 - QoS-flow-based, zone-based
 - Fibre Channel Congestion Control
 - Extended Buffer-To-Buffer Credits
- Diagnostics and troubleshooting tools
 - Power-on-self-test (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 Debug
- Network security
 - VSANs
 - Access Control Lists
 - Per-VSAN role-based access control
 - Fibre Channel Zoning
 - N_Port WWN
 - N_Port FC-ID
 - Fx_Port WWN
 - Fx_Port WWN and interface index
 - Fx_Port domain ID and interface index
 - Fx_Port domain ID and port number
 - LUN
 - Read-only
 - Broadcast
- iSCSI zoning
 - iSCSI name
 - IP address
- Fibre Channel Security Protocol (FC-SP)
 - DH-CHAP switch-switch authentication
 - DH-CHAP host-switch authentication
 - Port Security and Fabric Binding
 - IPsec for FCIP and iSCSI

Technical Specifications

- IKEv1 and IKEv2
- 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

Network Management

- Access methods through Cisco MDS 9500 Series Supervisor module
 - Out-of-band 10/100 Ethernet port
 - RS-232 serial console port
 - In-band IP-over-Fibre Channel
 - DB-9 COM port
- Access protocols
 - CLI-via console and Ethernet ports
 - SNMPv3-via Ethernet port and in-band IP-over-Fibre Channel access
- Distributed Device Alias service
- Network security
 - Per-VSAN role-based access control using RADIUS and TACACS+ based authentication, authorization, and accounting (AAA) functions
 - SFTP
 - SSH v2 implementing AES
 - SNMPv3 implementing AES
- Management applications
 - Cisco MDS 9000 Family CLI
 - Cisco Fabric Manager
 - Cisco Device Manager
 - CiscoWorks 2000 Resource Manager Essentials

O/S Support

Cisco MDS SAN-OS Release 2.0(1) or later

Performance

- Port speed: 2/1-Gbps auto-sensing, optionally configurable
- Buffer credits: Up to 3500 per port
- PortChannel: Up to 16 2-Gbps ports

Reliability Features

- Hot-swappable module
- Hot-swappable SFP optics
- Online diagnostics
- Stateful Process Restart
- Non-disruptive Supervisor Failover
- Any module, any port configuration for PortChannels
- Fabric-based multipathing
- Per-VSAN fabric services
- Port Tracking
- Virtual Routing Redundancy Protocol (VRRP) for management and FCIP or iSCSI connections

Dimensions (HxWxD) 1.75 x 14.4 x 16 in (3.0 x 35.6 x 40.6 cm)

Weight 10 lbs (4.5 kg)

Cable Type See Connectors/Cables



Technical Specifications

Relative Humidity (non-condensing)	Operating	10 to 90%, ambient (non-condensing) operating
	Shipping	10 to 95%, ambient (non-condensing) non-operating and storage
Temperature Range	Operating	32° to 104° F (0° to 40° C), ambient operating
	Shipping	-40° to 167° F (-40° to 75° C), ambient non-operating and storage

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