

# Cisco MDS Modular Switches and Directors

9200 and 9500 Series

Data sheet



MDS 9216A



MDS 9509



MDS 9216i



MDS 9513



## Cisco MDS 9200 Series Multilayer Fabric Switches

The Cisco MDS 9200 Series Switches share a consistent architecture with the Cisco MDS 9500 Series Director and offer the same multi-layer intelligence in a modular fabric switch. Intelligent features include multi-protocol support (Fibre Channel, iSCSI, FCIP), Virtual SANs (VSANs), embedded diagnostics and role-based security. With these innovations, you can build highly scalable, available storage networks with comprehensive security and unified management.

The Cisco MDS 9216A is fully populated out-of-the-box with 16 one Gb/sec and two Gb/sec auto-sensing Fibre Channel ports. The Cisco MDS 9216i has 14 Fibre Channel ports and two Ethernet ports built into the chassis; it also includes a two-port FCIP software license. An expansion slot allows for the addition of a Cisco MDS 9000 port card that is available for up to

an additional 48 Fibre Channel ports or a Cisco MDS 9000 IP Storage Service module for Fibre Channel/iSCSI connectivity. Cisco MDS 9000 port cards and IP Storage Service modules are interchangeable between the Cisco MDS 9200 Series Switches and Cisco MDS 9500 Series Directors, providing smooth migration, common sparing and investment protection.

### Key features and benefits—Cisco MDS 9216A

- **Inter-operable:** The Cisco MDS 9216A uses the open-standard FCIP protocol to break the distance barrier of current Fibre Channel solutions and enable interconnection of SAN islands over extended distances.
- **Cost-effective:** VSANs provide more efficient storage network utilization by creating hardware-based isolated environments within a single physical SAN fabric or switch. VSANs enable the cost of SAN infrastructure to be shared among more users, while maintaining absolute segregation of traffic.

- **Scalable:** The expansion slot for the Cisco MDS 9216A allows for the addition of any Cisco MDS 9000 Storage Networking modules, letting users add additional Fibre Channel ports and additional IP ports.
- **Investment protection:** The Cisco MDS 9216A enables IT organizations to extend their storage networks into the Ethernet infrastructure. It has all the benefits of SANs, including increased storage utilization, centralized backups, easier addition of storage capacity and reduced cost of ownership.
- **Performance:** The Cisco MDS 9216A supports hardware-based FCIP compression to improve the effective WAN bandwidth of SAN extension solutions. It achieves up to a 30:1 compression ratio, with typical ratios of 2:1 over a wide variety of data sources.

#### Key features and benefits—Cisco MDS 9216i

- **Integrated Fibre Channel and IP Storage Services in an effective form factor:** The Cisco MDS 9216i supports fourteen two Gb/sec Fibre Channel interfaces for high-performance storage area network (SAN) connectivity and two one 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):** The Cisco MDS 9216i supports up to 16 four Gb/sec Fibre Channel links or four 10Gb/sec Fibre Channel links in a single port channel. For added scalability and resilience, links may span any port on any module within a chassis. Up to 3,500 buffer-to-buffer credits can be assigned to a single Fibre Channel port to extend storage networks over unprecedented distances.
- **Intelligent network services:** The Cisco MDS 9216i uses Virtual SAN (VSAN) technology for hardware-enforced, isolated environments within a single physical fabric and access control lists (ACLs) for hardware-based intelligent frame processing. It also has 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:** The Cisco MDS 9216i supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH), and Simple Network Management Protocol 3 (SNMP 3) 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:** The Cisco MDS 9216i provides intelligent diagnostics, protocol decoding and network analysis tools for added reliability, faster problem resolution and reduced service costs.
- **Versatile expansion:** The modular design of the Cisco MDS 9216i gives it the ability to support current and future Cisco MDS 9000 Storage Networking modules. Currently available modules include the following:
  - 12-port, 24-port and 48-port four Gb/sec Fibre Channel switching modules
  - IP Services modules supporting iSCSI and FCIP over eight ports of one Gigabit Ethernet
  - The Multiprotocol Services module supporting 14 ports of two Gb/sec Fibre Channel and two ports of one Gigabit Ethernet provides iSCSI and FCIP storage services



- Four-port 10Gb/sec Fibre Channel module
- 32-port intelligent Storage Services module
- 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 by using open-standard FCIP tunneling
- Enhanced utilization of WAN resources for backup and replication by tunneling up to three virtual ISLs on a single Gigabit Ethernet port; also enables hardware-based compression, FCIP write acceleration and FCIP tape acceleration
- Cisco MDS 9000 Family enhanced capabilities, including VSANs, advanced traffic management and network 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 is possible by using Fibre Channel interconnect alone
- Increased storage utilization and availability through consolidation of IP and Fibre Channel block storage
- Transparent operation that preserves the capability of existing management storage applications

• **Advanced software packages**

- *Cisco Enterprise Package*—The Cisco Enterprise Package includes a set of traffic engineering and advanced security features, such as inter-VSAN routing, QoS, both switch-switch and host-switch authentication, LUN zoning and read-only zones that are recommended for all enterprise SANs.
- *SAN Extension with Fibre Channel over IP License*—The Cisco SAN Extension FCIP License provides an integrated, cost-effective and reliable business continuance solution that leverages the IP infrastructure by providing FCIP for remote SAN extension, along with a variety of advanced features. The result is an enhancement of the performance, security and manageability of FCIP links.
- *Cisco Fabric Manager Server Package*—The Cisco Fabric Manager Server (FMS) Package extends Cisco Fabric Manager by providing historical performance monitoring for network traffic hot-spot analysis, centralized management services and advanced application integration.
- *Cisco MDS 9500 SSM Enabler Software License* There are separate FMS and enterprise software packages for the 9100, 9200 and 9500 series products. There are also separate SSM software enabler licenses for the 9200 and 9500 series switches.

# The Cisco MDS 9506, 9509 and 9513 Multilayer Directors deliver multiple layers of intelligence, including multiprotocol support (Fibre Channel, iSCSI, FCIP), VSANs, embedded diagnostics and role-based security.

## Cisco MDS 9500 Series Multilayer Directors

The Cisco MDS 9506 and 9509 Multilayer Directors deliver multiple layers of intelligence, including multi-protocol support (Fibre Channel, iSCSI, FCIP), VSANs, embedded diagnostics and role-based security. With these innovations, companies can build highly scalable, available storage networks with comprehensive security and unified management.

The Cisco MDS 9506 and 9509 deliver impressive performance (1.44 terabits of internal system throughput), port density (up to 192 ports in the Cisco MDS 9506 and up to 336 ports in the Cisco MDS 9509) and high availability to lower TCO and to enable integrated SAN infrastructures. The Cisco MDS 9513 offers an even more powerful solution, delivering exceptional performance at 2.4 terabits of internal bandwidth and a port density of up to 528 ports.

MDS 9000 Family modules, including 12-port, 24-port and 48-port, four Gb Fibre Channel port cards, IP storage Services and multi-protocol modules, are interchangeable across MDS 9000 Family Directors and Fabric Switches, providing a smooth migration path, common sparing and investment protection.

HP delivers the Cisco MDS 9509 Multilayer Director Switch with Dual Supervisor 2 modules, redundant fans, power supplies and non-disruptive upgrades to provide smooth, continued operation. The seven open expansion slots can be filled by optional MDS 9000 Family modules, including earlier generation 16-port and 32-port two Gb Fibre Channel modules, along

with the new generation 12-port, 24-port and 48-port four Gb Fibre Channel and four-port, 10Gb Fibre Channel modules. Other modules available offer integrated Fibre Channel, FCIP and iSCSI operation for SAN extension over IP networks.

The Cisco MDS 9513 Multilayer Director delivers many unique innovations that can enable you to construct the most powerful, large-scale storage network infrastructure available in the industry today. With these innovations, companies can build highly scalable, highly available storage network solutions with comprehensive security and unified management. The MDS 9513 has multiple layers of intelligence, including multi-protocol support (Fibre Channel, iSCSI, FCIP), virtual SANs (VSANs), embedded diagnostics and role-based security.

The MDS 9513 base unit includes a 13-slot modular chassis with Dual Supervisor 2 modules, dual fabric modules and power supplies to help provide smooth, ongoing operation and non-disruptive upgrade capability.

The dual fabric modules are a new innovation that makes even the crossbars of the MDS 9513 both redundant and hot-swappable, thereby taking fabric availability to a higher plane. The 11 open expansion slots can be filled by optional MDS 9000 Family modules that include 12-port, 24-port and 48-port, four Gb Fibre Channel modules and a four-port, 10Gb Fibre Channel module. They also include eight-port IP Storage Services modules, a multi-protocol services module (14+2, 14, two Gb Fibre Channel and two one Gb IP ports), a four-port, 10Gb Fibre Channel module and a 32-port storage services module enabling integrated Fibre Channel, FCIP and iSCSI operation.

Layered, intelligent features also include integration with fabric-based applications to fabric-wide services—for a wide range of solutions for business continuance, storage virtualization, network-assisted backup and information lifecycle management. HP Storage Essentials and CiscoWorks RME integrate with these tools to deliver ease of administration, improved productivity and infrastructure management through a single pane of glass. Having a common software platform allows you to seamlessly scale your SAN environment as your business grows and technology evolves.

- **Versatile expansion:** Each slot offers four ports to 48 ports for various combinations of one Gb, two Gb, and four Gb Fibre Channel, FCIP, iSCSI or 10Gb Fibre Channel applications.
- **Multiple storage network connection possibilities:** The Cisco MDS 9513 provides the ability to add Fibre Channel ports or connect remote SANs through FCIP or iSCSI protocols. You can also configure with short-wave, long-wave or extended-reach SFPs for connectivity up to 100 kilometers.
- **Seamless integration:** The Cisco MDS 9513 offers compatibility with Cisco MDS 9000 Family of Multilayer Directors and Switches, and it supports the full range of Cisco services available, including VSANs, security and traffic management.
- **LAN to SAN connectivity:** The Cisco MDS 9513 delivers increased storage utilization and availability through consolidation of IP and Fibre Channel block storage.
- **Scalability:** The Cisco MDS 9513 provides you with scalability options where future SAN growth is apparent. Additional network nodes can be connected through a Fibre Channel expansion module once all ports have been filled within a switch chassis.

- **Security and continuity:** Data protection and business continuity is established through the use of bridging between a Fibre Channel SAN and an IP network. Remote replication is enabled through the FCIP operation within a Cisco Storage Networking module.
- **Inter-operability:** Through FCIP and iSCSI bridging, remote fabrics and servers can be connected to established Fibre Channel SANs where all the benefits of SANs can be leveraged over wide area or metro area networks.

#### Key features and benefits—Cisco MDS 9506

- **Manageable:** provides embedded Fabric Manager and optional Cisco Fabric Manager Server, as well as and integration with HP StorageWorks Management Essentials and CiscoWorks RME
- **Serviceable:** delivers embedded diagnostics (Fibre Channel ping, trace route and protocol analyzer) and “call home”
- **Upgradeable:** offers investment protection with multiple module options that are all interchangeable across MDS 9000 line
- **High availability:** provides non-disruptive software upgrades, stateful process failover and hot-swappable components
- **Protected:** supports VSANs, hardware-enforced zoning, role-based access control, IPsec and access control lists
- **Multi-protocol:** integrates Fibre Channel, iSCSI and FCIP in one system with no separate boxes to manage
- **Flexible:** introduces virtual SANs (VSANs) and inter-VSAN routing for consolidation of isolated SAN islands on a single physical fabric

This switch delivers industry-leading scalability, performance, high availability, manageability and security for SAN consolidation and ILM—significantly increasing ROI and lowering TCO for IT.

- **Scalable:** offers 12 to 192 Fibre Channel ports; supports throughput up to 160 Gb in a single PortChannel ISL
- **High-performance:** supplies 1.44 terabits of internal bandwidth for integrated four Gb and 10Gb Fibre Channel switching
- **Open:** provides an open platform for hosting third-party storage applications, such as virtualization
- **Inter-operable:** offers compatibility with a broad range of HP servers, as well as disk and tape storage devices

#### **Key features and benefits—Cisco MDS 9509**

In addition to the features and benefits of the Cisco MDS 9506, the Cisco MDS 9509 provides:

- **Scalable:** offers 12 to 336 Fibre Channel ports; supports throughput up to 160 Gb in a single PortChannel ISL

#### **Key features and benefits—Cisco MDS 9513**

In addition to the features and benefits of the Cisco MDS 9506 and Cisco MDS 9509, the Cisco MDS 9513 provides:

- **Scalable:** offers 12 to 528 Fibre Channel ports; supports throughput up to 160 Gb in a single PortChannel ISL
- **High-performance:** supplies 2.44 terabits of internal bandwidth for integrated four Gb and 10Gb Fibre Channel switching

## Cisco MDS 9000 Storage Networking modules

Cisco MDS 9000 Family Multiprotocol Services modules, commonly referred to as 14+2, provide flexible and scalable solutions for Cisco MDS 9200 and MDS 9500 Series switches. Using open-standard IP-based technology, the Cisco Storage Networking modules remove barriers to SAN expansion, enabling you to extend the reach of your Fibre Channel SANs throughout the data center and between data centers.

Multiple functionality supports the interconnection of remote SAN islands and extends SAN connectivity to IP-enabled servers using FCIP and iSCSI protocols. The modules integrate seamlessly into the Cisco MDS 9000 Family of Multilayer Directors and Fabric Switches. Traffic can be routed between an IP storage port and any other port on a Cisco MDS 9000 Family Switch. HP offers the following Cisco Networking modules:

- Cisco MDS 9000 eight-port IP Storage Services module
- Cisco MDS 9000 Multiprotocol Services module
- Cisco MDS 9000 12-port, four Gb module
- Cisco MDS 9000 24-port, four Gb module
- Cisco MDS 9000 48-port, four Gb module
- Cisco MDS 9000 32-port, two Gb Storage Services module
- Cisco MDS 9000 Fibre Channel four-port, 10Gb module

## Cisco MDS 9200 series\*



	Cisco MDS 9216A	Cisco MDS 9216i
<b>Availability</b>	Hot-swappable, 1+1 redundant power supplies; hot-swappable fan tray with integrated temperature and power management; hot-swappable SFP optics; hot-swappable switching module; stateful process restart; any module, any port configuration for PortChannels; fabric-based multi-pathing; per VSAN fabric services; passive backplane; online diagnostics	
<b>Port speed</b>	1/2/4 GB auto-sensing, or 10 GB optionally configurable	
<b>Buffer credits</b>	Up to 255 per port with Fibre Channel modules and up to 3500 per port with 14+2 multi-protocol module and embedded IP ports on 9216i	
<b>Ports per chassis</b>	Cisco MDS 9216A: 16 to 64 Fibre Channel ports, up to eight 1Gb Ethernet ports or four 10Gb Fibre Channel ports	Cisco MDS 9216i: 14 to 62 Fibre Channel ports plus two Ethernet ports, or 14 Fibre Channel ports and up to ten 1Gb Ethernet or four 10Gb Ethernet ports
<b>Ports per rack</b>	Up to 1024	
<b>PortChannel</b>	Up to sixteen 2Gb or 4Gb ports, or four 10Gb Fibre Channel ports	
<b>Supported optics, media and transmission distances (optics, media, distance)</b>	1 GB—short-wave, LC SFP 50/125 micron multi-mode 500 m 1 GB—short-wave, LC SFP 62.5/125 micron multi-mode 300 m 1 GB—long-wave, LC SFP 9/125 micron single-mode 10 km 1 Gb/sec—CWDM (Coarse Wave Division Multiplexing), LC SFP Dispersion penalty at 100 km 2 dB @ 1.25 Gb/sec	2 GB—short-wave, LC SFP 50/125 micron multi-mode 300 m 2 GB—short-wave, LC SFP 62.5/125 micron multi-mode 150 m 2 GB—long-wave, LC SFP 9/125 micron single-mode 10 km 2 Gb/sec—CWDM, LC SFP dispersion penalty at 100 km 3 dB @ 2.12 Gb/sec
<b>Fibre Channel port types</b>	Standard: E, F, FL, B Enhanced: SD, TE, TL	
<b>Fibre Channel security protocol</b>	Fibre Channel Security Protocol (FC-SP)	
<b>Management access</b>	Access methods: out-of-band 10/100 Ethernet port; RS-232 serial console port; in-band IP-over-FC; DB-9 COM port Access protocols: CLI—via console and Ethernet ports; SNMP 3—via Ethernet port and in-band IP-over-FC Access security: role-based access control using RADIUS-based AAA functions; SSH 2; SNMP 3 Management applications: Cisco MDS 9000 Family CLI; Cisco Fabric Manager; CiscoWorks 2000 Resource Manager Essentials	
<b>Management applications</b>	SSH 2, SNMP 3	
<b>Compatibility</b>	Fibre Channel protocols: FC-PH, Revision 4.3; FC-PH-2, Revision 7.4; FC-PH-3, Revision 9.4; FC-GS-2, Revision 5.3; FC-GS-3, Revision 7.01; FC-FLA, Revision 2.7; FC-FG, Revision 3.5; FC-SW-2, Revision 5.3; FC-AL, Revision 4.5; FC-AL-2, Revision 7.0; FC-PLDA, Revision 2.1; FC-VI, Revision 1.84; FCP, Revision 12; FCP-2, Revision 8; FC-SB-2, Revision 2.1; FC-BB, Revision 4.7; FC-FS, Revision 1.9; FC-PI, Revision 13; FC-MI, Revision 1.92; FC-Tape, Revision 1.17; IP over FC (RFC 2625); extensive IETF-standards-based TCP/IP, SNMP 3 and RMON MIBs	
<b>Security</b>	Virtual SANs (VSANs) zoning: N_Port WWN, N_Port FC-ID, Fx_Port WWN, FC-SP Management access: SSH 2, SNMP 3, RADIUS, role-based access control, IPsec data encryption	
<b>Zoning</b>	N_Port WWN, N_Port FC-ID, Fx_Port WWN	
<b>Class of service</b>	Class 2, Class 3, Class F	
<b>Fabric services</b>	Name server; Registered State Change Notification (RSCN); login services; private loop; public loop; translative loop; broadcast; in-order delivery; name server zoning	
<b>Diagnostics</b>	Power-On-Self-Test (POST) diagnostics; online diagnostics; internal loopbacks; SPAN; FC trace route; FC ping; FC debug; Cisco Fabric Analyzer; Syslog; online system health; port-level statistics	
<b>Serviceability</b>	Configuration file management; non-disruptive software upgrades for switching module; Call Home; power management LEDs; port beaconing; system LED; SNMP traps for alerts; network boot	
<b>Power and cooling</b>	Power supplies: power supply (845W AC); AC input characteristics; 100 to 240 VAC (10% range); 50-60 Hz (nominal) Airflow: 200 linear feet per minute (lfm) through system fan assembly; Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4 centimeters) between walls and the chassis air vents and a minimum separation of 6 inches (15.2 centimeters) between two chassis to prevent overheating	
<b>Dimensions (HxWxD)</b>	5.25 x 17.32 x 22.655 inches (13.34 x 43.99 x 57.54 centimeters)	
<b>What's included</b>	Cisco MDS 9216A base unit with one modular expansion slot; includes 16 FC ports populated with short-wave SFPs; RJ-45 10/100 Ethernet management port; RJ-45 console port; DB-9 COM port; software image; dual AC power supplies; power cords; fan modules; 19-inch rackmount kit; software: Cisco MDS OS, Cisco Fabric Manager	Cisco MDS 9216i base unit with one modular expansion slot; includes 14 Fibre Channel ports populated with short-wave SFPs and two Ethernet ports (unpopulated); RJ-45 10/100 Ethernet management port; RJ-45 console port; DB-9 COM port; software image; dual AC power supplies; power cords; fan modules; 19-inch rackmount kit; software: Cisco MDS OS, Cisco Fabric Manager and 2-port FCIP software license

For ordering information, please see QuickSpecs: [www.hp.com/go/QuickSpecs](http://www.hp.com/go/QuickSpecs).

\*Specifications are the same for the 9216A and the 9216i, except where noted.

## Cisco MDS 9506



<b>Availability</b>	Online, non-disruptive software upgrades; stateful supervisor module failover; hot-swappable redundant supervisor modules; hot-swappable 1+1 redundant power; hot-swappable fan tray with integrated temperature and power management; hot-swappable small form factor pluggable (SFP) optics; hot-swappable switching modules; stateful process restart; any module, any port configuration for Port Channels; fabric-based multi-pathing; per VSAN fabric services; passive backplane; online diagnostics
<b>Port speed</b>	2.125 Gb/sec line speed, full duplex ports
<b>Buffer credits</b>	Up to 255 per port with Fibre Channel modules and up to 3500 per port with multi-protocol module
<b>Ports per chassis</b>	192
<b>Ports per rack</b>	1152
<b>Switch bandwidth</b>	1.44 Tb/sec of internal bandwidth
<b>Maximum frame size</b>	2112-byte payload
<b>Supported optics, media and transmission distances (optics, media, distance)</b>	<p>1 Gb/sec—short-wave, LC SFP 50/125 micron multi-mode 500 m</p> <p>1 Gb/sec—short-wave, LC SFP 62.5/125 micron multi-mode 300 m</p> <p>1 Gb/sec—long-wave, LC SFP 9/125 micron single-mode 10 km</p> <p>2 Gb/sec—short-wave, LC SFP 50/125 micron multi-mode 300 m</p> <p>2 Gb/sec—short-wave, LC SFP 62.5/125 micron multi-mode 150 m</p> <p>2 Gb/sec—long-wave, LC SFP 9/125 micron single-mode 10 km</p> <p>1 Gb/sec—CWDM, LC SFP dispersion penalty at 100 km 2 dB @ 1.25 Gb/sec</p> <p>2 Gb/sec—CWDM, LC SFP dispersion penalty at 100 km 3 dB @ 2.12 Gb/sec</p> <p>4 GB—62.5 microns (core) multi-mode short-wave SFP optic 70 m</p> <p>4 GB—9 microns (core) SMF mid-range SFP optic 4 km</p> <p>4 GB—9 microns (core) long range SFP optic 10 km</p>
<b>Port types</b>	E, F, FL, B, SD, TE, TL, ST
<b>Management access</b>	Access methods: out-of-band 10/100 Ethernet port; RS-232 serial console port; in-band IP-over-FC; DB-9 COM port Access protocols: CLI—via console and Ethernet ports; SNMP 3—via Ethernet port and in-band IP-over-FC access
<b>Management applications</b>	Cisco SAN-OS command line interface (CLI), Cisco Fabric Manager, Cisco Device Manager, SNMP
<b>Compatibility</b>	Fibre Channel protocols: FC-PH, Revision 4.3; FC-PH-2, Revision 7.4; FC-PH-3, Revision 9.4; FC GS-2, Revision 5.3; FC GS-3, Revision 7.01; FC-FLA, Revision 2.7; FC-FG, Revision 3.5; FC-SW-2, Revision 5.3; FC-AL, Revision 4.5; FC-AL-2, Revision 7.0; FC-PLDA, Revision 2.1; FC-VI, Revision 1.84; FCP, Revision 12; FCP-2, Revision 8; FC-SB-2, Revision 2.1; FC-BB, Revision 4.7; FC-FS, Revision 1.9; FC-PI, Revision 13; FC-MI, Revision 1.92; FC-Tape, Revision 1.17 IP over FC (RFC 2625) extensive IETF standards-based TCP/IP, SNMP 3 and RMON MIBs
<b>Security</b>	Virtual SANs (VSANs) zoning: N_Port WWN, N_Port FC-ID, Fx_Port WWN, FC-SP Management access: SSH v2, SNMP v3, RADIUS, role-based access control, IPsec data encryption
<b>Zoning</b>	N_Port WWN, N_Port FC-ID, Fx_Port WWN
<b>Class of service</b>	Class 2, Class 3, Class F
<b>Diagnostics</b>	Power-On-Self-Test (POST); online system health monitoring; network analysis and debug tools; internal loopback; port-level statistics; Fibre Channel trace route; Fibre Channel ping; Switched Port Analyzer (SPAN); Remote Switched Port Analyzer (RSPAN); Cisco Fabric Analyzer; integrated Call Home
<b>Power consumption</b>	1050W @ 110 VAC, 1900W @ 220 VAC; these numbers represent the maximum output power provided by the power supply; the total actual power consumption is configuration dependent.
<b>Nominal voltage</b>	5A max @ 220 VAC @ 1900W output, 15A max @ 110 VAC @ 1050W output
<b>Voltage tolerance range (VAC)</b>	100-240 VAC (±10% for full range)
<b>Operating current (Amps)</b>	15A max @ 220 VAC @ 1900W output, 15A max @ 110 VAC @ 1050W output
<b>Heat dissipation (Btu/hr or kcal/hr)</b>	DS-C9506 with fans: 573 BTU/hr; DS-X9530-SF1: 1000 BTU/hr; DS-X9016: 1000 BTU/hr; DSX9032: 911 BTU/hr; DS-X9038-SMIP: 1000 BTU/hr. Note: these numbers assume worst-case conditions. Typical numbers are approximately 30 percent below the numbers listed here.
<b>Dimensions (HxWxD)</b>	12.25 x 17.37 x 21.75 inches (31.11 x 44.12 x 55.25 centimeters)
<b>What's included</b>	Cisco MDS 9506: Cisco MDS 9506 base unit with a 7U, 6-slot chassis; fans; dual supervisor modules; dual 1900W AC power supplies; firmware; rackmount kit; documentation CDs; ESD wrist strap (disposable); console cable kit; packaged documents; supports up to four optional expansion port modules

For ordering information, please see QuickSpecs: [www.hp.com/go/QuickSpecs](http://www.hp.com/go/QuickSpecs)

## Cisco MDS 9509



<b>Availability</b>	Online, non-disruptive software upgrades; stateful supervisor module failover; hot-swappable redundant supervisor module; hot-swappable 1+1 redundant power; hot-swappable fan tray with integrated temperature and power management; hot-swappable small form factor pluggable (SFP) optics; hot-swappable switching modules; stateful process restart; any module, any port configuration for PortChannels; fabric-based multi-pathing; per VSAN fabric services; passive backplane; online diagnostics
<b>Port speed</b>	1/2/4 Fibre Channel GB auto-sensing, optionally configurable
<b>Buffer credits</b>	Up to 255 per port with Fibre Channel modules and up to 3500 per port with multi-protocol module
<b>Ports per chassis</b>	Up to 336 1/2/4 GB Fibre Channel ports, up to 48 1GB Ethernet ports
<b>Ports per rack</b>	1008 1/2/4 Gb Fibre Channel ports
<b>Supported optics, media and transmission distances (optics, media, distance)</b>	<ul style="list-style-type: none"> <li>1 GB—short-wave, LC SFP 50/125 micron multi-mode 500 m</li> <li>2 GB—short-wave, LC SFP 50/125 micron multi-mode 300 m</li> <li>1 GB—short-wave, LC SFP 62.5/125 micron multi-mode 300 m</li> <li>2 GB—short-wave, LC SFP 62.5/125 micron multi-mode 150 m</li> <li>1 GB—long-wave, LC SFP 9/125 micron single-mode 10 km</li> <li>2 GB—long-wave, LC SFP 9/125 micron single-mode 10 km</li> <li>1 Gb/sec—CWDM (Coarse Wave Division Multiplexing), LC SFP dispersion penalty at 100 km 2 dB @ 1.25 Gb/sec</li> <li>2 Gb/sec—CWDM, LC SFP dispersion penalty at 100 km 3 dB @ 2.12 Gb/sec</li> <li>4 GB—62.5 microns (core) multi-mode short-wave SFP optic 70 m</li> <li>4 GB—9 microns (core) SMF mid-range SFP optic 4 km</li> <li>4 GB—9 microns (core) long range SFP optic 10 km</li> </ul>
<b>Fibre Channel port types</b>	Standard: E, F, B, FL Enhanced: SD, TE, TL
<b>Fibre Channel security protocol</b>	FC-SP
<b>Management</b>	SSH 2, SNMP 3
<b>Management access</b>	Access methods: out-of-band 10/100 Ethernet port; RS-232 serial console port; in-band IP-over-FC; DB-9 COM port Access protocols: CLI—via console and Ethernet ports; SNMP 3—via Ethernet port and in-band IP-over-FC Access security: role-based access control using RADIUS-based AAA functions; SSH 2; SNMP 3
<b>Management applications</b>	Cisco MDS 9000 Family CLI; Cisco Fabric Manager; CiscoWorks 2000 Resource Manager Essentials; one compact flash drive per supervisor module for onboard storage of management files
<b>Compatibility</b>	Fibre Channel protocols: FC-PH, Revision 4.3; FC-PH-2, Revision 7.4; FC-PH-3, Revision 9.4; FC GS-2, Revision 5.3; FC GS-3, Revision 7.0.1; FC-FLA, Revision 2.7; FC-FG, Revision 3.5; FC-SW-2, Revision 5.3; FC-AL, Revision 4.5; FC-AL-2, Revision 7.0; FC-PLDA, Revision 2.1; FC-VI, Revision 1.84; FCP, Revision 12; FCP-2, Revision 8; FC-SB-2, Revision 2.1; FC-BB, Revision 4.7; FC-FS, Revision 1.9; FC-PI, Revision 13; FC-MI, Revision 1.92; FC-Tape, Revision 1.17 IP over FC (RFC 2625) extensive IETF standards-based TCP/IP, SNMP 3 and RMON MIBs
<b>Security</b>	Virtual SANs (VSANs) zoning: N_Port WWN, N_Port FC-ID, Fx_Port WWN, FC-SP Management access: SSH 2, SNMP 3, RADIUS, role-based access control, IPsec data encryption
<b>Zoning</b>	N_Port WWN, N_Port FC-ID, Fx_Port WWN
<b>Class of service</b>	Class 2, Class 3, Class F
<b>Fabric services</b>	Name server; Registered State Change Notification (RSCN); login services; private loop; public loop; translative loop; broadcast; in-order delivery; name server zoning
<b>Diagnostics</b>	Power-On-Self-Test (POST) diagnostics; online diagnostics; internal loopbacks; SPAN; Fibre Channel trace route; Fibre Channel ping; Fibre Channel debug; Cisco Fabric Analyzer; Syslog; online system health; port-level statistics
<b>Serviceability</b>	Non-disruptive software upgrades; configuration file management; Call Home; power management; port beaconing; system LEDs; SNMP traps for alerts; network boot
<b>Power and cooling</b>	Power supplies (3000W AC)—Input: 100-240 VAC nominal ( $\pm 10\%$ for full range); 16A maximum; 50-60 Hz nominal ( $\pm 3$ Hz for full range) Output: 1300W (100 VAC @ 16A); 3000W (200 VAC @ 16A) Airflow: 300 lfm through system fan assembly; Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4 centimeters) between walls and the chassis air vents and a minimum separation of 6 inches (15.2 centimeters) between two chassis to prevent overheating.
<b>Dimensions (HxWxD)</b>	24.5 x 17.37 x 18.4 inches (62.3 x 44.1 x 46.8 centimeters), 14 RU
<b>What's included</b>	Cisco MDS 9509: Cisco MDS 9509 base unit with a 9-slot chassis; dual supervisor modules; dual 3000W power supplies, PDU cords and country cords; software: Cisco MDS SAN-OS, Cisco Fabric Manager; documentation (AC version only)

For ordering information, please see QuickSpecs: [www.hp.com/go/QuickSpecs](http://www.hp.com/go/QuickSpecs)

## Cisco MDS 9513



<b>Availability</b>	Online, non-disruptive software upgrades; stateful supervisor module failover; hot-swappable redundant supervisor module; hot-swappable 1+1 redundant power; hot-swappable fan tray with integrated temperature and power management; hot-swappable small form factor pluggable (SFP) optics; hot-swappable switching modules; stateful process restart; any module, any port configuration for PortChannels; fabric-based multi-pathing; per VSAN fabric services; passive backplane; online diagnostics
<b>Port speed</b>	1/2/4/10 GB auto-sensing, optionally configurable
<b>Buffer credits</b>	Up to 255 per port
<b>Ports per chassis</b>	528 1/2/4 GB Fibre Channel ports, up to 52 1GB Ethernet ports
<b>Ports per rack</b>	1584 1/2/4 GB Fibre Channel ports
<b>Supported optics, media and transmission distances (optics, media, distance)</b>	<ul style="list-style-type: none"> <li>1 GB—short-wave, LC SFP 50/125 micron multi-mode 500 m</li> <li>2 GB—short-wave, LC SFP 50/125 micron multi-mode 300 m</li> <li>1 GB—short-wave, LC SFP 62.5/125 micron multi-mode 300 m</li> <li>2 GB—short-wave, LC SFP 62.5/125 micron multi-mode 150 m</li> <li>1 GB—long-wave, LC SFP 9/125 micron single-mode 10 km</li> <li>2 GB—long-wave, LC SFP 9/125 micron single-mode 10 km</li> <li>1 Gb/sec—CWDM (Coarse Wave Division Multiplexing), LC SFP dispersion penalty at 100 km 2 dB @ 1.25 Gb/sec</li> <li>2 Gb/sec—CWDM, LC SFP dispersion penalty at 100 km 3 dB @ 2.12 Gb/sec</li> <li>4 GB—62.5 microns (core) multi-mode short-wave SFP optic 70 m</li> <li>4 GB—9 microns (core) SMF mid-range SFP optic 4 km</li> <li>4 GB—9 microns (core) long range SFP optic 10 km</li> </ul>
<b>Fibre Channel port types</b>	Standard: E, F, FL, B Enhanced: SD, TE, TL
<b>Fibre Channel security protocol</b>	FC-SP
<b>Management</b>	SSH 2, SNMP 3
<b>Management access</b>	Access methods: out-of-band 10/100 Ethernet port; RS-232 serial console port; in-band IP-over-FC; DB-9 COM port Access protocols: CLI—via console and Ethernet ports; SNMP 3—via Ethernet port and in-band IP-over-FC Access security: role-based access control using RADIUS-based AAA functions; SSH 2; SNMP 3
<b>Management applications</b>	Cisco MDS 9000 Family CLI; Cisco Fabric Manager; CiscoWorks 2000 Resource Manager Essentials; one compact flash drive per supervisor module for onboard storage of management files
<b>Compatibility</b>	Fibre Channel protocols: FC-PH, Revision 4.3; FC-PH-2, Revision 7.4; FC-PH-3, Revision 9.4; FC-GS-2, Revision 5.3; FC-GS-3, Revision 7.01; FC-FLA, Revision 2.7; FC-FG, Revision 3.5; FC-SW-2, Revision 5.3; FC-AL, Revision 4.5; FC-AL-2, Revision 7.0; FC-PLDA, Revision 2.1; FC-VI, Revision 1.84; FCP, Revision 12; FCP-2, Revision 8; FC-SB-2, Revision 2.1; FC-BB, Revision 4.7; FC-FS, Revision 1.9; FC-PI, Revision 13; FC-MI, Revision 1.92; FC-Tape, Revision 1.17 IP over FC (RFC 2625) extensive IETF standards-based TCP/IP, SNMP 3 and RMON MIBs
<b>Security</b>	Supports role-based access control, VSANs, hardware-enforced zoning, FC-SP, ACLs, RADIUS authentication, SNMP 3, SSH, SFTP, IPsec and encryption.
<b>Zoning</b>	N_Port WWN, N_Port FC-ID, Fx_Port WWN
<b>Class of service</b>	Class 2, Class 3, Class F
<b>Fabric services</b>	Name server; Registered State Change Notification (RSCN); login services; private loop; public loop; Fabric Configuration Server (FCS); translative loop; broadcast; in-order delivery; name server zoning
<b>Diagnostics</b>	Power-On-Self-Test (POST) diagnostics; online diagnostics; internal loopbacks; SPAN; Fibre Channel trace route; Fibre Channel ping; Fibre Channel debug; Cisco Fabric Analyzer; Syslog; online system health; port-level statistics
<b>Serviceability</b>	Non-disruptive software upgrades; configuration file management; Call Home; power management; port beaconing; system LEDs; SNMP traps for alerts; network boot
<b>Power and cooling</b>	Power supplies (3000W AC)—Input: 100-240 VAC nominal ( $\pm 10\%$ for full range); 16A maximum; 50-60 Hz nominal ( $\pm 3$ Hz for full range) Output: 1300W (100 VAC @ 16A); 3000W (200 VAC @ 16A) Airflow: 300 lfm through system fan assembly; Cisco recommends that you maintain a minimum air space of 2.5 inches (6.4 centimeters) between walls and the chassis air vents and a minimum separation of 6 inches (15.2 centimeters) between two chassis to prevent overheating.
<b>Dimensions (HxWxD)</b>	24.5 x 17.37 x 28 inches (62.3 x 44.1 x 71.1 centimeters)
<b>What's included</b>	Cisco MDS 9513: The base unit includes a 13-slot modular chassis with dual supervisor 2 modules, dual fabric modules country cord, PDU cords and power supplies to help provide smooth, ongoing operation and non-disruptive upgrade capability.

For ordering information, please see QuickSpecs: [www.hp.com/go/QuickSpecs](http://www.hp.com/go/QuickSpecs).

## Warranty and included services

HP warrants only that the software media will be free of physical defects for a period of 90 days from delivery. For more information about HP Global Limited Warranty and Technical Support, visit [www.hp.com/products/storageworks/warranty](http://www.hp.com/products/storageworks/warranty).

## HP Care Pack services

HP Care Pack services offer upgraded service levels to extend and expand your standard product warranty with easy-to-buy, easy-to-use support packages that help you make the most of your hardware and software investments. They let you choose the support levels that meet your business requirements, from basic to mission-critical. They help you contain total cost of ownership.

HP Care Pack warranty extensions can be purchased along with HP products to cost-effectively upgrade or extend your warranty. For many products, post-warranty HP Care Pack services are available when your original warranty has expired. For more information on these services, contact your local HP representative, authorized HP business partner, or visit [www.hp.com/services/storage\\_carepacks](http://www.hp.com/services/storage_carepacks).

## HP Services

HP Services has end-to-end, expertise in delivering solutions that help you improve your business agility. From initial assessment and design to technical integration and ongoing support, HP Services can be your single point of contact and accountability.

HP related services:

- **Cisco MDS Switches Installation service**—helps you with the design, configuration and verification of the multi-protocol (MP) router's Fibre Channel subnet routing and FCIP connectivity to a remote site.
- **Other HP Storage services** include:
  - SAN Solution service
- **HP Care Pack services**—offers a comprehensive portfolio of services for maintaining the highest levels of IT availability.
  - Critical service
  - Proactive 24 service
  - Support Plus 24 service
- **Instant Support Enterprise Edition (ISEE)**—provides remote monitoring and support solution for your IT data center.
- **Business Continuity services** – protect and reduce disruption to IT infrastructure and associated business processes against site outages, disasters and environmental events.

Across the globe, enterprise customers rely on HP Services to design, deploy, manage and support the IT systems that run their businesses. HP Services capabilities cover consulting and integration, outsourcing and support services. With more than 69,000 services professionals operating in 170 countries, acknowledged technology leadership and a heritage of innovation in services, HP Services can point to an extensive track record of helping customers improve their ability to support their changing business needs.

For further details, contact your HP sales representative or visit [www.hp.com/hps/storage](http://www.hp.com/hps/storage).

## HP Factory Express

HP Factory Express is a portfolio of more than 50 flexible and robust pre-priced, customized and integrated factory configuration and deployment services—supporting HP products from the desktop to the data center with Microsoft® Windows®, Linux and HP-UX 11i.

HP Factory Express is designed to help you get more from your technology investment, extend your valuable resources and accelerate your business results. It provides predictable, trusted and tested IT solutions designed to enhance your productivity. With Factory Express, you can customize hardware to your exact specifications at the HP factory—helping you plan and meet budget goals, cut costs, speed deployment and free up internal resources. To learn more, visit [www.hp.com/go/factory-express](http://www.hp.com/go/factory-express).

## Additional HP support services

HP Services provides a broad spectrum of services to commercial and enterprise customers, including performance and availability services such as proactive mission-critical services, as well as support management services for deployment of the entire IT infrastructure, including HP and multi-vendor environments. For more information on these services, contact your HP representative, authorized HP business partner, or visit [www.hp.com/hps/storage](http://www.hp.com/hps/storage).

## Education services

HP offers a variety of training methods to fit your needs including traditional instructor-led courses at one of our 120 training centers worldwide, onsite training customized to your needs, in your facility, or even Remotely Assisted Instruction Learning that combines the best of traditional classroom training (including its live instructor and labs) with the best of online training (no traveling required). If you like learning on your own schedule, at your own pace, make use of e-learning opportunities on the award-winning HP IT Resource Center, a “learning community” with extensive on-demand resources that can be accessed 24x7. For more information on these services, contact your HP representative, authorized HP business partner, or visit <http://education.hp.com/curr-storsan.htm>.

## Financial services

HP Financial services provides innovative financing and financial asset management programs to help customers cost-effectively acquire, manage and ultimately retire their HP solutions. For more information on these services, please contact your HP representative or visit [www.hp.com/go/hpfinancialservices](http://www.hp.com/go/hpfinancialservices).

## For more information

For more information about Cisco MDS switches and directors, please visit [www.hp.com/go/san](http://www.hp.com/go/san).

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