

Cisco MDS 9220i Multiservice Fabric Switch

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Cisco® MDS 9220i FCIP switch enables customers to implement high-performance SAN extension solutions, cost-effective multiprotocol connectivity, and distributed intelligent fabric services for both open systems and mainframe environments.

Product overview

Cisco MDS 9220i Multiservice Fabric Switch (Figure 1), the next generation of the highly flexible, industry-leading, proven Cisco MDS 9200 Series Multiservice Switches, is an optimized platform for deploying high-performance SAN-extension solutions, distributed intelligent fabric services, and cost-effective multiprotocol connectivity for both open systems and mainframe environments. With a compact form factor and advanced capabilities, the Cisco MDS 9220i is an ideal solution for departmental and remote branch-office SANs as well as in large-scale SANs in conjunction with Cisco MDS 9700 Series Multilayer Directors.

The Cisco MDS 9220i offers up to twelve 32-Gbps Fibre Channel ports, four 1/10-, two 25-, and one 40- Gigabit Ethernet IP storage services ports, in a fixed One-Rack-Unit (1RU) form factor. The Cisco MDS 9220i connects to existing native Fibre Channel networks, protecting current investments in storage networks. The Cisco SAN Extension over IP application package license is enabled as standard on the two fixed 1/10 Gigabit Ethernet IP storage services ports, enabling features such as Fibre Channel over IP (FCIP) and compression on the switch without the need for additional licenses.



Figure 1.
MDS 9220i Switch

Main features and benefits

The Cisco MDS 9220i Multiservice Fabric Switch provides unique multiservice and multiprotocol functions in a compact 1RU form factor:

- **SAN consolidation with integrated multiprotocol support:** The Cisco MDS 9220i is available in a base configuration of four ports of 32-Gbps Fibre Channel for high-performance SAN connectivity and two ports of 1/10-Gigabit Ethernet for FCIP storage services, running at a max speed of 1-Gbps.
- **SAN switch with 32-Gbps connectivity in 1RU form factor:** The Cisco MDS 9220i scales up to 12 ports with speeds up to 32-Gbps Fibre Channel in a fixed configuration switch. The base configuration comes with four ports of 32 Gbps Fibre Channel enabled for high-performance SAN connectivity, and it can be upgraded on site and online to enable an additional eight ports of 32-Gbps Fibre Channel by adding the Cisco MDS 9220i on-demand upgrade license. The upgrade license also enables 10 Gigabit speed on the initial two Ethernet ports, two additional 1/10 Gigabit ports, two 25 Gigabit ports, and one 40 Gigabit port.
- **Flexible FCIP port speed:** in line with recent industry trends, the Cisco MDS 9220i provides flexible connectivity options toward datacenter switches, routers or DWDM systems, including 25G speed. Both the 25G and 40G options can be very valuable for data with a lower level of compressibility, while the 1 and 10G options can well satisfy the needs of small-medium organizations.

- **IBM Fibre Connection support:** Cisco MDS 9220i cost-effectively scales up for IBM Fibre Connection (FICON) mainframe environments.¹
- **Intelligent application services engine:** The Cisco MDS 9220i includes, as standard, a single application-services engine that enables the included Cisco SAN Extension over IP software solution package to run on the two or more 1/10/25 or 40 Gigabit Ethernet storage-services ports. The Cisco SAN Extension over IP package provides an integrated, cost-effective, and reliable business-continuation solution that uses IP infrastructure by offering FCIP for remote SAN extension, along with a variety of advanced features to optimize the performance and manageability of FCIP links.
- **Hardware-based virtual fabric isolation with Virtual SANs (VSANs) and Fibre Channel routing with Inter-VSAN Routing (IVR):** VSANs and IVR enable deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port in a system or in a fabric to be partitioned into any VSAN. Included in the optional Cisco MDS 9000 Family Enterprise advanced software package, IVR provides line-rate routing between any of the ports in a system or in a fabric without the need for external routing appliances.
- Remote SAN extension with high-performance FCIP:
 - Simplifies data protection and business-continuation 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 FCIP tape read-and-write acceleration; up to 12 virtual Inter-Switch Link (ISL) connections are provided on the Ethernet ports through tunneling (3 tunnels for 1/10G or 4 tunnels for 40G IPS ports).
 - Leverages a powerful service engine chipset coupled with optimized software stack to push up to 40Gbps of traffic on the WAN link.
 - Preserves Cisco MDS 9000 Family enhanced capabilities, including VSANs, IVR, advanced traffic management, and network security across remote connections.
- **Advanced FICON services:**² The Cisco MDS 9220i will support FICON environments, including cascaded FICON fabrics, VSAN-enabled intermix of mainframe and open-systems environments, and N-Port ID Virtualization (NPIV) for mainframe Linux partitions. IBM Control Unit Port (CUP) support enables in-band management of Cisco MDS 9200 Series Multiservice Switches from the mainframe management console. FICON tape acceleration reduces latency effects for FICON channel extension over FCIP for FICON tape read-and-write operations to mainframe physical or virtual tape. This feature is sometimes referred to as tape pipelining.

¹ IBM FICON support is available for Cisco MDS 9220i starting with the Cisco MDS NX-OS 9.4.1(a) release, where it is embedded in the base NX-OS software and doesn't require a license.

² FICON and related features are supported on the Cisco MDS 9220i starting with the Cisco NX-OS 9.4.1(a), release where they are embedded in the base NX-OS software and don't require a license.

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- **Platform for intelligent fabric applications:** The Cisco MDS 9220i provides an open platform that delivers the intelligence and advanced features required to make multilayer intelligent SANs a reality, including hardware-enabled innovations to host or accelerate applications for data migration, storage backup, and data replication. Hosting or accelerating these applications in the network can dramatically improve scalability, availability, security, and manageability of the storage environment, resulting in increased utility and lower Total Cost of Ownership (TCO).
 - **Intelligent network services:** Cisco MDS 9220i uses 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 fabric-wide Quality of Service (QoS) to facilitate migration from SAN islands to enterprise-wide storage networks.
 - **High-performance ISLs:** Cisco MDS 9220i supports up to 12 Fibre Channel ISLs in a single port channel. Up to 8191 extended buffer-to-buffer credits (the default is 500) can be assigned to a single Fibre Channel port to extend storage networks over long distances.
 - **Comprehensive network security framework:** The Cisco MDS 9220i supports RADIUS and TACACS+, LDAP, Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardware-enforced zoning, ACLs, and per-VSAN Role-Based Access Control (RBAC). Additionally, the IPS ports offer IP security (IPsec) authentication, data integrity, and hardware-assisted data encryption for FCIP.
 - **IP Version 6 (IPv6) capable:** The Cisco MDS 9220i supports IPv6 as mandated by the U.S. Department of Defense (DoD), Japan, and China. IPv6 support is provided for FCIP, and management traffic routed in band and out of band.
 - **FIPS compliance:** The Cisco MDS 9220i will be **FIPS 140-2** compliant as mandated by the U.S. federal government.
 - **Sophisticated diagnostics:** The Cisco MDS 9220i provides intelligent diagnostics, protocol decoding, and network-analysis tools as well as integrated Cisco Smart Call Home capability for added reliability, faster problem resolution, and reduced service costs.
 - **High availability:** Cisco MDS 9220i is designed to provide 99.999% availability. It provides such outstanding availability and reliability by providing redundancy on all major components, such as the power supply and cooling subsystems. Dual power supplies also facilitate redundant power grids.

VSAN

VSANs are ideal for efficient, secure SAN consolidation, enabling 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 maintains its own fabric services for added scalability and resilience. VSANs allow the cost of SAN infrastructure to be shared among more users, while helping ensure complete segregation of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis.

IVR

In another step toward deploying efficient, cost-effective, consolidated storage networks, the Cisco MDS 9220i supports IVR, the industry's first 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 is one of the feature enhancements provided with the Cisco MDS 9000 Family Enterprise software license and 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. Deploying IVR means lower total cost of SAN ownership.

FCIP for remote SAN extension

Data distribution, data protection, and business continuance services are significant components of today's information-centric businesses. The capability to efficiently replicate critical data on a global scale not only helps ensure a higher level of data protection for valuable corporate information, but also increases utilization of backup resources and lowers total cost of storage ownership.

- Building on Cisco expertise and knowledge of IP networks, the Cisco MDS 9220i switch uses open-standards FCIP to break the distance barrier of current Fibre Channel solutions, enabling interconnection of SAN islands over extended distances.
- The Cisco MDS 9220i dramatically enhances hardware-based FCIP compression performance for both high-bandwidth and low-bandwidth links, providing immediate cost savings for expensive WAN infrastructure. The Cisco MDS 9220i achieves up to a 43:1 compression ratio, with typical ratios of 4:1 to 5:1 over a wide variety of data sources.
- The Cisco MDS 9220i supports hardware-based IPsec encryption for secure transmission of sensitive data over extended distances. Hardware enablement of IPsec helps ensure high throughput. Used together, hardware-based compression and hardware-based encryption provide high-performance, highly secure SAN extension capabilities.

Mainframe support³

The Cisco MDS 9220i is mainframe ready and will support IBM zSeries FICON and Linux environments provided with the Cisco MDS 9000 Mainframe advanced software package. To be qualified by IBM for attachment to all FICON-enabled devices in an IBM zSeries operating environment, Cisco MDS 9220i switches will support transport of the FICON protocol in both cascaded and noncascaded fabrics, as well as an intermix of FICON and open-systems Fibre Channel Protocol traffic on the same switch. VSANs simplify intermixing of SAN resources among IBM z/OS, mainframe Linux, and open-systems environments, enabling increased SAN utilization and simplified SAN management. VSAN-based intermix mode eliminates the uncertainty and instability often associated with zoning-based intermix techniques. VSANs also eliminate the possibility that a misconfiguration or component failure in one VSAN will affect operation in other VSANs. VSAN-based management access controls simplify partitioning of SAN management responsibilities between mainframe and open-systems environments, enhancing security. FICON VSANs can be managed using the standard Cisco Data Center Network Manager (DCNM), the Cisco Command-Line Interface (CLI), or IBM CUP-enabled management tools, including Resource Measurement Facility (RMF), and Dynamic Channel path Management (DCM).

³ Refer to Cisco MDS FICON documentation for the NX-OS version that enables FICON support.

Advanced traffic management

The following advanced traffic-management capabilities are integrated as standard on the Cisco MDS 9220i:

- **Virtual Output Queue (VOQ):** Helps ensure line-rate performance on each port, independent of traffic pattern, by eliminating head-of-line blocking.
- **PortChannels:** Allow users to aggregate up to 12 physical ISLs into a single logical bundle, providing optimized bandwidth utilization across all links. The bundle can consist of any speed-matched ports from any module in the chassis, helping ensure that the bundle can remain active even in the event of a module failure.
- **Fabric Shortest Path First (FSPF)-based multipathing:** Provides the intelligence to load balance across up to 12 equal-cost paths and, in the event of a switch failure, dynamically reroute traffic.
- **Up to 8191 buffer-to-buffer extended credits (500 default):**⁴ Can be assigned to an individual port for optimal bandwidth utilization across long distances.

The following additional advanced traffic-management capabilities are available on the Cisco MDS 9220i with the optional Cisco MDS 9000 Family Enterprise advanced software package to simplify deployment and optimization of large-scale fabrics:

- **QoS:** Can be used to manage bandwidth and control latency, to prioritize critical traffic for specific applications.
- **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.
- **SCSI flow statistics:** Collects Logical Unit Number (LUN)-level SCSI flow statistics, including read, write, and error statistics, for any combination of initiators and targets.

Comprehensive solution for robust network security

To address the need for failure-proof security in storage networks, the Cisco MDS 9220i includes as standard an extensive security framework to protect highly sensitive data crossing today's enterprise networks:

- **Anticounterfeit technology and secure boot:** by using a tamper-proof chipset on motherboard, hardware authenticity and software integrity are assured.
- **Smart zoning:** When the smart zoning feature is enabled, Cisco MDS 9000 Family fabrics provision the hardware access control entries specified by the zone set more efficiently, avoiding the superfluous entries that would allow servers (initiators) to talk to other servers, or allow storage devices (targets) to talk to other storage devices. This feature makes larger zones with multiple initiators and multiple targets feasible without excessive consumption of hardware resources. Thus, smart zones can correspond to applications, application clusters, hypervisor clusters, or other data center entities, saving the time that administrators previously spent creating many small zones, and enabling the automation of zoning tasks.
- Intelligent packet inspection is provided at the port level, including the application of ACLs for hardware enforcement of zones, VSANs, and advanced port-security features.

⁴ Extended Credit feature is part of the Enterprise license.

The following additional advanced security-management capabilities are available on the Cisco MDS 9220i with the Cisco MDS 9000 Family Enterprise advanced software package to further help ensure the security of large-scale fabrics:

- Switch-to-switch and host-to-switch authentication helps eliminate disruptions that may occur because of unauthorized devices connecting to a large enterprise fabric.
- FC-SP ESP payload encryption, which supports encrypted data to flow through the switch is supported.
- Port security locks down the mapping of an entity to a switch port to help ensure that SAN security is not compromised by the connection of unauthorized devices to a switch port.
- VSAN-based access control allows customers to define roles in which the scope of the roles is limited to certain VSANs.
- FC-SP provides switch-switch and host-switch Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) authentication supporting RADIUS and TACACS+ to help ensure that only authorized devices access protected storage networks.
- Comprehensive IPsec protocol suite delivers secure authentication, data integrity, and hardware-based encryption for FCIP.
- Digital certificates are issued by a trusted third party and are used as electronic passports to prove the identity of certificate owners.
- Fabric binding for open systems helps ensure that the ISLs are enabled between only switches that have been authorized in the fabric binding configuration.

Advanced diagnostics and troubleshooting tools

Management of large-scale storage networks requires proactive diagnostics, tools to verify connectivity and route latency, and mechanisms for capturing and analyzing traffic. The Cisco MDS 9000 Family integrates the industry's most advanced analysis and diagnostic tools, which are included as standard on the Cisco MDS 9220i. The Power-on Self-Test (POST) and Cisco Online Health Monitoring System (OHMS) provide proactive health monitoring. The Cisco MDS 9220i implements diagnostic capabilities such as Fibre Channel traceroute to identify the exact path and timing of flows, and Switched Port Analyzer (SPAN) to intelligently capture network traffic. After traffic has been captured, it can be analyzed with 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 Cisco MDS 9000 Family, Cisco delivers a comprehensive tool set for troubleshooting and analysis of storage networks.

Ease of management

To meet the needs of all users, the Cisco MDS 9220i provides three principal modes of management: the Cisco MDS 9000 Family CLI, Cisco DCNM, and integration with third-party storage management tools.

The Cisco MDS9220i presents a consistent, logical CLI. Adhering to the syntax of the widely known Cisco IOS® Software CLI, the Cisco MDS 9000 Family CLI is easy to learn and delivers broad management capabilities. The Cisco MDS 9000 Family CLI is an extremely efficient and direct interface designed to provide optimal capabilities to administrators in enterprise environments.

Cisco Data Center Network Manager (DCNM) SAN is the network industry's first converged SAN and LAN management solution. Cisco DCNM is able to manage all NX-OS-based devices, including the Cisco MDS 9000 Family and Cisco Nexus® products. The intuitive graphical user interface simplifies day-to-day operations of Cisco unified fabrics in today's highly virtualized data center environments.

The main functions supported by Cisco DCNM SAN include:

- Monitoring of events and performance historically and at scale.
- Wizard- and template-based provisioning of technologies and services based on Cisco NX-OS.
- Dynamic topology views with extended visibility into virtual infrastructure.
- Resource management through trend analysis of inventory and performance.
- Rule-based event notification and filtering.
- Role Based Access Control (RBAC), providing separation between the network and storage teams.

The solution is designed to scale to large enterprise deployments through scale-out server architecture with automated failover capability. These capabilities provide a resilient management system that centralizes infrastructure and path monitoring across geographically dispersed data centers. Cisco DCNM base management functions are available at no charge; advanced features are unlocked with the license. The Cisco DCNM application can be installed on Linux and Microsoft Windows operating systems and supports both PostgreSQL and Oracle databases.

An HTTP/HTTPS programming interface is also available under the name of NX-API. It supports all non-interacting commands and can be used to collect information from the switch or make configuration changes to it.

Advanced software packages

The Cisco MDS 9220i can be further enhanced through additional optional licensed software packages that offer advanced intelligence and functions (summarized in tables 1 and 2). Currently available software packages include the following:

- **Cisco MDS 9000 Family Enterprise Package:** This package includes a set of traffic engineering and advanced security features – such as IVR, QoS, switch-to-switch and host-to-switch authentication, LUN zoning, and read-only zones – that are recommended for enterprise SANs.
- **Cisco DCNM SAN Advanced License:** This is the licensed version of Cisco DCNM that provides server federation, historical performance monitoring for network traffic hot-spot analysis, centralized management services, and advanced application integration.

- **Cisco MDS 9000 Mainframe Package:** This mainframe feature set is a comprehensive collection of features required for using the Cisco MDS 9700 Series and MDS 9200 Series switches in mainframe storage networks, including FICON protocol, FICON tape acceleration (read and write), CUP management, switch cascading, fabric binding, and intermixing. The Mainframe feature set is supported for Cisco MDS 9220i starting 9.4.1a, and with 9.4.1a this feature set is included in the base NX-OS software and there is no license requirement for it.

The Cisco MDS 9000 SAN Extension over IP Package is included with the Cisco MDS 9220i switch.

Table 1. Advanced optional software packages

| Advanced software packages |
|---|
| Cisco DCNM SAN Advanced license (server- or switch-based) |
| Cisco MDS 9000 Family Enterprise |

Product specifications

Table 2. Product specifications

| Feature | Description |
|-------------------------------|--|
| Product family | Cisco MDS 9000 |
| Software compatibility | Cisco MDS 9000 NX-OS Release 8.5(1) or later Cisco MDS 9000 NX-OS Release 11.5.1 or later for Cisco DCNM support |
| Protocols | <ul style="list-style-type: none"> • Fibre Channel standards <ul style="list-style-type: none"> ◦ 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) |

| Feature | Description |
|---------|---|
| | <ul style="list-style-type: none"> ◦ FC-GS-4, Revision 7.91 (ANSI INCITS 387-2004) ◦ FC-GS-5, Revision 8.51 (ANSI INCITS 427-2007) ◦ FC-GS-6, Revision 9.4 (ANSI INCITS 463-2010) ◦ FCP, Revision 12 (ANSI INCITS 269-1996) ◦ FCP-2, Revision 8 (ANSI INCITS 350-2003) ◦ FCP-3, Revision 4 (ANSI INCITS 416-2006) ◦ FCP-4, Revision 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 ◦ 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-BB-6 ◦ 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 ICMP ● RFC 1323 TCP performance enhancements |

| Feature | Description |
|--|--|
| | <ul style="list-style-type: none"> • RFC 2338 VRRP • RFC 2460 and 4291 IPv6 • RFC 2463 and 4443 ICMPv6 • RFC 2461 and 2462 IPv6 neighbor discovery and stateless autoconfiguration • RFC 2464 IPv6/Ethernet • RFC 3643 and 3821 FCIP • Ethernet standards • IEEE Std 802.3-2005 Ethernet • IEEE Std 802.1Q-2005 VLAN • IPsec • RFC 2401 and 4301 security architecture for IP • RFC 2403 and 2404 HMAC • RFC 2405, 2406, 2451, and 4303 IP ESP • RFC 2407 and 2408 ISAKMP • RFC 2412 OAKLEY Key Determination Protocol • RFC 3566, 3602, and 3686 AES • Internet Key Exchange (IKE) • RFC 2409 IKEv1 • RFC 4306 IKEv2 |
| Cards, ports, and slots | <ul style="list-style-type: none"> • Fixed configuration with 12 ports of 32-Gbps Fibre Channel and 3 ports of 1/10-, 1 port of 1/10/25-, 1 port of 25- and 1 port of 40-gigabit Ethernet |
| Fabric services | <ul style="list-style-type: none"> • Name server • Registered State Change Notification (RSCN) • Login services • Fabric Configuration Server (FCS) • Broadcast • In-order delivery |
| Advanced functions | <ul style="list-style-type: none"> • VSAN • IVR • PortChannel with multipath load balancing • Flow-based and zone-based QoS • FICON over FCIP tape read and write acceleration (pipelining) |
| Diagnostics and troubleshooting tools | <ul style="list-style-type: none"> • POST diagnostics • Cisco Online Health Management System (OHMS) • Internal port loopbacks • SPAN and Remote SPAN (RSPAN) • Fibre Channel traceroute • Fibre Channel ping • Fibre Channel debug • Cisco Fabric Analyzer • Syslog • Online system health • Port-level statistics • Real-Time Protocol (RTP) debug |

| Feature | Description |
|-------------------------|---|
| Network security | <ul style="list-style-type: none"> • 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 • IP address • FC-SP • DH-CHAP switch-to-switch authentication • DH-CHAP host-to-switch authentication • Port security and fabric binding • IPsec for FCIP • IKEv1 and IKEv2 • Management access • SSHv2 implementing AES • SNMPv3 implementing AES • SFTP • Anti-counterfeit technology • Secure boot |
| FICON | <ul style="list-style-type: none"> • FC-SB-6 compliant • Cascaded FICON fabrics • Intermix of FICON and Fibre Channel Protocol traffic • CUP management interface |
| Serviceability | <ul style="list-style-type: none"> • Configuration file management • ISSU for Fibre Channel interfaces • Cisco Call Home • Power-management LEDs • Port beaconing • System LED • SNMP traps for alerts • Network boot |
| Performance | <ul style="list-style-type: none"> • Port speed: 4/8/16/32-Gbps autosensing, optionally configurable • Extended buffer-to-buffer Credits of 8191 and 500 buffer-to-buffer credit default • Ports per chassis: 12 ports of 32-Gbps Fibre Channel and 3 ports of 1/10-, 1 port of 1/10/25-, 1 port of 25- and 1 port of 40-gigabit ethernet • Ports per rack: Up to 1050 • PortChannel: Up to 12 physical links • FCIP tunnels: Up to 3 per 1/10G port or 4 per 40G port |

| Feature | Description |
|---------------------------------------|---|
| Reliability and availability | <ul style="list-style-type: none"> • Hot-swappable, 1+1 redundant power supplies • Hot-swappable fan module with integrated temperature and power management • Hot-swappable SFP+ optics • Passive backplane • Stateful process restart • Any port configuration for PortChannels • Fabric-based multipathing • Per-VSAN fabric services • Port tracking • Online diagnostics |
| Network management | <ul style="list-style-type: none"> • Access methods <ul style="list-style-type: none"> ◦ Out-of-band 10/100 Gigabit Ethernet port ◦ RS-232 serial console port ◦ In-band IP over Fibre Channel ◦ In-band FICON CUP over Fibre Channel ◦ USB (Software support to be enabled in a future release) • Access protocols <ul style="list-style-type: none"> ◦ CLI using the console and Ethernet ports ◦ SNMPv3 using the Ethernet port and in-band IP over Fibre Channel access ◦ Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S) on DCNM server ◦ FICON CUP • Distributed device alias service • Network security <ul style="list-style-type: none"> ◦ Per-VSAN RBAC using LDAP, RADIUS and TACACS+-based Authentication, Authorization, and Accounting (AAA) functions ◦ SFTP ◦ SSHv2 implementing AES ◦ SNMPv3 implementing AES • Management applications <ul style="list-style-type: none"> ◦ Cisco MDS 9000 Family CLI ◦ Cisco DCNM |
| Programming interfaces | <ul style="list-style-type: none"> • Scriptable CLI • NX-API • Cisco DCNM web services API • On-board Python interpreter |
| Environmental | <ul style="list-style-type: none"> • 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: 10 to 90% • Relative humidity, ambient (noncondensing) nonoperating and storage: 10 to 95% • Altitude, operating: -197 to 6500 ft (-60 to 2000m) |
| Physical dimensions and weight | <ul style="list-style-type: none"> • Width: 17.30 inches; Length: 20.12 inches; Height: 1.72 inches • 21.6 lb. (9.8 kg) |

| Feature | Description |
|---------------------------------|---|
| Power and cooling | <ul style="list-style-type: none"> • Power supply: 500W (Exhaust and Intake), 80Plus Platinum certified • Power cord: Notched C15 socket connector connecting to C16 plug on power supply • Typical power consumption: 240W • AC input characteristics • 100 to 240V AC (10% range) • 50 to 60 Hz (nominal) • Airflow (front to back, back to front) • 200 linear feet per minute (LFM) through system fan assembly |
| Approvals and compliance | <ul style="list-style-type: none"> • 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 3. Ordering information

| Part # | Product Description |
|-------------------------|---|
| DS-C9220I-4PEK9 | MDS 9220i Multiprotocol Fixed Switch Base configuration (4xFC, 2 x IPS 1 Gbps), port side exhaust |
| DS-C9220I-4PIK9 | MDS 9220i Multiprotocol Fixed Switch Base configuration (4xFC, 2 x IPS 1 Gbps), port side intake |
| M9220I-UPGK9 | MDS 9220i Upgrade license to enable all ports (12xFC, 6 x IPS 1/10/25/40 Gbps) |
| DS-C9220I-12PEK9 | MDS 9220i Multiprotocol Fixed Switch Advanced configuration (12xFC, 6 x IPS 1/10/25/40 Gbps), port side exhaust |
| DS-C9220I-12PIK9 | MDS 9220i Multiprotocol Fixed Switch Advanced configuration (12xFC, 6 x IPS 1/10/25/40 Gbps), port side intake |
| DS-C9220I-4PEK9= | MDS 9220i Multiprotocol Fixed Switch Base configuration (4xFC, 2 x IPS 1 Gbps), port side exhaust, (Spare) |
| DS-C9220I-4PIK9= | MDS 9220i Multiprotocol Fixed Switch Base configuration (4xFC, 2 x IPS 1 Gbps), port side intake, (Spare) |
| M9220I-UPGK9= | MDS 9220i Upgrade license to enable all ports (12xFC, 6 x IPS 1/10/25/40 Gbps), Spare |
| M9220I-UPGK9-SL= | MDS 9220i Upgrade Smart license to enable all ports (12xFC, 6 x IPS 1/10/25/40 Gbps), Spare |

| Part # | Accessories Description |
|-----------------------------|--|
| DS-9220I-KIT-CSCO(=) | MDS 9220 Accessory Kit for Cisco (Spare) |
| DS-9220I-KIT-EM(=) | MDS 9220 Accessory Kit for DellEMC (Spare) |
| DS-9220I-KIT-HDS(=) | MDS 9220 Accessory Kit for HDS (Spare) |
| DS-9220I-KIT-HPE(=) | MDS 9220 Accessory Kit for HPE (Spare) |
| DS-9220I-KIT-IBM(=) | MDS 9220 Accessory Kit for IBM (Spare) |
| DS-C32S-FAN-E= | MDS 9132 FAN module, port-side exhaust (works with 9220I switch), (Spare) |
| DS-C32S-FAN-I= | MDS 32G Switch FAN module, port-side intake (works with 9220I switch), (Spare) |
| DS-CAC-500W-E= | MDS 9100 500W port-side exhaust PSU (works with 9220I switch), (Spare) |
| DS-CAC-500W-I= | MDS 9100 500W AC PSU port-side intake (works with 9220I switch), (Spare) |

| Part # | Accessories Description |
|---------------------------|---|
| DS-CAC-1200W ⁵ | 1200W AC Power Supply (bi-directional), spare |

| Part # | Cables Description |
|---------------------|--|
| CAB-9K10A-AR(=) | Power cord, 250VAC 10A IRAM 2073 plug, Argentina |
| CAB-9K10A-SA(=) | Power cord, 250VAC 10A SABS 164/1 plug, South Africa |
| CAB-9K10A-SW(=) | Power cord, 250VAC 10A, straight C15, MP232 plug, SWITZ |
| CAB-9K10A-TWN(=) | Power cord, 125VAC 15A CNS10917-2, Taiwan |
| CAB-9K10A-UK(=) | Power cord, 250VAC 13A BS1363 plug (13 A fuse), UK |
| CAB-9K12A-NA(=) | Power cord, 125VAC 15A NEMA 5-15 plug, North America |
| CAB-C15-CBN(=) | Cabinet jumper power cord, 250 VAC 16A, C14-C15 connectors |
| CAB-9K10A-EU(=) | Power cord, 250VAC 10A CEE 7/7 plug, EU |
| CAB-9K10A-ISR(=) | Power cord, 250VAC 10A SI16S3 plug, Israel |
| CAB-9K10A-AU(=) | Power cord, 250VAC 10A 3112 plug, Australia |
| CAB-9K10A-CH(=) | Power cord, 250VAC 10A GB1002 plug, China |
| CAB-250V-10A-ID(=) | AC Power Cord - 250V, 10A, India |
| CAB-9K10A-KOR(=) | Power Cord, 125VAC 13A KSC8305 Plug, Korea |
| CAB-250V-10A-BR(=) | Power Cord - 250V, 10A - Brazil |
| CAB-9K10A-IT(=) | Power Cord, 250VAC 10A CEI 23-16/VII Plug, Italy |
| CAB-C15-CBN-EURA(=) | Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 connectors |
| CAB-C15-CBN-CK(=) | Cabinet Jumper Power Cord, 250 VAC 10A, C14-C15 connectors |

⁵ 1200W bi-directional power supply is certified and only available as a spare. Fans are still unidirectional and should be chosen based on data center air-flow requirements

| Part # | Optional Licenses |
|--------------------|--|
| M9200ENT1K9(=) | Cisco MDS 9200 Series Enterprise Package (Spare) |
| DCNM-SAN-M92-K9(=) | Cisco Data Center Network Manager (Server Based) (Spare) |
| DCNM-S-M92XK9(=) | Cisco Data Center Network Manager (Switch Based) (Spare) |

| Part # | Optics Description |
|---------------------|---|
| DS-SFP-FC32G-SW(=) | 32 Gbps Fibre Channel SW SFP+, LC (Spare) |
| DS-SFP-FC32G-LW(=) | 32 Gbps Fibre Channel LW SFP+, LC (Spare) |
| DS-SFP-FC32G-ELW(=) | 32 Gbps Fibre Channel Extended LW SFP+, LC (Spare) |
| DS-SFP-FC16G-SW(=) | 16 Gbps Fibre Channel SW SFP+, LC (Spare) |
| DS-SFP-FC16G-LW(=) | 16 Gbps Fibre Channel LW SFP+, LC (Spare) |
| DS-SFP-FC16GELW(=) | 16 Gbps Fibre Channel Extended LW SFP+, LC (Spare) |
| DS-SFP-FC8G-SW(=) | 8 Gbps Fibre Channel SW SFP+, LC (Spare) |
| DS-SFP-FC8G-LW(=) | 8 Gbps Fibre Channel LW SFP+, LC (Spare) |
| DS-SFP-FC8G-ER(=) | 8 Gbps Fibre Channel Extended Reach SFP+, LC (Spare) |
| GLC-SX-MMD(=) | 1000BASE-SX SFP transceiver module, MMF, 850nm, DOM (Spare) |
| GLC-LH-SMD(=) | 1000BASE-LX/LH SFP transceiver module, MMF/SMF, 1310nm, DOM (Spare) |
| DS-SFP-GE-T(=) | Gigabit Ethernet Copper SFP, RJ-45 (Spare) |
| SFP-10G-SR(=) | 10GBASE-SR SFP Module (Spare) |
| SFP-10G-LR(=) | 10GBASE-LR SFP Module (Spare) |
| DS-SFP-10GE-LR(=) | 10 Gbps Ethernet LR SFP, LC (Spare) |
| SFP-25G-SR-S(=) | 25GBASE-SR SFP Module (Spare) |
| SFP-10/25G-CSR-S(=) | Dual rate 10/25GBASE-CSR SFP Module (Spare) |
| SFP-10/25G-LR-S(=) | 10/25GBASE-LR SFP28 Module (Spare) |
| QSFP-40G-SR4 | 40GBASE-SR4 QSFP Transceiver Module with MPO Connector |

| Part # | Optics 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 |
| QSFP-40/100-SRBD(=) | 100G and 40GBASE SR-BiDi QSFP transceiver, LC, 100m OM4 MMF (Spare) |

Product sustainability

Information about Cisco’s Environmental, Social and Governance (ESG) initiatives and performance is provided in Cisco’s CSR and sustainability [reporting](#).

Table 4. Product sustainability

| Sustainability Topic | | Reference |
|----------------------|---|---|
| General | Information on product-material-content laws and regulations | Materials |
| | Information on electronic waste laws and regulations, including our products, batteries and packaging | WEEE Compliance |
| | Information on product takeback and reuse program | Cisco Takeback and Reuse Program |
| | Sustainability Inquiries | Contact: csr_inquiries@cisco.com |
| Material | Product packaging weight and materials | Contact: environment@cisco.com |
| | Size and Weights | Table 2. Product specifications |

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Document history

| New or revised topic | Described in | Date |
|---|--------------|-------------------|
| New data sheet for 9220i MDS FCIP switch | | February 24, 2021 |

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