

# Cisco MDS 9148S 16G Multilayer Fabric Switch for IBM System Storage

## IBM Redbooks Product Guide

This IBM® Redbooks® Product Guide describes the Cisco MDS 9148S 16G Multilayer Fabric Switch for IBM System Storage® (MDS 9148S). The MDS 9148S is the latest generation of the highly reliable, flexible, and low-cost Cisco MDS 9100 Series switches. It combines high performance with exceptional flexibility and cost effectiveness. This powerful, compact one rack-unit (1RU) switch scales from 12 to 48 line-rate 16 Gbps Fibre Channel ports.

The MDS 9148S is excellent for the following situations:

- A stand-alone SAN in small departmental storage environments
- A top-of-the-rack switch in medium-sized redundant fabrics
- An edge switch in enterprise data center core-edge topologies

The MDS 9148S is powered by Cisco NX-OS Software and Cisco Data Center Network Manager (DCNM) software. It delivers advanced storage networking features and functions with ease of management and compatibility with the entire Cisco MDS 9000 Family portfolio for reliable end-to-end connectivity.

Figure 1 shows the MDS 9148S.



Figure 1. MDS 9148S

### Did you know?

- Up to 48 autosensing Fibre Channel ports are capable of speeds of 2, 4, 8, and 16 Gbps, with 16 Gbps of dedicated bandwidth for each port.
- The MDS 9148S offers built-in storage network management and SAN plug-and-play capabilities.
- An extensive set of innovative and powerful security features and functions is available with the optional Cisco MDS 9100 Enterprise Package.

## Product highlights

The MDS 9148S has the following highlights.

### High performance and outstanding flexibility at low cost

Up to 48 autosensing Fibre Channel ports are capable of speeds of 2, 4, 8, and 16 Gbps, with 16 Gbps of dedicated bandwidth for each port. The base switch comes with 12 enabled ports. Upgrade it with additional ports by adding one or more 12-port MDS 9148S 12-port On-Demand activation licenses. The MDS 9148S scales from 12 to 48 high-performance Fibre Channel ports in a single 1RU form factor.

### High-availability platform for mission-critical deployments

In environments in which downtime is intolerable, the MDS 9148S offers In-Service Software Upgrades (ISSU), which means that Cisco NX-OS Software can be upgraded while the Fibre Channel ports carry traffic. The MDS 9148S includes dual redundant hot-swappable power supplies and fan trays, PortChannels for Inter-Switch Link (ISL) resiliency, and F-port channeling for resiliency on uplinks from an MDS 9148S operating in NPV mode. New hardware-based slow port detection and mitigation provide enhanced performance and monitoring capabilities.

### Simplified storage management with sophisticated diagnostic tests

The MDS 9148S offers built-in storage network management and SAN plug-and-play capabilities. All features are available through a command-line interface (CLI) or Cisco DCNM for SAN, which is a centralized management tool. DCNM task-based wizards simplify management of single or multiple switches and fabrics. For virtual infrastructure, it manages the entire path from the virtual machine and switch to the physical storage. The MDS 9148S also supports PowerOn Auto Provisioning (POAP) to automate software image upgrades and configuration file installation on newly deployed switches. Additionally, it provides intelligent diagnostic tests, protocol decoding, network analysis tools, and Cisco Call Home for added reliability, faster problem resolution, and reduced service costs.

### Intelligent network services and advanced traffic management

The MDS 9148S uses virtual SAN (VSAN) technology for hardware-enforced, isolated environments within a physical fabric. It offers access control lists (ACLs) for hardware-based, intelligent frame processing. Advanced traffic management features, such as fabric-wide quality of service (QoS) and Inter-VSAN Routing (IVR), are included in the optional Cisco MDS 9100 Enterprise Package. QoS prioritizes application data traffic for better and more predictable network service. Zone-based QoS simplifies configuration and administration by using the familiar zoning concept. IVR facilitates resource sharing across VSANs without compromising scalability, reliability, availability, and network security.

### Comprehensive network security framework

An extensive set of innovative and powerful security features and functions is available with the optional Cisco MDS 9100 Enterprise Package. It offers fabric-wide, Inter VSAN Routing (IVR), per-VSAN role-based authentication, authorization, and accounting (AAA) services that use RADIUS, Lightweight Directory Access Protocol (LDAP), Microsoft Active Directory (AD), and TACACS+. It also deploys VSAN fabric isolation, intelligent, port-level packet inspection, Fibre Channel Security Protocol (FC-SP) host-to-switch and switch-to-switch authentication, Secure File Transfer Protocol (SFTP), Secure Shell Version 2 (SSHv2), and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES). Other security features include control-plane security, hardware-enforced zoning, broadcast zones, and management access. The Cisco 9148S is FIPS 140-2 compliant as mandated by the US federal government.

## Architecture and key components

Table 1 summarizes the main features and benefits of the MDS 9148S.

Table 1. Main features and benefits of the MDS 9148S

Feature	Benefit
Common software across all platforms	Reduces total cost of ownership (TCO) by using Cisco NX-OS and Cisco DCNM for consistent provisioning, management, and diagnostic capabilities across the fabric.
PowerOn Auto Provisioning	Automates deployment and upgrade of software images.
Smart zoning	Reduces consumption of hardware resources and the administrative time that is needed to create and manage zones.
Intelligent diagnostic tests and hardware-based slow port detection	Enhances reliability, speeds problem resolution, and reduces service costs by using Fibre Channel ping and traceroute to identify exact path and timing of flows, and Cisco Switched Port Analyzer (SPAN) and Remote SPAN (RSPAN) and Cisco Fabric Analyzer to capture and analyze network traffic.
Virtual output queuing	Helps ensure line-rate performance on each port by eliminating head-of-line blocking.
High-performance ISLs	Optimizes bandwidth utilization by aggregating up to 16 physical ISLs into a single logical PortChannel bundle with multipath load balancing.
In-Service Software Upgrades	Reduces downtime for planned maintenance and software upgrades.

## Licensing

Table 2 describes the optional licenses that can be purchased to enable additional features and capabilities on the MDS 9148S.

Table 2. Optional licenses

License	Benefit
Cisco MDS 9100 Enterprise Package (FC 7210)	Includes advanced traffic-engineering and network security features, such as IVR, QoS and zone-based QoS, Fibre Channel Security Protocol (FC-SP), port security, VSAN-based access control, and fabric binding for open systems. Licensed per switch for all the ports on the switch.
MDS 9100 DCNM Advanced Edition (FC 7211)	Includes advanced management capabilities, such as vCenter integration, performance trending, advanced provisioning, backup, and dashboards. Licensed per switch for all the ports on the switch. License is hosted on a server.
MDS 9148S 12-port On-Demand (FC 7212)	Enables 12 additional Fibre Channel ports (up to 48 total ports on the switch).

## Specifications

Table 3 lists the specifications for the MDS 9148S.

Table 3. Product specifications for the MDS 9148S (part 1 of 4)

Feature	Description
Protocols	<ul style="list-style-type: none"> <li>● FC-PH, Revision 4.3 (ANSI INCITS 230-1994)</li> <li>● FC-PH, Amendment 1 (ANSI INCITS 230-1994/AM1-1996)</li> <li>● FC-PH, Amendment 2 (ANSI INCITS 230-1994/AM2-1999)</li> <li>● FC-PH-2, Revision 7.4 (ANSI INCITS 297-1997)</li> <li>● FC-PH-3, Revision 9.4 (ANSI INCITS 303-1998)</li> <li>● FC-PI, Revision 13 (ANSI INCITS 352-2002)</li> <li>● FC-PI-2, Revision 10 (ANSI INCITS 404-2006)</li> <li>● FC-PI-3, Revision 4 (ANSI INCITS 460-2011)</li> <li>● FC-PI-4, Revision 8 (ANSI INCITS 450-2008)</li> <li>● FC-PI-5, Revision 6 (ANSI INCITS 479-2011)</li> <li>● FC-FS, Revision 1.9 (ANSI INCITS 373-2003)</li> <li>● FC-FS-2, Revision 1.01 (ANSI INCITS 424-2007)</li> <li>● FC-FS-2, Amendment 1 (ANSI INCITS 424-2007/AM1-2007)</li> <li>● FC-FS-3, Revision 1.11 (ANSI INCITS 470-2011)</li> <li>● FC-LS, Revision 1.62 (ANSI INCITS 433-2007)</li> <li>● FC-LS-2, Revision 2.21 (ANSI INCITS 477-2011)</li> <li>● FC-SW-2, Revision 5.3 (ANSI INCITS 355-2001)</li> <li>● FC-SW-3, Revision 6.6 (ANSI INCITS 384-2004)</li> <li>● FC-SW-4, Revision 7.5 (ANSI INCITS 418-2006)</li> <li>● FC-SW-5, Revision 8.5 (ANSI INCITS 461-2010)</li> <li>● FC-GS-3, Revision 7.01 (ANSI INCITS 348-2001)</li> <li>● FC-GS-4, Revision 7.91 (ANSI INCITS 387-2004)</li> <li>● FC-GS-5, Revision 8.51 (ANSI INCITS 427-2007)</li> <li>● FC-GS-6, Revision 9.4 (ANSI INCITS 463-2010)</li> <li>● FCP, Revision 12 (ANSI INCITS 269-1996)</li> <li>● FCP-2, Revision 8 (ANSI INCITS 350-2003)</li> <li>● FCP-3, Revision 4 (ANSI INCITS 416-2006)</li> <li>● FCP-4, Revision 2b (ANSI INCITS 481-2011)</li> <li>● FC-SB-2, Revision 2.1 (ANSI INCITS 349-2001)</li> <li>● FC-SB-3, Revision 1.6 (ANSI INCITS 374-2003)</li> <li>● FC-SB-3, Amendment 1 (ANSI INCITS 374-2003/AM1-2007)</li> <li>● FC-SB-4, Revision 3.0 (ANSI INCITS 466-2011)</li> <li>● FC-SB-5, Revision 2.00 (ANSI INCITS 485-2014)</li> <li>● FC-BB-6, Revision 2.00 (ANSI INCITS 509-2014)</li> <li>● FC-BB-2, Revision 6.0 (ANSI INCITS 372-2003)</li> <li>● FC-BB-3, Revision 6.8 (ANSI INCITS 414-2006)</li> </ul>

Table 3. Product specifications for the MDS 9148S (part 2 of 4)

Feature	Description
Protocols (cont.)	<ul style="list-style-type: none"> <li>● FC-BB-4, Revision 2.7 (ANSI INCITS 419-2008)</li> <li>● FC-BB-5, Revision 2.0 (ANSI INCITS 462-2010)</li> <li>● FC-VI, Revision 1.84 (ANSI INCITS 357-2002)</li> <li>● FC-SP, Revision 1.8 (ANSI INCITS 426-2007)</li> <li>● FC-SP-2, Revision 2.71 (ANSI INCITS 496-2012)</li> <li>● FAIS, Revision 1.03 (ANSI INCITS 432-2007)</li> <li>● FAIS-2, Revision 2.23 (ANSI INCITS 449-2008)</li> <li>● FC-IFR, Revision 1.06 (ANSI INCITS 475-2011)</li> <li>● FC-FLA, Revision 2.7 (INCITS TR-20-1998)</li> <li>● FC-PLDA, Revision 2.1 (INCITS TR-19-1998)</li> <li>● FC-Tape, Revision 1.17 (INCITS TR-24-1999)</li> <li>● FC-MI, Revision 1.92 (INCITS TR-30-2002)</li> <li>● FC-MI-2, Revision 2.6 (INCITS TR-39-2005)</li> <li>● FC-MI-3, Revision 1.03 (INCITS TR-48-2012)</li> <li>● FC-DA, Revision 3.1 (INCITS TR-36-2004)</li> <li>● FC-DA-2, Revision 1.06 (INCITS TR-49-2012)</li> <li>● FC-MSQS, Revision 3.2 (INCITS TR-46-2011)</li> <li>● Fibre Channel classes of service: Class 2, Class 3, and Class F</li> <li>● Fibre Channel standard port types: E, F, and FL</li> <li>● Fibre Channel enhanced port types: SD, ST, and TE</li> <li>● In-band management that uses IP over Fibre Channel (RFC 2625)</li> <li>● IPv6, IPv4, and Address Resolution Protocol (ARP) over Fibre Channel (RFC 4338)</li> <li>● Extensive IETF-standards-based TCP/IP, SNMPv3, and remote monitoring (RMON) MIBs</li> </ul>
Ports	<ul style="list-style-type: none"> <li>● Maximum configuration with 48 ports of 16-Gbps Fibre Channel performance</li> <li>● Twelve active ports that are available in the base switch</li> <li>● Enable incremental ports with the 12-port On-Demand Activation license</li> </ul>
Performance	<ul style="list-style-type: none"> <li>● Port speed: 2/4/8/16-Gbps autosensing with 16 Gbps of dedicated bandwidth per port</li> <li>● Buffer credits: Up to 256 for a group of 4 ports, with a default of 64 buffer credits per port and a maximum of 253 buffer credits for a single port in the group</li> <li>● PortChannel: Up to 16 physical links</li> </ul>

Table 3. Product specifications for the MDS 9148S (part 3 of 4)

Feature	Description
Reliability and availability	<ul style="list-style-type: none"> <li>● ISSU</li> <li>● Hot-swappable, dual redundant power supplies</li> <li>● Hot-swappable fan tray with integrated temperature and power management</li> <li>● Hot-swappable SFP+ optics</li> <li>● Passive backplane</li> <li>● Stateful process restart</li> <li>● Any port configuration for PortChannels</li> <li>● Fabric-based multipathing</li> <li>● Per-VSAN fabric services</li> <li>● Port tracking</li> <li>● VRRP for management connections</li> <li>● Online diagnostic tests</li> </ul>
Network management	<ul style="list-style-type: none"> <li>● Access methods               <ul style="list-style-type: none"> <li>○ Out-of-band 10/100/1000 Ethernet port</li> <li>○ RS-232 serial console port</li> <li>○ USB</li> </ul> </li> <li>● Access protocols               <ul style="list-style-type: none"> <li>○ CLI that uses the console and Ethernet ports</li> <li>○ SNMPv3 that uses the Ethernet port and in-band IP over Fibre Channel access</li> <li>○ Storage Networking Industry Association (SNIA) Storage Management Initiative Specification (SMI-S)</li> </ul> </li> <li>● Distributed device alias service</li> <li>● Network security               <ul style="list-style-type: none"> <li>○ Per-VSAN RBAC that uses RADIUS and TACACS+-based authentication, authorization, and accounting (AAA) functions</li> <li>○ SFTP</li> <li>○ SSHv2 implementing AES</li> <li>○ SNMPv3 implementing AES</li> </ul> </li> <li>● Management applications               <ul style="list-style-type: none"> <li>○ Cisco MDS 9000 Family CLI</li> <li>○ Cisco DCNM</li> </ul> </li> </ul>
Programming interfaces	<ul style="list-style-type: none"> <li>● Scriptable CLI</li> <li>● Cisco DCNM web services API</li> </ul>

Table 3. Product specifications for the MDS 9148S (part 4 of 4)

Feature	Description
Fabric services	<ul style="list-style-type: none"> <li>● Name server</li> <li>● Registered State Change Notification (RSCN)</li> <li>● Login services</li> <li>● Fabric Configuration Server (FCS)</li> <li>● Public loop</li> <li>● Broadcast</li> <li>● In-order delivery</li> </ul>
Advanced functions	<ul style="list-style-type: none"> <li>● VSAN</li> <li>● IVR</li> <li>● PortChannel with multipath load balancing</li> <li>● Flow-based and zone-based QoS</li> </ul>
Supported optics, media, and transmission distances	<p>For detailed information about all supported transceivers, see <a href="http://bit.ly/1ySf9K">http://bit.ly/1ySf9K</a></p>
Approvals and compliance	<ul style="list-style-type: none"> <li>● Safety compliance</li> <li>● CE Marking</li> <li>● UL 60950</li> <li>● CAN/CSA-C22.2 No. 60950</li> <li>● EN 60950</li> <li>● IEC 60950</li> <li>● TS 001</li> <li>● AS/NZS 3260</li> <li>● IEC60825</li> <li>● EN60825</li> <li>● 21 CFR 1040</li> <li>● EMC compliance</li> <li>● FCC Part 15 (CFR 47) Class A</li> <li>● ICES-003 Class A</li> <li>● EN 55022 Class A</li> <li>● CISPR 22 Class A</li> <li>● AS/NZS 3548 Class A</li> <li>● VCCI Class A</li> <li>● EN 55024</li> <li>● EN 50082-1</li> <li>● EN 61000-6-1</li> <li>● EN 61000-3-2</li> <li>● EN 61000-3-3</li> </ul>

## System requirements

The Cisco MDS 9000 NX-OS Software Release 6.2(9) or later, which supports MDS 9148S and DCNM, is required.

## Physical and electrical specifications

Table 4 lists the physical and electrical specifications for the MDS 9148S.

Table 4. Physical and electrical specifications for the MDS 9148S

Feature	Description
Physical dimensions (H x W x D)	<ul style="list-style-type: none"><li>• Dimensions (H x W x D): 43.70 mm x 435.90 mm x 415.00 mm (1.72 in. x 17.16 in. x 16.34 in.), 1RU</li><li>• Rack-mountable in a standard 19-inch Electronic Industries Alliance [EIA] rack</li><li>• Weight of fully configured chassis: 9.00 kg (19.84 lb)</li></ul>
Power	<ul style="list-style-type: none"><li>• Power supply: 300 W ac (2 per switch)</li><li>• Power cord: Notched C15 socket connector connecting to C16 plug on power supply</li><li>• AC input characteristics</li><li>• 100 to 240 V ac (10% range)</li><li>• 50 to 60 Hz (nominal)</li><li>• Airflow: back to front (toward ports)</li><li>• 200 linear feet per minute (LFM) through system fan assembly</li><li>• Cisco recommends maintaining a minimum air space of 2.5 in. (6.4 cm) between walls and chassis air vents and a minimum horizontal separation of 6 in. (15.2 cm) between two chassis to prevent overheating.</li></ul>
Temperature range	<ul style="list-style-type: none"><li>• Temperature, ambient operating: 32 to 104°F (0 to 40°C)</li><li>• Temperature, ambient non-operating and storage: -40 to 158°F (-40 to 70°C)</li><li>• Relative humidity, ambient (noncondensing) operating: 10 to 90%</li><li>• Relative humidity, ambient (noncondensing) non-operating and storage: 10 to 95%</li><li>• Altitude, operating: -197 to 6500 ft (-60 to 2000 m)</li></ul>

## Related publications and links

For more information, see the following documents:

- IBM Support Fix Central support site (select a product from drop-down menus)  
<http://www.ibm.com/support/fixcentral/>
- IBM System Storage Interoperation Center (SSIC)  
<http://www.ibm.com/systems/support/storage/ssic/interoperability.wss>
- Cisco MDS 9148S 16G Multilayer Fabric Switch for IBM System Storage  
<http://www.ibm.com/systems/storage/san/ctype/9148S>



# Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service. IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.*

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you. This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk. IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you. Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

## COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

**© Copyright International Business Machines Corporation 2015. All rights reserved.**

Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This document was created or updated on February 19, 2015.

Send us your comments in one of the following ways:

- Use the online **Contact us** review form found at:  
[ibm.com/redbooks](http://ibm.com/redbooks)
- Send your comments in an e-mail to:  
[redbooks@us.ibm.com](mailto:redbooks@us.ibm.com)
- Mail your comments to:  
IBM Corporation, International Technical Support Organization  
Dept. HYTD Mail Station P099  
2455 South Road  
Poughkeepsie, NY 12601-5400 U.S.A.

This document is available online at <http://www.ibm.com/redbooks/abstracts/tips1255.html> .

## Trademarks

IBM, the IBM logo, and [ibm.com](http://ibm.com) are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the web at <http://www.ibm.com/legal/copytrade.shtml>.

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

IBM®  
Redbooks®  
Redbooks (logo)®  
System Storage®

The following terms are trademarks of other companies:

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.