

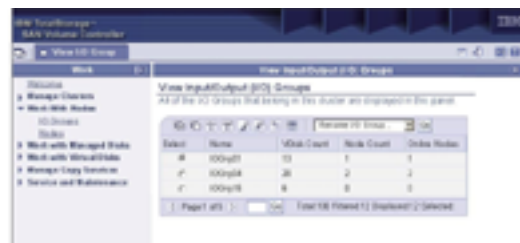
Cisco MDS 9000 Series Caching Services Module with IBM TotalStorage™ SAN Volume Controller Storage Software for Cisco MDS 9000

Cisco MDS 9000 Family Caching Services Module with IBM TotalStorage™ SAN Volume Controller for Cisco MDS 9000 Solution

Cisco Systems® and IBM combine the MDS 9000 Caching Services Module with the IBM TotalStorage SAN Volume Controller Storage Software to form a solution that reduces the complexity and costs of managing SAN-based storage. This solution can create a single pool of storage from disparate storage devices to increase capacity utilization, is simpler to manage and can help lower overall storage costs. By implementing a cache-based, clustered architecture, this solution is highly available and provides the scalability and performance necessary in today's demanding storage environments.

SAN Volume Controller for Cisco MDS 9000 Solution Description

Combining the SAN Volume Controller Storage Software with the Cisco MDS 9000 Series Caching Services Module provides a space efficient solution that delivers the benefits of virtualization: managing the combined storage volumes from a central point, implementing copy services from a single license across multiple storage devices, increasing capacity utilization, and avoiding downtime for planned outages. This solution is delivered as a feature of the Cisco MDS 9000 switch, and runs on a clustered pair of Caching Services Modules across switches. Since the solution is achieved in a switch, no additional fabric ports or cables are required. Based on virtualization technology, this solution helps to support a virtualized pool of storage from the storage subsystems attached to a storage area network (SAN). This storage pool helps customers tap into their unused storage capacity and make their business more efficient and resilient. It is an integrated solution supporting high performance and continuous availability in open-systems environments. Storage volumes are represented to applications as virtual disks, created from the pool of managed disks residing behind the Caching Services Modules. Storage administrators can scale performance by adding Caching Services Modules and can scale capacity by adding disks to the managed storage pool.





A Centralized Point of Control for Volume Management

Through virtualization, the SAN Volume Controller Storage Software helps to create pools of managed disks spanning multiple storage subsystems. These managed disks can then be mapped to virtual disks used by server applications. These virtual disks help businesses make better use of existing storage, and a comprehensive easy-to-use graphical interface help ease management. An ICAT GUI incorporates the Storage Management Initiative Specification (SMIS) API, and further demonstrates IBM's focus on open standards.

Avoidance of Downtime for Planned Outages, Maintenance and Backups

SAN Volume Controller Storage Software includes a dynamic data-migration function that can help administrators migrate storage from one device to another, without taking it offline. This allows administrators to reallocate and scale storage capacity without disrupting applications. The solution supports both LAN-free and server-free backups, while a clustered configuration designed to support high availability allows for nondisruptive software upgrades. SAN Volume Controller for Cisco MDS 9000 also uses the IBM TotalStorage Enterprise Storage Server™ multipathing software.

Improved Resource Utilization

This solution enables more efficient use of personnel and technology resources. It can help increase administrator productivity by empowering central management of volumes under disparate storage controllers from a single user interface. It can also help increase the amount of available storage capacity by pooling storage across multiple devices. Designed to manage up to two petabytes (PB) of total usable storage capacity, SAN Volume Controller for Cisco MDS 9000 will support even higher performance by adding Caching Services Modules. All of the Caching Services Modules within a cluster will jointly manage the entire capacity of a storage pool.

A Single, Cost-Effective Set of Advanced Copy Services

With conventional SAN disk arrays, copy operations are limited to in-box or like-box-to-like-box environments. SAN Volume Controller Storage Software moves copy services from individual storage controllers to the SAN. Administrators can apply copy services across disparate storage devices within the network. Advanced copy services—such as FlashCopy® and peer-to-peer remote copy (PPRC)—are supported across the managed storage.

Cisco MDS 9000 Caching Services Module

The Cisco MDS 9000 Caching Services Module integrates two high-performance processing nodes that, when combined with SAN Volume Controller Storage Software, deliver network-hosted virtualization and replication services. Each Caching Services Module includes 8 GB of local cache used to hold recently accessed data blocks. On-board dual batteries and hard disk drives protect cached data in the event of a power failure. To further ensure data availability and integrity, nodes are paired with nodes on other caching services modules in high-availability clusters. Up to four nodes can be added to a cluster today. Larger clusters can be supported in the future via a simple software upgrade.

Application Scalability Through Distributed Cache-Based Virtualization

The Cisco MDS 9000 Caching Services Module virtualization architecture provides performance benefits of lower latency, high aggregate throughput, and the ability to use lower cost disk arrays for greater flexibility. The architecture is designed so that virtualization performance can be easily scaled to the level required by even the largest



organizations, scaling up to 4 nodes today with support for larger SAN Volume Controller Storage Solution cluster sizes in the future. Simply adding caching services modules adds virtualization performance. Application I/O response time is improved through the use of local caching of disk blocks. By moving the virtualization into the network, any host can access any virtual volume from anywhere in the fabric, independent of the host's attachment point in the SAN. In addition to virtualization and replication services, the Cisco MDS 9000 Caching Services Module takes advantage of all of the advanced Cisco SAN-OS Software features available on the Cisco MDS 9000 platform, simplifying security, diagnostics, and management.

Cisco MDS 9000 Fabric-Based Virtualization Services—Intelligent Networking Features

Cisco MDS 9000 fabric-based virtualization provides a level of integration with intelligent SAN services unavailable to host or virtualization appliance-based solutions. As new modules are introduced to the Cisco MDS 9000 Family, they take advantage of all the advanced features and intelligence required to make multilayer intelligent SANs a reality including hardware-enabled innovations that dramatically improve scalability, availability, security, and manageability of storage networks, resulting in increased utility and lower total cost of ownership (TCO).



Multiprotocol Intelligence

The Cisco Caching Services Module is an integral component of the Cisco MDS 9000 multiprotocol platform that is designed for deployment of cost-optimized storage networks. SAN Volume Controller Storage Solution intends to support IETF standard iSCSI protocol over Ethernet and Fibre Channel over IP (FCIP), using the Cisco MDS 9000 platform. Companies will be able to provide virtualization and replication services to clients attached either directly via Fibre Channel or by using the iSCSI protocol over Ethernet for cost-effective connectivity to shared storage pools. Cisco MDS 9000 Fibre Channel over IP (FCIP) capability simplifies deployment of data replication services over extended distances, eliminating the need for separate channel extension devices. The Cisco MDS 9000 platform is designed to support future storage protocols so that users can migrate to new technologies while retaining a consistent set of features, services, and management tools.

Virtual SAN

Virtual SANs (VSANs) allow more efficient SAN utilization by creating hardware-based isolated environments within a single SAN fabric. Each VSAN can be configured with Fibre Channel zones and maintains its own fabric services for added scalability and resilience. VSANs allow SAN infrastructure costs to be shared among more users, while assuring absolute segregation and security of traffic and retaining independent control of configuration on a VSAN-by-VSAN basis. VSANs provide a protective barrier between application hosts (host VSANs) and physical storage (disk VSANs), enhancing data integrity in a virtualized storage environment.



Comprehensive Security

Recognizing the need for airtight security in virtualized storage networks, the Cisco Caching Services Module and SAN Volume Controller Storage Software integrate seamlessly into the MDS 9000 security infrastructure. The MDS 9000 platform applies extensive security measures at all possible points of attack. Secure Shell (SSH) Protocol, RADIUS, Simple Network Management Protocol Version 3 (SNMPv3), and role based access control are employed against unauthorized management access. To guard against compromising control traffic, Fibre Channel Security Protocol (FC-SP) is employed, providing data origin authentication. Data plane traffic is secured with VSANs, guaranteeing segregation of traffic across shared fabrics, and with zoning to satisfy traffic segregation requirements within a VSAN. Hardware-based access control lists provide further granularity for advanced security options. The Cisco Caching Services Module takes advantage of Cisco experience in securing the world's most sensitive data networks to deliver the industry's most secure network-hosted storage virtualization platform.

Advanced Diagnostics and Troubleshooting Tools

Cisco Caching Services Module applications use Cisco MDS 9000 Family advanced network analysis and debug tools. For fault management in large-scale storage networks, the Cisco MDS 9000 Family delivers commands such as FC Traceroute for detailing the exact path and timing of flows and uses Switched Port Analyzer (SPAN) to efficiently capture network traffic. Once traffic has been captured, it can then be analyzed with Cisco Fabric Analyzer. In addition, integrated call home capability is provided for added reliability, faster problem resolution, and reduced service costs. The Cisco MDS 9000 Family with the integrated Caching Services Module delivers the most comprehensive toolset for troubleshooting and analysis of an organization's virtualized storage environment.

Increased Availability

Like all other Cisco MDS 9000 Family modules, the Caching Services Module is hot-swappable and fully integrates into the Cisco MDS 9000 high availability architecture. When deployed in clustered pairs and combined with SAN Volume Controller Storage Software, availability is extended to the volume level, ensuring maximum uptime.

The Cisco MDS 9500 Family combines non-disruptive software upgrades, stateful process restart/failover, and full redundancy of all major components for a new standard in director-class availability. Fabric-level availability via Cisco PortChannel capability allows users to aggregate up to 16 physical links into one logical bundle. The bundle can consist of any port in the chassis, ensuring that the bundle remains active in the event of a port, application-specific integrated circuit (ASIC), or module failure. The bundle can sustain the failure of any physical link without causing a reset. Fabric Shortest Path First (FSPF) multipathing provides the intelligence to load balance across up to 16 equal cost paths and, in the event of a switch failure, to dynamically reroute traffic. Additionally, SAN Volume Controller Storage Software takes advantage of the QoS features embedded within the Cisco MDS 9000, maximizing the efficiency and prioritization of control and data traffic.

Ease-of-Management

Delivering on the promise of network-based storage virtualization means delivering on management capabilities. To meet the needs of all users, the Cisco MDS 9000 Family Caching Services Module provides three principal modes of management of your virtual storage environment: Cisco MDS 9000 Family Command Line Interface (CLI), IBM's SAN Volume Controller for Cisco MDS 9000 CLI and IBM's ICAT management GUI. For users who prefer a common interface for both SAN and Volume management, the Cisco SAN-OS CLI includes the full suite of capabilities necessary to manage your virtual storage environment from the SAN-OS command line.



Cisco Caching Services Module with IBM TotalStorage™ SAN Volume Controller for Cisco MDS 9000 Software Highlights

At a Glance

LUN virtualization

- Up to 1024 virtual disks on 64 hosts
- Up to 4096 physical LUNs on 64 controllers
- Up to 128 controller ports
- Up to 2 TB virtual disk size

Synchronous Peer-to-Peer Remote Copy (PPRC)

FlashCopy®—Point-in-time copy

Data migration—Transparent virtual disk to physical LUN mapping

Online re-layout of physical storage

Host software—Multipathing Software subsystem device driver (SDD)

Nondisruptive software upgrades

Load balancing

Fully redundant components with smooth failover

Management

- Browser-based GUI
- Command line interface (CLI)
- Error logs
- Fault isolation
- Performance monitoring
- SNMP traps
- SMIS compliant

- Centralized point of control for volume management—IBM TotalStorage SAN Volume Controller for Cisco MDS 9000 helps IT administrators manage storage volumes from their SANs. It helps combine the capacity of multiple storage controllers into a single resource, with a single view of the volumes.
- Avoidance of downtime for planned and unplanned outages, maintenance, and backups—With SAN Volume Controller for Cisco MDS 9000, IT administrators will have the ability to migrate storage from one device to another without taking the storage offline. And they will be able to better reallocate, scale, upgrade, and back up storage capacity without disrupting applications.
- Improved resource utilization—SAN Volume Controller for Cisco MDS 9000 helps increase storage capacity and uptime, as well as administrator productivity and efficiency, while using existing storage investments through virtualization and centralization of management.
- A single, cost-effective set of advanced copy services—SAN Volume Controller for Cisco MDS 9000 supports advanced copy services across all attached storage, regardless of the intelligence of the underlying controllers. The result is a single point of virtualization and replication services across heterogeneous physical storage and servers in the network.
- Scalable architecture—The Cisco MDS 9000 distributed virtualization architecture makes virtual disks (Vdisks) accessible to authorized clients from any port in the fabric, independent of the physical location of the Caching Services Module on which the Vdisk is being virtualized. Simply adding service modules to the fabric scales virtualization performance to meet the needs of the most demanding application environments, with clusters of up to four nodes today and the ability to increase cluster size in the future via software upgrades.
- Enhanced application-level performance—8 GB of local cache reduces I/O response time improving application I/O performance.
- Ensured data availability and integrity: Write data synchronization between clustered Caching Services Modules ensures data availability in the event of a node failure. On-board redundant batteries and hard disk drives protect cached data in the event of loss of system power.
- Integration of IBM SAN Volume Controller for Cisco MDS 9000 and Cisco SAN-OS features deliver lower SAN TCO.
 - Intelligent network services—VSAN technology for hardware-enforced, isolated environments within a single physical fabric; Access Control Lists for hardware-based intelligent frame processing; and advanced traffic management features such as Fibre Channel Congestion Control and fabric-wide QoS to enable migration from SAN islands to enterprise-wide storage networks.
 - Comprehensive security framework—Supports RADIUS authentication, SNMPv3, Role-based access control, SSH, Secure FTP (SFTP), FC-SP, VSANs, hardware-enforced zoning, and Access Control Lists.
 - Sophisticated diagnostics—Provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated call home capability for added reliability, faster problem resolution, and reduced service costs.
 - Ease of management—Integration of advanced volume management and replication services via IBM SAN Volume Controller for Cisco MDS 9000 and SAN management services via Cisco SAN-OS Software enable your IT staff to manage more storage per administrator, reducing your storage TCO.
- Trusted storage virtualization solution: Uses highly integrated IBM TotalStorage SAN Volume Controller for Cisco MDS 9000 Software available from IBM.



Specifications

Caching Services Module—Provides

- Virtualization services processing nodes: Two nodes per module
- Cache memory: 8 GB per module (4GB per node)
- Battery packs: Two per module, maintains power during cache dump to on-board hard disk drives in the event of a system power failure
- Disk drives: Two per module (20 GB ATA), used to store volume meta-data and to store cache data during system power failure
- Switch interface: Backplane interface to Cisco MDS 9000 crossbar and intelligent SAN switching services
- Front Panel LED Indicators—Module status, battery status, node status (2)

Minimum Software Requirement

- Cisco SAN-OS Software Release 1.3(1)

Management

- Access methods
 - Out-of-band 10/100 Ethernet port
 - RS-232 serial console port
 - In-band IP-over-FC
- Management Applications
 - SAN Management
 - Cisco MDS 9000 Family CLI
 - Cisco Fabric Manager
 - CiscoWorks 2000 Resource Manager Essentials
 - Volume and Replication Management
 - Cisco MDS 9000 Family CLI
 - IBM SAN Volume Controller for Cisco MDS 9000 CLI
 - IBM ICAT

Security

- Role-based access control using RADIUS based AAA functions
- FC-SP for host-to-switch and switch-to-switch authentication
- TACACS+
- Virtual SANs (VSANs)
- VSAN-based roles
- Hardware-enforced zoning
- Management Access
 - SSHv2
 - SNMPv3



Traffic Management

- QoS
- Fibre Channel Congestion Control

Availability and Data Integrity

- Clustering of up to 4 nodes on independent Caching Services Modules
- On-board hard disk backup of meta-data and cache data
- PortChannels

Diagnostics and Troubleshooting Tools

- Power-on-self-test (POST) diagnostics
- Online diagnostics
- SPAN
- FC Traceroute
- FC Ping
- FC Debug
- Cisco Fabric Analyzer
- Syslog
- Call home

Environmental

- Temperature, ambient operating
 - 32 to 104 F (0 to 40 C)
- Temperature, ambient non-operating and storage
 - -40 to 167 F (-40 to 75 C)
- Humidity (RH), ambient (non-condensing) operating
 - 10 to 90 percent
- Humidity (RH), ambient (non-condensing) non-operating and storage
 - 10 to 90 percent
- Altitude, operating
 - -197 to 6500 ft (-60 to 2000 m)

Physical Characteristics

- Dimensions (H x W x D)
 - 1.75 x 15.5 x 16.5 in. (4.4 x 39.4 x 41.9 cm)
- Weight
 - 10 lb (4.5 kg)



Power and Cooling

- Output: 220W
- Input current (3.05A @ 90 VAC)

Safety Compliance

- CE Marking
- UL 60950
- CAN/CSA-C22.2 No. 60950
- EN 60950
- IEC 60950
- AS/NZS 3260

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

Software	Description
Contact IBM for a quote	IBM TotalStorage SAN Volume Controller for Cisco MDS 9000

Part Number	Description
DS-X9560-SMC	Cisco MDS 9000 Caching Services Module
DS-C9560-SMC=	Cisco MDS 9000 Caching Services Module (spare)



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