



CHAPTER 1

Cisco MDS DMM Overview

Data migration is the process of copying data from an existing storage device to a new storage device. Data migration is required for storage array upgrades and for consolidation or replacement of existing storage arrays. Traditional methods of migrating data can be complex and can cause service disruptions.

Cisco MDS Data Mobility Manager (DMM) for the Cisco MDS 9000 Family switches provides capabilities and features that simplify data migration and minimize service disruptions.

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- [About Cisco MDS DMM, page 1-1](#)
- [Concepts and Terminology, page 1-2](#)
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About Cisco MDS DMM

Traditional data migration methods can be complex and disruptive, often requiring extensive rewiring and reconfiguration of the SAN infrastructure. Configuration changes to servers and storage subsystems require coordination among different IT groups and storage vendor service representatives. Server downtime requires advanced scheduling with potentially long lead times.

Cisco MDS DMM is an intelligent software application that runs on the Storage Services Module (SSM), the Cisco MDS 9000 18/4-Port Multiservice Module (MSM-18/4), and the MDS 9222i switch. With Cisco MDS DMM, no rewiring or reconfiguration is required for the server, the existing storage, or the SAN fabric. The SSM, MSM-18/4 module, or MDS 9222i switch can be located anywhere in the fabric, as Cisco MDS DMM operates across the SAN. Data migrations are enabled and disabled by software control from the Cisco Fabric Manager.

Cisco MDS DMM provides a graphical user interface (GUI) (integrated into Fabric Manager) for configuring and executing data migrations. There is also a command-line interface (CLI), which is suitable for creating scripts.

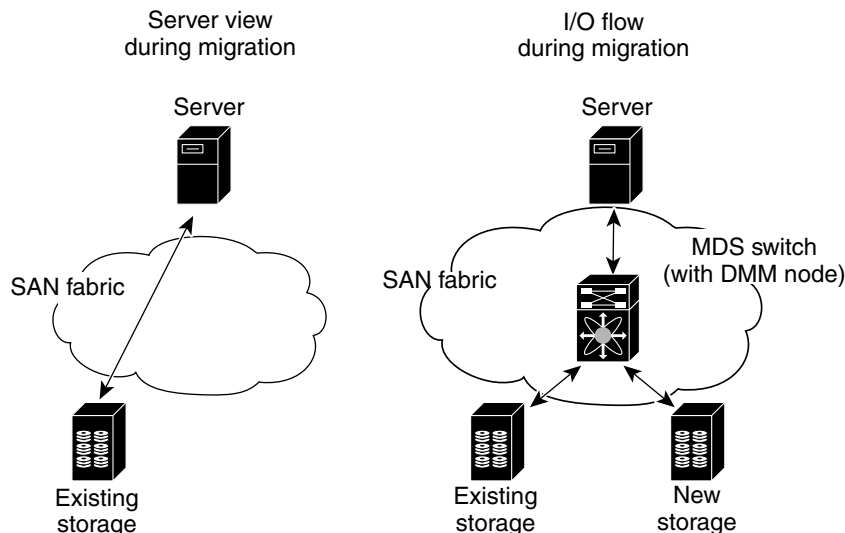
Cisco MDS DMM can be used in SANs that have only Cisco MDS 9000 switches as well as those containing a heterogeneous mixture of Cisco and other vendor switches.

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Application downtime is a critical factor in data migration, as prolonged periods of downtime are difficult to schedule. Cisco MDS DMM minimizes application downtime. Existing data is available to the applications while the migration is performed. Cisco MDS DMM uses hardware and software resources on the SSM, MSM-18/4 module, or MDS 9222i switch to move data to the new storage. This approach ensures that data migration adds no processing overhead to the servers.

Cisco MDS DMM supports online migration, allowing applications to continue to access the existing storage devices. During data migration, all traffic between the server and storage flows through the SSM, MSM-18/4 module, or MDS 9222i switch, as shown in Figure 1-1 (right side). The SSM, MSM-18/4 module, or MDS 9222i switch coordinates all server access to the storage and performs the data migration. The migration activity is transparent to the server, which continues to have full access to the data. Figure 1-1 (left side) shows the server's view of the network during data migration. The server is unaware of the SSM, MSM-18/4 module, or MDS 9222i switch, the new storage, and the migration activity.

Figure 1-1 Data Migration Using Cisco MDS DMM



Cisco MDS DMM performs data migration without any additional layer of virtualization. Cisco MDS DMM requires only the SSM, MSM-18/4 module, or MDS 9222i switch configuration to enable the feature and SAN configuration to access the new storage array. Cisco MDS DMM can be enabled (when data needs to be migrated) and disabled (after the migration is completed) without any major SAN or host reconfiguration.

Concepts and Terminology

Cisco MDS DMM uses the following concepts and terminology:

Existing Storage

The storage that is currently used by the application server. The data contained in the existing storage will be migrated to the new storage.

New Storage

The storage to which the data will be migrated.

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Logical Unit Number (LUN)

A logical unit number (LUN) is a reference to a unit of storage that you can specify for migration. The LUN is only a unique number in the context of a storage port.

Data Migration Session

A data migration session migrates the data from one LUN in the existing storage to a LUN in the new storage.

Data Migration Job

A data migration job defines a set of LUNs to be migrated together. A data migration session is created for each LUN that is to be migrated. The data migration job is the main unit of configuration and management. For example, the migration rate and other attributes are configured for the data migration job. The data migration job (not individual sessions) can be started or stopped.

DMM node

The DMM node comprises of the MDS switch modules like SSM, MSM-18/4 module, or MDS 9222i switch that provides intelligent services. The Cisco MDS DMM feature executes on the DMM node.

SSM, MSM-18/4 module, or MDS 9222i switch

The SSMs, MSM-18/4 modules, or MDS 9222i switches are MDS switches or modules that provides intelligent services. The Cisco MDS DMM feature executes on the SSMs, MSM-18/4 modules, or MDS 9222i switches.

Peer SSM, MSM-18/4 module, or MDS 9222i switch

In a dual-fabric topology, a data migration job runs on an SSM, MSM-18/4 module, or MDS 9222i switch in each fabric. The two SSMs, MSM-18/4 modules, or MDS 9222i switches are peers. SSMs, MSM-18/4 modules, or MDS 9222i switches communicate with their peer SSMs, MSM-18/4 modules, or MDS 9222i switches to coordinate the data migration jobs.

Fibre Channel Redirect

Fibre Channel redirect (FC-Redirect) allows on-demand insertion and removal of SSM, MSM-18/4 module, or MDS 9222i switch intelligent services with minimal disruption to existing traffic. No configuration changes are required on the server or storage devices. Cisco MDS DMM uses the FC Redirect capability to redirect traffic to the SSM, MSM-18/4 module, or MDS 9222i switch. This redirection is transparent to the host and storage devices.

Virtual Target

A virtual target (VT) is a proxy target address for a storage port. During data migration, the FC-Redirect feature redirects traffic from the server to a VT on the SSM, MSM-18/4 module, or MDS 9222i switch.

Virtual Initiator

A virtual initiator (VI) is a proxy initiator address for a server host bus access (HBA) port. During data migration, the SSM, MSM-18/4 module, or MDS 9222i switch uses a VI to forward redirected traffic to the existing storage port. The SSM, MSM-18/4 module, or MDS 9222i switch also uses the VI to forward data migration traffic to the new storage.

Control Plane Processor

The control plane processor (CPP) is the main processor in the SSM, MSM-18/4 module, or MDS 9222i switch. DMM runs on the CPP.

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Data Path Processors

The data path processors (DPPs) are a set of resource processors in the SSM, MSM-18/4 module, or MDS 9222i switch. The DPP transfers blocks of data across the switch without impacting the CPP. DMM uses a VI on the DPP for migrating data.

Production Fabric

The production fabric is a fabric where the host port(s) and existing storage port(s) are connected. The server to storage traffic is carried in the production fabric. The new storage port is not present in the production fabric.

Migration Fabric

The migration fabric is a fabric dedicated for data migration or remote replication. The existing storage and the new storage are connected to the migration fabric. No server port is present in the migration fabric.

Cisco MDS DMM Features and Capabilities

Cisco MDS DMM supports the following features and capabilities:

Server-Based Migration

In server-based migration, the focus is data migration for the storage used by a particular server (or server HBA port). All LUNs accessed by the selected server are available for migration to new storage.

Storage-Based Migration

In storage-based migration, the focus is data migration for storage exposed by a particular storage array (or storage array port). All LUNs in the specified storage array are available for migration to new storage.

Online Data Migration

Cisco MDS DMM is designed to provide online data migration. The existing storage is available to server applications while the SSM, MSM-18/4 module, or MDS 9222i switch performs the data migration. During migration, data reads from the server are directed to the existing storage. DMM ensures that data writes are processed correctly. For example, if the write is to a storage segment already migrated, the write is mirrored to the existing and new storage.

Offline Data Migration

During offline data migration, servers must not initiate reads or writes to the existing storage. Any server application using the existing storage must be quiesced. Offline data migration is faster than online data migration and can be used for noncritical data applications.

Method 1 Data Migration

For the section of existing storage LUN whose data is already migrated to a new storage LUN, any new SCSI Write I/Os from the server is written to both the existing and new storage LUN before sending a response back to the server. Method 1 is typically used in local data migration.

Method 2 Data Migration

SCSI Write I/Os from the server to any section of existing storage LUN are written only to the existing storage LUN. The Write I/O changes to the existing storage LUN are marked in the Modified Region Log (MRL) before sending a response back to the server. These changes are then migrated to the New Storage LUN in subsequent iterations. Method 2 is typically used in remote data center migration.

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Method 3 Data Migration

Method 3 is used for data migration in topologies where there is a dedicated fabric/VSAN for the data copy independent of the production fabrics or VSANs. The migration fabric connects the existing storage to the new storage in a remote data center. The SSM, MSM-18/4 module, or MDS 9222i switch in the production fabric is responsible for handling SCSI write I/Os from the server to the existing storage LUNs. The write I/O changes to the existing storage LUN are marked in the MRL before sending a response back to the server. The data copy from the existing storage LUN to the new storage LUN is handled by the SSM, MSM-18/4 module, or MDS 9222i switch in the migration fabric/VSAN. The MRL changes are communicated to the SSM, MSM-18/4 module, or MDS 9222i switch in the migration fabric or VSAN to be applied to the new storage on subsequent copy iterations.

Configuration Using Cisco Fabric Manager GUI

The Cisco MDS DMM GUI is integrated into Fabric Manager. The DMM GUI provides a wizard to guide you through the steps required to configure a data migration job. To minimize customer impact, you can schedule the start time for a data migration and you can configure the rate of data migration. The wizard also prompts you to perform tasks on external entities such as the fabric switch and the storage devices.

The DMM GUI also provides a job status screen, for monitoring and managing data migration jobs and sessions.

Configuration Using CLI

Cisco MDS DMM provides a set of CLI commands, which are suitable for creating scripts. These commands are accessed from the MDS switch command console or Telnet session.

Migration to Larger LUN

To increase the amount of data that an existing server can access, Cisco MDS DMM facilitates migration to a larger LUN. After the migration, expand the file system on the LUN to take advantage of the increased storage space.

Heterogeneous Storage Migration

Cisco MDS DMM can migrate data between storage devices from different vendors. The supported devices are listed in the *Cisco MDS 9000 Family Interoperability Support Matrix*, which is available at the following URL:

http://www.cisco.com/en/US/docs/storage/san_switches/mds9000/interoperability/matrix/Matrix.pdf

Heterogeneous SAN Environments

Cisco MDS DMM supports data migration on SANs that contain third-party vendor switches (such as Brocade). The existing and new storage devices must be attached to an MDS switch.

Offline Verification

Cisco MDS DMM supports verification of the new storage. The existing storage is offline during the verification.

Simultaneous Migration of Multiple LUNs

Cisco MDS DMM supports multiple simultaneous data migration jobs and simultaneous data migration sessions within a job.

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Dual Fabric Support

Cisco MDS DMM supports data migration for dual fabric topology. In this topology, servers are connected to storage devices across two independent SAN fabrics and the servers are configured for multipathing.

Cisco MDS DMM also supports data migration for single fabric SANs with single-path or multipath configurations.

Delayed Server Reconfiguration

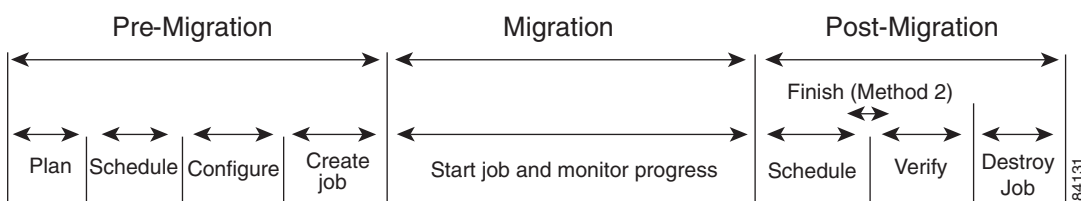
After the data is copied from the existing storage to the new storage, you can delay the reconfiguration of the server to access the new storage. During this period, all writes are mirrored to the existing storage and the new storage. This description assumes Method 1.

Data Migration Overview

A data migration job typically comprises three major stages (see [Figure 1-2](#)).

In the pre-migration stage, create a plan for data migration, configure the new storage, and create the DMM job. In the migration stage, start the data migration job and monitor its progress. In the post-migration phase, prepare the server to use the new storage, delete the data migration job, and remove the old storage.

Figure 1-2 Data Migration Stages



The following sections provide an overview of the typical data migration stages (additional details are covered in subsequent chapters):

- [Pre-Migration, page 1-6](#)
- [Migration, page 1-7](#)
- [Post-Migration, page 1-7](#)

Pre-Migration

In the pre-migration stage, create a plan for the migration, configure the new storage, and create the data migration job. Full details about pre-migration activities are covered in [Chapter 4, “Preparing for Data Migration.”](#)

Plan

Create a plan for data migration, identifying external dependencies and activities that need to be scheduled.

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Configure

Configure the new storage device and any other configuration.

Create the Data Migration Job

Create and configure the data migration job using the DMM GUI. You can create a job without a schedule or you can specify the day and time for the job to start.

Migration

In the migration stage, jobs with a configured schedule jobs start automatically. Manually start unscheduled data migration jobs.

Start the Migration

A data migration job comprises one or more data migration sessions. A data migration session performs the migration of one LUN from the existing storage to the new storage.

During migration, the DMM feature ensures the integrity of the storage data by intercepting all traffic from the server and storage ports involved in the migration job.

Cisco MDS DMM directs all server-initiated reads and writes to the existing storage. If the server initiates a write to a region that has already been migrated, the write is mirrored to the new storage for Method 1. For Method 2, if the server initiates a write to a region that is already migrated, the MRL gets updated for that region while the data gets migrated in the background subsequently.

Monitor

During migration, you can monitor progress of the DMM job by using the job status display for Method 1 in the DMM GUI. For Method 2 jobs, the Est. TOC field determines when to enter the **Finish** command.

Post-Migration

In the post-migration stage, reconfigure the server to use the new storage. The exact post-migration configuration steps vary depending on the operating system of the server.

Method 1

To configure the post-migration steps for Method 1, follow these steps.

Schedule

Schedule a time (and the personnel) to reconfigure the server to use the new storage and remove references to the existing storage.

Verify

Optionally, verify the data integrity between the existing and new storage after the migration has completed. The existing storage must be offline during the verification.

Delete

To delete a data migration job, follow these steps:

- Shut down the server applications to stop accessing the existing storage.

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- Use the DMM GUI to delete the completed data migration job.
- Reconfigure the server to access the new storage.

Method 2

To configure the post-migration steps for Method 2, follow these steps.

Schedule

Schedule a time (and the personnel) to reconfigure the server to use the new storage and remove references to the existing storage.

Finish

To complete Method 2 data migration, click **Finish** to stop access to the existing storage.

The existing storage LUNs are offline for the servers. Cisco DMM migrates the changed blocks from the existing storage LUNs to the new storage LUNs for the last time. See the [“Finishing Jobs” section on page 5-51](#) for more details.

Verify Job

Optionally, you can verify the data integrity between existing and new storage after the Finish operation is completed. The existing storage LUNs will be offline during the verification. This optional operation can be performed just before deleting a job.

Delete

To delete a data migration job (in Method 2), follow these steps:

-
- | | |
|---------------|---|
| Step 1 | Use the DMM GUI to delete the completed data migration job. |
| Step 2 | Reconfigure the server to access the new storage. |
-

Method 3

To configure the post-migration steps for Method 3, follow these steps.

Schedule

Schedule a time (and the personnel) to reconfigure the server to use the new storage and remove references to the existing storage.

Finish

To complete Method 2 data migration, click **Finish** to stop access to the existing storage.

The existing storage LUNs are offline for the servers. Cisco DMM migrates the changed blocks from the existing storage LUNs to the new storage LUNs for the last time. See the [“Finishing Jobs” section on page 5-51](#) for more details.

Verify Job

Optionally, you can verify the data integrity between existing and new storage after the Finish operation is completed. The existing storage LUNs will be offline during the verification. This optional operation can be performed just before deleting a job.

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Delete

To delete a data migration job (in Method 2), follow these steps:

-
- Step 1** Use the DMM GUI to delete the completed data migration job.
- Step 2** Bring up the server to access new storage port in migration/remote fabric.
-



Note

Restarting the stopped or failed state for Method 1, restarts the job from the beginning. Restarting the stopped or failed state for Method 2 and Method 3, restarts the job from the point where the job failed or stopped.

Software Requirements

Table 1-1 lists the supported modules, methods and the releases for Cisco MDS DMM.

Table 1-1 Software Requirements

Switch Modules	Method	Supported Release
Storage Service Module (SSM)	Method 1	SAN Release 3.1.2a or 3.2.1 and later
Storage Service Module (SSM)	Method 2	NX-OS Release 4.1.1b and later
MDS 9222i switch	Method 1	NX-OS Release 4.1.3a and later
MDS 9222i switch	Method 2	NX-OS Release 4.1.3a and later
Multiservice Module (MSM-18/4)	Method 1	NX-OS Release 4.1.1b and later
Multiservice Module (MSM-18/4)	Method 2	NX-OS Release 4.1.1b and later
Multiservice Module (MSM-18/4)	Method 3	NX-OS Release 4.1.3a and later

To configure DMM on a switch running NX-OS 4.1(1) or later, the Fabric Manager server must be running NX-OS 4.1(1) or later

Hardware Requirements

Cisco MDS DMM software application executes in the SSM, MSM-18/4, or the MDS 9222i switch.

SSM, MSM-18/4 module, or MDS 9222i Capable Switches

The following switches support the SSM, MSM-18/4 module, or the MDS 9222i switches:

- All MDS 9200 Series switches
- All MDS 9500 Series switches

Storage Ports

The storage ports must connect to Cisco MDS switches that support FC-Redirect. All Cisco MDS switches support FC-Redirect, with the following exceptions:

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- MDS 9124
- MDS 9134
- MDS 9020

Server HBA Ports

The server HBA ports can be connected to any switch (Cisco or third-party vendor).

SAN Fabric

The SAN fabric has the following hardware-related requirements:

- Cisco MDS DMM supports single-fabric and dual-fabric topologies. The DMM feature requires at least one SSM, MSM-18/4 module, or MDS 9222i switch in each fabric.
- The Cisco MDS DMM feature is supported in homogeneous and heterogeneous SAN fabrics. SSMs, MSM-18/4 modules, or MDS 9222i switches can be located in the fabric on any MDS switch that is capable of supporting these modules. However, the SSM, MSM-18/4 module, or the MDS 9222i switch and the storage ports must either be located on the same switch or connected through a Cisco SAN.

Limitations and Restrictions

Configuration Limitations

The Cisco MDS DMM software application has the following configuration limitations:

- Maximum number of jobs on the SSM, MSM-18/4 module, or MDS 9222i switch is 16
- Maximum number of sessions on the SSM, MSM-18/4 module, or MDS 9222i switch is 255
- Maximum number of LUNs in a job is 128
- Maximum LUN size is 1099511627264 bytes

Restrictions

The Cisco MDS DMM software application has the following restrictions:

- On a single service engine, only one intelligent application can be provisioned.
- The SME, IOA, SANTap, IVR, NPV and NPIV, F PortChannel or Trunk features cannot coexist with DMM for a specific flow.