IBM System Storage

Multipath Subsystem Device Driver User's Guide Errata

Contents

Introduction

This guide provides errata information that pertains to release 1.7.x of the *IBM®
System Storage™ Multipath Subsystem Device Driver User's Guide*.

Specifically, this guide contains updates to the following chapters for the IBM
BladeCenter S SAS RAID Controller Module:

- Overview of the SDD
- Using SDDDSM on a Windows Server 2003/2008 host system
- Using the datapath commands

All of the changes in these chapters are indicated by a vertical bar (|).

Refer to the *IBM System Storage Multipath Subsystem Device Driver 1.7.x User's Guide*
for general information and if you are using the AIX, HP-UX, SUN Solaris, Linux,
Windows, or Netware operating system and SDD Version 1 Release 7 Modification
1 Level *x* for HP-UX, SDD Version 1 Release 7 Modification 2 Level *x* for AIX®,
SDD Version 1 Release 6 Modification 4 Level *x* for Solaris and Windows®, SDD
Version 1 Release 6 Modification 3 Level *x* for Linux®, SDD Version 1 Release 6
Modification 0 Level *x* for Netware, SDD Device Specific Module Version 2 Release
4 Modification 0 Level *x*, or SDD Path Control Module Version 2 Release 2
Modification 0 Level *x*.

Who should use this book

This errata is intended for those who are using the IBM BladeCenter S SAS RAID
Controller Module and plan to install and configure IBM System Storage
Multipath Subsystem Device Driver (SDD) 1.7.x or the IBM System Storage
Multipath Subsystem Device Driver Path Control Module (SDDPCM) 2.2.0.x driver.
The installer of SDD or SDDPCM should be:

- Familiar with the operating systems on which the driver will be installed
- Familiar with the storage systems on which the driver will be operated
- Familiar with the applications used with the driver
- Aware of the procedures in this document
- Aware of related installation and service publications

Last update

This guide was last updated: October 24, 2008

Chapter 1. Overview of the SDD

The IBM System Storage Multipath Subsystem Device Driver (SDD) supports a storage-redundant configuration environment for a host system that is attached to the following devices:

- IBM TotalStorage® Enterprise Storage Server® (ESS)
- IBM System Storage DS8000™
- IBM System Storage DS6000™
- IBM System Storage SAN Volume Controller
- IBM System Storage DS4000™
- IBM System Storage DS5000
- IBM BladeCenter S SAS RAID Controller Module

This guide uses the following terminology:

- The phrase *supported storage devices* refers to the following types of devices:
  - ESS
  - DS8000
  - DS6000
  - SAN Volume Controller
  - DS4200
  - DS4300
  - DS4500
  - DS4700
  - DS4800
  - DS5100
  - DS5300
  - IBM BladeCenter S SAS RAID Controller Module
- The phrase *disk storage system* refers to ESS, DS8000, or DS6000 devices.
- The phrase *virtualization product* refers to the SAN Volume Controller. Table 1 indicates the products that different SDD platforms support.
- The phrase *DS4000* refers to DS4200, DS4300, DS4500, DS4700, and DS4800 devices.
- The phrase *DS5000* refers to DS5100 and DS5300 devices.
- The phrase *BladeCenter* refers to IBM BladeCenter S SAS RAID Controller Module devices.

Table 1. SDD platforms that are supported by supported storage devices

Platform	Supported storage device						
	ESS	DS8000	DS6000	DS5000	DS4000	BladeCenter	SAN Volume Controller
AIX SDD	✔	✔	✔				✔
AIX SDDPCM	✔	✔	✔				✔
HP	✔	✔	✔	✔	✔		✔

Table 1. SDD platforms that are supported by supported storage devices (continued)

Platform	Supported storage device						
	ESS	DS8000	DS6000	DS5000	DS4000	BladeCenter	SAN Volume Controller
Linux	✔	✔	✔				✔
Novell	✔	✔	✔				
SUN	✔	✔	✔				✔
Windows NT® SDD	✔						✔
Windows 2000/2003 SDD	✔	✔	✔				✔
Windows 2003/2008 SDDDSM	✔	✔	✔		✔	✔	✔

The SDD supports a storage-redundant configuration environment for a host system that is attached to storage devices. It provides enhanced data availability, dynamic input/output (I/O) load balancing across multiple paths, and automatic path failover protection.

This guide provides step-by-step procedures on how to install, configure, and use SDD features on the following host systems:

- IBM AIX (SDD and SDDPCM)
- HP-UX
- Supported Linux distributions, levels, and architectures. For up to date information about specific kernel levels supported in this release, see the Readme file on the CD-ROM or visit the SDD Web site:

  www.ibm.com/servers/storage/support/software/sdd

- Novell Netware (disk storage systems only)
- Sun Solaris
- Microsoft® Windows NT/2000/2003 SDD
- Microsoft Windows Server 2003/2008 (SDD and SDDDSM)

The SDD architecture

The SDD is a software solution to support the multipath configuration environments in supported storage devices. It resides in a host system with the native disk device driver and provides the following functions:

- Enhanced data availability
- Dynamic input/output (I/O) load balancing across multiple paths
- Automatic path failover protection
- Concurrent download of licensed machine code

Table 2 on page 3 shows the position of the SDD in the protocol stack. I/O operations that are sent to the SDD proceed to the host disk driver after path selection. When an active path experiences a failure (such as a cable or controller failure), the SDD dynamically switches to another path.

Table 2. SDD in the protocol stack

Raw disk I/O → Logical Volume Manager (LVM) I/O → LVM device driver → Subsystem Device Driver → AIX SCSI/FCP disk driver → SCSI/FCP adapter driver

S008996Q

Disk I/O, File system → Subsystem Device Driver → Linux disk SCSI driver → SCSI adapter driver

S009318

Raw disk I/O → Logical Volume Manager I/0 → LVM device driver → Subsystem Device Driver → HP disk driver → SCSI adapter driver

S008998Q

Raw disk I/O → Logical Volume Manager I/O → LVM device driver → Subsystem Device Driver → Sun Solaris disk driver → SCSI adapter driver

S008999Q

Table 2. SDD in the protocol stack (continued)

System disk I/O	System disk I/O
Subsystem Device Driver → Windows NT disk driver → adapter driver → (disk) S008997Q	Windows 2000 disk driver → Subsystem Device Driver → adapter driver → (disk)
System disk I/O Windows Server 2003 disk driver → Subsystem Device Driver → adapter driver → (disk)	This space intentionally blank
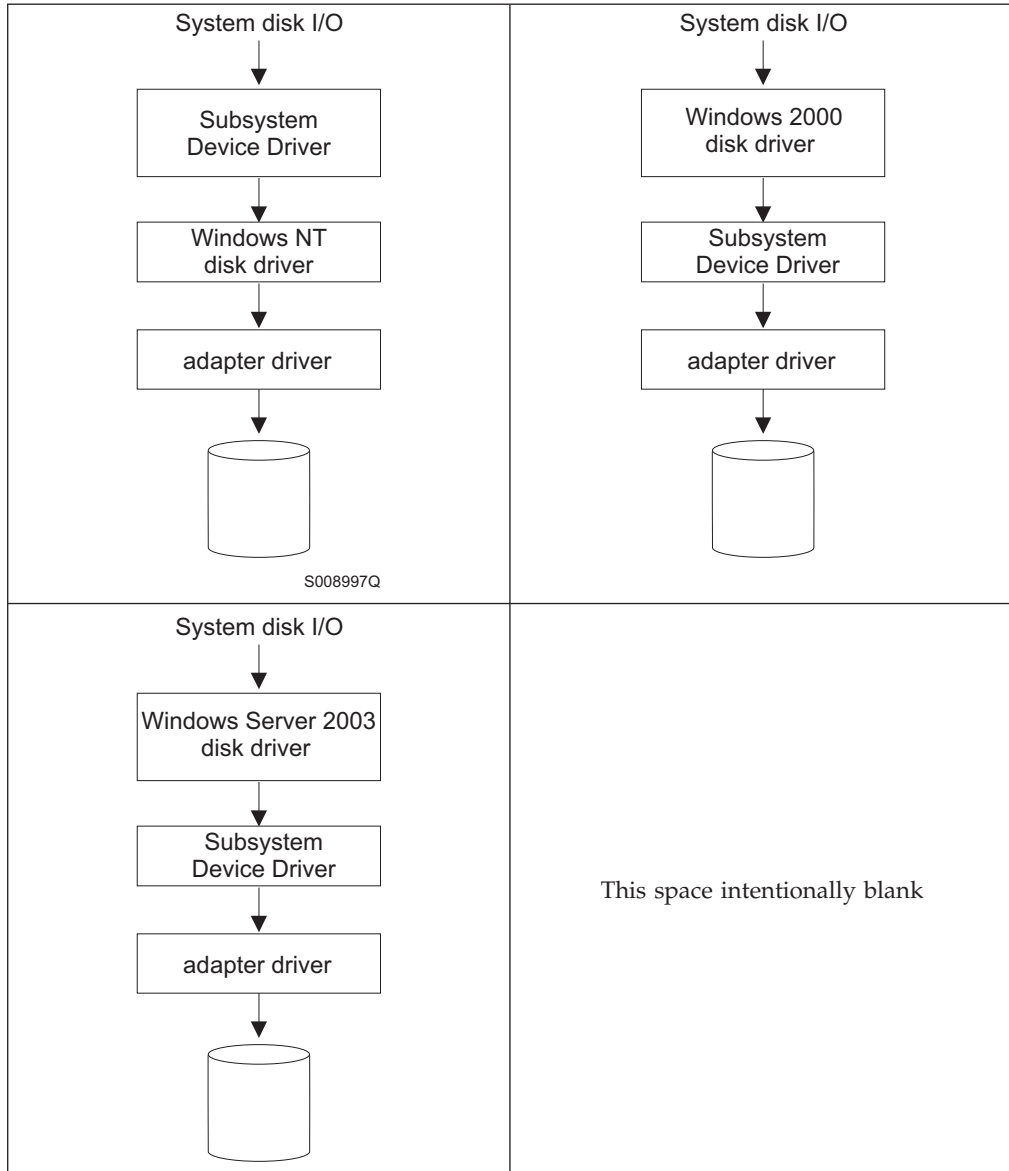
Each SDD vpath device represents a unique physical device on the storage server. Each physical device is presented to the operating system as an operating system disk device. There can be up to 32 operating system disk devices that represent up to 32 different paths to the same physical device.

The SDD vpath devices behave almost like native operating system disk devices. You can use most disk device operations of operating systems on the SDD vpath devices, including commands such as **open**, **close**, **dd**, or **fsck**.

Enhanced data availability

Figure 1 on page 5 shows a host system that is attached through small computer system interface (SCSI) or fibre-channel adapters to a disk storage system that has internal component redundancy and multipath configuration. The SDD, residing in the host system, uses this multipath configuration to enhance data availability. That is, when there is a path failure, the SDD reroutes I/O operations from the failing

path to an alternate operational path. This capability prevents a single failing bus adapter on the host system, SCSI or fibre-channel cable, or host-interface adapter on the disk storage system from disrupting data access.
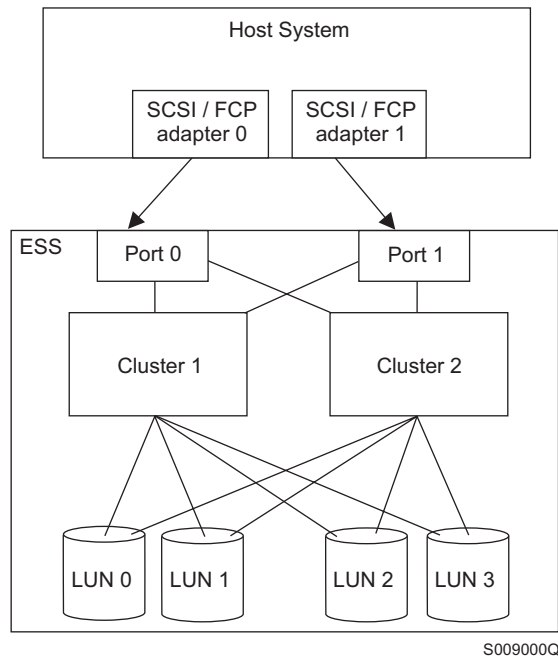
Figure 1. Multipath connections between a host system and the disk storage in a disk storage system

Figure 2 shows a host system that is attached through fibre-channel adapters to a SAN Volume Controller that has internal components for redundancy and multipath configuration. The SDD, residing in the host system, uses this multipath configuration to enhance data availability. That is, when there is a path failure, the SDD reroutes I/O operations from the failing path to an alternate operational path. This capability prevents a single failing bus adapter on the host system, fibre-channel cable, or host-interface adapter on the SAN Volume Controller from disrupting data access.
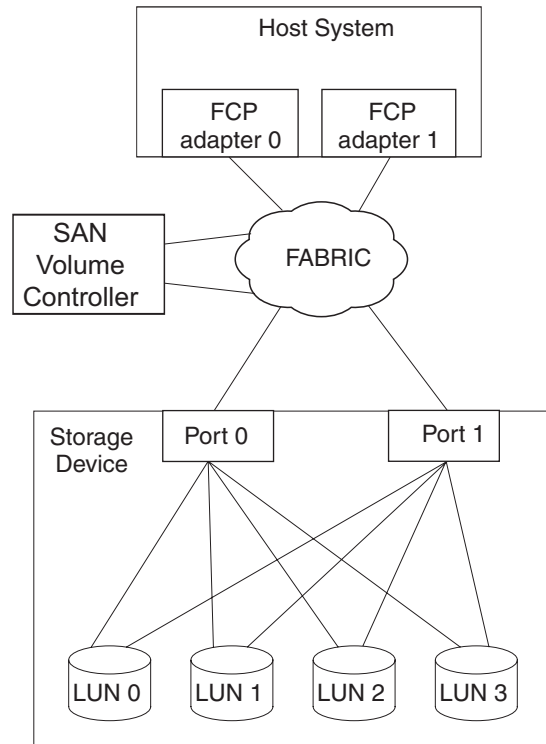
Figure 2. Multipath connections between a host system and the disk storage with the SAN Volume Controller

Note: SAN Volume Controller does not support parallel SCSI attachment.

Dynamic I/O load balancing

By distributing the I/O workload over multiple active paths, the SDD provides dynamic load balancing and eliminates dataflow bottlenecks. In the event of failure in one data path, the SDD automatically switches the affected I/O operations to another active data path, ensuring path-failover protection.

Automatic path-failover protection

The SDD failover protection feature minimizes any disruptions in I/O operations and recovers I/O operations from a failing data path. The SDD provides path-failover protection using the following process:

- Detects a path failure.
- Notifies the host system of the path failure.
- Selects and uses an alternate data path.

The SDD dynamically selects an alternate I/O path when it detects a software or hardware problem.

Some operating system drivers report each detected error in the system error log. With the SDD automatic path-failover feature, some reported errors are actually recovered from an alternative path.

Concurrent download of licensed machine code for disk storage systems

With the SDD multipath mode (configured with at least two paths per multipath device), you can concurrently download and install the licensed machine code (LMC) while applications continue to run. For certain disk storage system LMC, the disk storage system I/O bay or tower are quiesced and resumed. Its adapters might not respond for the duration of the service action, which could be 30 minutes or more.

Note: The SDD does not support single-path mode during the concurrent download of LMC. Also, the SDD does not support single-path mode during any disk storage system concurrent maintenance that impacts the path attachment, such as a disk storage system host-bay-adapter replacement.

Attention: Do not shut down the host or reconfigure the SDD during the concurrent download of licensed machine code or you might lose your initial SDD configuration.

For information about performing the concurrent download of LMC for ESS, see the microcode installation instructions for your specific type and model.

Concurrent download of licensed machine code for virtualization products

With the SDD multipath mode (configured with at least two paths per multipath device), you can concurrently download and install the licensed machine code while your applications continue to run.

At least one path must be configured through each node of a virtualization product group. That is, if only two paths exist, they must go to separate nodes for each I/O group. However, at least two paths to each node are recommended.

During the code upgrade, each node of an I/O group is upgraded sequentially. The node that is being upgraded is temporarily unavailable, and all I/O operations to that node fail. However, failed I/O operations are directed to the other node of the I/O group, and applications do not see any I/O failures.

Attention: Do not shut down the host or reconfigure the SDD during the concurrent download of licensed machine code or you might lose your initial SDD configuration.

For information about performing concurrent download of LMC for virtualization products, see the Configuration Guide for your specific type and model.

Concurrent download of licensed machine code for DS4000

With the SDD multipath mode (configured with at least two paths per multipath device), you can concurrently download and install the licensed machine code while your applications continue to run.

At least one path must be configured through each controller of a DS4000. That is, if only two paths exist, they must go to a separate controller.

Attention: Do not shut down the host or reconfigure the SDD during the concurrent download of licensed machine code or you might lose your initial SDD configuration.

For information about performing concurrent download of LMC for virtualization products, see the Configuration Guide for your specific type and model.

Preferred node path-selection algorithm for the virtualization products

Virtualization products are two-controller disk subsystems. The SDD distinguishes the paths to a virtualization product LUN:
- Paths on the preferred controller
- Paths on the alternate controller

When the SDD selects paths for I/O, preference is always given to a path on the preferred controller. Therefore, in the selection algorithm, an initial attempt is made to select a path on the preferred controller. Only if no path can be used on the preferred controller is a path selected on the alternate controller. This means that the SDD automatically fails back to the preferred controller any time a path on the preferred controller becomes available during either manual or automatic recovery. Paths on the alternate controller are selected at random. If an error occurs and a path retry is required, retry paths are first selected on the preferred controller. If all retries fail on the preferred controller's paths, paths on the alternate controller are selected for retry. The following is the path selection algorithm for the SDD:

1. With all paths available, I/O is only routed to paths on the preferred controller.
2. If no path on the preferred controller is available, I/O failover processing to the alternate controller occurs.
3. When failover processing to the alternate controller has occurred, automatic I/O failback processing to the preferred controller occurs if a path on the preferred controller is available.

The following output of the **datapath query device** command shows that the preferred paths are being selected and shows the format of the virtualization product serial number.

```
DEV#:   0  DEVICE NAME: Disk0 Part0    TYPE: 2145        POLICY: OPTIMIZED
SERIAL: 6005676801800005F800000000000004
============================================================================
Path#              Adapter/Hard Disk    State    Mode     Select       Errors
    0   Scsi Port4 Bus0/Disk0 Part0      OPEN     NORMAL   501876            0
    1   Scsi Port4 Bus0/Disk0 Part0      OPEN     NORMAL   501238            0
    2   Scsi Port4 Bus0/Disk0 Part0      OPEN     NORMAL        0            0
    3   Scsi Port4 Bus0/Disk0 Part0      OPEN     NORMAL        0            0
    4   Scsi Port5 Bus0/Disk0 Part0      OPEN     NORMAL   499575            0
    5   Scsi Port5 Bus0/Disk0 Part0      OPEN     NORMAL   500698            0
    6   Scsi Port5 Bus0/Disk0 Part0      OPEN     NORMAL        0            0
    7   Scsi Port5 Bus0/Disk0 Part0      OPEN     NORMAL        0            0
```

Chapter 2. Using SDDDSM on a Windows Server 2003/2008 host system

Subsystem Device Driver Device Specific Module (SDDDSM) provides multipath I/O support based on the MPIO technology of Microsoft. SDDDSM is a device-specific module designed to provide support for supported storage devices.

This chapter provides procedures for you to install, configure, use, and remove SDDDSM on a Windows Server 2003 or a Windows Server 2008 host system that is attached to a supported storage device.

Install the package from the %ProgramFiles%\IBM\SDDDSM directory of the SDDDSM CD-ROM or the location where SDDDSM package was saved.

For updated and additional information that is not included in this chapter, see the readme file on the CD-ROM or visit the SDDDSM Web site:

www.ibm.com/servers/storage/support/software/sdd

Verifying the hardware and software requirements

You must have the following hardware and software components in order to install SDDDSM:

Hardware

The following hardware components are needed:

- Supported storage devices
- Host system
- Fibre-channel adapters and cables

Software

The following software components are needed:

- Operating system:
  - Windows Server 2003 or Windows Server 2008 (32-bit)
  - Windows Server 2003 or Windows Server 2008 (x64)
- Device driver for fibre-channel adapters (it must be a STORPORT-based miniport driver)
- SDDDSM installation package, which includes:
  - MPIO drivers. MPIO is not shipped with the Windows Server 2003 operating system but is shipped with the Windows Server 2008 operating system. On Windows Server 2003, the MPIO drivers that are shipped with the SDDDSM package are used, while for Windows Server 2008, the MPIO drivers that are shipped with the operating system are used.
  - SDDDSM driver: sdddsm.sys
  - SDDDSM installer: setup.exe, install and uninstall MPIO, and SDDDSM
  - SDDDSM readme file
  - SDDDSM command windows shortcut

Unsupported environments

SDDDSM does not support the following environments:

- Single-path mode during code distribution and activation of LMC nor during any disk storage system concurrent maintenance that impacts the path attachment, such as a disk storage system host-bay-adapter replacement.
- SDDDSM is not supported on the Windows Server 2003 Web edition.
- DS8000 and DS6000 do not support SCSI connectivity.

Host system requirements

To successfully install SDDDSM, your Windows Server 2003 or Windows Server 2008 host system must be an x86-based 32-bit system, an AMD-based 64-bit system, or an Intel® EM64T-based system with Windows Server 2003 installed. The host system can be a uniprocessor system or a multiprocessor system.

To support SDDDSM, your Windows Server 2003 or Windows Server 2008 host system must have the following installed:

- SDDDSM
- Any Windows Server 2003 or Windows Server 2008 hotfixes, when applicable
- Any HBA-required Windows Server 2003 or Windows Server 2008 hotfixes, when applicable

See the SDDDSM readme and the HBA driver readme or release notes for additional information.

To install all components, you must have at least 1 MB (MB equals approximately 1 000 000 bytes) of disk space available on the drive where Windows Server 2003 or Windows Server 2008 is installed.

Fibre-channel requirements

To use the SDDDSM fibre-channel support, ensure that your host system meets the following requirements:

- No more than 32 fibre-channel adapters are attached.
- A fiber-optic cable connects each fibre-channel adapter to a disk storage system port.
- If you need the SDDDSM I/O load-balancing and failover features, ensure that a minimum of two fibre-channel adapters are installed.

Note: If your host has only one fibre-channel adapter, it requires you to connect through a switch to multiple disk storage system ports. You should have at least two fibre-channel adapters to prevent data loss due to adapter hardware failure or software failure.

For information about the fibre-channel adapters that can attach to your Windows Server 2003 or Windows Server 2008 host system, go to the following Web site:

www.ibm.com/servers/storage/support

Preparing for SDDDSM installation

Before installing SDDDSM, you must:

1. Ensure that all hardware and software requirements are met before you install SDDDSM. See "Verifying the hardware and software requirements" on page 9 for more information.

2. Configure the fibre-channel adapters that are attached to your Windows Server 2003 or Windows Server 2008 host system. See "Configuring fibre-channel adapters" for more information.

3. For SDDDSM uninstallation and installation instructions, see "Uninstalling SDDDSM" on page 18 and "Installing SDDDSM."

Configuring the supported storage device

Before you install SDDDSM, configure your supported storage device for single-port or multiport access for each LUN. To use the load-balancing and failover features, SDDDSM requires a minimum of two independent paths that share the same logical unit.

For information about configuring your supported storage device, see the Implementation Guide or Configuration Guide for your product.

Configuring fibre-channel adapters

You must configure the fibre-channel adapters that are attached to your Windows Server 2003 host system before you install SDDDSM. Follow the adapter-specific configuration instructions to configure the adapters attached to your Windows Server 2003 or Windows Server 2008 host systems.

Installing SDDDSM

You can install SDDDSM either from a CD-ROM or download. After it is installed, you can update SDDDSM or display the current version number.

Installing for the first time

The following section describes how to install SDDDSM on your system.

Note: Ensure that SDDDSM is installed *before* adding additional paths to a device. Otherwise, the Windows Server 2003 or Windows Server 2008 server could lose the ability to access existing data on that device.

Installing SDDDSM from CD-ROM

Perform the following steps to install SDDDSM on your system:

1. If this is a new installation, ensure that there is a single connection from your host to your storage. Multipath access to the storage can be added after SDDDSM is installed.

2. Log on as the administrator user.

   If you plan to install SDDDSM from CD-ROM, continue with step 3; otherwise, go to step 9.

3. Insert the SDDDSM installation CD-ROM into the selected drive.

4. Start the Windows Server 2003 or Windows Server 2008 Explorer program.

5. Select the CD-ROM drive. A list of all the installed directories on the compact disc is displayed.

6. If you have the zip file for the SDDDSM package available, select the %ProgramFiles%\IBM\SDDDSM installation subdirectory and go to step 9.

7. If you still do not have the zip file for the SDDDSM package available, go to the SDD Web site and download and save it to a directory.

8. Extract the zip file for the SDDDSM package to a directory and go to that directory.

9. Run the setup.exe program. Follow the instructions.

10. Shut down your Windows Server 2003 or Windows Server 2008 host system.

11. Connect additional cables to your storage if needed.

12. Make any necessary zoning configuration changes.

13. Restart your Windows Server 2003 or Windows Server 2008 host system.

After completing the installation procedures and when you log on again, you will see an **SDDDSM** entry in your Program menu containing the following selections:

1. Subsystem Device Driver DSM

2. SDDDSM Technical Support Web site

3. README

Notes:

1. You can verify that SDDDSM has been successfully installed by issuing the **datapath query device** command. You must issue the **datapath** command from the datapath directory. If the command runs, SDDDSM is installed.

   You can also use the following operation to verify that SDDDSM has been successfully installed:

   a. Click **Start → Programs → Administrative Tools → Computer Management**.

   b. Double-click **Device Manager**.

   c. Expand **Disk drives** in the right pane.

   In Figure 3 on page 13, there are eight SAN Volume Controller devices connected to the host and four paths to each of the SAN Volume Controller devices. The Device manager shows eight 2145 Multipath Disk Devices and 32 2145 SDDDSM SCSI Devices.
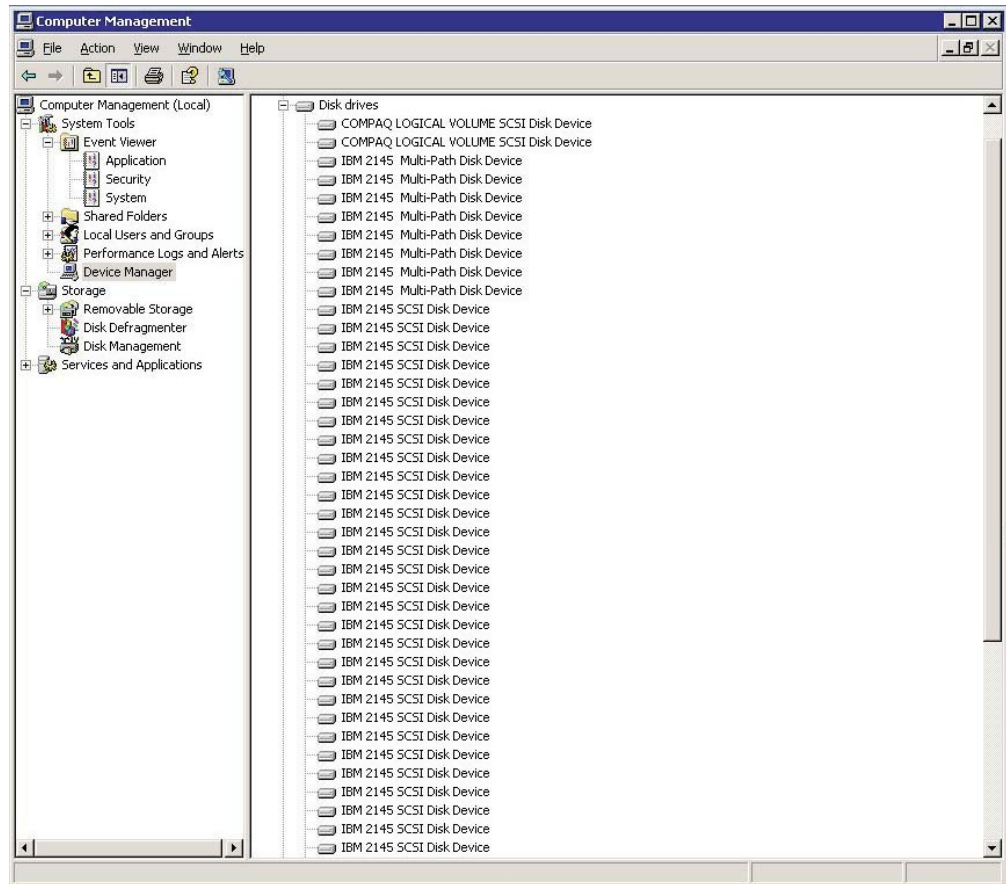
Figure 3. Example showing SAN Volume Controller devices to the host and path access to the SAN Volume Controller devices in a successful SDDDSM installation on a Windows Server 2003 host system

2. You can also verify the current version of SDDDSM. For more information, go to "Displaying the current version of SDDDSM" on page 14.

Installing SDDDSM from downloaded code

Use this procedure to install SDDDSM from downloaded code:

1. Unzip the SDDDSM code to your installation subdirectory.

2. Run the setup.exe program and follow the instructions. **Tip**: The setup.exe program offers the following command line options for silent install:

```
--> setup -s : silent install
--> setup -s -n : silent install; no reboot (requires SDDDSM 2.1.1.0 or later)
```

3. When the setup.exe program is finished, you will be asked if you want to reboot. If you answer **y**, the setup.exe program will restart your SDDDSM system immediately. Follow the instructions to restart. Otherwise, the setup.exe program exits, and you need to manually restart your SDDDSM system to activate the new installation.

4. Shut down your SDDDSM host system.

5. Reconnect all cables that connect the host bus adapters and the supported storage devices if needed.

6. Change any zoning information that needs to be updated.

7. Restart your SDDDSM host system.

Upgrading SDDDSM

Use the following procedure to upgrade SDDDSM.

1. Log in as administrator.
2. Open Windows Explorer and go to the directory where the SDDDSM package is located.
3. Double-click the file setup.exe.
4. Follow the instructions to continue with SDDDSM setup procedure.
5. When the upgrade is complete, SDDDSM will ask you to reboot. Answer yes to reboot the system and activate the new SDDDSM.

You can check the SDDDSM version to verify that SDDDSM has been successfully upgraded. For more information, see "Displaying the current version of SDDDSM."

Displaying the current version of SDDDSM

You can display the current version of SDDDSM on a Windows Server 2003 host system by viewing the sdddsm.sys file properties. Perform the following steps to view the properties of sdddsm.sys file:

1. Click **Start → Programs → Accessories → Windows Explorer** to open Windows Explorer.
2. In Windows Explorer, go to the %SystemRoot%\system32\drivers directory, where *%SystemRoot%* is:

   %SystemDrive%\Windows for Windows Server 2003 or Windows Server 2008.

   If Windows is installed on the C: drive, *%SystemDrive%* is C:. If Windows is installed on E: drive, *%SystemDrive%* is E:
3. Right-click the sdddsm.sys file, and then click **Properties**. The sdddsm.sys properties window opens.
4. In the sdddsm.sys properties window, click **Version**. The file version and copyright information about the sdddsm.sys file is displayed.

If the SDDDSM version is 2.1.1.0 or later, you can use the **datapath query version** command:

1. Open the SDDDSM command window.
2. Issue the **datapath query version** command.

Configuring SDDDSM

Use these topics to configure SDDDSM.

Maximum number of LUNs

There is no physical limitation on the maximum number of devices that can be configured for SDDDSM. Any limitation exists on the host operating system. A practical limit is 250 LUNs.

Consult the *Host Attachment Guide* for your product.

Verifying the configuration

To activate SDDDSM, you need to restart your Windows Server 2003 or Windows Server 2008 system after it is installed.

Attention: Ensure that SDDDSM is installed and activated before you add additional paths to a device. Otherwise, the Windows Server 2003 or Windows Server 2008 server could lose the ability to access existing data on that device.

Before adding any additional hardware, review the configuration information for the adapters and devices currently on your Windows Server 2003 server. Perform the following steps to display information about the adapters and devices:

1. You must log on as an administrator user to have access to the Windows Server 2003 or Windows Server 2008 Computer Management.
2. Click **Start → Program → Subsystem Device Driver DSM → Subsystem Device Driver Management**. An MS-DOS window opens.
3. Enter **datapath query adapter** and press **Enter**. The output includes information about all the installed adapters. In the example shown in the following output, one HBA is installed:

```
Active Adapters : 1

Adpt#      Adapter Name   State     Mode      Select      Errors  Paths  Active
   0   Scsi Port4 Bus0   NORMAL   ACTIVE       592           0     6     6
```

4. Enter **datapath query device** and press **Enter**. In the example shown in the following output, eight devices are attached to the SCSI path:

```
Total Devices : 6


DEV#:   0  DEVICE NAME: Disk1 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 06D23922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk1 Part0     OPEN    NORMAL       108           0

DEV#:   1  DEVICE NAME: Disk2 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 06E23922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk2 Part0     OPEN    NORMAL        96           0

DEV#:   2  DEVICE NAME: Disk3 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 06F23922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk3 Part0     OPEN    NORMAL        96           0

DEV#:   3  DEVICE NAME: Disk4 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 07023922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk4 Part0     OPEN    NORMAL        94           0

DEV#:   4  DEVICE NAME: Disk5 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 07123922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk5 Part0     OPEN    NORMAL        90           0

DEV#:   5  DEVICE NAME: Disk6 Part0  TYPE: 2107900    POLICY: OPTIMIZED
SERIAL: 07223922
============================================================================
Path#              Adapter/Hard Disk    State     Mode     Select      Errors
   0     Scsi Port4 Bus0/Disk6 Part0     OPEN    NORMAL        98           0
```

Activating additional paths

Perform the following steps to activate additional paths to an SDDDSM vpath device:

1. Install any additional hardware on the Windows Server 2003 or Windows Server 2008 server or the SAN Volume Controller.
2. Click **Start → Program → Administrative Tools → Computer Management**.
3. Click **Device Manager**.
4. Right-click **Disk drives**.
5. Click **Scan for hardware changes**.
6. Verify that the path is added correctly. See "Verifying that additional paths are installed correctly."

Verifying that additional paths are installed correctly

After installing additional paths to SDDDSM devices, verify that the additional paths have been installed correctly.

Perform the following steps to verify that the additional paths have been installed correctly:

1. Click **Start → Program → Subsystem Device Driver DSM → Subsystem Device Driver Management**. An MS-DOS window opens.
2. Enter **datapath query adapter** and press **Enter**. The output includes information about any additional adapters that were installed. In the example shown in the following output, an additional HBA has been installed:

```
Active Adapters : 2

Adpt#     Adapter Name   State    Mode     Select     Errors  Paths  Active
    0  Scsi Port2 Bus0  NORMAL   ACTIVE    391888        844    16     16
    1  Scsi Port3 Bus0  NORMAL   ACTIVE    479686        566    16     16
```

3. Enter **datapath query device** and press **Enter**. The output should include information about any additional devices that were installed. In this example, the output includes information about the new HBA and the new device numbers that were assigned. The following output is displayed:

```
Total Devices : 8

DEV#:   0  DEVICE NAME: \Device\Harddisk2\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000023
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk2 Path0   OPEN   NORMAL     3079       103
    1   Scsi Port2 Bus0/Disk2 Path1   OPEN   NORMAL       43         6
    2   Scsi Port3 Bus0/Disk2 Path2   OPEN   NORMAL    45890        72
    3   Scsi Port3 Bus0/Disk2 Path3   OPEN   NORMAL       30         4

DEV#:   1  DEVICE NAME: \Device\Harddisk3\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000025
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk3 Path0   OPEN   NORMAL    51775       101
    1   Scsi Port2 Bus0/Disk3 Path1   OPEN   NORMAL       34         6
    2   Scsi Port3 Bus0/Disk3 Path2   OPEN   NORMAL    64113        68
    3   Scsi Port3 Bus0/Disk3 Path3   OPEN   NORMAL       30         4

DEV#:   2  DEVICE NAME: \Device\Harddisk4\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000024
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk4 Path0   OPEN   NORMAL    43026       124
    1   Scsi Port2 Bus0/Disk4 Path1   OPEN   NORMAL      440         6
    2   Scsi Port3 Bus0/Disk4 Path2   OPEN   NORMAL    51992        63
    3   Scsi Port3 Bus0/Disk4 Path3   OPEN   NORMAL    11152         4

DEV#:   3  DEVICE NAME: \Device\Harddisk5\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000026
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk5 Path0   OPEN   NORMAL    47507       106
    1   Scsi Port2 Bus0/Disk5 Path1   OPEN   NORMAL      402         6
    2   Scsi Port3 Bus0/Disk5 Path2   OPEN   NORMAL    51547        76
    3   Scsi Port3 Bus0/Disk5 Path3   OPEN   NORMAL    10930         4

DEV#:   4  DEVICE NAME: \Device\Harddisk6\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000027
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk6 Path0   OPEN   NORMAL    45604       107
    1   Scsi Port2 Bus0/Disk6 Path1   OPEN   NORMAL       45         6
    2   Scsi Port3 Bus0/Disk6 Path2   OPEN   NORMAL    60839        76
    3   Scsi Port3 Bus0/Disk6 Path3   OPEN   NORMAL       31         4

DEV#:   5  DEVICE NAME: \Device\Harddisk7\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000029
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk7 Path0   OPEN   NORMAL    46439        80
    1   Scsi Port2 Bus0/Disk7 Path1   OPEN   NORMAL      423         6
    2   Scsi Port3 Bus0/Disk7 Path2   OPEN   NORMAL    50638        76
    3   Scsi Port3 Bus0/Disk7 Path3   OPEN   NORMAL    10226         4

DEV#:   6  DEVICE NAME: \Device\Harddisk8\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A800000000000028
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk8 Path0   OPEN   NORMAL    42857        92
    1   Scsi Port2 Bus0/Disk8 Path1   OPEN   NORMAL       46         6
    2   Scsi Port3 Bus0/Disk8 Path2   OPEN   NORMAL    61256        53
    3   Scsi Port3 Bus0/Disk8 Path3   OPEN   NORMAL       31         4

DEV#:   7  DEVICE NAME: \Device\Harddisk9\DR0  TYPE: 2145      POLICY: OPTIMIZED
SERIAL: 6005076801968009A80000000000002A
================================================================================
Path#           Adapter/Hard Disk   State    Mode    Select    Errors
    0   Scsi Port2 Bus0/Disk9 Path0   OPEN   NORMAL     2161        62
    1   Scsi Port2 Bus0/Disk9 Path1   OPEN   NORMAL   108007        27
    2   Scsi Port3 Bus0/Disk9 Path2   OPEN   NORMAL    50767        50
    3   Scsi Port3 Bus0/Disk9 Path3   OPEN   NORMAL    10214         4
```

Uninstalling SDDDSM

Attention:

1. You must install SDDDSM immediately before performing a system restart to avoid any potential data loss. Go to "Installing SDDDSM" on page 11 for instructions.
2. If you are not planning to reinstall SDDDSM after the uninstallation, ensure that there is a single-path connection from the system to the storage device before performing a restart to avoid any potential data loss.

Perform the following steps to uninstall SDDDSM on a Windows Server 2003 or Windows Server 2008 host system:

1. Log on as the administrator user.
2. Click **Start → Settings → Control Panel**. The Control Panel opens.
3. Double-click **Add/Remove Programs**. The Add/Remove Programs window opens.
4. In the Add/Remove Programs window, select **Subsystem Device Driver DSM** from the currently installed programs selection list.
5. Click **Add/Remove**. You will be asked to confirm that you want to uninstall.
6. Shut down your Windows Server 2003 or Windows Server 2008 host system after the uninstallation process has been completed.
7. Change the zoning configuration or cable connections to ensure that there is only single-path connection from the system to the storage device.
8. Power on your Windows Server 2003 or Windows Server 2008 host system.

SAN boot support

Use the following procedures for SAN boot support.

Remote boot support for 32-bit Windows Server 2003 or Windows Server 2008 using a QLogic HBA

Perform the following steps to install SDD:

1. Configure the SAN Environment so that both Qlogic HBAs in the server can see the SAN boot device.
2. Start the server with 2 fibre-channel cables connected to both HBAs.
3. Press **Crl+Q** to go to Qlogic Bios Fast Utilities.
4. Select the first HBA.
5. Select **Configuration Settings**.
6. Select **Host Adapter Setting**. Enable the BIOS.
7. Press **ESC**.
8. Select **Selectable Boot Settings**.
9. Enable **Selectable Boot**.
10. Select **first (primary) boot** and press **Enter**.
11. Select **IBM storage device** and press **Enter**.
12. At the **Select LUN** prompt, select the first supported LUN, which is LUN 0.
13. Press **Esc** and select **Save Changes**.

14. Select the second HBA and repeat steps 5-13.
15. Remove the fibre-channel cable from the second HBA so that you have only a single path to first HBA.
16. Restart the server with Windows Server 2003 or Windows Server 2008 with latest Service Pack CD-ROM.
17. At the very first Windows 2003 installation screen, quickly press **F6** to install the third-party device. For Windows Server 2008, skip to step 20.
18. Select **S** to specify an additional device.
19. Insert the diskette with the Qlogic storport miniport driver into the diskette drive and press **Enter**.
20. Continue with the Windows Server 2003 or Windows Server 2008 installation process. Remember to select the SAN device that is seen by Qlogic HBA as the device to install Windows Server 2003 or Windows Server 2008. Continue with the OS installation.
21. After Windows Server 2003 or Windows Server 2008 is successfully installed on the SAN boot device, shut down the system.
22. Unplug the fibre-channel cable from first HBA and plug the fibre-channel cable to the second HBA so that you have a single path from second HBA to the SAN device.
23. Restart the server. The system should come up in SAN Boot mode.
24. Install the latest SDDDSM and restart.
25. To add multipath support to a SAN boot device:
    a. Shut down the server.
    b. Plug in the fibre-channel cable to the other HBA.
    c. Configure the SAN to have more paths to SAN boot device if needed.
26. Restart the server.

Booting from a SAN device with Windows Server 2003 or Windows Server 2008 and the SDD using an Emulex HBA

Note: The **Automatic LUN Mapping** checkbox of the Emulex Configuration Settings should be selected so that both HBA ports can see all assigned LUNs.

Perform the following steps.
1. Configure the SAN Environment so that both Emulex HBAs in the server can see the SAN boot device.
2. Boot the server with 2 fibre-channel cables connected to both HBAs.
3. Press **Alt+E** to go to the Emulex BIOS Utilities.
4. Select the first HBA.
5. Select **Configure HBA Parameter Settings**.
6. Select **Option 1** to enable BIOS for this HBA.
7. Press **Page Up** to go back. Then select **Configure Boot Device**.
8. Select the first unused boot device for **Select Boot Entry** from the **List Of Saved Boot Devices**.
9. Select **01** for **Select The Two Digit Number Of The Desired Boot Device**.
10. Enter **00** for **Enter Two Digit Of Starting LUNs (hexadecimal)**.
11. Select device number 01 for **Enter Selection For Starting LUN**.
12. Select **Boot Device Via WWPN**.

13. Page up. Then select the second HBA. Repeat steps 5-12 to configure boot support for this HBA.

14. Unplug the fibre-channel cable from second HBA and plug the fibre-channel cable to the first HBA so that you have a single path from first HBA to the SAN device.

15. Restart the server with Windows Server 2003 or Windows Server 2008 with latest Service Pack CD-ROM.

16. At the very first Windows 2003 installation screen, quickly press **F6** to install third-party device. For Windows Server 2008, skip to step 19.

17. Select **S** to specify an additional device.

18. Insert the diskette with the Emulex HBA driver into the diskette drive and press **Enter**.

19. Continue with the Windows Server 2003 or Windows Server 2008 installation process. Remember to select the SAN device seen by the Emulex HBA as the device to install Windows 2003. Continue with the OS installation.

20. After Windows 2003 is successfully installed on the SAN Boot device, shut down the system.

21. Unplug the fibre-channel cable from the first HBA and plug in the fibre-channel cable to the second HBA so that you have a single path from second HBA to SAN device.

22. Restart the server. The system should be up in SAN boot mode.

23. Install the latest SDD and restart.

24. To add multipath support to a SAN boot device:

    a. Shut down the server.

    b. Plug in the fibre-channel cable to the other HBA.

    c. Configure the SAN to have more paths to the SAN boot device if needed.

25. Restart the server.

Support for Windows Server 2003 or Windows Server 2008 clustering

When running Windows Server 2003 clustering, clustering failover might not occur when the last path is being removed from the shared resources. See *Microsoft article Q294173* for additional information. Windows Server 2003 does not support dynamic disks in the MSCS environment.

Special considerations in the Windows Server 2003 clustering environment

There are subtle differences in the way that SDDDSM handles path reclamation in a Windows Server 2003 clustering environment compared to a nonclustering environment. When the Windows Server 2003 server loses a path in a nonclustering environment, the path condition changes from open to dead and the adapter condition changes from active to degraded. The adapter and path condition will not change until the path is made operational again. When the Windows Server 2003 server loses a path in a clustering environment, the path condition changes from open to dead and the adapter condition changes from active to degraded. However, after a period of time, the path condition changes back to open and the adapter condition changes back to normal, even if the path has not been made operational again.

Note: The adapter goes to DEGRAD state when there are active paths left on the adapter. It goes to FAILED state when there are no active paths.

The **datapath set adapter # offline** command operates differently in a clustering environment as compared to a nonclustering environment. In a clustering environment, the **datapath set adapter offline** command does not change the condition of the path if the path is active or being reserved. If you issue the command, the following message is displayed: `to preserve access some paths left online`.

Configuring a Windows Server 2003 or Windows Server 2008 cluster with SDDDSM installed

The following variables are used in this procedure:

server_1   Represents the first server with two HBAs.

server_2   Represents the second server with two HBAs.

Perform the following steps to configure a Windows Server 2003 or Windows Server 2008 cluster with SDDDSM:

1. On both *server_1* and *server_2*, configure SAN devices on supported storage as shared for all HBAs.
2. Install the latest SDDDSM on *server_1*. For installation instructions, see "Installing SDDDSM" on page 11.
3. Connect fibre-channel cables from *server_1* to the supported storage, and restart *server_1*.
4. Use the **datapath query adapter** and **datapath query device** commands to verify the correct number of SAN devices and paths on *server_1*.
5. Click **Start** → **All Programs** → **Administrative Tools** → **Computer Management**. From the Computer Management window, select **Storage** and then select **Disk Management** to work with the storage devices attached to the host system.
6. Format the raw devices with NTFS and assign drive letters for all SAN devices that are going to be used as MSCS resources. Ensure that you keep track of the assigned drive letters on *server_1*.
7. Shut down *server_1*.
8. Install the latest SDDDSM on *server_2* . For installation instructions, see "Installing SDDDSM" on page 11.
9. Connect fibre-channel cables from *server_2* to the supported storage, and restart *server_2*.
10. Use the **datapath query adapter** and **datapath query device** commands to verify the correct number of SAN devices and paths on *server_2*.
11. Click **Start** → **All Programs** → **Administrative Tools** → **Computer Management**. From the Computer Management window, select **Storage** and then select **Disk Management** to work with the storage devices attached to the host system. Verify that the assigned drive letters for MSCS resources on *server_2* match the assigned drive letters on *server_1*.
12. Insert the Windows 2003 CD-ROM into the CD-ROM drive and install the MSCS software on *server_2*. For Windows 2008, enable the "Failover Clustering" feature and configure MSCS on *server_2*.
13. Restart *server_1*.
14. Insert the Windows 2003 CD-ROM into the CD-ROM drive and install the MSCS software on *server_1* as the second node of the MSCS cluster. For Windows 2008, enable the "Failover Clustering" feature and configure MSCS on *server_1* as the second node of the MSCS cluster.

15. Use the **datapath query adapter** and **datapath query device** commands to verify that the correct number of LUNs and paths on *server_1* and *server_2*. (This step is optional.)

   Note: You can use the **datapath query adapter** and **datapath query device** commands to show all the physical and logical volumes for the host server. The secondary server shows only the physical volumes and the logical volumes that it owns.

Information about installing a Windows 2003 cluster can be found in the confclus.exe file, located at:

www.microsoft.com/downloads/details.aspx?displaylang=en&familyid=96F76ED7-9634-4300-9159-89638F4B4EF7

Removing SDDDSM in a two-node cluster environment

Use the following steps if you intend to remove the multipathing functions to a SAN device in a two-node cluster environment.

Perform the following steps to remove SDDDSM in a two-node cluster environment:

1. Move all cluster resources from node A to node B.
2. Ensure that there is a single-path connection from the system to the storage device which may include the following activities:
   a. Disable access of second HBA to the storage device.
   b. Change the zoning configuration to allow only one port accessed by this host.
   c. Remove shared access to the second HBA through the IBM TotalStorage Expert V.2.1.0 Specialist.
   d. Remove multiple SAN Volume Controller port access, if applicable.
3. Uninstall SDDDSM. See "Uninstalling SDDDSM" on page 18 for instructions.
4. Restart your system.
5. Move all cluster resources from node B to node A.
6. Perform steps 2 - 5 on node B.

SDDDSM datapath command support

SDDDSM supports the following **datapath** commands:
- **datapath query adapter [ ]**
- **datapath query device [ ]/ [ ] [-d] [-i /()] [-l] [-s]**
- **datapath set adapter online/offline**
- **datapath set device online/offline**
- **datapath query adaptstats [ ]**
- **datapath query devstats [ ]/ [ ] [-d] [-i /()] [-l] [-s]**

Beginning with SDDDSM version 2.1.1.0, SDDDSM also supports the following datapath commands:
- **datapath query version**
- **datapath query portmap**
- **datapath query essmap**
- **datapath set device /() policy rr/fo/lb/df**
- **datapath clear device /() count error/all**

- **datapath disable/enable ports ess**

Notes:

1. The options [], [**-d**], [**-i** /()], [**-s**] in **datapath query device** are supported only by SDDDSM 2.1.1.0 or later.

2. For BladeCenter devices, even when two or more Serial Attached SCSI (SAS) HBAs are installed on the host, SDDDSM finds only a single HBA, and the output of datapath query adapter shows only one adapter.

See Chapter 3, "Using the datapath commands," on page 25 for additional information about the **datapath** commands.

SDDDSM server daemon

The SDDDSM server (also referred to as sddsrv) is an integrated component of SDDDSM. This component consists of a Windows application daemon that is installed in addition to the SDDDSM device driver.

Verifying if the SDDDSM server has started

After you have installed SDD, perform the following steps to verify that the SDDDSM server (sddsrv) has automatically started:

1. Click **Start → Programs → Administrative Tools → Computer Management**.
2. Expand the Services and Applications tree.
3. Click **Services**.
4. Right-click **SDD Service**.
5. Click **Start**. The status of SDD Service should be *Started* if the SDDDSM server has automatically started.

Starting the SDDDSM server manually

If the SDDDSM server did not start automatically after you performed the SDDDSM installation, perform the following steps to start sddsrv:

1. Click **Start → Programs → Administrative Tools → Computer Management**.
2. Expand the Services and Applications tree.
3. Click **Services**.
4. Right-click **SDD Service**.
5. Click **Start**.

Changing to a different port number for the SDDDSM server

To change to a different port number for the SDDDSM server, see the *IBM System Storage Multipath Subsystem Device Driver User's Guide*.

Stopping the SDDDSM server

To stop the SDDDSM server, perform the following steps:

1. Click **Start → Programs → Administrative Tools → Computer Management**.
2. Expand the Services and Applications tree.
3. Click **Services**.
4. Right-click **SDD Service**.
5. Click **Stop**.

Chapter 3. Using the datapath commands

SDD provides commands that you can use to:
- Display the status of adapters that are used to access managed devices.
- Display the status of devices that the device driver manages.
- Dynamically set the status of paths or adapters to *online* or *offline*.
- Dynamically remove paths or adapters.
- Open an Invalid or Close_Dead path.
- Change the path selection algorithm policy of a device.
- Run the essutil Product Engineering tool.
- Dynamically clear the select counter or error counter

This chapter includes descriptions of these commands. Table 3 provides an alphabetical list of these commands, a brief description, and where to go in this chapter for more information.

Table 3. Commands

Command	Description	Page
datapath clear device count	Dynamically clears the select counter or error counter.	27
datapath disable ports	Places paths connected to certain ports offline.	28
datapath enable ports	Places paths connected to certain ports online.	29
datapath open device path	Dynamically opens a path that is in an Invalid or Close_Dead state.	30
datapath query adapter	Displays information about adapters.	32
datapath query adaptstats	Displays performance information for all SCSI and FCS adapters that are attached to SDD devices.	34
datapath query device	Displays information about devices.	35
datapath query devstats	Displays performance information for a single SDD vpath device or all SDD vpath devices.	38
datapath query essmap	Displays each SDD vpath device, path, location, and attributes.	40
datapath query portmap	Displays the connection status of SDD vpath devices with regard to the storage ports to which they are attached.	42
datapath query version	Displays the version of SDD that is installed.	44
datapath query wwpn	Displays the World Wide Port Name (WWPN) of the host fibre-channel adapters.	45
datapath remove adapter	Dynamically removes an adapter.	46
datapath remove device path	Dynamically removes a path of an SDD vpath device.	47

Table 3. Commands (continued)

Command	Description	Page
datapath set adapter	Sets all device paths that are attached to an adapter to online or offline.	49
datapath set device policy	Dynamically changes the path-selection policy of a single or multiple SDD vpath devices.	50
datapath set device path	Sets the path of an SDD vpath device to online or offline.	51
datapath set qdepth	Dynamically enables or disables queue depth of an SDD vpath device.	52

datapath clear device count

The **datapath clear device count** command dynamically sets the select counter or error counter to zero.

Syntax

```
►►──datapath clear─device number 1──────────────────count──┬─error─┬────────►◄
                             └─device number 2─┘           └─all───┘
```

Parameters

device number 1 <device number 2>
> When two device numbers are entered, this command applies to all the devices whose index numbers fit within the range of these two device index numbers.

error
> Clears only the error counter of the SDD vpath device or range of devices specified.

all Clear both the select counter and the error counter of the SDD vpath device or devices in the specified range.

Examples

If you have a nonzero select counter or error counter, entering the **datapath query device** command causes the following output to be displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2145           POLICY:    Optimized
SERIAL: 600507680181006B200000000000000D1
==========================================================================
Path#      Adapter/Hard Disk       State     Mode     Select      Errors
   0          fscsi0/hdisk15       CLOSE    NORMAL      53020          47
   1          fscsi0/hdisk20       CLOSE    NORMAL          0           0
   2          fscsi1/hdisk55       CLOSE    NORMAL     365742           0
   3          fscsi1/hdisk60       CLOSE    NORMAL          0           0
```

If you enter the **datapath clear device 0 count all** command and then enter the **datapath query device** command, the following output is displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2145           POLICY:    Optimized
SERIAL: 600507680181006B200000000000000D1
==========================================================================
Path#      Adapter/Hard Disk       State     Mode     Select      Errors
   0          fscsi0/hdisk15       CLOSE    NORMAL          0           0
   1          fscsi0/hdisk20       CLOSE    NORMAL          0           0
   2          fscsi1/hdisk55       CLOSE    NORMAL          0           0
   3          fscsi1/hdisk60       CLOSE    NORMAL          0           0
```

datapath disable ports

The **datapath disable ports** command sets SDD vpath device paths offline for specified disk storage system location code.

Note: This command is not supported for Novell host systems.

Syntax

```
►►──datapath disable ports─<connection>─ess <essid>──────────────────────────►◄
```

Parameters

connection
> The connection code must be in one of the following formats:
> - Single port = R1-Bx-Hy-Zz
> - All ports on card = R1-Bx-Hy
> - All ports on bay = R1-Bx
>
> Use the output of the **datapath query essmap** command to determine the connection code.

essid
> The disk storage system serial number, given by the output of the **datapath query portmap** command.

Examples

If you enter the **datapath disable ports R1-B1-H3 ess 12028** command and then enter the **datapath query device** command, the following output is displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2105E20  POLICY:  Optimized
SERIAL: 20112028
========================================================================
Path#         Adapter/Path Name      State     Mode      Select      Errors
   0           fscsi0/hdisk2         DEAD      OFFLINE       6          0
   1           fscsi0/hdisk4         OPEN      NORMAL        9          0
   2           fscsi1/hdisk6         DEAD      OFFLINE      11          0
   3           fscsi1/hdisk8         OPEN      NORMAL        9          0
```

datapath enable ports

The **datapath enable ports** command sets SDD vpath device paths online for specified disk storage system location code.

Note: This command is not supported for Novell host systems.

Syntax

```
►►──datapath enable ports─connection─ess essid──────────────────────►◄
```

Parameters

connection
>   The connection code must be in one of the following formats:
>   - Single port = R1-Bx-Hy-Zz
>   - All ports on card = R1-Bx-Hy
>   - All ports on bay = R1-Bx
>
>   Use the output of the **datapath essmap** command to determine the connection code.

essid
>   The disk storage system serial number, given by the output of the **datapath query portmap** command.

Examples

If you enter the **datapath enable ports R1-B1-H3 ess 12028** command and then enter the datapath **query device command**, the following output is displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2105E20  POLICY:  Optimized
SERIAL: 20112028
========================================================================
Path#         Adapter/Path Name      State     Mode     Select     Errors
   0            fscsi0/hdisk2         OPEN     NORMAL        6          0
   1            fscsi0/hdisk4         OPEN     NORMAL        9          0
   2            fscsi1/hdisk6         OPEN     NORMAL       11          0
   3            fscsi1/hdisk8         OPEN     NORMAL        9          0
```

datapath open device path

The **datapath open device path** command dynamically opens a path that is in Invalid or Close_Dead state. You can use this command even when the I/O is actively running.

Note: This command is supported for AIX, HP, Linux, and Sun host systems.

Syntax

►►──datapath open device─*device number*─path─*path number*────────────────────►◄

Parameters

device number
>   The device number refers to the device *index* number as displayed by the **datapath query device** command.

path number
>   The path number that you want to change, as displayed by the **datapath query device** command.

Examples

If you enter the **datapath query device 8** command, the following output is displayed:

```
DEV#:   8  DEVICE NAME: vpath9  TYPE: 2105E20   POLICY: Optimized
SERIAL: 20112028
================================================================
Path#      Adapter/Hard Disk   State    Mode     Select  Errors
    0         fscsi1/hdisk18    OPEN     NORMAL      557       0
    1         fscsi1/hdisk26    OPEN     NORMAL      568       0
    2         fscsi0/hdisk34    INVALID  NORMAL        0       0
    3         fscsi0/hdisk42    INVALID  NORMAL        0       0
```

Note that the current state of path 2 is INVALID.

If you enter the **datapath open device 8 path 2** command, the following output is displayed:

```
Success: device 8 path 2 opened

DEV#:   8  DEVICE NAME: vpath9  TYPE: 2105E20   POLICY: Optimized
SERIAL: 20112028
================================================================
Path#      Adapter/Hard Disk   State    Mode     Select  Errors
    0         fscsi1/hdisk18    OPEN     NORMAL      557       0
    1         fscsi1/hdisk26    OPEN     NORMAL      568       0
    2         fscsi0/hdisk34    OPEN     NORMAL        0       0
    3         fscsi0/hdisk42    INVALID  NORMAL        0       0
```

After issuing the **datapath open device 8 path 2** command, the state of path 2 becomes OPEN.

The terms used in the output are defined as follows:

Dev#   The number of this device.

Device name
>   The name of this device.

Type   The device product ID from inquiry data.

Policy The current path-selection policy selected for the device. See "datapath set device policy" on page 50 for a list of valid policies.

Serial The logical unit number (LUN) for this device.

Path# The path number displayed by the **datapath query device** command.

Adapter
> The name of the adapter to which the path is attached.

Hard Disk
> The name of the logical device to which the path is bound.

State The condition of the named device:
> **Open**   Path is in use.
> **Close**   Path is not being used.
> **Close_Dead**
> > Path is broken and is not being used.
>
> **Dead**   Path is no longer being used.
> **Invalid**
> > The path failed to open.

Mode The mode of the named path, which is either Normal or Offline.

Select The number of times that this path was selected for input and output.

Errors The number of input errors and output errors that are on this path.

datapath query adapter

The **datapath query adapter** command displays information about a single adapter or all adapters.

Syntax

►►──datapath query adapter─*adapter number*───────────────────────────────────────►◄

Parameters

adapter number
    The index number for the adapter for which you want information displayed. If you do not enter an adapter index number, information about all adapters is displayed.

Examples

If you enter the **datapath query adapter** command, the following output is displayed:

```
Active Adapters :4

Adpt#          Name   State    Mode     Select   Errors  Paths  Active
   0          scsi3  NORMAL   ACTIVE  129062051        0     64       0
   1          scsi2  NORMAL   ACTIVE   88765386      303     64       0
   2         fscsi2  NORMAL   ACTIVE  407075697     5427   1024       0
   3         fscsi0  NORMAL   ACTIVE  341204788    63835    256       0
```

The terms used in the output are defined as follows:

Adpt #
    The number of the adapter defined by SDD.

Adapter Name
    The name of the adapter.

State The condition of the named adapter. It can be either:
    Normal
        Adapter is in use.
    Degraded
        One or more paths attached to the adapter are not functioning.
    Failed All paths attached to the adapter are no longer operational.

Mode The mode of the named adapter, which is either Active or Offline.

Select The number of times this adapter was selected for input or output.

Errors The number of errors on all paths that are attached to this adapter.

Paths The number of paths that are attached to this adapter.

> **Note:** In the Windows NT host system, this is the number of physical and logical devices that are attached to this adapter.

Active The number of functional paths that are attached to this adapter. The number of functional paths is equal to the number of paths attached to this adapter minus any that are identified as failed or offline.

Note: Windows 2000 and Windows Server 2003 host systems can display different values for State and Mode depending on adapter type when a path is placed

offline due to a bay quiescence.

datapath query adaptstats

The **datapath query adaptstats** command displays performance information for all SCSI and fibre-channel adapters that are attached to SDD devices. If you do not enter an adapter number, information about all adapters is displayed.

Syntax

```
►►──datapath query adaptstats──adapter number─────────────────────────────►◄
```

Parameters

adapter number
> The index number for the adapter for which you want information displayed. If you do not enter an adapter index number, information about all adapters is displayed.

Examples

If you enter the **datapath query adaptstats 0** command, the following output is displayed:

```
Adapter #:  0
=============
            Total Read  Total Write  Active Read  Active Write   Maximum
I/O:              1442     41295166            0            2         75
SECTOR:         156209    750217654            0           32       2098

/*----------------------------------------------------------------------*/
```

The terms used in the output are defined as follows:

Total Read
- I/O: total number of completed Read requests
- SECTOR: total number of sectors that have been read

Total Write
- I/O: total number of completed Write requests
- SECTOR: total number of sectors that have been written

Active Read
- I/O: total number of Read requests in process
- SECTOR: total number of sectors to read in process

Active Write
- I/O: total number of Write requests in process
- SECTOR: total number of sectors to write in process

Maximum
- I/O: the maximum number of queued I/O requests
- SECTOR: the maximum number of queued sectors to Read or Write

datapath query device

The **datapath query device** command displays information about a single device, a range of devices, a specific model of supported storage devices, or all devices. If you do not enter a device number, information about all devices is displayed. You cannot use the option to specify a device model when you query with device numbers.
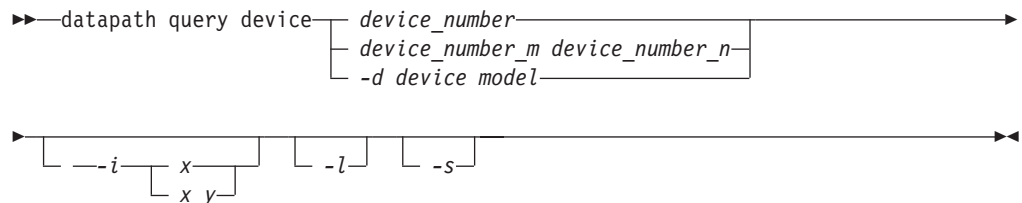
Syntax

```
►►──datapath query device──┬─ device_number ─────────────────────┬──────►
                           ├─ device_number_m device_number_n ───┤
                           └─ -d device model ───────────────────┘

 ►─┬──────────────┬──┬─────┬──┬─────┬──────────────────────────────────►◄
   └──-i─┬─ x ──┬─┘  └─ -l ┘  └─ -s ┘
         └─ x y ┘
```

Parameters

device_number
> The *device_number* refers to the device *index* number as displayed by the **datapath query device** command, rather than the SDD device number.

device_number_m device_number_n
> Use the *device_number_m device_number_n* option to provide a range of device index numbers.

-d device model [1]
> The device model that you want to display.
>
> Examples of valid device models include the following models:
>
> **2105**   Display all 2105 models (ESS).
>
> **2105F**   Display all 2105 F models (ESS).
>
> **2105800**
> > Display all 2105 800 models (ESS).
>
> **2145**   Display all 2145 models (SAN Volume Controller).
>
> **2107**   Display all DS8000 models.
>
> **1750**   Display all DS6000 models.

-i   Repeats the command every *x* seconds for *y* times. If *y* is not specified, the command will repeat every *x* seconds indefinitely.

-l   Marks the nonpreferred paths with an asterisk, displays the LUN identifier, and for AIX only, displays the qdepth_enable value.

-s   Queries the SCSI address of the device. This option is available for both SDD 1.6.1.*x* (or later) and SDDDSM 2.1.1.*x* (or later) for Windows platforms.

---

1. The option to specify a device model is supported on all platforms except Novell.

Examples

If you enter the **datapath query device 0** command, the following output is displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2145              POLICY:    Optimized
   SERIAL: 6005076801818008C000000000000065
=========================================================================
Path#      Adapter/Hard Disk      State     Mode     Select      Errors
   0          fscsi1/hdisk72       OPEN    NORMAL          0           0
   1          fscsi0/hdisk22       OPEN    NORMAL    5571118           0
   2          fscsi0/hdisk32       OPEN    NORMAL          0           0
   3          fscsi1/hdisk62       OPEN    NORMAL    5668419           0
```

If you enter the **datapath query device 0 -l** command for a device type that has preferred and nonpreferred paths, the following output is displayed:

```
DEV#:   0  DEVICE NAME: vpath0  TYPE: 2145              POLICY:    Optimized
SERIAL: 6005076801818008C000000000000065
LUN IDENTIFIER: 6005076801818008C000000000000065
=========================================================================
Path#      Adapter/Hard Disk      State     Mode     Select      Errors
   0*         fscsi1/hdisk72       OPEN    NORMAL          0           0
   1          fscsi0/hdisk22       OPEN    NORMAL    5571118           0
   2*         fscsi0/hdisk32       OPEN    NORMAL          0           0
   3          fscsi1/hdisk62       OPEN    NORMAL    5668419           0
```

Notes:

1. Usually, the *device number* and the device *index* number are the same. However, if the devices are configured out of order, the two numbers are not always consistent. To find the corresponding index number for a specific device, you should always run the **datapath query device** command first.

2. For SDD 1.4.0.0 (or later), the location of Policy and Serial Number are swapped.

The terms used in the output are defined as follows:

Dev# The number of this device defined by SDD.

Name The name of this device defined by SDD.

Type The device product ID from inquiry data.

Policy The current path selection policy selected for the device. See "datapath set device policy" on page 50 for a list of valid policies.

Serial The LUN for this device.

Path# The path number.

Adapter
The name of the adapter to which the path is attached.

Hard Disk
The name of the logical device to which the path is bound.

State The condition of the named device:
Open Path is in use.
Close Path is not being used.
Close_Dead
Path is broken and not being used.
Dead Path is no longer being used. It was either removed by SDD due to errors or manually removed using the **datapath set device M path N offline** or **datapath set adapter N offline** command.

Invalid
> The path failed to open.

Mode The mode of the named path. The mode can be either Normal or Offline.

Select The number of times this path was selected for input or output.

Errors The number of input and output errors on a path that is attached to this device.

datapath query devstats

The **datapath query devstats** command displays performance information for a single SDD device, a range of devices, a specific model of supported storage devices, or all SDD devices. If you do not enter a device number, information about all devices is displayed.

The option to specify a device model cannot be used when you query with device numbers.
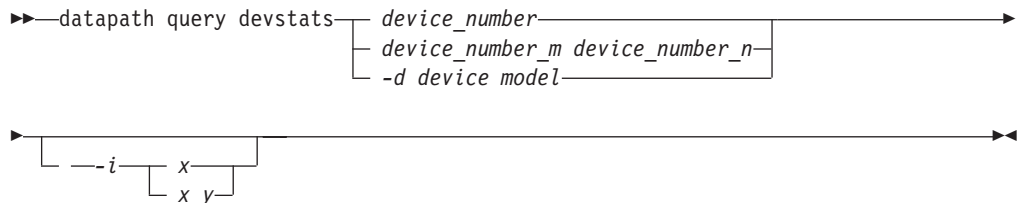
Syntax

```
►►──datapath query devstats──┬─ device_number ──────────────────┬──────────────────►
                             ├─ device_number_m device_number_n ─┤
                             └─ -d device model ─────────────────┘

►──────────────────────────────────────────────────────────────────────────────►◄
      ┌────────────────┐
      └── -i ──┬─ x ──┬─┘
               └─ x y ─┘
```

Parameters

device number
> The device number refers to the device *index* number as displayed by the **datapath query device** command, rather than the SDD device number.

device_number_m device_number_n
> Use the *device_number_m device_number_n* option to provide a range of device index numbers.

-d device model
> The device model that you want to display.
>
> **Note:** The *-d device model* option is supported on AIX only.
>
> Examples of valid device models include the following:
>
> **2105**   Display all 2105 models (ESS).
>
> **2105F** Display all 2105 F models (ESS).
>
> **2105800**
> > Display all 2105 800 models (ESS).
>
> **2145**   Display all 2145 models (SAN Volume Controller).
>
> **2107**   Display all DS8000 models.
>
> **1750**   Display all DS 6000 models.
>
> **Note:** The option to specify a device model is supported on all platforms except Novell.

-i   Repeats the command every *x* seconds for *y* times. If *y* is not specified, the command will repeat every *x* seconds indefinitely.

Examples

If you enter the **datapath query devstats 0** command, the following output is displayed:

```
Device #:   0
=============
           Total Read  Total Write  Active Read  Active Write   Maximum
I/O:              387     24502563            0             0        62
SECTOR:          9738    448308668            0             0      2098

Transfer Size:    <= 512        <= 4k       <= 16K       <= 64K     > 64K
                 4355850      1024164     19121140         1665       130

/*------------------------------------------------------------------------*/
```

The terms used in the output are defined as follows:

Total Read

- I/O: total number of completed Read requests
- SECTOR: total number of sectors that have been read

Total Write

- I/O: total number of completed Write requests
- SECTOR: total number of sectors that have been written

Active Read

- I/O: total number of Read requests in process
- SECTOR: total number of sectors to read in process

Active Write

- I/O: total number of Write requests in process
- SECTOR: total number of sectors to write in process

Maximum

- I/O: the maximum number of queued I/O requests
- SECTOR: the maximum number of queued sectors to Read or Write

Transfer size

- <= 512: the number of I/O requests received, whose transfer size is 512 bytes or less
- <= 4k: the number of I/O requests received, whose transfer size is 4 KB or less (where KB equals 1024 bytes)
- <= 16K: the number of I/O requests received, whose transfer size is 16 KB or less (where KB equals 1024 bytes)
- <= 64K: the number of I/O requests received, whose transfer size is 64 KB or less (where KB equals 1024 bytes)
- > 64K: the number of I/O requests received, whose transfer size is greater than 64 KB (where KB equals 1024 bytes)

datapath query essmap

The **datapath query essmap** command displays data collected from the sddfcmap program invoked by cfgmgr. sddfcmap issues SCSI commands directly to the disks (inquiry, read capacity, and log sense) to collect the information displayed.

Notes:

1. This command is not supported for Novell host systems.
2. This command is supported for disk storage systems only.
3. If the output of **datapath query essmap** doesn't display the correct volume group name on an HP-UX, complete the following steps:
   a. Find the process ID number (PID) of sddsrv.
   b. Enter **kill -SIGUSR1** (the PID of sddsrv).
   c. Wait for a little while and then run the **datapath query essmap** command again.

Syntax

```
►►──datapath query essmap──────────────────────────────────────►◄
```

Examples

If you enter the **datapath query essmap** command, the following output is displayed:

```
    Disk    Path    P Location    adapter    LUN SN       Type      Size  LSS  Vol  Rank  C/A   S ...
    ------  ----    - ---------- -------    ----------- -----------  ----  ---- ---  ----- ----  - ...
vpath20 hdisk1      30-60-01[FC] fscsi1  13AAAKA1200 IBM 1750-500   1.1   18    0   0000   01   Y ...
vpath20 hdisk720 * 30-60-01[FC] fscsi1  13AAAKA1200 IBM 1750-500   1.1   18    0   0000   01   Y ...
vpath20 hdisk848   20-60-01[FC] fscsi0  13AAAKA1200 IBM 1750-500   1.1   18    0   0000   01   Y ...
vpath20 hdisk976 * 20-60-01[FC] fscsi0  13AAAKA1200 IBM 1750-500   1.1   18    0   0000   01   Y ...
```

The terms used in the output are defined as follows:

Disk	The logical device name assigned by the host.
Path	The logical path name of an SDD vpath device.
P	Indicates whether the logical path is a preferred path or nonpreferred path. "*" indicates it is a nonpreferred path. This field applies only to 1750 devices.
Location	The physical location code of the host adapter through which the LUN is accessed.
Adapter	The logical adapter name assigned by the host LUN.
LUN SN	The unique serial number for each LUN within the disk storage system.
Type	The device and model.
Size	The configured capacity of the LUN.
LSS	The logical subsystem where the LUN resides. (Beginning with 1.6.3.0, the value displayed is changed from decimal to hexadecimal.)
Vol	The volume number within the disk storage system.
Rank	The unique identifier for each RAID array within the disk storage system.

C/A   The cluster and adapter accessing the array.

S   Indicates that the device is shared by two and more disk storage
                 system ports. Valid values are *yes* or *no*.

Connection   The physical location code of disk storage system adapter through
                 which the LUN is accessed.

Port   The disk storage system port through which the LUN is accessed.

RaidMode   The disk RAID mode.

datapath query portmap

The **datapath query portmap** command displays hdisk status from an disk storage system physical location code perspective.

Notes:

1. This command is not supported for Novell host systems.
2. This command is supported for disk storage systems only.
3. For Solaris, only the state of slice c of a lun is displayed. The states of other slices of the same lun might be in different states.

Syntax

```
►►──datapath query portmap────────────────────────────────────────────────────────►◄
```

Examples

If you enter the **datapath query portmap** command, the following output is displayed:

```
                      BAY-1(B1)              BAY-2(B2)              BAY-3(B3)              BAY-4(B4)
        ESSID   DISK   H1   H2   H3   H4     H1   H2   H3   H4     H1   H2   H3   H4     H1   H2   H3   H4
                      ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD
                      BAY-5(B5)              BAY-6(B6)              BAY-7(B7)              BAY-8(B8)
                       H1   H2   H3   H4     H1   H2   H3   H4     H1   H2   H3   H4     H1   H2   H3   H4
                      ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD   ABCD ABCD ABCD ABCD
        13AAAKA vpath20  O--- ---- ---- ----   O--- ---- ---- ----   ---- ---- ---- ----   ---- ---- ---- ----
        13AAAKA vpath21  Y--- ---- ---- ----   y--- ---- ---- ----   ---- ---- ---- ----   ---- ---- ---- ----

    Y  = online/open            y = (alternate path) online/open
    O  = online/closed          o = (alternate path) online/closed
    N  = offline                n = (alternate path) offline
    -  = path not configured
    PD = path down
```

The terms used in the output are defined as follows:

Y   The port is online and open, meaning that at least one path attached to this port is functional.

y   Paths connected to this port are nonpreferred paths. The port is online and open, meaning that at least one path attached to this port is functional.

O   The port is online and closed, meaning that at least one path state and mode is closed and online.

o   Paths connected to this port are nonpreferred paths. The port is online and closed, meaning that at least one path state and mode is closed and online.

N   The port is offline, meaning that all paths attached to this port are offline.

n   Paths connected to this port are nonpreferred paths. The port is offline, meaning that all paths attached to this port are offline.

-   The path is not configured.

PD   The path is down. It is either not functional or has been placed offline.

Note: The following fields apply only 1750 devices:

- y
- o

- n

The serial number of ESS devices is five digits, whereas the serial number of DS6000 and DS8000 devices is seven digits.

datapath query version

The **datapath query version** command displays the version of the SDD that is installed.

Syntax

►►──datapath query version──►◄

Parameters

None

Examples

If you enter the **datapath query version** command, the following output is displayed:

```
[root@abc]>    datapath query version
IBM SDD Version 1.6.1.0 (devices.sdd.52.rte)
```

datapath query wwpn

The **datapath query wwpn** command displays the World Wide Port Name (WWPN) of the host fibre-channel adapters.

Notes:

1. This command is available for AIX, Linux, HP, and Solaris host systems.

2. For Solaris, this option is supported on Solaris 8, 9, and 10. It requires that SNIA HBA libraries are installed in the Solaris system. The SNIA HBA library consists of the following two components:

   - common SNIA HBA library
   - vendor-specific SNIA HBA library

   The common SNIA HBA library is included in the Solaris 10 installation, but users need to download the common SNIA HBA library from SUN for Solaris 8 and 9. The vendor-specific SNIA HBA library is provided by each HBA vendor.

3. Because this command is only for fibre-channel adapters, it does not display the WWPN of Serial Attached SCSI (SAS) HBAs that are used to connect to BladeCenter devices on Windows hosts.

Syntax

```
►►──datapath query wwpn─────────────────────────────────────────────────────►◄
```

Parameters

None

Examples

If you enter the **datapath query wwpn** command, the following output is displayed:

```
[root@abc]>     datapath query wwpn
Adapter Name    PortWWN
fscsi0          10000000C925F5B0
fscsi1          10000000C9266FD1
```

datapath remove adapter

The **datapath remove adapter** command dynamically removes an adapter and all paths attached to this adapter from SDD. This command is used when a new adapter must be installed, for example, due to failure of an existing adapter. SDD reserves the last path of a device. If all accessible paths to a device are attached to one adapter, this command will fail.

Note: The newly installed adapter can be reclaimed with the **addpaths** command. For detailed procedures, see "SDD utility programs" in Chapter 2 of the *SDD User's Guide*.

Note: This command is available for AIX host systems only.

Syntax

►►──datapath remove adapter─*adapter number*──────────────────────────────────►◄

Parameters

adapter number
> The index number of the adapter that you want to remove.

Examples

If you enter the **datapath query adapter** command, the following output is displayed:

```
+---------------------------------------------------------------------------+
|Active Adapters :4                                                         |
|                                                                           |
|Adpt#            Name    State     Mode      Select      Errors  Paths  Active|
|   0           fscsi0  NORMAL    ACTIVE      62051          0     10     10|
|   1           fscsi1  NORMAL    ACTIVE      65386          3     10     10|
|   2           fscsi2  NORMAL    ACTIVE      75697         27     10     10|
|   3           fscsi3  NORMAL    ACTIVE       4788         35     10     10|
+---------------------------------------------------------------------------+
```

If you enter the **datapath remove adapter 0** command:

- The entry for Adpt# 0 disappears from the **datapath query adapter** command output.
- All paths attached to adapter 0 disappear from the **datapath query device** command output.
- This can be done while I/O is running.

```
+---------------------------------------------------------------------------+
|Active Adapters :3                                                         |
|                                                                           |
|Adpt#            Name    State     Mode      Select      Errors  Paths  Active|
|   1           fscsi1  NORMAL    ACTIVE      65916          3     10     10|
|   2           fscsi2  NORMAL    ACTIVE      76197         27     10     10|
|   3           fscsi3  NORMAL    ACTIVE       4997         35     10     10|
+---------------------------------------------------------------------------+
```

Note that Adpt# 0 fscsi0 is removed and the Select counts are increased on other three adapters, indicating that I/O is still running.

datapath remove device path

The **datapath remove device path** command dynamically removes a specific path of an SDD vpath device that is attached to an adapter. SDD reserves the last path of an SDD vpath device. If the requested path is the only accessible path to an SDD vpath device, the command will fail.

Notes:

1. A removed path can be reclaimed by using the **addpaths** command. See "SDD utility programs" in Chapter 2 of the *SDD User's Guide*.
2. This command is available for AIX host systems only.

Syntax

```
►►──datapath remove device──device number──path──path number─────────────────────►◄
```

Parameters

device number
> The device number shown in the output of the **datapath query device** command.

path number
> The path number shown in the output of the **datapath query device** command.

Examples

If you enter the **datapath query device 0** command, the following output is displayed:

```
+------------------------------------------------------------------+
|DEV#:   0  DEVICE NAME: vpath0  TYPE: 2105E20 POLICY: Optimized    |
| SERIAL: 20112028                                                 |
|                                                                  |
|==================================================================|
|Path#      Adapter/Hard Disk    State    Mode      Select  Errors |
|   0       fscsi1/hdisk18       OPEN     NORMAL       557       0  |
|   1       fscsi1/hdisk26       OPEN     NORMAL       568       0  |
|   2       fscsi0/hdisk34       OPEN     NORMAL       566       0  |
|   3       fscsi0/hdisk42       OPEN     NORMAL       545       0  |
+------------------------------------------------------------------+
```

If you enter the **datapath remove device 0 path 1** command, the entry for DEV# 0 Path# 1 (that is, fscsi1/hdisk26) disappears from the **datapath query device 0** command output and the Path#'s are rearranged.

```
+------------------------------------------------------------------+
|Success: device 0 path 1 removed                                  |
|                                                                  |
|DEV#:   0  DEVICE NAME: vpath0  TYPE: 2105E20 POLICY: Optimized    |
| SERIAL: 20112028                                                 |
|==================================================================|
|Path#      Adapter/Hard Disk    State    Mode      Select  Errors |
|   0       fscsi1/hdisk18       OPEN     NORMAL       567       0  |
|   1       fscsi0/hdisk34       OPEN     NORMAL       596       0  |
|   2       fscsi0/hdisk42       OPEN     NORMAL       589       0  |
+------------------------------------------------------------------+
```

Note that fscsi1/hdisk26 is removed and Path# 1 is now fscsi0/hdisk34.

The **addpaths** command reclaims the removed path. The mode of the added path is set to NORMAL and its state to either OPEN or CLOSE, depending on the device state.

```
+-----------------------------------------------------------------+
|DEV#:   0  DEVICE NAME: vpath0  TYPE: 2105E20 POLICY: Optimized |
| SERIAL: 20112028                                                |
|=================================================================|
|Path#      Adapter/Hard Disk    State    Mode     Select  Errors|
|   0       fscsi1/hdisk18       OPEN     NORMAL      580       0|
|   1       fscsi0/hdisk34       OPEN     NORMAL      606       0|
|   2       fscsi0/hdisk42       OPEN     NORMAL      599       0|
|   3       fscsi1/hdisk26       OPEN     NORMAL       14       0|
+-----------------------------------------------------------------+
```

Note that fscsi1/hdisk26 is back online with Path# 3 and is selected for I/O.

datapath set adapter

The **datapath set adapter** command sets all SDD vpath device paths attached to an adapter either to online or offline.

SDD reserves the last path of an SDD vpath device. If all accessible paths to an SDD vpath device are attached to one adapter, the offline option will fail.

Note: The **datapath set adapter offline** command can be entered even when the SDD vpath device is closed.

Syntax

```
►►──datapath set adapter──adapter number──┬─ online ──┬────────────────────────────►◄
                                          └─ offline ─┘
```

Parameters

adapter number
> The index number of the adapter that you want to change.

online
> Sets the adapter online.

offline
> Sets the adapter offline.

Examples

If you enter the **datapath set adapter 0 offline** command:
- The mode of Adapter 0 will be changed to OFFLINE while the state of the adapter remains the same.
- All paths attached to adapter 0 change to OFFLINE mode and their states change to Dead, if they were in the Open state.

You can use the **datapath set adapter 0 online** command to cause an adapter that is offline to come online:
- Adapter 0's mode changes to ACTIVE and its state to NORMAL.
- The mode of all paths attached to adapter 0 changes to NORMAL and their state to either OPEN or CLOSE depending on the SDD vpath device state.

datapath set device policy

The **datapath set device policy** command dynamically changes the path selection policy per SDD vpath device.

Syntax

►►──datapath set device── *device_num1* ──────────────── policy─*option* ──────────►◄
                                      └─ *device_num2* ─┘

Note: This command is available for AIX, Linux, HP, and SUN host systems only.

Parameters

device number1 [device number2]
    When two device numbers are entered, this command will apply to all the devices whose index numbers fit within the range of these two device index numbers.

option
    Specifies one of the following policies:
    - **rr**, where *rr* indicates round robin
    - **rrs**, where *rrs* indicates round robin sequential (AIX and Linux Only)
    - **lb**, where *lb* indicates load balancing (also known as optimized policy)
    - **lbs**, where *lbs* indicates load balancing sequential (AIX and Linux Only)
    - **df**, where *df* indicates the default policy, which is load balancing
    - **fo**, where *fo* indicates failover policy

Note: You can enter the **datapath set device** *N* **policy** command to dynamically change the policy associated with SDD vpath devices in either Close or Open state.

Examples

If you enter **datapath set device 2 7 policy rr**, the path-selection policy of SDD vpath devices with device index 2 to 7 is immediately changed to the round robin policy.

datapath set device path

The **datapath set device path** command sets the path of an SDD vpath device either to online or offline. You cannot remove the last path to an SDD vpath device from service. This prevents a data access failure from occurring. The **datapath set device path** command can be entered even when the SDD vpath device is closed.

Syntax

►►—datapath set device–*device number*–path–*path number*─┬─ online ─┬─────────►◄
                                                          └─ offline ─┘

Parameters

device number
    The device index number that you want to change.

path number
    The path number that you want to change.

online
    Sets the path online.

offline
    Removes the path from service.

Examples

If you enter the **datapath set device 0 path 0 offline** command, path 0 for device 0 changes to Offline mode.

datapath set qdepth

The **datapath set qdepth** command dynamically sets the queue depth logic of an SDD vpath device to either *enable* or *disable* even when I/O is running.

Note: This command is available for AIX host systems only.

Syntax

```
►►──datapath set device──┬──────┬──┬──────┬──qdepth──┬─ enable ──┬──────────────────────►◄
                         └─ n ──┘  └─ m ──┘           └─ disable ─┘
```

Parameters

n The beginning vpath number for which the queue depth logic setting is to be applied.

m Then ending vpath number for which the queue depth logic setting is to be applied.

Enable
    Enable the queue depth logic.

Disable
    Disable the queue depth logic.

Examples

If you enter the **datapath set device 0 2 qdepth disable** command, the following output is displayed:

```
Success: set qdepth_enable to no for vpath0

Success: set qdepth_enable to no for vpath1

Success: set qdepth_enable to no for vpath2
```

The qdepth_enable ODM attribute of these SDD vpath devices is updated. The following output is displayed when you enter **lsattr -El vpath0**.

```
# lsattr -El vpath0
active_hdisk  hdisk66/13AB2ZA1020/fscsi3            Active hdisk                 False
active_hdisk  hdisk2/13AB2ZA1020/fscsi2             Active hdisk                 False
active_hdisk  hdisk34/13AB2ZA1020/fscsi2            Active hdisk                 False
active_hdisk  hdisk98/13AB2ZA1020/fscsi3            Active hdisk                 False
policy        df                                    Scheduling Policy            True
pvid          0005f9fdcda4417d0000000000000000      Physical volume identifier   False
qdepth_enable no                                    Queue Depth Control          True
reserve_policy PR_exclusive                         Reserve Policy               True
serial_number 13AB2ZA1020                           LUN serial number            False
unique_id     yes                                   Device Unique Identification False
```

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