



AssuredSAN 3000 Series

Installing Optional Software for Microsoft Windows Server

Copyright © 2011 Dot Hill Systems Corp. All rights reserved. Dot Hill Systems Corp., Dot Hill, the Dot Hill logo, AssuredSAN, AssuredSnap, AssuredCopy, AssuredRemote, EcoStor, SimulCache, R/Evolution, and the R/Evolution logo are trademarks of Dot Hill Systems Corp. All other trademarks and registered trademarks are proprietary to their respective owners.

The material in this document is for information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, changes in the product design can be made without reservation and without notification to its users.



Adobe PostScript

Contents

About this guide	5
Intended audience	5
Prerequisites	5
Related documentation	5
Document conventions and symbols	6
1 Installing host software components	7
Before you begin	7
What's new in this release	7
Overview of the R/Evolution software components	7
CAPI proxy	7
MPIO DSM	8
VDS provider	8
VSS provider	8
SES driver	8
2 Windows 2003 planning and installation	9
Installation requirements	9
CAPI proxy (Windows 2003)	9
VDS provider (Windows 2003)	9
VSS provider (Windows 2003)	10
SES driver (Windows 2003)	10
MPIO DSM (Windows 2003)	10
Verifying your Windows 2003 installations	11
Verifying an MPIO installation	11
Verifying a VDS provider installation	12
Verifying a VSS installation	13
Known issues with Windows Server 2003 MPIO installations	13
Dot Hill MPIO DSM	13
Microsoft MPIO driver subsystem	13
3 Windows Server 2008 planning and installation	15
Installation requirements	15
CAPI proxy (Windows Server 2008)	15
VDS provider (Windows Server 2008)	15
VSS provider (Windows Server 2008)	16
SES driver (Windows Server 2008)	16
MPIO DSM (Windows Server 2008)	16
Upgrading from Windows Server 2003	17
Installing the native 2008 MPIO DSM	18
Installing the native 2008 MPIO DSM from the command line	22
Verifying your installations	23
Managing MPIO LUNs	23
Verifying the VDS provider installation	24
Verifying a VSS installation	25
4 Using the MPIO DSM	27
Windows native MPIO DSM on Windows Server 2008 or Windows Server 2008 R2	27
Using the dsmcli command-line utility	27
clear	27
devinfo	28
pathinfo	29
policies	30
primary	30

weight	31
mpiolist	32
pgr	33
pgr list	34
pgr tur	34
5 Using the Dot Hill VDS hardware provider	35
Hotfix recommendations	35
Storage Manager for SANs	35
Supported Microsoft DiskRaid commands	35
LUN 0 mapping	36
Modifying the Microsoft Windows Server 2008 default SAN policy for newly discovered disks	37
HBA driver reconfiguration	37
6 Using the Dot Hill VSS hardware provider	39
Supported features	39
Hotfix recommendations	39
Creating shadow copies	39
LUN 0 mapping	40
64-bit VSS clients	40
Ensuring read-write access of VSS shadow copies	40
Restoring read-write access	41
Resolving VSS provider snap pool problems on 2730 controllers	41
Insufficient free space on the vdisk	41
Snap pools are automatically deleted	42
Solution	42
7 Troubleshooting	43
MPIO DSM troubleshooting	43
Windows native MPIO DSM on Windows Server 2008 or Windows Server 2008 R2	43
Dot Hill MPIO DSM on 2003 Server	43
VDS provider troubleshooting	43
VSS provider troubleshooting	44
8 Uninstalling R/Evolution Host Software Components	47
Uninstalling the MPIO DSM	47
Uninstalling the VDS Hardware Provider	47
Uninstalling the VSS Hardware Provider	47
Uninstalling the CAPI Proxy	48

About this guide

This guide provides information about managing an AssuredSAN™ 3000 Series storage system by using its web interface, RAIDar Storage Management Utility.

Intended audience

This guide is intended for storage system administrators.

Prerequisites

Prerequisites for using this product include knowledge of:

- Network administration
- Storage system configuration
- Storage area network (SAN) management and direct attach storage (DAS)
- Fibre Channel, and Ethernet protocols

Related documentation

For information about	See
Enhancements, known issues, and late-breaking information not included in product documentation	Release Notes
Overview of product shipkit contents and setup tasks	Getting Started*
Regulatory compliance and safety and disposal information	AssuredSAN Product Regulatory Compliance and Safety*
Installing and using optional host-based software components (CAPI Proxy, MPIO DSM, VDS Provider, VSS Provider, SES Driver)	AssuredSAN Installing Optional Software for Microsoft Windows® Server
Recommendations for using optional data-protection features (AssuredSnap, AssuredCopy, AssuredRemote)	AssuredSAN 3000 Series Using Data Protection Software
Using a rackmount bracket kit to install an enclosure into a rack	AssuredSAN Rackmount Bracket Kit Installation* <i>or</i> AssuredSAN 2-Post Rackmount Bracket Kit Installation*
Product hardware setup and related troubleshooting	AssuredSAN 3000 Series Setup Guide
Obtaining and installing a license to use licensed features	AssuredSAN 3000 Series Obtaining and Installing a License Certificate File
Using the web interface to configure and manage the product	AssuredSAN 3000 Series RAIDar User Guide
Using the command-line interface (CLI) to configure and manage the product	AssuredSAN 3000 Series CLI Reference Guide
Event codes and recommended actions	AssuredSAN Event Descriptions Reference Guide
Identifying and installing or replacing field-replaceable units (FRUs)	AssuredSAN 3000 Series FRU Installation and Replacement Guide


* Printed document included in product shipkit.

For additional information, see Dot Hill's Customer Resource Center web site: <http://crc.dothill.com>.


Document conventions and symbols


Table 1 Document conventions

Convention	Element
Blue text	Cross-reference links and e-mail addresses
Blue, underlined text	Web site addresses
Bold font	<ul style="list-style-type: none">• Key names• Text typed into a GUI element, such as into a box• GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
<i>Italics font</i>	Text emphasis
Monospace font	<ul style="list-style-type: none">• File and directory names• System output• Code• Text typed at the command-line
<i>Monospace, italic font</i>	<ul style="list-style-type: none">• Code variables• Command-line variables
Monospace, bold font	Emphasis of file and directory names, system output, code, and text typed at the command line

 **WARNING!** Indicates that failure to follow directions could result in bodily harm or death.

 **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:** Provides clarifying information or specific instructions.

 **NOTE:** Provides additional information.

 **TIP:** Provides helpful hints and shortcuts.

1 Installing host software components

Before you begin

This document describes how to install host software packages that work with Dot Hill™ AssuredSAN™ and R/Evolution™ storage systems.

The installation requirements and procedures for Windows Server 2003 and Windows Server 2008 or Windows Server 2008 R2s differ. Be sure to read the overview section in this chapter and then read the appropriate chapter for your installation:

- Chapter 2 - *Windows 2003 Planning and Installation*
- Chapter 3 - *Windows Server 2008 Planning and Installation*


The overview section below introduces the Software Components and provides background information for installation on either platform.

What's new in this release

This software version is required for use with TS230 firmware on any AssuredSAN or R/Evolution 2000 Family, 2002 Family, 3000 Family, or 5000 Family storage system, as most of its firmware components have been modified to mirror changes to the in-band management API in the TS230 firmware.


Dot Hill products previously identified as R/Evolution systems have now been branded as AssuredSAN rather than R/Evolution. References within this document to Dot Hill, R/Evolution, or AssuredSAN can safely be regarded as the same.

The MPIO DSM version remains the same as the previous release of this software.

 **NOTE:** Because multiple software versions, product models, and operating system versions are all covered by the same document, you might find occasional differences between product directories and product names or model numbers shown here and what you see on your computer. In all cases, these variations will be obvious and you can safely substitute what you see on your computer for what you see in this document. Instructions specific to these hardware provider versions are also included with the software you download.

Overview of the R/Evolution software components

This section provides a brief explanation of the software components available for installation: the R/Evolution Configuration API (CAPI), the Microsoft Multipath Input/Output (MPIO) solution, the R/Evolution Virtual Disk Service (VDS) Provider, the R/Evolution Volume Shadow Copy Service (VSS) Provider, and the SCSI Enclosure Services (SES) driver.

 **NOTE:** The R/Evolution branding of Dot Hill products has recently been replaced by the AssuredSAN brand. However, the optional host software applies equally to AssuredSAN and earlier R/Evolution storage systems. In some cases, the R/Evolution term is still used in filenames and directory names. In this document, R/Evolution, AssuredSAN, and Dot Hill all refer to the same products.

CAPI proxy


The CAPI component enables in-band management from host-based applications and must be installed on all hosts running R/Evolution VDS or VSS providers.

MPIO DSM

Multipathing solutions, are designed to provide failover protection through the use of redundant physical path components (cables, adapters, and switches) between the server and the storage device. Multipathing also permits the redistribution of the read/write load among multiple paths, reducing bottlenecks and balancing work loads.


- If you are installing MPIO on Windows Server 2003, use the Setup Wizard to install the Dot Hill MPIO DSM which works in conjunction with the Microsoft MPIO solution. Read the chapter “Verifying your Windows 2003 installations” on page 11 for details.
- If you are using Windows Server 2003 and AssuredSAN or R/Evolution iSCSI storage arrays, the required MPIO DSM is included in the Microsoft iSCSI Software Initiator. Note that the Dot Hill MPIO DSM and the MPIO DSM included with the Microsoft iSCSI Software Initiator can be installed side-by-side on the same server if AssuredSAN or R/Evolution iSCSI and FC storage arrays are both installed.
- If you are upgrading to Windows Server 2008 from Windows Server 2003 with the Dot Hill MPIO DSM already installed, see “Upgrading from Windows Server 2003” on page 17.
- If you are installing MPIO on Windows Server 2008, you should install the native Multipath-IO Optional Component included with Microsoft Server 2008. Read the chapter “Installing the native 2008 MPIO DSM” on page 18 for details.

VDS provider

 **NOTE:** R/Evolution VDS is a licensed option. To use the R/Evolution VDS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The *R/Evolution Virtual Disk Service Hardware Provider* is software that allows Windows to automatically install and register a storage device that you have added, enabling the array to be managed from within the Windows environment. After the *R/Evolution VDS Hardware Provider* is installed, *DiskRaid* and *Storage Manager for SANs* from Microsoft or VDS client utilities from other third-party vendors can be used to configure and manage your array. Read [Using the Dot Hill VDS hardware provider](#) on page 35 for details.

VSS provider

 **NOTE:** R/Evolution VSS is a licensed option. To use the R/Evolution VSS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The Microsoft Windows Server operating system provides enhanced services for managing storage area networks, including Volume Shadow Copy Service. VSS, with its standard set of extensible APIs, provides the backup infrastructure for Windows Server, as well as a mechanism for creating consistent point-in-time copies of data known as shadow copies. VSS provides interfaces to ensure that volume shadow copies are in a consistent state.

The *R/Evolution VSS Hardware Provider* installs on a Windows server and enables VSS to create hardware-resident shadow copies on any R/Evolution Family array attached to the server. With the *R/Evolution VSS Hardware Provider* and VSS, you can create a shadow copy of the source data volume on one server and then import the shadow copy onto another server (or back to the same server).

SES driver

The SCSI Enclosure Services (SES) driver component is a “null driver” which prevents Windows from displaying New Hardware Found dialogs at boot time. This component should be installed only on Windows Server 2003; Microsoft provides an equivalent driver in Windows Server 2008.

2 Windows 2003 planning and installation

This chapter discusses host component dependencies, inter-dependences, and known issues that you should consider prior to installing R/Evolution host software components on Windows 2003. The last half of this chapter discusses the installation procedure using the *R/Evolution Host Software Setup Wizard*.


- If you are upgrading to Windows Server 2008 from Windows Server 2003 with the Dot Hill MPIO DSM already installed, see “Upgrading from Windows Server 2003” on page 17.

Installation requirements

Each of the software components described in this document can be downloaded from Dot Hill’s Customer Resource Center at <http://crc.dothill.com>. Choose AssuredSAN & R/Evolution Products from the left pane and then select Software Downloads.

CAPI proxy (Windows 2003)

Download the CAPI Proxy zip file from the Customer Resource Center page that also contains the VDS and VSS Hardware Providers software. Installing it will upgrade existing CAPI Proxy versions 2.2 or later. CAPI Proxy versions prior to 2.2 should be removed before installing a newer version.

 **NOTE:** If you have already installed the Dot Hill CAPI Proxy v. 2.8 (with the VSS or VDS installation package), you need not reinstall it. If you have an older version installed, upgrade it to version 2.8 or later.

Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files.

To remove a CAPI Proxy version older than 2.2, select R/Evolution CAPI Proxy from the Microsoft Add Remove Programs list and uninstall it.

- The CAPI Proxy must be installed on all systems running R/Evolution VDS or VSS providers.

VDS provider (Windows 2003)

Download the VDS Provider zip file that is appropriate for your operating system from the Customer Resource Center.

 **NOTE:** Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

This release can be installed directly on top of previous releases of the P2000/MSA2000 VDS Provider, versions 2.2 or later.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files. Follow the installation instructions in the `readme.txt` file.

 **NOTE:** VDS is a licensed option. To use the VDS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The VDS Hardware Provider requires the following software:

- Dot Hill MPIO DSM 2.6 or later – only required if you have redundant paths to Dot Hill Fibre Channel or SAS storage arrays (Windows Server 2003 only)
- Windows Server 2003 Service Pack 2.
- R/Evolution CAPI Proxy 2.6 or later.

There are two separate VDS Providers that can be installed:

- For storage systems that have Fibre Channel and/or SAS host connections install the *FC/SAS VDS Provider*.
- For storage systems that have iSCSI connections install the *iSCSI VDS Provider*.

For storage systems that have a Fiber Channel or SAS storage system, and also have an iSCSI storage system connection to the same server, install both VDS providers.

In environments with 3920 or 3930 multiprotocol FC/iSCSI controllers, install either the Fibre Channel VDS provider or the iSCSI VDS provider, depending on which interface is connected to the host. Do not connect both iSCSI and FC ports from the same controller to the same host. VDS Providers for the different protocols are not supported concurrently for the same controller.


VSS provider (Windows 2003)

Download the VSS Provider zip file that is appropriate for your operating system from the Customer Resource Center.

 **NOTE:** Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

 **NOTE:** If you have already installed the Dot Hill CAPI Proxy v. 2.8 (with the VDS installation package), you need not reinstall it. If you have an older version installed, upgrade it to version 2.8 or later.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files. Follow the installation instructions in the `readme.txt` file.

 **NOTE:** R/Evolution VSS is a licensed option. To use the R/Evolution VSS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The *R/Evolution VSS Hardware Provider* requires the following software:

- Windows Server 2003 Service Pack 2.
- R/Evolution CAPI Proxy 2.6 or later.

SES driver (Windows 2003)

The SES driver should always be installed on Windows Server 2003 to avoid the `New Hardware Found` dialog boxes at boot time.

Download the SES driver.zip file from the Customer Resource Center.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files.

MPIO DSM (Windows 2003)

The MPIO installation dependencies can be somewhat complicated compared to the other host software components and may require additional steps to be taken prior to installation.

- In general, the *Dot Hill MPIO DSM* should be installed only on Windows Server 2003, and only if there are multiple paths to a SAS or FC subsystem. It should not be installed if there are only iSCSI paths. Read the following sections to understand the steps that you may need to take prior to installation.
- Windows Server 2003 (Service Pack 2) is required.
- If you are using an iSCSI controller enclosure, the required MPIO DSM is included in the Microsoft iSCSI Software Initiator. Installation of the Dot Hill MPIO DSM is not required.
- Note that the Dot Hill MPIO DSM and the MPIO DSM included with the Microsoft iSCSI Software Initiator may be installed side-by-side if your server is attached to a FC Controller Enclosure and an iSCSI Controller Enclosure.
- Use the *R/Evolution Host Software Setup Wizard* to install the *Dot Hill MPIO DSM*, which works in conjunction with the Microsoft MPIO solution, and includes drivers and utilities for managing multipathing on your array. See the “*Verifying your Windows 2003 installations*” on page 11 in this chapter for details about installing and configuring the MPIO DSM.

Verifying your Windows 2003 installations

Verifying an MPIO installation

The Windows Server Device Manager enables you to display or change devices, paths, and load balance policies, and enables you to diagnose and troubleshoot the DSM. After initial installation of the MPIO DSM, use the DSMCLI command line utility to verify installation. To run `dsmcli` from the Windows Start menu, click Start > All Programs > R-Evolution > MPIO Configuration.

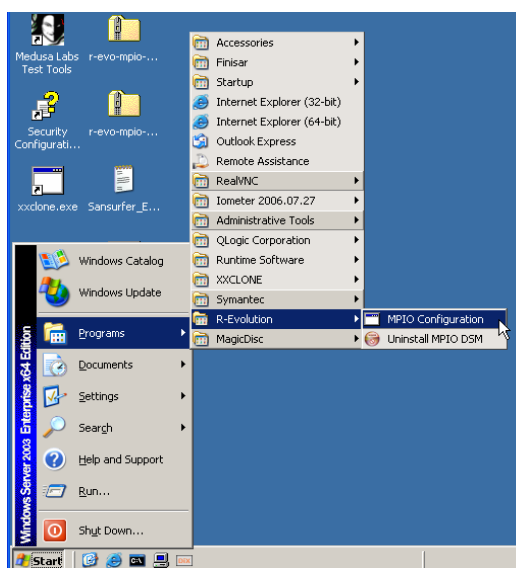


Figure 1 DSMCLI Utility Selected

To run `dsmcli` from the command-line prompt, open a command line window, navigate to the directory in which the MPIO DSM was installed

(`C:\Program Files\R-Evolution\R-Evolution MPIO DSM` by default), and enter the following command:

```
dsmcli
```

To verify that the Dot Hill MPIO DSM is installed, type `dev` on the command line. If all physical components are connected and functional, the `nPaths` column should show an integer greater than 1 for each Device in column one (the number of paths available to the device).

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	RoundRobin	2	N/A
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failover
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-off
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failback-on
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-on
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

For more details see using “Using the `dsmcli` command-line utility” on page 27. To learn more about how to use the MPIO DSM, see [Using the MPIO DSM](#) on page 27.

Verifying a VDS provider installation

To verify the installation, run the `diskraid` command, and make sure that “R/Evolution VDS Provider” is displayed in the list of providers

```
>diskraid
Microsoft Diskraid version 5.2.3790
Copyright (c) 2003 Microsoft Corporation
DISKRAID> list providers
```

Prov ###	Name	Version	Type
Prov 0	R/Evolution VDS Provider	2.3.0.19	FC
Prov 1	R/Evolution iSCSI VDS Provider	2.3.0.19	iSCSI

To learn about how to use the VDS provider, see [Using the Dot Hill VDS hardware provider](#) on page 35

Verifying a VSS installation

To verify the installation, run the `list providers` command, and make sure that “R/Evolution VSS Provider” is displayed in the list of providers.

```
>vssadmin list providers
vssadmin 1.1 - Volume Shadow Copy Service administrative command-line tool
(C) Copyright 2001 Microsoft Corp.
```

```
Provider name: 'Microsoft Software Shadow Copy provider 1.0'
Provider type: System
Provider ID: {b5946137-7b9f-4925-af80-51abd60b20d5}
Version: 1.0.0.7
```

```
Provider name: 'R/Evolution VSS Provider'
Provider type: Hardware
Provider ID: {bd04cbf9-212c-4553-9ea5-c5bfb05ccc8f}
Version: 2.3.0.19
```

To learn more about using the VSS Provider, see [Using the Dot Hill VSS hardware provider](#) on page 39.

Known issues with Windows Server 2003 MPIO installations

This section describes the known issues that you should review prior to installing the Dot Hill MPIO DSM on Windows Server 2003.

Dot Hill MPIO DSM

- Removing the *Dot Hill MPIO DSM* (prior to version 2.3) may cause DSMs from other vendors fail.
Workaround: Unless you are planning on reinstalling a new version immediately after removing the Dot Hill MPIO DSM, do not remove it; otherwise, reinstall the other DSMs after removing the *Dot Hill MPIO DSM*.
- Uninstalling the *Dot Hill MPIO DSM* package may fail with a message referring to `iKernel.exe`. This is likely an InstallShield error that can occur if another software package created with InstallShield has been added to the system.
Workaround: Reinstall the newly added software package to repair the damage caused by InstallShield, and then uninstall the *Dot Hill MPIO DSM* package.
- The Dot Hill MPIO DSM is not for hosts connected to the 2330, 3320, or 3330 iSCSI Controller Enclosure. The Microsoft iSCSI Software Initiator includes the MPIO DSM that is required for iSCSI. However, both DSMs can be installed side-by-side on the same server if both an R/Evolution or AssuredSAN FC Controller Enclosure and iSCSI Controller Enclosure are installed.

Microsoft MPIO driver subsystem

The Microsoft MPIO Driver Subsystem is installed along with the Dot Hill DSM. The following are known Microsoft issues regarding its MPIO Driver Subsystem:

- Uninstall of the DSM does not always complete. You may need to reboot your system to remove the DSM.
- If MPIO is being installed on a system with mirrored disks, the disks may appear as “failed redundancy.” This is caused by the MPIO installation restarting the disk stacks.
Workaround: To prevent the mirrored disks from displaying the “failed redundancy” status, ensure that all applications that use the `dmadmin` service are not running at the time of MPIO installation. These applications include, but are not limited to `diskmgmt.msc` and `diskpart.exe`.
- Other port filter drivers might interfere with the proper function of MPIO solutions. Microsoft does not recommend the use of these drivers.

3 Windows Server 2008 planning and installation

This chapter discusses host component dependencies, interdependences, and known issues that you should consider prior to installing R/Evolution host software components on Windows Server 2008 including the installation of the native Windows Server 2008 MPIO DSM. The latter part of this chapter discusses the installation procedure using the *R/Evolution Host Software Setup Wizard*.


- If you are upgrading to Windows Server 2008 from Windows Server 2003 with the Dot Hill MPIO DSM already installed, see “Upgrading from Windows Server 2003” on page 17.

Installation requirements

Each of the software components described in this document can be downloaded from Dot Hill’s Customer Resource Center at <http://crc.dothill.com>. Choose AssuredSAN & R/Evolution Products from the left pane and then select Software Downloads.

CAPI proxy (Windows Server 2008)

Download the CAPI Proxy zip file from the Customer Resource Center page that also contains the VDS and VSS Hardware Providers software. Installing it will upgrade existing CAPI Proxy versions 2.2 or later. CAPI Proxy versions prior to 2.2 should be removed before installing a newer version.

 **NOTE:** If you have already installed the Dot Hill CAPI Proxy v. 2.8 (with the VDS or VSS installation package), you need not reinstall it. If you have an older version installed, upgrade it to version 2.8 or later.

Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files.

To remove a CAPI Proxy version older than 2.2, select R/Evolution CAPI Proxy from the Microsoft Add Remove Programs list and uninstall it. The CAPI Proxy must be installed on all systems running R/Evolution VDS or VSS providers.

VDS provider (Windows Server 2008)

Download the VDS Provider zip file that is appropriate for your operating system from the Customer Resource Center.

 **NOTE:** Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

 **NOTE:** If you have already installed the Dot Hill CAPI Proxy v. 2.8 (with the VSS installation package), you need not reinstall it. If you have an older version installed, upgrade it to version 2.8 or later.

This release can be installed directly on top of previous releases of the VDS Provider, versions 2.2 or later.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files. Follow the installation instructions in the `readme.txt` file.

 **NOTE:** VDS is a licensed option. To use the VDS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The *R/Evolution VDS Hardware Provider* requires the following software:

- If you have multiple paths to your storage the Microsoft's native Windows Server 2008 MPIO DSM is required.
- Windows Server 2008.
- CAPI Proxy 2.6 or later. To remove CAPI Proxy versions earlier than version 2.2. See *CAPI Proxy* above.

There are two separate VDS Providers that can be installed:

If you have Fibre Channel and/or SAS host connections install the FC/SAS VDS Provider.

If your storage system is iSCSI, install the iSCSI VDS Provider.

Install both VDS providers if you have a Fiber Channel or SAS storage system and also have an iSCSI storage system connected.

In environments with 3920 or 3930 multiprotocol FC/iSCSI controllers, install either the Fibre Channel VDS provider or the iSCSI VDS provider, depending on which interface is connected to the host. Do not connect both iSCSI and FC ports from the same controller to the same host. VDS Providers for the different protocols are not supported concurrently for the same controller.


VSS provider (Windows Server 2008)

- Download the VSS Provider zip file that is appropriate for your operating system from the Customer Resource Center.

 **NOTE:** Install the CAPI Proxy before installing either the VDS Provider or VSS Provider.

 **NOTE:** If you have already installed the Dot Hill CAPI Proxy v. 2.8 (with the VDS installation package), you need not reinstall it. If you have an older version installed, upgrade it to version 2.8 or later.

Unpack the downloaded zip file into any convenient directory. A subdirectory will be created which contains a `setup.exe` file along with other files necessary for the installation; do not attempt to execute the `setup.exe` from the zip file without first extracting all the files. Follow the installation instructions in the `readme.txt` file.

 **NOTE:** VSS is a licensed option. To use the VSS Hardware Provider, you must first obtain and install a license certificate. Refer to the document *Obtaining and Installing the License Certificate File* on the Customer Resource Center Web site: <http://crc.dothill.com>.

The VSS Hardware Provider requires the following software:

CAPI Proxy 2.6 or later.

SES driver (Windows Server 2008)

The SES driver is not required for Windows Server 2008.

MPIO DSM (Windows Server 2008)

In general, the native Windows Server 2008 MPIO DSM should be installed if there are multiple paths to a SAS or FC subsystem.

You may also elect to install the Dot Hill MPIO DSM on Windows Server 2008 where the native 2008 MPIO DSM is already resident. A CLI for advanced users will be installed for troubleshooting purposes. The Dot Hill MPIO DSM itself will not be enabled.

If you are using Windows Server 2008 and your array is an iSCSI Controller Enclosure, the required MPIO DSM is already included in the Microsoft iSCSI Software Initiator.

The Microsoft Windows Server 2008 native MPIO DSM and the Microsoft MPIO DSM included with the Microsoft iSCSI Software Initiator may be installed side-by-side if your server has an R/Evolution FC Controller Enclosure and an iSCSI Controller Enclosure attached. Note that both of these packages are native Microsoft applications and are not installed by the R/Evolution Install Wizard.


If you are upgrading to Windows Server 2008 from Windows Server 2003 with the Dot Hill MPIO DSM already installed, see “Upgrading from Windows Server 2003” on page 17.

Upgrading from Windows Server 2003

If you have installed the Dot Hill MPIO DSM and are upgrading from Windows Server 2003 to Windows Server 2008, it is recommended that you uninstall the Dot Hill MPIO DSM prior to performing the upgrade.

 **NOTE:** While it is possible to upgrade to Windows Server 2008 with the Dot Hill MPIO DSM installed, it is not a supported configuration. If the Dot Hill MPIO DSM remains installed on a Windows Server 2008 system, it can be removed using Programs & Features from the Windows Control Panel.

1. Shut down the host.
2. Disconnect the storage array.

 **NOTE:** Although it is not necessary to disconnect the storage array from the host while uninstalling and installing the MPIO DSM, depending on the number of paths and LUNs in the configuration, the process may complete significantly faster with the array disconnected.

3. With the storage array disconnected, boot the host.
4. Use Add/Remove Programs to uninstall the Dot Hill MPIO DSM.
5. Reboot the host to complete the removal of the Dot Hill MPIO DSM.
6. Perform the upgrade to Windows Server 2008.
7. Perform the steps in “Installing the native 2008 MPIO DSM” on page 18.
8. Reconnect the storage array to the host.

Installing the native 2008 MPIO DSM

1. Select **Add Features** from the **Server Manager**.



Figure 2 The **Features** Window with **Add Features** option displayed
The **Select Features** Window appears.

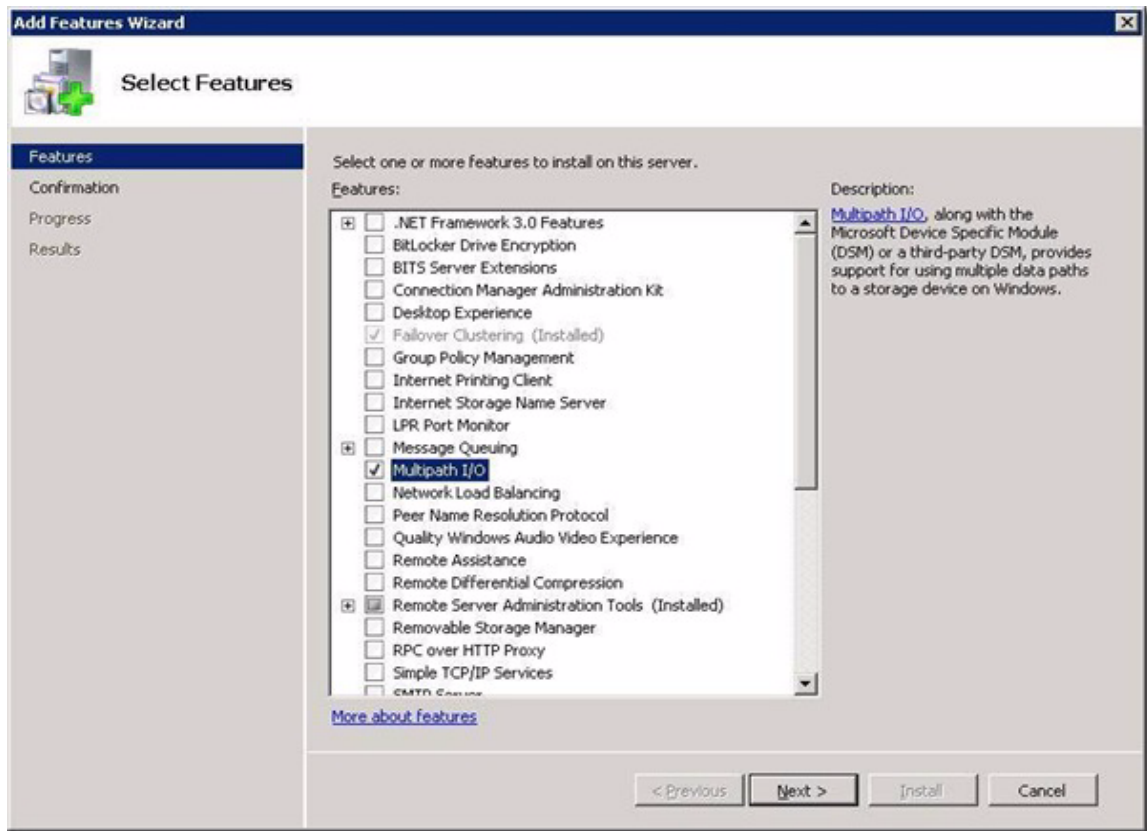


Figure 3 The **Select Features** window with **Multipath IO** selected

2. Select the **Multipath I/O** checkbox, then select **Next**.

3. The Confirm Installation Services Window is displayed. Click **Install**

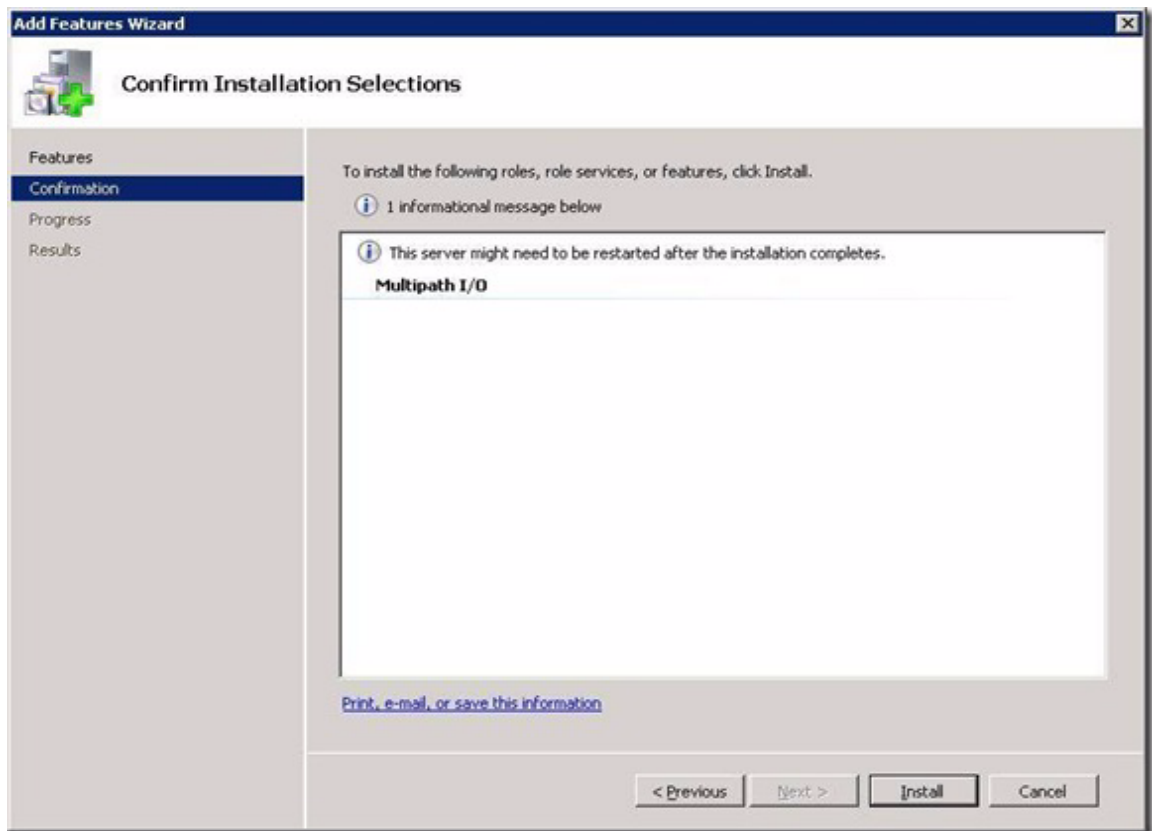


Figure 4 The Confirm Installation Selections window

The Installation Progress window is displayed. Allow the MPIO installation to complete and initialize before beginning the next step below.

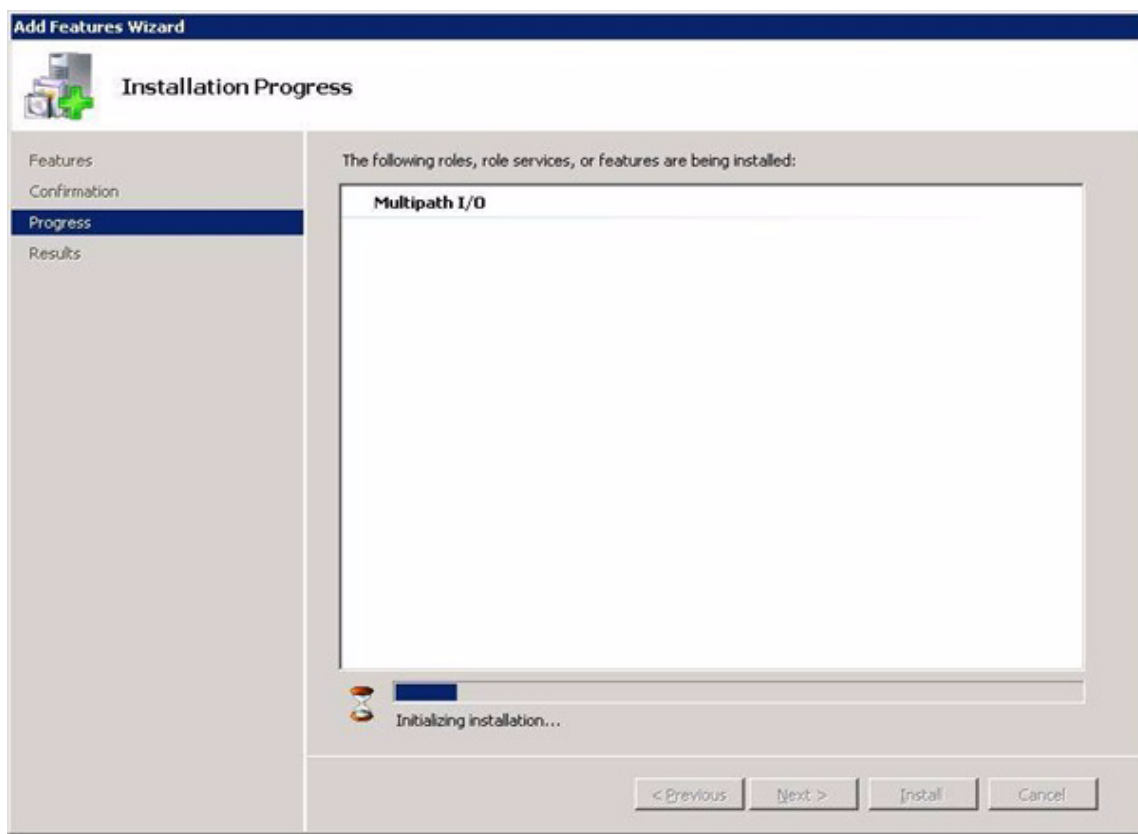


Figure 5 The Installation Progress window

4. Select **Close** when the **Restart Pending** message appears on the **Installation Results** window.

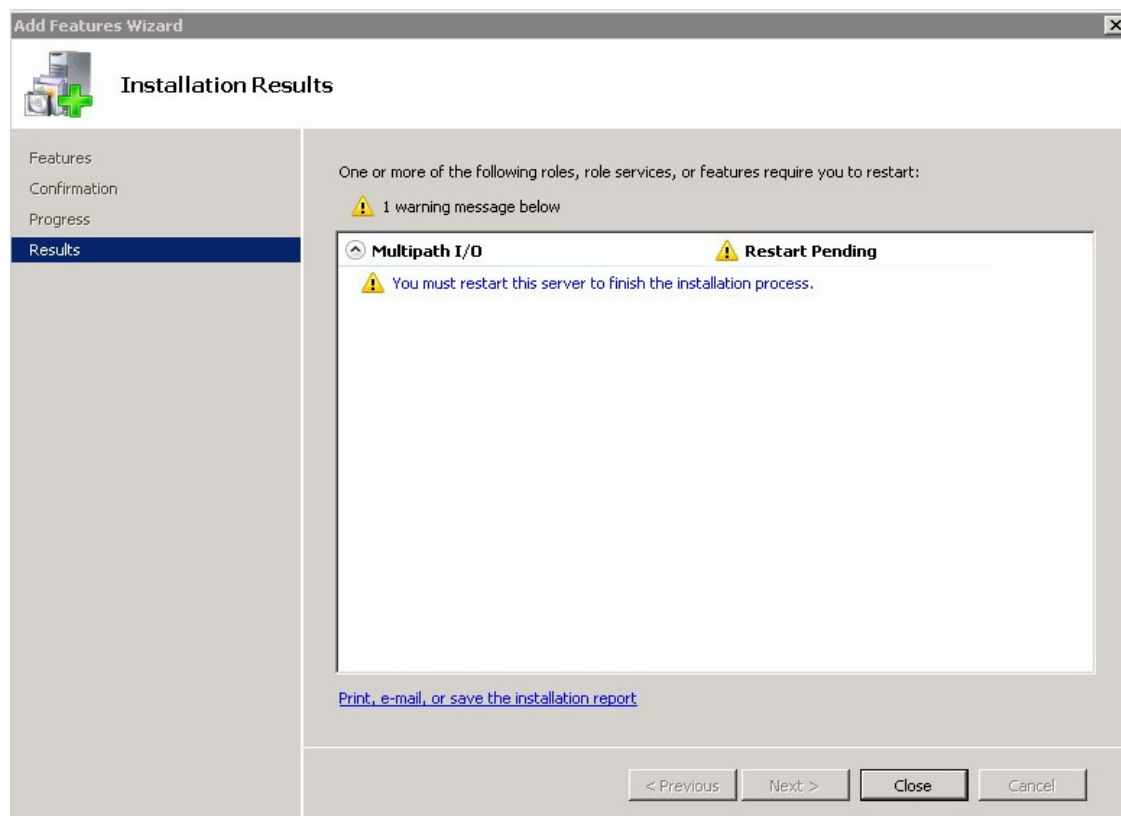


Figure 6 The **Installation Results** Window

5. After restart, select **MPIO** properties from the **Control Panel**

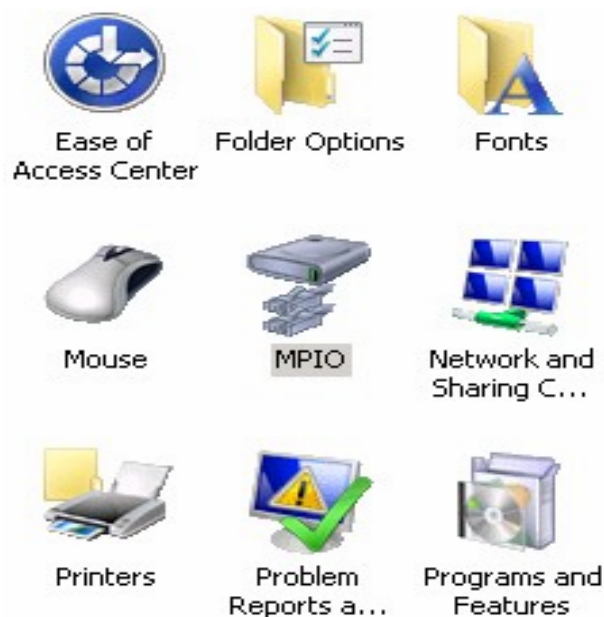


Figure 7 Control Panel Configuration Tool

The **MPIO Properties** window appears.

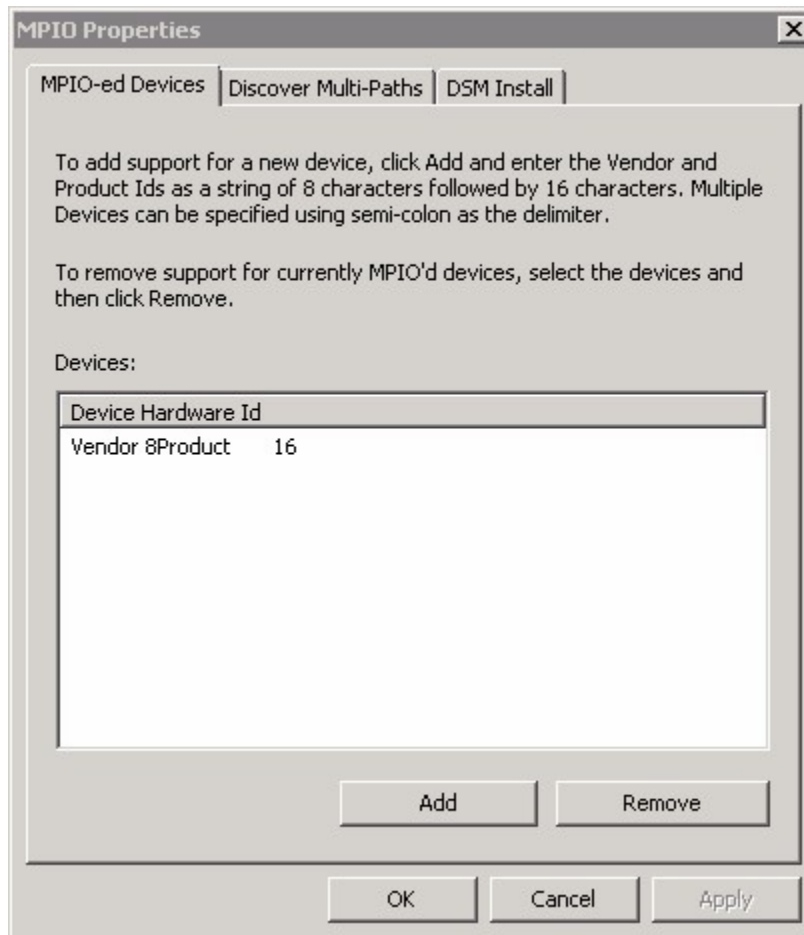


Figure 8 MPIO Properties window with tabs.

To complete the configuration of the MPIO driver you must use the tabs on the **Control Panel Configuration Tool** or the command line interface, **MPClaim**.

- Search for *Multipath I/O Overview* on the Microsoft Technet website technet.microsoft.com for details about using the **Control Panel Configuration Tool**.
- See step 2 in the following section for details about running **MPClaim**.

Installing the native 2008 MPIO DSM from the command line

It is possible to install the native 2008 MPIO DSM using the command line rather than using the Server Manager (described in the last section). Perform the following steps to install and configure the native MPIO DSM included with Windows Server 2008.

NOTE: The installation procedure for Windows Server 2008 R2 differs from Windows Server 2008. For Windows Server 2008 R2, the `servermanagercmd` command has been deprecated.

1. For Windows Server 2008 R2, open a command prompt window and run the following commands:

```
ocsetup MultipathIo /norestart
mpclaim -n -i -a
```

2. For Windows Server 2008, open a command prompt window and run the following command:

```
servermanagercmd -install multipath-io
```


The MPIO software is installed. The MPIO Control Panel applet can then be used to configure support for specific devices instead of using `mpclaim`.

3. For Windows Server 2008 used with Dot Hill 2000 or 20002 family storage systems, run the following command:

```
mpclaim -r -i -d "DotHill R/Evo"
```

4. For Windows Server 2008 used with Dot Hill 3000 family storage systems, run the following command:

```
mpclaim -r -i -d "DotHill DH3000"
```

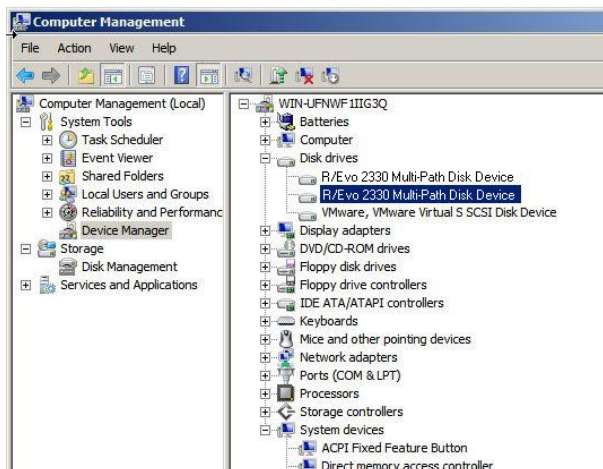
 **NOTE:** As soon as the `mpclaim` command completes, the host will be rebooted

Once the MPIO DSM is installed, no further configuration is required; however, after initial installation, you should use Windows Server 2008 Device Manager to ensure that the MPIO DSM has installed correctly as described in *Managing MPIO LUNs* in this document.

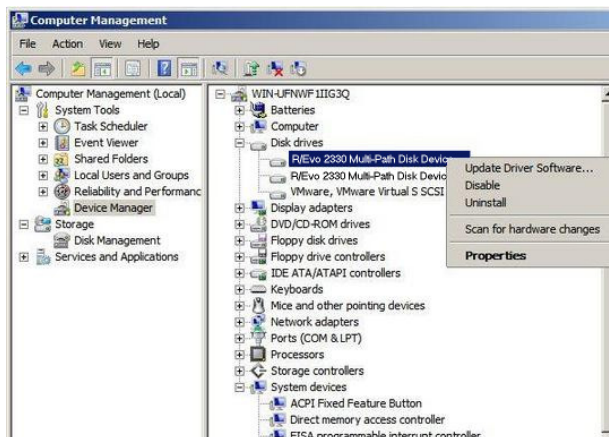
Verifying your installations

Managing MPIO LUNs

If the MPIO DSM was installed correctly, each R/Evolution storage volume visible to the host will be listed as a multi-path disk drive as shown in the following example.



To verify that there are multiple, redundant paths to a volume, right-click the Multi-Path Disk Device and select Properties.



Click the MPIO tab to view the MPIO property sheet, which enables you to view or change the load balance policy and view the number of paths and their status.

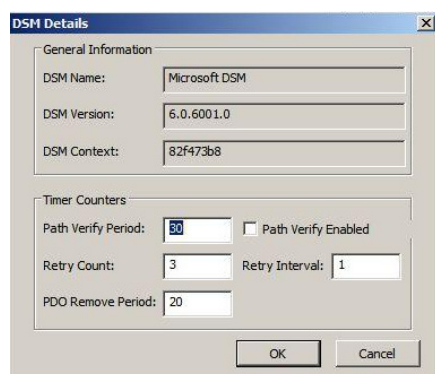
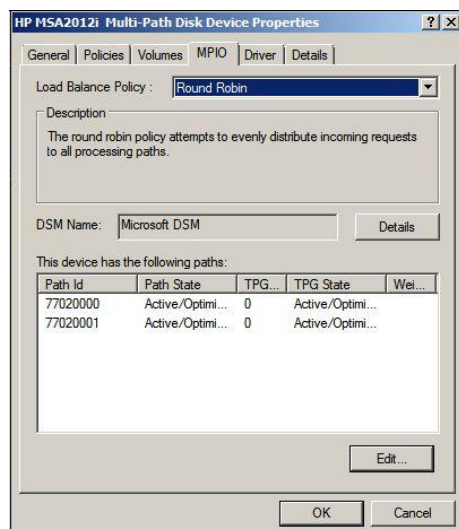


Figure 9 The Details tab shows additional parameters.

Verifying the VDS provider installation

To verify the installation, run the `diskraid` command, and make sure that "R/Evolution VDS Provider" is displayed in the list of providers

```
>diskraid
Microsoft Diskraid version 5.2.3790
Copyright (c) 2003 Microsoft Corporation
DISKRAID> list providers
```

Prov ###	Name	Version	Type
Prov 0	R/Evolution VDS Provider	2.3.0.19	FC
Prov 1	R/Evolution iSCSI VDS Provider	2.3.0.19	iSCSI

To learn about how to use the VDS provider, see [Using the Dot Hill VDS hardware provider](#) on page 35

Verifying a VSS installation

To verify the installation, run the `list providers` command, and make sure that "R/Evolution VSS Provider" is displayed in the list of providers.

```
>vssadmin list providers
vssadmin 1.1 - Volume Shadow Copy Service administrative command-line tool
(C) Copyright 2001 Microsoft Corp.
```

```
Provider name: 'Microsoft Software Shadow Copy provider 1.0'
Provider type: System
Provider ID: {b5946137-7b9f-4925-af80-51abd60b20d5}
Version: 1.0.0.7
```

```
Provider name: 'R/Evolution VSS Provider'
Provider type: Hardware
Provider ID: {bd04cbf9-212c-4553-9ea5-c5bfb05ccc8f}
Version: 2.3.0.19
```

To learn more about using the VSS Provider, see [Using the Dot Hill VSS hardware provider](#) on page 39.


4 Using the MPIO DSM

Windows native MPIO DSM on Windows Server 2008 or Windows Server 2008 R2

Refer to the Microsoft Storage Area Networking website for information about using the Windows Server 2008 native MPIO DSM or the native MPIO DSM included with the Microsoft iSCSI Software Initiator. Contact Microsoft Technical Support for Windows related issues at +1-800-642-7676 or on the Microsoft Technical Support Web site.

Using the `dsmcli` command-line utility

The `dsmcli` command-line utility is installed along with the Dot Hill DSM. The DSM command-line interface enables you to display or change devices, paths, and load balance policies, and enables you to diagnose and troubleshoot the DSM. This utility is intended for advanced users only.

 **NOTE:** The `dsmcli` command-line utility is available after installing the Dot Hill MPIO DSM on Windows Server 2003. It is only available on Windows Server 2008 if the native Microsoft MPIO DSM is resident and the Dot Hill MPIO DSM is installed as an addition to the native MPIO DSM.

To run `dsmcli` from the Windows Start menu, click Start > All Programs > R-Evolution > Rapid Evolution MPIO Configuration.

To run `dsmcli` from the command-line prompt, open a command line window, navigate to the directory in which the MPIO DSM was installed (C:\Program Files\R-Evolution\R-Evolution MPIO DSM by default), and enter the following command:

```
dsmcli
```

The `dsmcli>` command line prompt is displayed. From the `dsmcli>` prompt, the following commands are available:

- clear
- devinfo
- help
- pathinfo
- policies
- primary
- weight
- mpiolist
- pgr

The `help` command displays a help file with available `dsmcli` command options.

clear

The `clear` command clears the performance counters. Performance counter information (for example, BytesRead, BytesWritten, NumberReads, and NumberWrites) can be viewed by executing the `pathinfo` command, which is explained in “pathinfo” on page 29.

```
dsmcli> clear
```

```
Clear all counters: OK
```

devinfo

The `devinfo` command displays device information or enables you to change the load balance policy for the specified device.

```
devinfo [ SerialNumber | all ] [ policy | {failback-on | failback-off} ]
```

where:

SerialNumber is the serial number of the device and *policy* is the load balance policy that you want to use for the specified device. See “policies” on page 30 for a list of currently supported load balance policies.

- *all policy* sets the load balance policy of all devices.
- *SerialNumber {failback on / failback off}* sets the failback status of the specified device.
- *all {failback-on / failback off}* sets the failback status of all devices.

The failback feature is only valid when the load balance mode is `FailOver`. You can enable or disable the failback feature for a device. By default, failback is enabled when the device is in `FailOver` mode.`elp`.

Example

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	RoundRobin	2	N/A
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failover
```

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-off
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev 9B68DE12-01 failback-on
```

```
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	FailOver	2	failback-on
1	AF68DE12-01	RoundRobin	2	N/A
2	EB3FDE12-01	RoundRobin	2	N/A
3	1A69DE12-01	RoundRobin	2	N/A
4	3869DE12-01	RoundRobin	2	N/A

```
dsmcli> dev all Weighted
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	Weighted	2	N/A
1	AF68DE12-01	Weighted	2	N/A
2	EB3FDE12-01	Weighted	2	N/A
3	1A69DE12-01	Weighted	2	N/A
4	3869DE12-01	Weighted	2	N/A

pathinfo

The `pathinfo` command displays path information or enables you to change the status of the path.

To display information about all paths, run the following command

```
pathinfo
```

`HbaWWPN` (initiator's ID) and `CtrlPortWWPN` (controller port's ID) are the two end points of a path.

To display information about a specific path, specify the serial number or the worldwide port name (WWPN) of the HBA:

```
pathinfo [ SN serial_number | HBA HBA_wwpn ]
```

where *serial_number* is the serial number of the path and *HBA_wwpn* is the worldwide port name of the HBA.

The status of the path can be set to `online`, `standby`, or `failed`

```
pathinfo HBA_wwpn [ online | standby | failed ]
```

where *HBA_wwpn* is the worldwide port name of the HBA.

- `Online` – The path is active and can perform the I/O operation.
- `Primary: True` = active
- `Standby` – The path will perform the I/O operation if the active path fails.
- `Primary: False` = standby
- `Failed` – You can fail the path to simulate the physical error.

Example

```
dsmcli> pathinfo sn AF68DE12-01
```

```
Policy:          RoundRobin
SerialNumber:    AF68DE12-01
PathId:          02010102
Weight:          0
Primary:         false
ScsiAddress:     02000102
HbaWWPN:         10000000C92F464E
CtrlPortWWPN:   217000C0FF0A4052
State:           Online
BytesRead:       177152
BytesWritten:    36864
NumberReads:     46
NumberWrites:    9
```

```
dsmcli> pathinfo 10000000C930E202 standby
dsmcli> pathinfo
```

```
Policy:          RoundRobin
SerialNumber:    9B68DE12-01
PathId:          03010001
Weight:          0
Primary:         false
ScsiAddress:     03000001
HbaWWPN:         10000000C930E202
CtrlPortWWPN:   217000C0FF0A4052
State:           Standby
BytesRead:       184832
BytesWritten:    90112
NumberReads:     51
NumberWrites:    21
```

policies

The `policies` command displays the currently supported load balance policies. Each LUN can have its own load balance policy. Possible values include the following:

- `FailOver` – No load balancing is performed. There is a single active path and the rest of the paths are standby paths. The active path is used for sending all I/O. If the active path fails then one of the standby paths is used.
- `RoundRobin` (default for older non-ULP devices) – All paths are active paths. They are used for sending I/O in a round-robin fashion.
- `RoundRobinWithSubset` (default for ULP devices) – Round-robin load-balancing is used but non-optimal paths are ignored. For example, if a volume is owned by (assigned to) controller A, paths to controller B will not be used as long as all the paths to controller A are good.
- `Dynlqđ` (default for non-ULP devices only) – Uses the path with the least number of active requests.
- `Weighted` – Each path is assigned a weight and I/O is sent on the path with the lowest weight. If the path with the lowest weight fails, then the path with the next lowest weight is used.
- `LeastBlocks` – Uses the path with the fewest pending I/O blocks.

See “`devinfo`” on page 28 for information on changing the policy

Example

```
dsmcli> policies

FailOver
RoundRobin
Dynlqđ
Weighted
LeastBlocks
```

primary

The `primary` command sets the primary path to the specified path ID.

```
primary pathID
```

where `pathID` is the new primary path ID.

Example

In the following example, before executing the command, `primary 02010104`, `Primary` is shown as `false`; after running the command, `Primary` is shown as `true`.

```
dsmcli> primary 02010104
dsmcli> pathinfo


Policy:          FailOver
SerialNumber:    EB3FDE12-01
PathId:          02010104
Weight:          0
Primary:         true
ScsiAddress:     02000104
HbaWWPN:         10000000C92F464E
CtrlPortWWPN:   217000C0FF0A4052
State:           Online
BytesRead:       193536
BytesWritten:    1871360
NumberReads:     93
NumberWrites:    1752
```

weight

The `weight` command sets the weight of the specified path. I/O is sent to the path with the lowest weight. If that path fails, I/O is sent to the path with the next lowest weight, and so on.

```
weight pathID weight
```

where *pathID* is the specified path ID and *weight* is the assigned weight. The recommended weight range is 0–100.

 **NOTE:** The `weight` command is valid only when the `weighted` load balance policy is available (see “policies” on page 30 for the list of currently supported load balance policies).

Example

```
dsmcli> weight 03010104 10
dsmcli> dev
```

Device#	SerialNumber	Policy	nPaths	FailBack
0	9B68DE12-01	Weighted	2	N/A
1	AF68DE12-01	Weighted	2	N/A
2	EB3FDE12-01	Weighted	2	N/A
3	1A69DE12-01	Weighted	2	N/A
4	3869DE12-01	Weighted	2	N/A

```
dsmcli> pathinfo
```

```
Policy:           Weighted
SerialNumber:     3869DE12-01
PathId:           03010104
Weight:           10
Primary:          false
ScsiAddress:      03000104
HbaWWPN:          10000000C930E202
CtrlPortWWPN:    207800C0FF0A4052
State:            Online
BytesRead:        196608
BytesWritten:     87552
NumberReads:      55
NumberWrites:     23
```

mpiolist

The `mpiolist` command displays specified MPIO WMI objects. It shows the information of the local host only.

```
mpiolist WMI_object
```

where *WMI_object* is either the name of a WMI or object or one of the types (digit 0–5) described in the following table:

<code>mpiolist</code> Option	Parameter
0	MSDisk_Driver_Performance
1	MPIO_DISK_INFO
2	MPIO_PATH_INFORMATION
3	MPIO_CONTROLLER_CONFIGURATION
4	MPIO_TIMERS_COUNTERS
5	MPIO_GET_DESCRIPTOR

Example

```
dsmcli> mpiolist 1
<ROOT\wmi>
  MPIO_DISK_INFO
    InstanceName* = "Root\MPIO\0000_0"
    NumberDrives = 0x5
    DriveInfo =
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk0"
        SerialNumber = "60CFF00E50321A69DE121000"
        DsmName = "Dot Hill Multi-Path Device Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk1"
        SerialNumber = "60CFF00E50323869DE121000"
        DsmName = "Dot Hill Multi-Path Device Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk2"
        SerialNumber = "60CFF00E50419B68DE121000"
        DsmName = "Dot Hill Multi-Path Device Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk3"
        SerialNumber = "60CFF00E5041AF68DE121000"
        DsmName = "Dot Hill Multi-Path Device Specific Module"
      }
      instance of MPIO_DRIVE_INFO {
        NumberPaths = 0x2
        Name = "MPIO Disk4"
        SerialNumber = "60CFF00E5041EB3FDE121000"
        DsmName = "Dot Hill Multi-Path Device Specific Module"
      }
    }
```

pgr

Used for diagnostic and troubleshooting purposes only, the `pgr` (Persistent Group Reservations) command enables you to determine whether the DSM is currently using SCSI-2 Reserve and Release commands or SCSI-3 Persistent commands. It also enables you to specify which commands the DSM is to use.

Typically, SCSI Reserve and Release commands are used in clustered environments where it is necessary to limit access to a target device to only one host at a time. Persistent Reservation refers to a set of SCSI-3 commands that replace the original Reserve and Release commands with a more sophisticated mechanism that provides better support for SAN and multipath configurations.

The `pgr` command shows whether the DSM is currently using SCSI-3 Persistent commands and the PGR key. If the `pgr` command is enabled, the DSM uses SCSI-3 Persistent commands. If the command is disabled, the DSM uses SCSI-2 Reserve and Release commands to reserve and release volumes on behalf of clustering software. The key is used to identify the host.

```
dsmcli> pgr
Persistent Reservation: Enable
Key: T-W2K3-H
```

The `pgr` command also enables you to specify which commands the DSM is to use. The change is not active until the system is rebooted.

```
pgr [ enable | disable ]
```

where:

- `enable` specifies that the DSM use SCSI-3 Persistent commands
- `disable` specifies that the DSM use SCSI-2 Reserve and Release commands

pgr list

The `pgr list` command displays the current persistent reservation status for all disk drives as seen by the current host. This information is used by service technicians when troubleshooting a problem.

Example

```
dsmcli> pgr list
\\.\PhysicalDrive1 registered keys:
00 00 00 38 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...8....T-W2K3-H
54 2D 57 32 4B 33 2D 48                               T-W2K3-H
\\.\PhysicalDrive1 reservations:
00 00 00 38 00 00 00 00                               ...8....
\\.\PhysicalDrive2 registered keys:
00 00 00 38 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...8....T-W2K3-H
54 2D 57 32 4B 33 2D 48                               T-W2K3-H
\\.\PhysicalDrive2 reservations:
00 00 00 38 00 00 00 00                               ...8....
\\.\PhysicalDrive3 registered keys:
00 00 00 CD 00 00 00 10 54 2D 57 32 4B 33 2D 48 .....T-W2K3-H
54 2D 57 32 4B 33 2D 48                               T-W2K3-H
\\.\PhysicalDrive3 reservations:
00 00 00 CD 00 00 00 10 54 2D 57 32 4B 33 2D 48 .....T-W2K3-H
00 00 00 00 00 06 00 00                               .....
\\.\PhysicalDrive4 registered keys:
00 00 00 45 00 00 00 10 54 2D 57 32 4B 33 2D 48 ...E....T-W2K3-H
54 2D 57 32 4B 33 2D 48                               T-W2K3-H
\\.\PhysicalDrive4 reservations:
00 00 00 45 00 00 00 00                               ...E....
```

pgr tur

You can send a “test unit ready” command to the device to show its status.

```
pgr tur devicename
```


Example

```
dsmcli> pgr tur \\.\PhysicalDrive3
result: 0 status: 0x0 sense: 0x0d 0x50 0x68
dsmcli> pgr tur \\.\PhysicalDrive4
result: 0 status: 0x0 sense: 0x0d 0x50 0x68
```

5 Using the Dot Hill VDS hardware provider

The Microsoft Windows Server operating systems provide enhanced services for managing storage area networks, including *Virtual Disk Service* (VDS), a storage management application that enables you to manage volumes across heterogeneous disk arrays from a single point of control. VDS is a single storage management interface that enables you to configure your mixed storage environment without having to use individual storage management tools.

The Dot Hill VDS Hardware Provider is software that implements the VDS 1.1 API. When you add a storage device to your array that has the Dot Hill VDS Hardware Provider, Windows server automatically installs and registers the storage device, enabling your array to be managed from within the Windows environment. After the Dot Hill VDS Hardware Provider is installed, *DiskRaid* and *Storage Manager for SANs* from Microsoft or VDS client utilities from other third-party vendors can be used to configure and manage your array.

 **NOTE:** VDS is a licensed option. That is, to enable use of VDS, you must obtain and install a license certificate file for the purchased option.

The Dot Hill VDS Hardware Provider may be installed concurrently with VDS and VSS Providers for other storage products.

This release can be installed directly on top of previous releases of the P2000/MSA2000 VDS Provider, versions 2.2 or later.

In environments with 3920 or 3930 hybrid FC/iSCSI controllers, install either the Fibre Channel VDS provider or the iSCSI VDS provider, depending on which interface is connected to the host. Do not connect both iSCSI and FC ports from the same controller to the same host. VDS Providers for the different protocols are not supported concurrently for the same controller.

Hotfix recommendations

For Windows Server 2003 R2 with Service Pack 2, the following hotfixes are recommended:

- KB943545 (VDS & VSS)
 - KB938390 (VDS)
 - KB940467 (VSS)
 - KB940349 (VSS)
- Dot Hill CAPI Proxy 2.6 or later

Storage Manager for SANs

Storage Manager for SANs is a Microsoft Management Console snap-in that helps you create and manage logical unit numbers on Fibre Channel and iSCSI disk drive subsystems that support VDS. For more information about and instructions for installing the *Storage Manager for SANs*, go to the following web site and search for *Storage Manager for SANs*:

<http://microsoft.com/technet/windowsserver/default.aspx>

Supported Microsoft DiskRaid commands

DiskRaid is a command-line utility from Microsoft that enables you to configure and manage your storage after the Dot Hill VDS Hardware Provider is installed. This section contains a list of supported Microsoft DiskRaid commands.

- **ASSOCIATE** – Specifies which controller owns a vdisk by associating a LUN to a port. The following rules apply when using this command:
 - The vdisk has only one volume

- The volume is not yet mapped
- You must specify all controller ports. For example, to assign the vdisk to controller 0 with 2 ports, you must specify the following:


```
associate port 0-0,0-1
```


```
CREATE LUN <TYPE> [SIZE=<N>] [DRIVES=<N>,<N>[,...]] [STRIPESIZE=<N>] [NOERR] -
```

Creates a new vdisk or creates a volume on an existing vdisk. An existing vdisk is used if it has enough free space to satisfy the request. <TYPE> can be simple, stripe, mirror, raid (NRAID, RAID0, RAID1/10, RAID5). STRIPESIZE is ignored.

- `DELETE LUN` – Deletes a volume on an existing vdisk. If the volume is the last one on the vdisk, the vdisk itself is also deleted.
- `DETAIL` – Displays the detailed information of the specified device.
- `EXTEND LUN size=<N>` – Creates the size of the volume, which is allocated from the vdisk on which the volume resides.
- `EXTEND LUN DRIVES=<N>,<N>[,...]` – Adds drives to the vdisk on which the volume resides. To extend the LUN's size, after the add drive operation is finished, use the `EXTEND LUN size=<N>` operation.
- `FLUSHCACHE CONTROLLER` – Flushes the cache of all the volumes on the selected controller.
- `LBPOLICY` – Sets the load balance policy, weight, and primary path of the LUN.
- `LIST` – Lists the provider, subsystem, controller, port, drive, and LUN.
- `MAINTENANCE DRIVE BLINK [COUNT=<N>]` – Blinks the selected drive.
- `MAINTENANCE CONTROLLER BEEP` – Beeps the selected controller.
- `NAME SUBSYSTEM` – Changes the subsystem (controller's) name.
- `NAME LUN` – Changes the volume's name.
- `REENUMERATE` – Determines that a new array has been added.
- `REFRESH` – Refreshes the subsystem.
- `SELECT` – Selects the provider, subsystem, controller, port, drive, and LUN.
- `SETFLAG` – Assigns/unassigns the global spare disk drive.
- `UNMASK` – Creates or deletes the normal map or filter map.

The following DISKRAID commands are not supported: ADD, BREAK, INVALIDATECACHE, IPSEC, OFFLINE, ONLINE, RECOVER, REMOVE, REPLACE, RESET, and STANDBY.

 **NOTE:** Changes made to the array configuration by the SMU may not be visible to VDS clients until the `REFRESH PROVIDER` command (or equivalent operation in other clients) is used to refresh the VDS Hardware Provider's internal database.

 **NOTE:** After a LUN is assigned to the host, you may need to execute a rescan operation in Device Manager to view the paths for the LUN in some commands, such as `DETAIL LUN`.

LUN 0 mapping

For best performance, avoid mapping any array volumes to the host using LUN number 0, which is used by the VDS/VSS Hardware Provider to monitor and manage the array. The VDS and VSS Hardware Providers automatically assign LUN numbers starting at LUN 1, but if you have manually mapped LUNs to the host using LUN number 0, the VDS/VSS Providers have to compete with I/O traffic and this may cause commands to run more slowly or time out.

Modifying the Microsoft Windows Server 2008 default SAN policy for newly discovered disks

When a disk is newly discovered on a Windows Server 2008 system, it may show up as either online or offline, and may be read-write or read-only. This is influenced by the mapping of the volume.

You can modify the SAN policy to change the access level using the `DISKPART san policy` command in Windows Server 2008 and later.

On Windows Server 2008 Enterprise and Windows Server 2008 Datacenter, the default SAN policy is `VDS_SP_OFFLINE_SHARED`. On all other Windows Server 2008 editions, the default SAN policy is `VDS_SP_ONLINE`.

The available policies you can select are:

- `VDS_SP_ONLINE`
All newly discovered disks are brought online and made read-write.
- `VDS_SP_OFFLINE_SHARED`
All newly discovered disks that do not reside on a shared bus are brought online and made read-write.
- `VDS_SP_OFFLINE`
All newly discovered disks remain offline and read-only.

For more information, refer to Microsoft's MSDN Library discussion of VDS SAN Policy Enumeration:

[http://msdn.microsoft.com/en-us/library/bb525577\(VS.85\).aspx](http://msdn.microsoft.com/en-us/library/bb525577(VS.85).aspx)

It includes this description of how the SAN policy works.

The SAN policy determines whether a newly discovered disk is brought online or remains offline, and whether it is made read/write or remains read-only. When a disk is offline, the disk layout can be read, but no volume devices are surfaced through Plug and Play (PnP). This means that no file system can be mounted on the disk. When a disk is online, one or more volume devices are installed for the disk.

Newly discovered disks that are read-only due to the SAN policy are generally also offline. If you place them online, the SAN policy impact is removed. If the newly discovered disks continue to be read-only, it is due to some other reason, such as the mapping of the disk / LUN on the array.

HBA driver reconfiguration


Some HBA drivers may need to be reconfigured before they will pass more than 64 KB of data for a SCSI pass-through command. This software requires that the HBA driver support transfers of up to 128 KB. For more information, see the HBA user documentation.

6 Using the Dot Hill VSS hardware provider

Microsoft Windows operating systems provide enhanced services for managing storage area networks, including Volume Shadow Copy Service (VSS). VSS, with its standard set of extensible APIs, provides the backup infrastructure for Windows Servers, as well as a mechanism for creating consistent point-in-time copies of data known as shadow copies. VSS provides interfaces to ensure that volume shadow copies are in a consistent state.

The *Dot Hill VSS Hardware Provider* enables VSS to create hardware-resident shadow copies on any array attached to the server. With the Dot Hill VSS Hardware Provider and VSS, you can create a shadow copy of the source data volume on one server and then import the shadow copy onto another server (or back to the same server).

This hardware provider does not include user interfaces or standalone functionality. Instead it enables other applications to manage Dot Hill AssuredSAN and R/Evolution storage products. `vshadow.exe` is a useful command-line tool for creating, deleting, querying, and managing shadow copies in a Microsoft Windows environment. It is available from Microsoft as part of a large software developers' software toolkit. Third party developers have extracted and redistributed it on the Internet.

 **NOTE:** VSS is a licensed option. That is, to enable use of VSS, you must obtain and install a license certificate file for the purchased option and to enable snapshot functionality. Then you must create a snap pool and enable shadow copies for a master volume by using your configuration management tool. See "Creating shadow copies" on page 39 for more information.

 **NOTE:** In a cluster environment the Dot Hill VSS Hardware Provider cannot be installed unless a Microsoft Distributed Transaction Coordinator (MS DTC) cluster resource is configured. If the host part of a cluster and MSDTC is not running, installation will fail. Refer to <http://support.microsoft.com/kb/301600> for instructions on configuring MS DTC.

Supported features

The Dot Hill VSS Hardware Provider supports the following features supported by the Windows VSS subsystem:

- Creating shadow copies/snapshots.
- Exporting shadow copies/snapshots: prepare for use in another Windows server.
- Importing snapshots: prepare for local use after export from another Windows server.
- Determining when snapshots can be deleted and deleting them.
- Reverting snapshots using the `diskshadow` command (Windows Server 2008 R2 only)

Hotfix recommendations

For Windows Server 2003 R2 with Service Pack 2, the following hotfixes are recommended:

- KB943545 (VDS & VSS)
- KB938390 (VDS)
- KB940467 (VSS)
- KB940349 (VSS)

Creating shadow copies

VSS functionality includes creating, deleting, and managing shadow copies. However, to create a shadow copy, you must *first* use RAIDar to create a snap-pool, and then either convert an existing standard volume

to a master volume (enable the volume for shadow copies) or to create a new master volume. Refer to the *Administrator's Guide* for more information.

To create a shadow copy:

1. Use RAIDar to create a snap-pool and to either convert a standard volume to a master volume (enable the volume for shadow copies) or to create a new master volume.


You should do this for all the RAID partitions that are part of any Windows volumes for which you want to use shadow copies. If you do not do this, the VSS Provider will attempt to do this using a simple allocation policy which may not be appropriate for your needs.

2. If necessary, create a Windows file system using Windows Disk Management to create a partition or file system on the RAID partition that you want to use for shadow copy.

Make sure the volume is mapped with a drive letter or assigned to a mount point.

3. Create the shadow copy using a software product that supports the VSS requester protocol. On Windows Server 2008, the Microsoft `diskshadow` command line utility may be used.

The Dot Hill VSS Hardware Provider is automatically invoked by backup utilities that support VSS, which includes the backup utility provided in Windows Server.

 **NOTE:** The *Dot Hill VSS Hardware Provider* takes shadow copies quickly (less than 5 seconds), but the Microsoft VSS subsystem can take a long time to recognize and import the new shadow copies. Typically it takes about 90 seconds to create and import a shadow copy. It takes longer if more RAID partitions are included in the same shadow copy set.

LUN 0 mapping


For best performance, avoid mapping any array volumes to the host using LUN number 0, which is used by the VDS/VSS Hardware Provider to monitor and manage the array. The VDS and VSS Hardware Providers automatically assign LUN numbers starting at LUN 1, but if you have manually mapped LUNs to the host using LUN number 0, the VDS/VSS Providers have to compete with I/O traffic and this may cause commands to run more slowly or time out.

64-bit VSS clients

When creating snapshots on a 64-bit OS, you must use a 64-bit VSS client application. Microsoft's VSS framework does not support 32-bit requestors on 64-bit operating systems.

Ensuring read-write access of VSS shadow copies

When VSS creates a shadow copy, it maps the LUN with the shadow copy data back to the host. Because this is generally used for backup, the volumes on the LUN are read-only. The LUN is mapped read-write, and the disk on the server is read-write; only the volumes are read-only. You can restore read-write access of the volumes on the server, as shown below.

 **NOTE:** Multiple terms for the same or similar storage elements can include disks, volumes, snapshots and LUNs, depending on whether the storage element is being referenced by an operating system, a storage device, or an application.

The read-only or read-write attribute may also be influenced by the SAN policy of Windows Server 2008 systems. The SAN policy in place on the server affects the access level for newly discovered disks, but volumes on the disks for VSS shadow copy snapshots are always initially discovered as read-only, regardless of the SAN policy or version of Windows operating system.

See [Modifying the Microsoft Windows Server 2008 default SAN policy for newly discovered disks](#) on page 37 for more information.

Restoring read-write access

On the server, clear the read-only status of the imported snapshots' disks and volumes using the commands below. Select the disk that corresponds to the LUN with the snapshot data. After selecting the disk and clearing the disk's read-only status, select the volume and clear the volume's read-only status.

```
DISKPART> list disk
```

(this command allows you to determine which disk number to use in the following command)

```
DISKPART> select disk x
```

(where *x* refers to the disk number from the `list disk` command)

```
DISKPART> detail disk
```

(use this command to verify that the disk is in an offline and/or read-only state)

```
DISKPART> online disk
```

(use this command to bring the selected disk online)

```
DISKPART> attributes disk clear readonly
```

(clear the `readonly` attribute, allowing this host to write to the disk)

```
DISKPART> list volume
```

(get a list of volumes residing on the disk, if any; the volume number displayed will be used in the `select volume` command)

(the next set of commands are repeated for each volume on the LUN; typically, there will be only one volume, or none for a newly-provisioned LUN)

```
DISKPART> select volume y
```

(where *y* refers to the volume shown in the `LIST VOLUMES` command)

```
DISKPART> detail volume
```

(use this command to verify that the volume is read-only)

```
DISKPART> attributes volume clear readonly
```

(clear the `readonly` flag for the volume)

Resolving VSS provider snap pool problems on 2730 controllers

By default, the VSS Provider attempts to convert standard volumes to master volumes on demand, automatically allocating and deallocating snap pools as needed. This mode of operation works best for turnkey configurations where the number of available snapshot licenses is less than the number of volumes and manual conversion of standard volumes to master volumes would be inconvenient. However, there are two potential drawbacks to the default behavior:


Insufficient free space on the vdisk

Creating snapshots on a standard volume may fail with the following error posted to the Applications event log:

```
calculateReserveSize(): The vdisk doesn't have sufficient space to create snap pool
```

This error occurs when the standard volume's vdisk does not contain enough free space to allocate a backing store which is at least 20% of the size of the volume, or 6GB, whichever is larger. To avoid this

problem, find or create a snap pool on another vdisk with sufficient free space and convert the standard volume to a master volume using that snap pool instead. Placing the snap pool on a separate vdisk may also improve performance if the other vdisk is not subject to a heavy I/O load.

 **NOTE:** The vdisk for the snap pool and the vdisk for the standard volume must be owned by the same controller.

Snap pools are automatically deleted

In order to help manage limited disk space and snapshot licenses, the VSS Hardware Provider will, by default, automatically convert master volumes to standard volumes when the last snapshot for the volume is removed, and automatically delete snap pools when no snapshots refer to them.

However, this mode of operation may cause problems in environments where some manual management of snap pools is desired, or in SAN environments where multiple hosts are using VSS to create and delete snapshots concurrently on the same array.

To avoid these issues, the VSS Hardware Provider can be configured so that it does not attempt to automatically create or delete snap pools or convert standard volumes to master volumes and vice versa. Instead, the administrator must perform these steps manually.

Solution

To disable automatic conversion of standard volumes and automatic creation and deletion of snap pools, enter the following command at the Windows command prompt to change the provider's `StandardVolumesAreSupported` parameter value to 0:

```
reg add "HKLM\SYSTEM\CurrentControlSet\Services\HP StorageWorks VSS Hardware Provider\Parameters" /v StandardVolumesAreSupported /f /t REG_DWORD /d 0
```

To restore the default behavior, change the value of `StandardVolumesAreSupported` back to 2:

```
reg add "HKLM\SYSTEM\CurrentControlSet\Services\HP StorageWorks VSS Hardware Provider\Parameters" /v StandardVolumesAreSupported /f /t REG_DWORD /d 2
```

After changing the `StandardVolumesAreSupported` value, the VSS server must be stopped if it is currently running:

```
net stop VSS
net stop "R/Evo VSS Hardware Provider"
```

Alternately, reboot the server to ensure that all the VSS components have been restarted.

7 Troubleshooting

This chapter discusses what you can do if you encounter problems with your software installation, including known issues. If the following discussion does not help fix your problem contact Dot Hill Systems' Customer Service at +1-877-368-7924 or the Dot Hill Customer Resource Center. Contact Microsoft Technical Support for Windows related issues at +1-800-642-7676 or on the Microsoft Technical Support Web site.

MPIO DSM troubleshooting

Windows native MPIO DSM on Windows Server 2008 or Windows Server 2008 R2

For troubleshooting the Windows Server 2008 native MPIO DSM or the native MPIO DSM included with the Microsoft iSCSI Software Initiator, contact Microsoft Technical Support for Windows related issues at +1-800-642-7676 or on the Microsoft Technical Support Web site.

Dot Hill MPIO DSM on 2003 Server

For help troubleshooting the Dot Hill MPIO DSM contact Dot Hill Systems' Customer Service at +1-877-368-7924 or support@dothill.com.

VDS provider troubleshooting

This section contains troubleshooting information for the Dot Hill VDS Hardware Provider.


Table 2 Troubleshooting the Dot Hill VDS Hardware Provider

Issue	Description
<p>The VDS Provider is not working and either of the following conditions apply:</p> <ul style="list-style-type: none">• DiskRaid (and any VDS client) does not list the subsystems.• Event Properties displays the following error: There is no valid VDS license data for such subsystem with ChassisSN=XXXXXX, ProductID: R/Evo XXXX-XX, ProductRevision: XXXXXXXX	<p>The system does not have a license certificate file installed. To enable use of VDS, you must obtain and install a license certificate file for the purchased option.</p>
<p>DiskRaid exits abnormally.</p>	<p>Halt and automatically restart the VDS service using this command:</p> <pre>net stop vds</pre> <p>If the problem persists, use Task Manager to terminate the <code>dllhost.exe</code> process that hosts the VDS provider. If more than one <code>dllhost.exe</code> process is running, use the Microsoft Sysinternals Process Explorer utility to determine which one is hosting the VDS provider. For more information, refer to: http://www.microsoft.com/technet/sysinternals/utilities/ProcessExplorer.msp</p>

Table 2 Troubleshooting the Dot Hill VDS Hardware Provider (continued)

Issue	Description
<p>An application error in the Windows event log states: <code>ssproxy</code> needs a 128-Kbyte buffer. You might need to set the <code>MaximumSGList</code> to a value of 33 or higher</p>	<p>In the Process Explorer main window, double-click a process, select the Threads tab, and examine the Start Address column for entries that begin with <code>capihw-prv.dll</code>. If you find a match, switch to the Image tab and select Kill Process to terminate the process.</p> <p>The Dot Hill CAPI Proxy requires the maximum data for the CAPI command to be 128 Kbyte; therefore, you need to create a <code>MaximumSGList</code> registry entry if it does not already exist, or set it to a value of 33 or larger if it hasn't already been set.</p>
<p>Cannot view paths for the LUN in some commands.</p>	<p>To set the registry for Qlogic cards, double-click <code>qla2300.reg</code> in the CAPI Proxy's installation directory (for example, <code>C:\Program Files\R-Evolution\R-Evolution VSS Provider\qla2300.reg</code>).</p> <p>After a LUN is assigned to the host, you might need to execute a rescan operation in Device Manager to view the paths for the LUN in some commands, such as <code>detail lun</code>.</p>
<p>When uninstalling the CAPI Proxy, the following message is displayed: <code>ssproxy.exe</code> cannot be removed</p>	<p>The CAPI Proxy is automatically stopped during the uninstall process. If the CAPI Proxy is not stopped for some reason, manually stop it by running the following command:</p> <pre>taskkill /F /IM ssproxy.exe /T</pre> <p>You can also stop <code>ssproxy.exe</code> by using the Task Manager.</p> <p>After stopping the process manually, choose "Retry" to remove <code>ssproxy.exe</code>.</p>
<p>RAID 6 volumes are indistinguishable from RAID 5 volumes</p>	<p>RAID 6 volumes are not supported by Microsoft's VDS 1.1 infrastructure, and as a result, they are indistinguishable from RAID 5 volumes in VDS clients, and can only be created using the management controller's user interfaces.</p>

VSS provider troubleshooting

 **NOTE:** R/Evolution VDS is a licensed option. To use the R/Evolution VDS

This section contains troubleshooting information for the Dot Hill VSS Hardware Provider beginning with Table 7-1 below.

Table 3 Troubleshooting the Dot Hill VSS Hardware Provider

Issue	Description
<p>The VSS Provider is not working and either of the following conditions apply:</p>	<p>The system might not have a license certificate file installed. To enable use of VSS, you must obtain and install a license certificate file for the purchased option. VSS doesn't function unless there's a snapshot license.</p>
<ul style="list-style-type: none"> • DiskRaid (and any VSS client) does not list the subsystems. • Event Properties displays the following error: There is no valid VSS license data for such subsystem with Chassis SN=XXXXXX, ProductID: R/Evo XXXX-XX, ProductRevision:XXXX, LUN(Path X, Target X, Lun X) 	<p>The maximum number of snapshots allowed by the snapshot license has already been created.</p>
<p>The following error is reported: VSS_E_PROVIDER_VETO</p>	<ul style="list-style-type: none"> • The storage system has failed to execute the commands from the VSS Provider, or the communication between the VSS Provider and the system is broken due to any of the following conditions: <ul style="list-style-type: none"> • The LUN that will be used to create the snapshot is not a master volume. • The serial number cannot be obtained for the controller owning the master volume partition. • The snapshot cannot be found in the VSS Provider's snapshot list. • The partition is not a snapshot. • The LUN assignment to the newly created snapshot failed. • The snapshot that will be deleted is not a Dot Hill snapshot. • The system might not have a license certificate file installed. To enable use of VSS, you must obtain and install a license certificate file for the purchased option.
<p>The shadow copy does not exist on the controller.</p>	<ul style="list-style-type: none"> • The backup utility automatically deletes the shadow copy when the backup is complete. • You might have used the Windows Explorer shadow copy shell extension context menu to create a shadow copy, which is to be used for creating a Windows software shadow copy, not hardware shadow copies. • Make sure you have created the shadow copy using the persistent (-p) attribute.

Table 3 Troubleshooting the Dot Hill VSS Hardware Provider (continued)

Issue	Description
Shadow copy creation failed or the following error message is displayed in the system application event log: SCSI bus # supports maximum SCSI I/O length #, but VSS needs #	<ul style="list-style-type: none">• If you use the <code>vssadmin</code> tool from Microsoft to create shadow copies, Dot Hill VSS Hardware Provider is not used. <code>vssadmin create shadow</code> only works with the Microsoft software shadow copy provider built into Windows.• The <code>MaximumSGList</code> registry entry must be set to a value of 33 or larger. To set the registry for Qlogic cards, double-click <code>qla2300.reg</code> in the Dot Hill VSS Hardware Provider's installation directory (for example, <code>C:\Program Files\R-Evolution VSS Provider\qla2300.reg</code>).• You might have exceeded the limit allowed for shadow copies on the controller, which varies depending on the model of the array. Refer to the documentation for your array.• There are insufficient resources available to create the shadow copy, which can happen if you create and delete shadow copies too quickly. Wait for the controller to make resources available, and then try again.
It is taking a long time to create the shadow copy.	The Dot Hill VSS Hardware Provider takes shadow copies quickly (less than 5 seconds), but the Microsoft VSS subsystem can take a long time to recognize and import the new shadow copies. Typically, it takes about 90 seconds to create and import a shadow copy. It takes longer if more RAID partitions are included in the same shadow copy set.

8 Uninstalling R/Evolution Host Software Components


Uninstalling the MPIO DSM

To uninstall the Dot Hill MPIO DSM, perform the following steps.

 **NOTE:** This procedure requires a reboot.

1. Choose Start > Control Panel > Add/Remove Programs.
2. Choose Dot Hill MPIO DSM and click Change/Remove.
3. Respond appropriately to the prompts.

The progress of the uninstall procedure is displayed in a splash screen, which automatically closes after the drivers are uninstalled.

 **NOTE:** If there are no other DSMs on the server, the procedure uninstalls the Microsoft MPIO drivers as well as the Dot Hill MPIO DSM. If there are other DSMs on the server, only the Dot Hill MPIO DSM is removed.

4. Reboot the server.

Uninstalling the VDS Hardware Provider

 **NOTE:** This procedure requires a reboot.

To uninstall the R/Evolution VDS Hardware Provider, perform the following steps.

1. Choose Start > Control Panel > Add/Remove Programs.
2. Depending on which version you are uninstalling, choose R/Evolution VDS Hardware Provider or R/Evolution iSCSI VDS Provider and click Change/Remove.
3. Respond appropriately to the prompts.
4. If the R/Evolution VSS Hardware Provider is not running the CAPI proxy, you can select R/Evolution CAPI Proxy from the Add Remove Programs list and uninstall it now.
5. Reboot the server.


Uninstalling the VSS Hardware Provider

 **NOTE:** This procedure requires a reboot.

To uninstall the R/Evolution VSS Hardware Provider, perform the following steps.

1. Choose Start > Control Panel > Add/Remove Programs.
2. Choose R/Evolution VSS Hardware Provider and click Change/Remove.
3. Respond appropriately to the prompts.
4. If the R/Evolution VDS Hardware Provider is not running the CAPI proxy, you can select R/Evolution CAPI Proxy from the Add Remove Programs list and uninstall it now.
5. Reboot the server

Uninstalling the CAPI Proxy

 **NOTE:** This procedure requires a reboot.

Both the R/Evolution VSS Provider and the R/Evolution VDS Provider require the R/Evolution CAPI Proxy to be running. Installing a new version of the CAPI Proxy will upgrade existing CAPI Proxy versions, if existing versions are 2.2 or later. CAPI Proxy versions prior to 2.2 should be removed before installing a newer version. To uninstall the R/Evolution CAPI Proxy, perform the following steps:

1. Choose Start > Control Panel > Add/Remove Programs.
2. Choose R/Evolution CAPI Proxy and click Change/Remove.
3. Respond appropriately to the prompts.
4. If the R/Evolution VDS Hardware Provider is not running the CAPI proxy, you can select R/Evolution CAPI Proxy from the Add Remove Programs list and uninstall it now.
5. Reboot the server