



# AssuredSAN VDS and VSS Hardware Providers Installation Guide

## **Abstract**

This document provides installation and usage instructions for Hardware Providers that work with Microsoft Windows Server and Dot Hill AssuredSAN 3004, 4004, Pro 5000, and Ultra48 storage systems. They include the VSS Hardware Provider, VDS Hardware Providers for FC/SAS and for iSCSI, and the CAPI Proxy, which must be installed to enable support for any of the hardware providers.

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# About this guide

This document provides installation and usage instructions for Hardware Providers that work with Microsoft Windows Server and Dot Hill AssuredSAN™ 3004, 4004, Pro 5000, and Ultra48 storage systems. They include the VSS Hardware Provider, VDS Hardware Providers for FC/SAS and for iSCSI, and the CAPI Proxy, which must be installed to enable support for any of the hardware providers.

## Intended audience

This guide is intended for system administrators and storage administrators.

## Prerequisites

Prerequisites for using this product include knowledge of:

- Server system administration
- Microsoft Windows servers
- Storage system configuration
- Storage area network (SAN) management and direct attach storage (DAS)
- Fibre Channel and iSCSI

## Related documentation

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

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

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

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**NOTE:** Provides additional information.

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

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# 1 Hardware providers and the CAPI Proxy

The hardware providers described in this document are used with Dot Hill AssuredSAN 4004, 3004, Pro 5000, and Ultra48 storage systems in Microsoft Windows Server environments. They are available for download as separate installation files:

- A VDS hardware provider for FC and SAS storage systems.
- A VDS hardware provider for iSCSI storage systems.
- A VSS hardware provider for FC, iSCSI, and SAS storage systems.
- A CAPI Proxy that enables in-band management from host-based applications. The CAPI Proxy is necessary to enable all of the hardware providers shown above. It should be installed on all hosts that will run any of the hardware providers.

Version 3.2 adds support for GL200 firmware on AssuredSAN 3004 and 4004 platforms. GL200 firmware offers two distinct web-based interfaces, the new Storage Management Console and the legacy RAIDar. See [Using VDS and VSS with virtual pools](#) on page 8 for more information.

If any of the providers on a host are upgraded to 3.2, all other AssuredSAN 4004, 3004, and Ultra48 VDS/VSS providers and the CAPI Proxy installed on the host must be upgraded to the same version.

You can install both iSCSI and FC/SAS VDS hardware providers on the same host if your environment includes any combination of AssuredSAN iSCSI, Fibre Channel, hybrid, or SAS storage systems.

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**IMPORTANT:** In environments with AssuredSAN hybrid FC/iSCSI storage systems, 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.

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AssuredSAN version 3.x hardware providers and the AssuredSAN version 3.x CAPI Proxy do not support earlier AssuredSAN or R/Evolution storage systems. You can install version 3.x providers alongside earlier *r-evo* hardware providers used with these older generations of storage systems in order to support multiple storage systems on the same host, as long as the older *r-evo* CAPI Proxy remains installed on the host.

VDS, VSS, and CAPI proxy versions:	Applies to product family:	Applies to product family:
AssuredSAN v. 3.x.xx	AssuredSAN 3004	
	AssuredSAN 4004	
	AssuredSAN Pro 5000	
	AssuredSAN Ultra48	
R/Evolution or AssuredSAN v. 2.x.xx		R/Evolution or AssuredSAN 2000
		R/Evolution or AssuredSAN 2002
		R/Evolution or AssuredSAN 3000
		R/Evolution or AssuredSAN 3003
		R/Evolution or AssuredSAN 4000
		R/Evolution or AssuredSAN 5000

Refer to *Installing Optional Software for Microsoft Windows Server* for information about the R/Evolution or AssuredSAN v. 2.x.xx hardware providers and CAPI proxy.

AssuredSAN VDS and VSS Hardware Providers may also be installed alongside VDS and VSS providers for other storage products.

## About VDS

Microsoft Windows Server operating systems provide enhanced services for managing storage area networks, including Virtual Disk Service (VDS), an API that enables storage management applications to manage 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 AssuredSAN VDS Hardware Provider implements the VDS 1.1 API. After the AssuredSAN VDS Hardware Provider is installed, the Microsoft DiskRaid CLI and Storage Manager for SANs, or VDS client utilities from other third-party vendors, can be used to configure and manage your storage system.

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**NOTE:** For Windows Server 2012, VDS has been superseded by the Windows Storage Management API, as described in “Virtual Disk Service (Windows)” at: [http://msdn.microsoft.com/en-us/library/windows/desktop/bb986750\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/bb986750(v=vs.85).aspx). However the use of VDS is still supported.

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## Storage Manager for SANs

Storage Manager for SANs is a Microsoft Management Console (MMC) snap-in that helps you create and manage volumes on disk drive subsystems that support VDS. For more information about—and instructions for installing—the Storage Manager for SANs, search for Storage Manager for SANs at: <http://technet.microsoft.com/>

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**NOTE:** Windows Server 2012 no longer supports Storage Manager for SANs. The Storage Manager for SANs snap-in for MMC has been removed.

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## About VSS

Microsoft Windows Server 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 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 AssuredSAN VSS Hardware Provider installs on a server running Windows Server and enables VSS to create hardware-resident shadow copies on any array attached to the server. With the AssuredSAN 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 AssuredSAN storage systems. [VShadow.exe](#) and [DiskShadow.exe](#) are useful command-line tools for creating, deleting, querying, and managing shadow copies in a Microsoft Windows environment. DiskShadow is included in Windows Server 2008 and subsequent releases, while Vshadow is available from Microsoft as part of the Windows SDK.

## Supported VSS Features

The AssuredSAN VSS Hardware Provider supports the following features provided by the Windows VSS subsystem:

- Creating shadow copies/snapshots.
- Exporting shadow copies/snapshots: prepare for use in another Windows Server system.
- Importing snapshots: prepare for local use after export from another Windows Server system.
- Determining when snapshots can be deleted and deleting them.
- Reverting snapshots using the [DiskShadow resync](#) subcommand or [vshadow -resync](#) option, which were introduced in Windows Server 2008 R2.

## Using VDS and VSS with virtual pools

The VDS and VSS Providers support both traditional linear storage volumes which are allocated from linear disk groups as well as virtual volumes which are allocated from storage pools when using GL200 or later firmware.

Most VDS and VSS operations work the same way on virtual volumes as they do on linear volumes, with the following exceptions:

The VDS Provider can create new linear disk groups on unused disk drives when existing disk groups cannot accommodate a request to create a new volume, but the VDS Provider does not create virtual storage pools or allocate new disk groups to storage pools. Instead, use the embedded CLI or the SMU to modify the disk groups allocated to a storage pool.

The DISKRAID LIST POOLS command displays a list of storage pools on the array. The controller's virtual pools, if present, are reported as PS Pool A and PS Pool B, assuming the default pool names A and B, along with a pool number assigned by VDS. This pool number can be used with the CREATE LUN command to allocate a volume on the specified pool.

To create a volume using DISKRAID on a specific virtual pool, use the syntax `CREATE LUN AUTO POOL=<pool> SIZE=<size>GB` where `<pool>` is the pool number reported by the LIST POOLS command, and `<size>` is the designed size of the LUN in GB.

The VSS Provider can create snapshots of volumes on virtual pools without the preparation that is required for linear volumes such as allocating a backing store or converting the volume to a master volume.

## 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>.

All VDS/VSS/CAPI packages are shipped in a single archive file, such as `assuredsan-vds-vss-3.2.x.xx.zip`, which in turn contains `.zip` files for each individual component, such as `assuredsan-capi-proxy-3.2.x.xx.zip`, where `version` represents the version number.

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**NOTE:** Make sure that you are downloading an `assuredsan 3.x` version. Older `r-evo 2.x` providers only work with earlier hardware platforms such as R/Evolution or AssuredSAN 3000 series platforms.

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Version 3.x AssuredSAN VDS Hardware Providers and the AssuredSAN VSS Hardware Provider require the following software:

- A supported operating system:
  - Microsoft Windows Server 2008 x86 Edition with Service Pack 2
  - Microsoft Windows Server 2008 x64 Edition with Service Pack 2
  - Microsoft Windows Server 2008 R2 x64 Edition with Service Pack 1
  - Microsoft Windows Server 2012 x64 Edition
  - Microsoft Windows Server 2012 R2 x64 Edition
- AssuredSAN CAPI Proxy 3.2 or later

## Installing the AssuredSAN CAPI Proxy

The AssuredSAN CAPI Proxy is a prerequisite for VDS and VSS providers. Install it before installing the providers.

1. Download the single archive file described above.
2. Extract and open the CAPI proxy setup file to begin the installation.



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**NOTE:** The CAPI Proxy `setup.exe` can be launched directly from within the archive file without extracting the other files if desired.

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**3.** Follow the onscreen prompts to install the software.

On 32-bit operating systems, the program is installed in:

`C:\Program Files\Dot Hill\AssuredSAN CAPI Proxy`

On 64-bit operating systems, the program is installed in:

`C:\Program Files(x86)\Dot Hill\AssuredSAN CAPI Proxy`

If a previous version of the AssuredSAN CAPI Proxy is already installed, a message tells you that the software is installed but not up to date.

**4.** Press Yes to continue with the installation process or press No to exit setup.

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**NOTE:** Overwriting an existing AssuredSAN CAPI Proxy will not overwrite previously installed CAPI proxies used with hardware providers for earlier storage systems.

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## 2 Installing and using the AssuredSAN VDS Hardware Provider or AssuredSAN iSCSI VDS Provider

This section describes how to install the AssuredSAN VDS Hardware Provider. Note that there are two different versions of the provider. One supports iSCSI devices only, and the other supports Fibre Channel and SAS devices. Both can be installed at the same time if you have a mix of iSCSI and non-iSCSI devices.

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**IMPORTANT:** In environments with AssuredSAN hybrid FC/iSCSI storage systems, 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.

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1. To begin the installation, extract and open the VDS hardware provider setup file(s) that are appropriate for your operating system and storage system.
2. Follow the onscreen prompts to install the software.

Each provider is installed in one of the following directories:

C:\Program Files\Dot Hill\AssuredSAN iSCSI VDS Provider

or

C:\Program Files\Dot Hill\AssuredSAN VDS Provider

If a previous version of the AssuredSAN VDS Provider or AssuredSAN iSCSI VDS Provider is already installed, a message tells you that the software is installed but not up to date.

3. Press Yes to continue with the installation process or press No to exit setup.

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**NOTE:** Overwriting an existing AssuredSAN VDS Provider or AssuredSAN iSCSI VDS Provider will not overwrite previously installed hardware providers used with earlier storage systems.

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4. To verify the installation, run the DISKRAID `list providers` subcommand as shown below, and make sure that the AssuredSAN VDS Hardware Provider or AssuredSAN iSCSI VDS Provider is displayed in the list of providers. DiskRaid is a command-line utility from Microsoft that enables you to configure and manage your storage after the hardware provider is installed.

```
C:\>diskraid
```

```
Microsoft Diskraid version 5.2.3790
```

```
Copyright (c) 2003 Microsoft Corporation
```

```
DISKRAID> list providers
```

```
Prov ### Name                               Version  Type
-----
Prov X   AssuredSAN VDS Provider                   3.2.x.xx FC
Prov X   AssuredSAN iSCSI VDS Provider             3.2.x.xx iSCSI
```

If the hardware provider does not appear in the list of providers, reboot the host to reinitialize the VDS subsystem.

Once the CAPI Proxy and the VDS Provider are installed, no further configuration is necessary.

# Supported Microsoft DiskRaid Commands

This section contains a list of supported Microsoft DiskRaid commands.

- **CREATE LUN** <TYPE> [SIZE=<N>] [DRIVES=<N>, <N> [, . . .]] [STRIPESIZE=<N>] [NOERR]  
– Creates a new vdisk (linear only) or creates a linear 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, RAID6 and RAID50). STRIPESIZE is ignored.  
For information about virtual volumes see [Using VDS and VSS with virtual pools](#) on page 8.
- **DELETE LUN** – Deletes a linear volume on an existing vdisk. If the volume is the last one on the vdisk, the vdisk itself is also deleted. For information about virtual volumes see [Using VDS and VSS with virtual pools](#) on page 8.
- **DETAIL** – Displays the detailed information of the specified device.
- **EXTEND LUN size=<N>** – Increases the size of the volume by the specified value.
- **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.

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△ **CAUTION:** Virtual disk expansion cannot be stopped and can take days to complete, depending on drive type, RAID level, and other factors. Use RAIDar to view information about the vdisk size and the expansion's progress (*vdisk-name* > View > Overview).

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- **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.
- **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 RAIDar 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.

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**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**.

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## 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 Providers to monitor and manage the array. The VDS and VSS 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 and Windows Server 2012 Default SAN Policy for Newly Discovered Disks

When a disk is newly discovered on a Windows Server 2008 or Windows Server 2012 server, 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, Windows Server 2008 Datacenter and Windows Server 2012, 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.

## Microsoft Windows Registry Change for VDS Support With Some iSCSI HBAs

Accessing an AssuredSAN iSCSI or hybrid array using a CN1000E, NC551m, or NC551i HBA as an iSCSI initiator may have issues with passing in-band CAPI commands using the AssuredSAN2000 VDS provider. To avoid these issues:

1. Locate the registry value at:

`HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\be2iscsi\Parameters\Device\DriverParameters`

2. Double-click `DriverParameters`

3. Edit to include the following text:

`large_io=512`

4. Reboot the system for the registry option to take effect.

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**NOTE:** The `DriverParameters` key may not exist. If it does not exist, create the key `DriverParameters` as a STRING Value.

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# Troubleshooting

This section contains troubleshooting information for the AssuredSAN VDS Hardware Provider.

**Table 1** Troubleshooting the VDS Hardware Provider

Issue	Description
<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:</p> <p><a href="http://www.microsoft.com/technet/sysinternals/utilities/ProcessExplorer.mspx">http://www.microsoft.com/technet/sysinternals/utilities/ProcessExplorer.mspx</a></p> <p>In the Process Explorer main window, hover the cursor over the process name for each <code>dllhost.exe</code> process and look for one which displays a description containing <code>capihwprv.dll</code>. If you find a match, right-click on the process name and select Kill Process to terminate the process.</p>
<p>An application error in the Windows event log states:</p> <pre>ssproxy needs a 256-Kbyte buffer. You might need to set the MaximumSGList to a value of 65 or higher if using a SCSIPort driver.</pre>	<p>The AssuredSAN CAPI Proxy requires the maximum data for the CAPI command to be 256 Kbyte. This does not apply to Storport HBA drivers.</p> <p>For SCSIport HBA drivers, create a <code>MaximumSGList</code> registry entry if it does not already exist and set it to a value of 65 or higher, if it hasn't already been set.<sup>1</sup></p> <p>Note: The SCSIport host-bus adapter driver has been removed in Windows Server 2012. Instead, use either a Storport driver or a different host-bus adapter.</p> <p>To set the registry for Qlogic cards using the SCSIport driver, double-click <code>qla2300.reg</code> in the CAPI Proxy's installation directory, such as:</p> <pre>C:\Program Files\Dot Hill\AssuredSAN CAPI Proxy\qla2300.reg.</pre>
<p>Cannot view paths for the LUN in some commands.</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:</p> <pre>ssproxy.exe cannot be removed</pre>	<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>

**Table 1** Troubleshooting the VDS Hardware Provider <Emphasis>(Continued)

Issue	Description
A LUN appears with a capacity of 0KB	If a vdisk exists on the array and no volumes are allocated from it, the VDS Hardware Provider will present the vdisk to the VDS subsystem as a LUN with 0 KB of capacity. Normally, the VDS Provider will automatically delete a vdisk when the last volume on the vdisk is removed, but this might not happen if the last volume was removed using the RAIDar or CLI interfaces, or while a long-running operation such as a rebuild was in progress. The 0 KB “pseudo-LUN” allows the VDS subsystem to report the vdisk's name, status, and disk configuration, and allows the vdisk to be deleted by VDS clients if desired. Alternately, if a new LUN is created on the vdisk, either using a VDS client or the embedded user interfaces, the 0 KB pseudo-LUN will disappear.
DISKRAID “LBPOLICY” command fails with error 0x80041008	Setting the MPIO load balance policy to WEIGHTED PATHS via the VDS API may fail. As a workaround, use the MPIO tab in the Device Manager.
DISKRAID “ASSOCIATE PORT” command might fail with error 0x80042448	This command can be used to change the controller associated with a LUN, but this operation requires that all of the LUNs allocated from the same vdisk be migrated to the other controller. If the command fails, retry the operation by using the embedded user interfaces to set the vdisk association. If unsuccessful, the embedded user interface can provide a more detailed explanation of the problem.

1. For more information see: [http://msdn.microsoft.com/en-us/library/windows/hardware/ff563970\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff563970(v=vs.85).aspx)

## Uninstalling the AssuredSAN VDS Hardware Provider or AssuredSAN iSCSI VDS Provider

To uninstall the AssuredSAN VDS Hardware Provider or AssuredSAN iSCSI VDS Provider, perform the following steps.

1. Choose Start > Control Panel > Add/Remove Programs or Start > Control Panel > Programs and Features
2. Depending on which version you are uninstalling, choose AssuredSAN VDS Provider or AssuredSAN iSCSI VDS Provider and click Change/Remove.
3. Respond appropriately to the prompts.
4. You can also select the AssuredSAN CAPI Proxy from the Add Remove Programs list if you do not need it to enable either the VDS or VSS hardware provider, for which it is a prerequisite, and uninstall it now.

To uninstall the AssuredSAN VSS Hardware Provider, see [Uninstalling the AssuredSAN VSS Provider](#) on page 19.

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## 3 Installing and using the AssuredSAN VSS Provider

This section describes how to install the AssuredSAN VSS Provider.

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**NOTE:** In a cluster environment the AssuredSAN VSS 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.

---

1. Double-click the downloaded hardware provider file to launch the installation.
2. Press the Install button.
3. Follow the onscreen prompts to install the software.

The provider is installed in this directory:

```
C:\Program Files\Dot Hill\AssuredSAN VSS Provider
```

If a previous version of the AssuredSAN VSS Provider is already installed, a message tells you that the software is installed but not up to date.

4. Press Yes to continue with the installation process or press No to exit setup.

---

**NOTE:** Overwriting an existing AssuredSAN VSS Hardware Provider will not overwrite previously installed hardware providers used with earlier storage systems.

---

5. To verify the installation, run the `list providers` command, and make sure that the AssuredSAN VSS Provider is displayed in the list of providers.

```
C:\> vssadmin list providers
```

```
vssadmin 1.1 - Volume Shadow Copy Service administrative command-line tool  
(C) Copyright 2001-2005 Microsoft Corp.
```

```
Provider name: 'AssuredSAN VSS Provider'
```

```
Provider type: Hardware
```

```
Provider Id: {9d09666c-5cf8-45ca-9294-127c95562094}
```

```
Version: 3.2.0.xx
```

```
Provider name: 'Microsoft Software Shadow Copy provider 1.0'
```

```
Provider type: System
```

```
Provider Id: {b5946137-7b9f-4925-af80-51abd60b20d5}
```

```
Version: 1.0.0.7
```

### Creating shadow copies

VSS functionality includes creating, deleting, and managing shadow copies. To create a shadow copy of an ordinary linear volume which is not already assigned to a snap-pool, use RAIDar or the CLI to create a snap-pool, and then convert an existing standard volume to a master volume using the CLI (enabling the volume for shadow copies).

To create a shadow copy of a volume in a virtual pool, skip to step 2 below.

If you try to take a snapshot of an ordinary linear volume that has not been converted into a master volume first, the VSS Hardware Provider will attempt to convert it to a master volume automatically, after allocating a backing store of approximately 20% of the size of the volume (but not less than 6GB). When the last snapshot is deleted, the volume will then be converted back to a normal volume to free up resources that might subsequently be needed to take snapshots of other volumes.

Refer to the *RAIDar Reference Guide*, *Storage Management Guide*, and *CLI Reference Guide* for more information.

To create a shadow copy:

1. If the volume is a linear volume, use RAIDar or the CLI to create a snap pool and then convert an existing standard volume to a master volume using the CLI (enabling the volume for shadow copies). If the linear volume is not already a master volume, convert it to a master volume using the CLI `convert std-to-master` command.

The VSS Provider will attempt to automatically allocate a snap-pool, and convert a standard volume into a master volume. However, performing these steps ahead of time enables more control over the allocation of storage, and provides better feedback in case an operation does not succeed.

2. Create the shadow copy using a VSS requestor such as DiskShadow (included in Windows Server 2008 and later) or VShadow (available as a download from microsoft.com as part of the Windows SDK).

---

**NOTE:** After the hardware provider is installed, your backup software may take advantage of it to create temporary hardware snapshots on the array when your backups are run.

---

---

**NOTE:** The AssuredSAN VSS 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. It may take up to 90 seconds to create and import a shadow copy. It takes longer if multiple 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 Providers 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; 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 and Windows Server 2012 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 [LUN 0 Mapping](#) on page 11 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)

# Troubleshooting

This section contains troubleshooting information for the AssuredSAN VSS Provider.

**Table 2** Troubleshooting the VSS Hardware Provider

Issue	Description
<p>The VSS Provider cannot create a snapshot.</p> <p>The following error is reported:</p> <p>VSS_E_PROVIDER_VETO</p>	<ul style="list-style-type: none"> <li>The maximum number of snapshots allowed by the snapshot license has already been created.</li> <li>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"> <li>The LUN that will be used to create the snapshot is not a master volume.</li> <li>The serial number cannot be obtained for the controller owning the master volume partition.</li> <li>The snapshot cannot be found in the VSS Provider's snapshot list.</li> <li>The partition is not a snapshot.</li> <li>The LUN assignment to the newly created snapshot failed.</li> <li>The snapshot that will be deleted is not a Dot Hill snapshot.</li> </ul> </li> </ul>
<p>The shadow copy does not exist on the controller.</p>	<ul style="list-style-type: none"> <li>The backup utility automatically deletes the shadow copy when the backup is complete.</li> <li>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.</li> </ul>
	<ul style="list-style-type: none"> <li>Make sure you have created the shadow copy using the persistent (-p) attribute.</li> <li>If you use the Vssadmin tool from Microsoft to create shadow copies, it is not designed to work with the AssuredSAN VSS Provider. Vssadmin create shadow only works with the Microsoft software shadow copy provider built into Windows.</li> </ul>
<p>Shadow copy creation failed or the following error message is displayed in the system application event log:</p> <p>SCSI bus # supports maximum SCSI I/O length #, but VSS needs #</p>	<ul style="list-style-type: none"> <li>The MaximumSGList registry entry must be set to a value of 65 or larger. To set the registry for Qlogic cards, double-click qla2300.reg in the AssuredSAN VSS Provider's installation directory; for example, C:\Program Files\Dot Hill\AssuredSAN VSS\qla2300.reg.</li> <li>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.</li> </ul>

**Table 2** Troubleshooting the VSS Hardware Provider <Emphasis>(Continued)

Issue	Description
	<ul style="list-style-type: none"> <li>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.</li> </ul>
It is taking a long time to create the shadow copy.	The AssuredSAN VSS 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. It may take up to 90 seconds to create and import a shadow copy. It takes longer if more RAID partitions are included in the same shadow copy set.
Not Implemented or 0x80004001 error when <code>revert</code> command used in <code>VShadow</code> or <code>DiskShadow</code> .	The <code>revert</code> option is meant for host-based snapshots and is not supported for array-based snapshots. Use the <code>resync</code> command instead.
VSS_E_MISSING_DISK error when using the <code>RESYNC</code> command	This error can occur if the target volume is in use when the <code>RESYNC</code> command is issued. The target volume may be left in an offline state; use Disk Management or <code>DISKPART</code> to bring the target volume back online. To minimize the likelihood of this error occurring, stop the VSS subsystem with the command <code>NET STOP VSS</code> prior to performing the <code>RESYNC</code> operation; the VSS subsystem will automatically restart when you launch a VSS client. If necessary, use <code>MOUNTVOL</code> to unmount the volume prior to issuing the <code>RESYNC</code> command to ensure that other applications are not accessing the volume.
VSS_E_PROVIDER_VETO error when using the <code>RESYNC</code> command	This error can occur if a previous operation in the array is still in progress and the <code>resync</code> operation cannot proceed. The target volume may be left in an offline state; use Disk Management or <code>DISKPART</code> to bring the target volume back online. Review the event log on the array and wait for any operation in progress to complete before retrying the operation.

## Uninstalling the AssuredSAN VSS Provider

To uninstall the AssuredSAN VSS Provider, perform the following steps.

1. Choose Start > Control Panel > Add/Remove Programs or Start > Control Panel > Programs and Features
2. Choose AssuredSAN VSS Provider and click Change/Remove.
3. Respond appropriately to the prompts.
4. You can also select the AssuredSAN CAPI Proxy from the Add Remove Programs list if you do not need it to enable either the VDS or VSS hardware provider, for which it is a prerequisite, and uninstall it now.

To uninstall the AssuredSAN VDS Hardware Provider, see [Uninstalling the AssuredSAN VDS Hardware Provider or AssuredSAN iSCSI VDS Provider](#) on page 14.