IBM System Storage N series

IBM

Windows Host Utilities 6.0 Installation and Setup Guide

Contents

Preface

Supported features

IBM System Storage N series storage systems are driven by NetApp Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details.

Information about supported features can also be found on the N series support website (accessed and navigated as described in *Websites* on page 7).

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:
  www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:
  www.ibm.com/storage/support/nseries/
  This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:
  www.ibm.com/systems/storage/network/interophome.html
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:
  publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains

information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure they are connected.
- Check the power switches to make sure the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Refer to the N series support website (accessed and navigated as described in *Websites* on page 7) for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the N series support website (accessed and navigated as described in *Websites* on page 7).

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, ensure that you run the latest level of firmware. Any firmware updates are posted to the N series support website (accessed and navigated as described in *Websites* on page 7).

Note: If you do not see new firmware updates on the N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

How to send your comments

Your feedback helps us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, please send them by e-mail to *starpubs@us.ibm.com*.

Be sure to include the following:

*   Exact publication title
*   Publication form number (for example, GC26-1234-02)
*   Page, table, or illustration numbers
*   A detailed description of any information that should be changed

Changes to this document: May 2012

Several changes have been made to this document since it was first published.

May 2012 update

In May 2012, this document was updated with the following information for the Windows Host Utilities 6.0 release:

- The list of hotfixes that are required for Windows Server was added.
  See *List of required hotfixes for Windows Server* on page 28.
- Instructions for setting up a SAN boot LUN were updated.
  See *Setting up a SAN boot LUN for Windows Server* on page 77.

October 2011 update

In October 2011, this document was updated for the release of the Windows Host Utilities 6.0. At that time, the document was updated to add the following information:

- Two new Windows registry settings (UseCustomPathRecoveryInterval and PathRecoveryInterval).
- A change to the value of an existing registry setting (LinkDownTimeOut).
- A new registry value that overrides a setting from the Data ONTAP DSM for Windows MPIO software (ReservationTimeout).
- Additional requirements and limitations for using the mbralign program.
- Removed information about Virtual Server 2005. Use Hyper-V if possible; otherwise use Windows Host Utilities 5.3 with Virtual Server 2005.

Related concepts

ReservationTimeout setting on page 64

Related references

UseCustomPathRecoveryInterval setting on page 65
PathRecoveryInterval setting on page 64
LinkDownTime setting on page 63

New features in this Host Utilities release

Windows Host Utilities 6.0 includes several new features and support for additional configurations.

Host Utilities 6.0 includes the following changes from 5.3:

- Support for Data ONTAP Cluster-Mode SAN.
- The Host Utilities are no longer required if the Windows host is running the Data ONTAP DSM 3.5 for Windows MPIO or later.
- Support for Hyper-V guests running Red Hat Enterprise Linux (RHEL). The IBM N series interoperability matrix lists the specific versions supported.
- The timeout values set by the Host Utilities installation program are updated based on ongoing testing.
- The Host Utilities installation program overrides the HKLM\SYSTEM\CurrentControlSet \Services\ontapdsm\Parameters\ReservationTimeout value set by Data ONTAP DSM 3.3.1 for Windows MPIO. The new value improves the recovery of Windows Server 2008 failover clusters from storage controller reboots.
- The mbralign.exe program is updated to align partitions to the latest Microsoft-recommended offset.
- New HBA and CNA driver and firmware versions are supported; the IBM N series interoperability matrix shows the currently supported versions.
- New Microsoft Windows hotfixes are required.

Related concepts

Related references

Introduction to Host Utilities

This section introduces the Host Utilities and what they contain.

What the Host Utilities are

The Host Utilities are a set of software programs and documentation that enable you to connect host computers to IBM N series storage systems.

The Host Utilities include the following components:

- An installation program that sets required parameters on the host computer and on certain host bus adapters (HBAs).
- A program (mbralign.exe) to detect and correct master boot record (MBR) partition alignment problems for virtual machines. The mbralign program now also includes the function provided by the mbrscan program in earlier Host Utilities versions.
- An ISO file (LinuxGuestConfig.iso) you can mount in Hyper-V virtual machines running Linux that contains a script (linux_gos_timeout-install.sh) for setting disk timeouts for best read/write performance with IBM N series storage.
- This documentation, which describes how to install the Host Utilities and troubleshoot common problems.

Tasks required for installing and configuring the Host Utilities

Installing and configuring the Host Utilities involves performing a number of tasks on the host and the storage system.

The required tasks are as follows.

1. Install the Host Utilities and other required and optional software.

2. Record the FC and iSCSI initiator identifiers.

3. Create LUNs and make them available as disks on the host computer.

The following tasks are optional, depending on your configuration.

- Change the Fibre Channel cfmode setting of the storage system to single_image.
- Configure SAN booting of the host.

Related concepts

Host configuration settings on page 55

Related tasks

Related information

What the Host Utilities contain

The Host Utilities include an installation program. When you install the Host Utilities software, the
installer sets required Windows registry and HBA parameters.

The following programs and files are installed on the Windows host computer. The default directory
is C:\Program Files\IBM\Windows Host Utilities.

Program	Purpose
emulexhba.reg	Troubleshooting program; run this program only if instructed to do so by technical support personnel.
\IBMQCLI\fcconfig.exe	Used by the installation program to set HBA parameters. Not installed if Data ONTAP DSM for Windows MPIO is detected on the host.
\IBMQCLI\fcconfig.ini	Used by the installation program to set HBA parameters. Not installed if Data ONTAP DSM for Windows MPIO is detected on the host.
LinuxGuestConfig.iso	Sets disk timeouts for Hyper-V virtual machines running Linux. Must be run from the Linux guest.
mbralign.exe	Detects and corrects VHD alignment problems for Hyper-V virtual machines.
NOTICE.pdf	Contains legal notices for the Host Utilities programs.
\IBMQCLI*.*	Used by the installation program to set QLogic Fibre Channel HBA parameters.
san_version.exe	Displays the version of the Host Utilities and Fibre Channel HBAs.

Related tasks

Windows configurations supported by the Host Utilities

The Host Utilities support a number of Windows host configurations.

Depending on your specific environment, the Host Utilities support the following:

• iSCSI paths to the storage system
• Fibre Channel paths to the storage system
• Multiple paths to the storage system when a multipathing solution is installed
• Virtual machines using Hyper-V (Windows Server 2008, Windows Server 2008 R2) or Virtual Server 2005 (Windows Server 2003), both parent and guest
• Veritas Storage Foundation
• SAN booting

Use the IBM N series interoperability matrix to find a supported combination of host and storage system components and software and firmware versions.

Related information

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

Windows configurations that support ALUA

Windows hosts support ALUA (asymmetric logical unit access) with certain combinations of Windows, Data ONTAP, Host Utilities, and MPIO software.

The following table lists configurations that support ALUA. Use the N series interoperability matrix to determine a supported combination of Windows, Data ONTAP, Host Utilities, and MPIO software. Then enable or disable ALUA based on the information in the table.

Windows version	MPIO software	Minimum Data ONTAP	ALUA supported?
Server 2008 Server 2008 R2	Microsoft DSM (msdsm)	7.3.0	Yes
Server 2008 SP2 Server 2008 R2	Data ONTAP DSM 3.4 and later	7.3.2	Yes
Server 2008 Server 2008 R2	Data ONTAP DSM 3.3.1 and earlier	none	No

Windows version	MPIO software	Minimum Data ONTAP	ALUA supported?
Server 2008 Server 2008 R2	Veritas DSM from Storage Foundation for Windows 5.1 and earlier	none	No
Server 2003 SP2 Server 2003 R2	Data ONTAP DSM 3.4 and later	7.3.2	Yes
Server 2003	Data ONTAP DSM 3.3.1 and earlier	none	No
Server 2003	Veritas DSM from Storage Foundation for Windows 5.1 and earlier	none	No

Note: For MPIO software not listed in this table, see the documentation for that software for updated ALUA support and requirements.

ALUA is required for FC paths when using the Microsoft DSM (msdsm) or the Data ONTAP DSM 3.4 or later.

ALUA is supported and required for both iSCSI and FC paths with Data ONTAP 8.1 operating in Cluster-Mode. ALUA is enabled by default and cannot be disabled for any path when operating in Cluster-Mode. ALUA is not supported for iSCSI paths with Data ONTAP 8.1 operating in 7-Mode.

Protocols supported by the Host Utilities

The Host Utilities provide support for Fibre Channel, Fibre Channel over Ethernet, and iSCSI connections to the storage system.

For more information about SAN protocols and supported configurations, see the *Fibre Channel and iSCSI Configuration Guide* for your version of Data ONTAP software.

Related information

[Fibre Channel and iSCSI Configuration Guide - www.ibm.com/storage/support/nseries/](www.ibm.com/storage/support/nseries/)

Dynamic disk support

Windows dynamic disks are supported with specific configuration requirements.

When using the native Windows storage stack, all LUNs composing the dynamic volume must be located on the same storage system controller.

When using Veritas Storage Foundation for Windows, the LUNs composing the dynamic volume can span storage controllers in active/active configurations.

Dynamic disks are not supported by SnapDrive for Windows.

Multipathing options supported by the Host Utilities

The Host Utilities support multiple FC (Fibre Channel) paths, multiple iSCSI paths, or a combination of FC and iSCSI paths.

Configure multiple paths to ensure a highly available connection between the Windows host and storage system.

Multipath I/O (MPIO) software is required any time a Windows host has more than one path to the storage system. The MPIO software presents a single disk to the operating system for all paths, and a device-specific module (DSM) manages path failover. Without MPIO software, the operating system could see each path as a separate disk, which can lead to data corruption.

On a Windows system, there are two main components to any MPIO configuration: the Windows MPIO components and a DSM. MPIO is supported for Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 systems. MPIO is not supported for Windows XP and Windows Vista running in a Hyper- V virtual machine.

When you select MPIO support during Host Utilities installation, the Host Utilities installer installs the Microsoft MPIO components on Windows Server 2003 or enables the included MPIO feature of Windows Server 2008.

See the appropriate interoperability matrix for your N series product, available on the IBM support Web site for multipathing software currently supported.

The Microsoft Windows multipathing software uses a DSM to communicate with storage devices such as IBM N series storage systems. You must use only one DSM for a given storage vendor. More precisely, you can have only one DSM that claims the LUNs for a given vendor ID, product ID (VID/PID) pair. If you are using Windows Server 2008 or Windows Server 2008 R2, you must enable the optional Windows multipathing feature before installing a DSM.

A supported DSM is required for multipathing. The following DSMs are available for Windows hosts.

Data ONTAP DSM for Windows MPIO	This multipathing software supports active/active and active/passive policies on Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2. If installed on Windows Server 2008, the Data ONTAP DSM claims IBM N series LUNs and the Microsoft msdsm is not used. ALUA must be disabled on the storage system igroup when using Data ONTAP DSM 3.3.1 and earlier.
Veritas DMP DSM	For MPIO using Veritas DMP, only the Veritas DMP DSM is supported; the Veritas DMP Array Support Library (ASL) is not supported. See the N series interoperability matrix for details on supported load balance policies with FC and iSCSI protocols.

Note: If you are using Veritas Storage Foundation for Windows, configure either Fibre Channel paths or iSCSI paths depending on how you want to connect to the storage system. There is no support for both Fibre Channel and iSCSI protocols on the same host with Veritas Storage Foundation.

Windows Server 2008 msdsm	This is the native DSM provided with Microsoft Windows Server 2008 and Windows Server 2008 R2. It offers active/active and active/passive load balance policies for both the FC and iSCSI protocols. ALUA must be enabled on the storage system igroup for FC. See the N series interoperability matrix to be sure you have a version of Data ONTAP software that is supported with this DSM.
Microsoft iSCSI DSM	This is the DSM provided with the Microsoft iSCSI initiator. You can use this DSM for iSCSI paths on Windows Server 2003 systems.

Related information

   IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

What is Hyper-V

Hyper-V is a Windows technology that enables you to create multiple virtual machines on a single physical x64 computer running Microsoft Windows Server 2008 or Windows Server 2008 R2.

Hyper-V is a "role" available in Microsoft Windows Server 2008 and Windows Server 2008 R2. Each virtual machine runs its own operating system and applications. For a list of currently-supported operating systems on Hyper-V virtual machines, see the Windows Host Utilities Release Notes.

Methods for using storage with Hyper-V

Hyper-V enables you to provision storage using a virtual hard disk, an unformatted (raw) LUN, or an iSCSI LUN.

Virtual machines use storage on a storage system in the following ways:

- A virtual hard disk (IDE or SCSI) formatted as NTFS. The virtual hard disk is stored on a LUN mapped to the Hyper-V parent system. The guest OS must boot from an IDE virtual hard disk.
- An unformatted (raw) LUN mapped to the Hyper-V parent system and provided to the virtual machine as a physical disk mapped through either the SCSI or IDE virtual adapter.

  Note: Do not enable multipathing in Windows Host Utilities installed on a guest OS if you are using raw (passthru) disks. The raw disks do not show up in the guest OS if multipathing is enabled.

- An iSCSI LUN accessed by an iSCSI initiator running on the guest OS.

  - For Windows Vista, use the built-in iSCSI initiator; multipathing is not supported.
  - For Windows XP, use Microsoft iSCSI initiator 2.07; multipathing is not supported.

- For Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2, use an iSCSI initiator and multipathing solution that is supported by IBM for use on a standard host platform. The guest OS supports the same iSCSI configurations as if it was not running on a virtual machine.
- For SUSE Linux Enterprise Server, use a supported iSCSI initiator and multipathing solution. The guest OS supports the same iSCSI configurations as if it was not running on a virtual machine.

The parent Hyper-V system can connect to storage system LUNs just like any other Windows Server 2008 or Windows Server 2008 R2 host.

Methods for clustering Windows hosts with Hyper-V

Hyper-V provides two ways to let you cluster Windows hosts.

- You can cluster the parent Hyper-V system with other parent systems using Windows failover clustering.
- You can cluster guest systems running in virtual machines with other guest systems using the clustering solution supported on the operating system You must use an iSCSI software initiator on the guest system to access the quorum and shared disks.

Recommended LUN layout with Hyper-V

You can put one or more virtual hard disks (VHDs) on a single LUN for use with Hyper-V.

The recommended LUN layout with Hyper-V is to put up to 10 VHDs on a single LUN. If you need less than ten VHDs, put each VHD on its own LUN. If you need more than ten VHDs for a Windows host, spread the VHDs evenly across about ten LUNs.

When you create virtual machines, store the virtual machine and the VHD it boots from in the same LUN.

For Windows failover clusters, the layout is different.

- For Windows Server 2008 R2 with cluster shared volumes (CSVs), you can have VHDs for multiple guests on the same LUN.
- For failover clusters without CSV, use a separate LUN for each guest's VHDs.

About SAN booting

SAN booting is the general term for booting a Windows host from a storage system LUN instead of an internal hard disk. The host might or might not have any hard drives installed.

SAN booting offers many advantages. Because the system (C:\) drive is located on the storage system, all of the reliability and backup features of the storage system are available to the system drive. You can also clone system drives to simplify deploying many Windows hosts and to reduce the total storage needed. SAN booting is especially useful for blade servers.

The downside of SAN booting is that loss of connectivity between the host and storage system can prevent the host from booting. Be sure to use a reliable connection to the storage system.

There are three options for SAN booting a Windows host:

Fibre Channel HBA	Requires one or more supported adapters. These same adapters can also be used for data LUNs. The Windows Host Utilities installer automatically configures required HBA settings.
iSCSI HBA	Requires one or more supported adapters. These same adapters can also be used for data LUNs, or you can use an iSCSI software initiator for data. You must manually configure the HBA settings.
iSCSI software boot	Requires a supported network interface card (NIC) and a special version of the Microsoft iSCSI software initiator.

For information on iSCSI software boot, see the vendor (Intel or IBM) documentation for the iSCSI boot solution you choose. Also, see Technical Report 3644.

> **Note:** This technical report contains information about NetApp products that IBM licenses and in some cases customizes. Technical reports might contain information about models and features that are not supported by IBM.

Related information

Technical Report 3644: iSCSI Software Boot for Windows with NetApp Storage

Support for non-English operating system versions

Windows Host Utilities are supported on all Language Editions of Windows Server 2003, Server 2008, and Server 2008 R2. All product interfaces and messages are displayed in English. However, all variables accept Unicode characters as input.

Where to find more information

For additional information about host and storage system requirements, supported configurations, your operating system, and troubleshooting, refer to the appropriate documentation.

If you need more information about...	Go to...
Known issues, system requirements, and last minute updates	The latest Host Utilities *Release Notes*
The latest supported configurations	• The IBM N series interoperability matrix • *IBM System Storage N series Introduction and Planning Guide*

If you need more information about...	Go to...
Configuring the storage system	• The *Data ONTAP Software Setup Guide* • The *Data ONTAP Block Access Management Guide for iSCSI and FC*
Supported SAN topologies	The *Fibre Channel and iSCSI Configuration Guide* for your version of Data ONTAP software
Installing and configuring the HBA in your host	Your HBA vendor documentation
Installing and configuring MPIO using the Data ONTAP DSM	The *Installation and Administration Guide* for that version of Data ONTAP DSM for Windows MPIO
Installing and configuring Veritas Storage Foundation for Windows and the Veritas DMP DSM	• The *Veritas Storage Foundation and High Availability Solutions Installation and Upgrade Guide* • The *Veritas Storage Foundation Administrator's Guide*
Configuring Veritas Cluster Server and Microsoft Clustering in a Storage Foundation environment	• The *Veritas Cluster Server Administrator's Guide* • The *Veritas Storage Foundation Administrator's Guide*
Installing and configuring a supported version of SnapDrive® for Windows software	The *Installation and Administration Guide* for that version of SnapDrive for Windows
Managing SAN storage on the storage system	• The *Data ONTAP Block Access Management Guide for iSCSI and FC* • Data ONTAP man pages or the *Data ONTAP Commands: Manual Page Reference*
General product information, including support information	See the N series support website (accessed and navigated as described in *Websites* on page 7)

Related information

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html
FC and iSCSI Configuration Guide - www.ibm.com/storage/support/nseries/

Installing and Configuring Host Utilities

This section describes how to install and configure the Host Utilities and how to perform related tasks.

Steps

Installing and configuring the Host Utilities (high level)

The following steps provide a high-level overview of what is involved in installing the Host Utilities and configuring your system to work with that software.

About this task

This section is for people familiar with this operating system and storage systems. If you need more information, see the detailed instructions for the steps.

Note: If you are upgrading a host running the Data ONTAP DSM from Windows Server 2008 to Server 2008 R2, you must upgrade to Data ONTAP DSM 3.3.1 before installing Server 2008 R2. You must also upgrade to Windows Host Utilities 5.2 before upgrading to Windows Server 2008 R2.

Steps

1. Verify your host and storage system configuration.

2. Confirm your storage system is set up.

3. Configure FC HBAs and switches.

4. Check the media type setting of FC target ports.

5. Install an iSCSI software initiator or HBA.

6. Configure iSCSI options and security.

7. Configure a multipathing solution.

8. Install Veritas Storage Foundation.

9. Install the Host Utilities.

10. Install SnapDrive for Windows.

After you finish

If you add a Windows 2008 R2 host to a failover cluster after installing the Host Utilities, run the Repair option of the Host Utilities installation program to set the required ClusSvcHangTimeout parameter.

Verifying your host and storage system configuration

Before you install the Host Utilities, verify that the Host Utilities version supports your host and storage system configuration.

About this task

The N series interoperability matrix lists all supported configurations. Individual computer models are not listed; Windows hosts are qualified based on their CPU chips. The following configuration items must be verified:

- Windows host CPU architecture
- Windows operating system version, service pack level, and required hotfixes

  Note: If you are upgrading a host running the Data ONTAP DSM from Windows Server 2008 to Server 2008 R2, you must upgrade to Data ONTAP DSM 3.3.1 or later before installing Server 2008 R2. You must also upgrade to Windows Host Utilities 5.2 or later before upgrading to Windows Server 2008 R2.

  If you upgrade to Data ONTAP DSM 3.5 or later, Windows Host Utilities is not required. All of the components and functions of the Host Utilities are included in the DSM package.

- HBA model and firmware version
- Fibre Channel switch model and firmware version
- iSCSI initiator
- Multipathing software
- Veritas Storage Foundation for Windows software
- Data ONTAP version and cfmode setting

• Option software such as SnapDrive for Windows

Steps

1. Verify that your entire configuration is listed in the matrix.

2. Verify guest operating systems on Hyper-V virtual machines are shown as supported in the Windows Host Utilities Release Notes.

Related information

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

Installing Windows hotfixes

Obtain and install the required Windows hotfixes for your version of Windows.

Before you begin

Some of the hotfixes require a reboot of your Windows host. You can wait to reboot the host until after you install or upgrade the Host Utilities.

When you run the installer for the Windows Host Utilities, it lists any missing hotfixes. You must add the required hotfixes before the installer will complete the installation process.

Note: Some hotfixes for Windows Server 2008 are not recognized unless the affected feature is enabled. For example, an MPIO hotfix might not be recognized as installed until the MPIO feature is enabled. If you are prompted to install a hotfix that is already installed, try enabling the affected Windows feature and then restart the Host Utilities installation program.

Steps

1. Determine which hotfixes are required for your version of Windows.

2. Download hotfixes from the Microsoft support site.

Note: Some hotfixes must be requested from Microsoft support. They are not available for direct download.

3. Follow the instructions provided by Microsoft to install the hotfixes.

Related information

Microsoft support site
IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

List of required hotfixes for Windows Server

Specific Windows Server hotfixes are required before you install or upgrade the Windows Host Utilities.

The hotfixes listed in this section are the minimum requirement. The following tables specify the name and version of the file that is included in each hotfix and required for the Windows Host Utilities. The specified file version is the minimum requirement.

The N series interoperability matrix lists updates to hotfix requirements when new hotfixes supersede older hotfixes.

Note: The product installer does not check for the hotfixes that are required for Windows Failover Clustering configurations. The installer checks for all other hotfixes.

Windows Server 2003 SP2 and Windows Server 2003 R2 SP2

The following table lists the minimum required hotfixes for Windows Server 2003 SP2 and Windows Server 2003 R2 SP2.

Hotfix	When required	File name	File version
945119	Always	Storport.sys	5.2.3790.4189
982109	Always	Mpio.sys	5.2.3790.4706

Windows Server 2008 SP2

The following table lists the minimum required hotfixes for Windows Server 2008 SP2.

Hotfix	When required	File name	File version
968675	Always	Storport.sys	6.0.6002.22128
2277440	Always	Msdsm.sys	6.0.6002.22459
2522766	Always	Mpio.sys	6.0.6002.22637
2637162	Windows Failover Clustering configurations	Clusres.dll	6.0.6002.22717

Windows Server 2008 R2

The following table lists the minimum required hotfixes for Windows Server 2008 R2.

Hotfix	When required	File name	File version
2522766	Always	Mpio.sys	6.1.7600.20970

Hotfix	When required	File name	File version
2528357	Always	Storport.sys	6.1.7600.20959
979711	Always	Msiscsi.sys	6.1.7600.16519
981379	Always	Msdsm.sys	6.1.7600.20671
2520235	Windows Failover Clustering configurations	Clusres.dll	6.1.7600.20921

Windows Server 2008 R2 SP1

The following table lists the minimum required hotfixes for Windows Server 2008 R2 SP1.

Hotfix	When required	File name	File version
2522766	Always	Mpio.sys	6.1.7601.17619
2528357	Always	Storport.sys	6.1.7601.21720
2520235	Windows Failover Clustering configurations	Clusres.dll	6.1.7601.21680
2531907	Windows Failover Clustering configurations	Failoverclusters.agent.interop.dll	6.1.7601.17514
		Failoverclusters.validation.bestpracticetests.dll	6.1.7601.21710
		Failoverclusters.validation.common.dll	6.1.7601.21710
		Failoverclusters.validation.generaltests.dll	6.1.7601.21710
		Failoverclusters.validation.storagetests.dll	6.1.7601.21710
		Failoverclusters.validation.wizard.dll	6.1.7601.21710

Related information

Microsoft support site
IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

Confirming your storage system configuration

You must make sure your storage system is properly cabled and the FC and iSCSI services are licensed and started.

About this task

This topic describes the high-level tasks you must complete to configure your storage system for use with Fibre Channel and iSCSI hosts. See the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP for detailed instructions.

Steps

1. Add the iSCSI or FCP license and start the target service. The Fibre Channel and iSCSI protocols are licensed features of Data ONTAP software. If you need to purchase a license, contact your IBM or sales partner representative.

2. Verify your cabling. See the *FC and iSCSI Configuration Guide* for detailed cabling and configuration information.

Related information

FC and iSCSI Configuration Guide - www.ibm.com/storage/support/nseries/

Configuring FC HBAs and switches

Install and configure one or more supported Fibre Channel host bus adapters (HBAs) for Fibre Channel connections to the storage system.

About this task

The Windows Host Utilities installer sets the required Fibre Channel HBA settings.

Note: Do not change HBA settings manually.

Steps

1. Install one or more supported Fibre Channel host bus adapters (HBAs) according to the instructions provided by the HBA vendor.

2. Obtain the supported HBA drivers and management utilities and install them according to the instructions provided by the HBA vendor.

   The supported HBA drivers and utilities are available from the following locations:

   Emulex HBAs   Emulex support page for IBM.

QLogic HBAs   QLogic support page for IBM.

3. Connect the HBAs to your Fibre Channel switches or directly to the storage system.

4. Create zones on the Fibre Channel switch according to your Fibre Channel switch documentation.

   For Data ONTAP 8.1 operating in Cluster-Mode, zone the switch by WWPN. Be sure to use the WWPN of the logical interfaces (LIFs) and not of the physical ports on the storage controllers.

Related information

   FC and iSCSI Configuration Guide - www.ibm.com/storage/support/nseries/
   Emulex support page for IBM
   QLogic support page for IBM

Checking the media type of FC ports

The media type of the storage system FC target ports must be configured for the type of connection between the host and storage system.

About this task

The default media type setting of "auto" is for fabric (switched) connections. If you are connecting the host's HBA ports directly to the storage system, you must change the media setting of the target ports to "loop".

This task applies to Data ONTAP operating in 7-Mode. It does not apply to Data ONTAP operating in Cluster-Mode.

Steps

1. To display the current setting of the storage system's target ports, enter the following command at a storage system command prompt:

   fcp show adapter -v

   The current media type setting is displayed.

2. To change the setting of a target port to "loop" for direct connections, enter the following commands at a storage system command prompt:

   fcp config *adapter* down

   fcp config *adapter* mediatype loop

   fcp config *adapter* up
   adapter is the storage system adapter directly connected to the host.

For more information, see the fcp man page or *Data ONTAP Commands: Manual Page Reference, Volume 1* for your version of Data ONTAP.

Configuring iSCSI initiators and HBAs

For configurations using iSCSI, you must either download and install an iSCSI software initiator or install an iSCSI HBA, or both.

An iSCSI software initiator uses the Windows host CPU for most processing and Ethernet network interface cards (NICs) or TCP/IP offload engine (TOE) cards for network connectivity. An iSCSI HBA offloads most iSCSI processing to the HBA card, which also provides network connectivity.

The iSCSI software initiator typically provides excellent performance. In fact, an iSCSI software initiator provides better performance than an iSCSI HBA in most configurations. The iSCSI initiator software for Windows is available from Microsoft at no charge. In some cases, you can even SAN boot a host with an iSCSI software initiator and a supported NIC.

iSCSI HBAs are best used for SAN booting. An iSCSI HBA implements SAN booting just like an FC HBA. When booting from an iSCSI HBA, it is recommended that you use an iSCSI software initiator to access your data LUNs.

Note: You configure iSCSI paths differently for Data ONTAP 8.1 operating in Cluster-Mode. You need to create one or more iSCSI paths to each storage controller that can access a given LUN. Unlike earlier versions of Data ONTAP software, the iSCSI ports on a partner node do not assume the IP addresses of the failed partner. Instead, the MPIO software on the host is responsible for selecting the new paths. This behavior is very similar to Fibre Channel path failover.

iSCSI software initiator options

Select the appropriate iSCSI software initiator for your host configuration.

The following is a list of operating systems and their iSCSI software initiator options.

Windows Server 2003	Download and install the iSCSI software initiator
Windows Server 2008	The iSCSI initiator is built into the operating system. The iSCSI Initiator Properties dialog is available from Administrative Tools.
Windows Server 2008 R2	The iSCSI initiator is built into the operating system. The iSCSI Initiator Properties dialog is available from Administrative Tools.
Windows XP guest systems on Hyper-V	For guest systems on Hyper-V virtual machines that access storage directly (not as a virtual hard disk mapped to the parent system), download and install the iSCSI software initiator. You cannot select the Microsoft MPIO Multipathing Support for iSCSI option; Microsoft does not support MPIO with Windows XP. Note that a Windows XP iSCSI connection to IBM N series storage is supported only on Hyper-V virtual machines.

Windows Vista guest systems on Hyper-V	For guest systems on Hyper-V virtual machines that access storage directly (not as a virtual hard disk mapped to the parent system), the iSCSI initiator is built into the operating system. The iSCSI Initiator Properties dialog is available from Administrative Tools. Note that a Windows Vista iSCSI connection to IBM N series storage is supported only on Hyper-V virtual machines.
SUSE Linux Enterprise Server guest systems on Hyper-V	For guest systems on Hyper-V virtual machines that access storage directly (not as a virtual hard disk mapped to the parent system), use an iSCSI initiator solution on a Hyper-V guest that is supported for standalone hardware. A supported version of Linux Host Utilities is required.
Linux guest systems on Virtual Server 2005	For guest systems on Virtual Server 2005 virtual machines that access storage directly (not as a virtual hard disk mapped to the parent system), use an iSCSI initiator solution on a Virtual Server 2005 guest that is supported for standalone hardware. A supported version of Linux Host Utilities is required.

Note: If you want to use an iSCSI HBA on Windows Server 2003 hosts to access the storage system, you must download and install the iSCSI initiator service.

Related tasks

Downloading the iSCSI software initiator

To download the iSCSI initiator, complete the following steps.

About this task

If you are using iSCSI software boot, you need a special boot-enabled version of the iSCSI software initiator.

Steps

1. Go to the Microsoft Web site at http://www.microsoft.com/.

2. Click **Downloads & Trials**.

3. Click **Download Center**.

4. Keep the default setting of All Downloads. In the Search box, type

   iSCSI Initiator
   and then click **Go**.

5. Select the supported Initiator version you want to install.

6. Click the download link for the CPU type in your Windows host. You might also choose to download the *Release Notes* and *Users Guide* for the iSCSI Initiator from this Web page.

7. Click **Save** to save the installation file to a local directory on your Windows host.

Result

The initiator installation program is saved to the Windows host.

Related concepts

About SAN booting on page 21

Installing the iSCSI Initiator software

On the Windows host, complete the following steps to install the iSCSI Initiator.

Before you begin

You must have downloaded the appropriate iSCSI initiator installer to the Windows host.

Steps

1. Open the local directory to which you downloaded the iSCSI Initiator software.

2. Run the installation program by double-clicking the icon.

3. When prompted to select installation options, select **Initiator Service** and **Software Initiator**.

4. For all multipathing solutions except Veritas, select the **Microsoft MPIO Multipathing Support for iSCSI** check box, regardless of whether you are using MPIO or not. For the Veritas multipathing, clear this check box.

   Multipathing is not available for Windows XP and Windows Vista.

5. Follow the prompts to complete the installation.

Installing the iSCSI HBA

If your configuration uses an iSCSI HBA, you must make sure that the HBA is installed and configured correctly.

Before you begin

If you use an iSCSI HBA on Windows Server 2003 hosts, you also need to install the Microsoft iSCSI initiator service. If you are using only the iSCSI HBA, you can clear the "iSCSI Initiator" check box when installing the initiator package. The initiator service is built into Windows Server 2008 and Windows Server 2008 R2.

About this task

You can optionally boot your Windows host from a storage system LUN using a supported HBA.

Steps

1. Install one or more supported iSCSI host bus adapters according to the instructions provided by the HBA vendor.

2. Obtain the supported HBA drivers and management utilities and install them according to the instructions provided by the HBA vendor.

3. Manually set the required QLogic iSCSI HBA settings.

   a. Start the SANsurfer program on the Windows host and select the iSCSI HBA. See the SANsurfer online Help for more information.

   b. Specify an IP address for each HBA port.

   c. Set the Connection KeepAliveTO value to 180.

   d. Enable ARP Redirect.

   e. Set the iSCSI node name of all iSCSI HBA ports to the same name as shown in the iSCSI initiator GUI on the Windows host.

   f. Save the HBA settings and reboot the Windows host.

4. Connect the iSCSI HBA to your Ethernet switches or directly to the storage system. Avoid routing if possible.

5. Using the iSCSI initiator GUI, configure the iSCSI target addresses of your storage system. If you are using more than one path, explicitly select the initiator and target for each path when you log on.

After you finish

If you are SAN booting from an iSCSI HBA, you must also manually set the boot BIOS on the HBA.

Related tasks

Setting up a SAN boot LUN for Windows Server on page 77

Related information

QLogic support page for IBM

Options for iSCSI sessions and error recovery levels

The defaults allowed by Data ONTAP are one TCP/IP connection per iSCSI session and an error recovery level of 0.

You can optionally enable multiple connections per session and error recovery level 1 or 2 by setting Data ONTAP option values. Regardless of the settings, you can always use error recovery level 0 and

single-connection sessions. For more information, see the chapter about managing the iSCSI network in the *Data ONTAP Block Access Management Guide for iSCSI and FC*.

The iSCSI initiator does not automatically create multiple sessions. You must explicitly create each session using the iSCSI Initiator GUI.

Options for using CHAP with iSCSI Initiators

You can use one-way or mutual (bidirectional) authentication with the challenge handshake authentication protocol (CHAP).

For one-way CHAP, the target only authenticates the initiator. For mutual CHAP, the initiator also authenticates the target.

The iSCSI Initiator sets strict limits on the length of both the initiator's and target's CHAP passwords. For Windows Server 2003, see the readme file on the host (C:\Windows\iSCSI \readme.txt) for more information. For Windows Server 2008 or Windows Server 2008 R2, see the Manage iSCSI Security topic in Help.

There are two types of CHAP user names and passwords. These types indicate the direction of authentication, relative to the storage system:

Inbound The storage system authenticates the iSCSI Initiator. Inbound settings are required if you are using CHAP authentication.

Outbound The iSCSI Initiator authenticates the storage system using CHAP. Outbound values are used only with mutual CHAP.

You specify the iSCSI Initiator CHAP settings using the Microsoft iSCSI Initiator GUI on the host. Click **Advanced** on the **GUI Discovery** tab to specify inbound values for each storage system when you add a target portal. Click **Secret** on the **General** tab to specify the outbound value (mutual CHAP only).

By default, the iSCSI Initiator uses its iSCSI node name as its CHAP user name.

Always use ASCII text passwords; do not use hexadecimal passwords. For mutual (bidirectional) CHAP, the inbound and outbound passwords cannot be the same.

Using RADIUS for iSCSI authentication

You can optionally use a RADIUS (Remote Authentication Dial-in User Service) server to centrally manage passwords for iSCSI authentication. Using RADIUS simplifies password management, increases security, and offloads authentication processing from storage systems.

Support for RADIUS is available starting with Data ONTAP 8.0 for the iSCSI target and Windows Server 2008 or Windows Server 2008 R2 for the iSCSI initiator.

You can configure either one-way authentication (the target authenticates the initiator), or mutual authentication (the initiator also authenticates the target).

There are three parts to enabling RADIUS authentication for iSCSI initiators:

- Set up a RADIUS server
- Configure the storage system to use RADIUS
- Configure iSCSI initiators to use RADIUS

Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 include a RADIUS server. For information about configuring this RADIUS server, see the Windows online Help.

For information about configuring the storage system to use RADIUS, see the *Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

Configuring iSCSI initiators for one-way authentication using RADIUS

One-way authentication means the target verifies the identity of the initiator; the initiator does not verify the identity of the target. To use one-way RADIUS authentication, you must configure the Windows Server 2008 or Windows Server 2008 R2 iSCSI software initiator to use the RADIUS server.

Before you begin

Set up the RADIUS server and configure the storage system before configuring the iSCSI initiator to use RADIUS.

Steps

1. On the Windows Server 2008 or Windows Server 2008 R2 host, click **Start > Administrative Tools > iSCSI Initiator** to open the Windows iSCSI Initiator Properties dialog.

2. On the **Targets** tab, select an iSCSI target and click **Log on > Advanced**.

3. Select the **CHAP logon information** and **Use RADIUS to authenticate target credentials** check boxes.

Related tasks

Configuring iSCSI initiators for mutual authentication using RADIUS

Mutual authentication means the target verifies the identity of the initiator, and the initiator verifies the identity of the target. To use mutual RADIUS authentication, you must configure the Windows Server 2008 or Windows Server 2008 R2 iSCSI software initiator to use the RADIUS server.

Before you begin

Set up the RADIUS server and configure the storage system before configuring the iSCSI initiator to use RADIUS.

Steps

1. On the Windows Server 2008 or Windows Server 2008 R2 host, click **Start > Administrative Tools > iSCSI Initiator** to open the Windows iSCSI Initiator Properties dialog.

2. On the **RADIUS** tab, click **Add** and specify the IP address of the RADIUS server.

   You can optionally add additional RADIUS servers.

3. Click **RADIUS** and enter the shared secret for the RADIUS server.

   The 26-character shared secret should be the same value as is used in the RADIUS client for this initiator.

4. On the **Discovery** tab, click **Add Portal**.

5. Enter the IP address of the iSCSI target port on the storage system, and then click **Advanced**.

6. Select the **CHAP logon information** check box, and then enter the CHAP user name and target secret.

   These values must match the outbound user name and password specified on the storage system.

7. Select the **Use RADIUS to generate authentication credentials** and **Perform mutual authentication** check boxes, then click **OK**.

8. On the **Targets** tab, select the iSCSI target and click **Log on**. Optionally select the **Automatically restore this connection when the computer starts** and **Enable multi-path** check boxes.

9. Click **Advanced**.

10. In the **Local adapter** field, select **Microsoft iSCSI Initiator**. Select the desired IP addresses for **Source IP** and **Target portal**.

11. Select the **CHAP logon information** check box, and then enter the CHAP user name and target secret.

    Use the same values you entered for the **Discovery** tab.

12. Select the **Use RADIUS to generate authentication credentials** and **Perform mutual authentication** check boxes, then click **OK**.

13. Click **OK** twice to close the Windows iSCSI Initiator Properties dialog.

Related tasks

Installing multipath I/O software

You must have multipathing set up if your Windows host has more than one path to the storage system.

The MPIO software presents a single disk to the operating system for all paths, and a device-specific module (DSM) manages path failover. Without MPIO software, the operating system could see each path as a separate disk, which can lead to data corruption.

On a Windows system, there are two main components to any MPIO solution: a DSM and the Windows MPIO components.

Install a supported DSM before you install the Windows Host Utilities. Choices include the Data ONTAP DSM for Windows MPIO, the Veritas DMP DSM, the Microsoft iSCSI DSM (part of the iSCSI initiator package), and the Microsoft msdsm (included with Windows Server 2008 and Windows Server 2008 R2).

MPIO is supported for Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 systems. MPIO is not supported for Windows XP and Windows Vista running in a Hyper- V virtual machine.

When you select MPIO support, the Windows Host Utilities installs the Microsoft MPIO components on Windows Server 2003 or enables the included MPIO feature of Windows Server 2008 and Windows Server 2008 R2.

How to have a DSM multipath solution

If your environment uses DSM as its multipathing solution, see the appropriate DSM documentation for installation instructions.

To install the Data ONTAP DSM for Windows MPIO, follow the instructions in the Installation and Administration Guide for your version of the DSM.

To install the Veritas DMP DSM in Veritas Storage Foundation for Windows software, follow the instructions in the Veritas Storage Foundation and High Availability Solutions Installation and Upgrade Guide. Be sure to install the Veritas DMP DSM when you install the Veritas Storage Foundation for Windows software.

To install the Microsoft iSCSI DSM, you select the **Microsoft MPIO Multipathing Support for iSCSI** option when you install the iSCSI initiator on Windows Server 2003.

The Microsoft msdsm is included with Windows Server 2008 and Windows Server 2008 R2. No additional installation is required if you selected MPIO support when you installed Windows Host Utilities. If you did not originally select MPIO support, run the Repair option of the Windows Host Utilities installer and select MPIO support.

Note: You must select MPIO support during the Host Utilities installation.

Disabling ALUA for Data ONTAP DSM 3.3.1 and earlier

Disable asymmetric logical unit access (ALUA) on the storage system initiator group (igroup) when you use the Data ONTAP DSM for Windows MPIO.

About this task

ALUA was introduced in Data ONTAP 7.2. The default settings is disabled, which is the required setting for the Data ONTAP DSM 3.3.1 and earlier.

ALUA is enabled or disabled on igroups.

You must reboot a Windows host after enabling or disabling ALUA for the change to be detected.

Steps

1. If the igroup has already been created, verify the ALUA setting by entering

   `igroup show -v igroup_name`

   If ALUA is enabled, the command output includes
   `ALUA: Yes`
   If ALUA is disabled, nothing about ALUA is displayed.

2. If enabled, disable ALUA on the igroup by entering

   `igroup set igroup_name alua no`

   For more information about the igroup command, see the igroup man page or the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

Enabling ALUA for FC with msdsm

Enable asymmetric logical unit access (ALUA) on the storage system initiator group (igroup) when you use the Microsoft native Fibre Channel (FC) device specific module (DSM) in Windows Server 2008 or Windows Server 2008 R2 (msdsm) for FC paths.

Before you begin

Data ONTAP 7.3.0 or later software running single_image cfmode is required to support ALUA for the msdsm.

About this task

The msdsm uses ALUA to identify the primary (non-proxy) paths to FC LUNs.

ALUA is enabled on FC igroups. ALUA is not currently supported for iSCSI Windows igroups. You cannot map a LUN to both FC and iSCSI igroups when ALUA is enabled on the FC igroup.

The msdsm does not support mixed FC and iSCSI paths to the same LUN. If you want mixed paths, use the Data ONTAP DSM for Windows MPIO.

Starting with Data ONTAP 8.1 software, ALUA is always enabled for FC. For 8.1 Cluster-Mode, ALUA is also enabled for iSCSI.

You must reboot a Windows host after enabling or disabling ALUA for the change to be detected.

Steps

1. Verify you have a supported version of Data ONTAP software and it is configured for single_image cfmode.

2. Create the FC igroup for the Windows host.

3. Enable ALUA on the igroup by entering

   `igroup set igroup_name alua yes`

   For more information about the igroup command, see the igroup man page or the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

Configuring Hyper-V systems

Hyper-V systems require special configuration steps for some virtual machines.

Adding virtual machines to a failover cluster

To add Hyper-V virtual machines to a cluster, they must be on a node to which you are creating and adding virtual machines.

About this task

When you have more than one virtual machine (configuration files and boot.vhd file) stored on the same LUN, and you are adding the virtual machines to a failover cluster, you must put all of the virtual machine resources in the same resource group. Otherwise adding virtual machines to the cluster fails.

Steps

1. Move the available storage group to the node on which you are creating and adding virtual machines. (The available storage resource group in a Windows Server 2008 or Windows Server 2008 R2 failover cluster is hidden.) On the cluster node, enter the following command at a Windows command prompt:

   `c:\cluster group "Available Storage" /move:node_name`
   node_name is the host name of the cluster node from which you are adding virtual machines.

2. Move all of the virtual machine resources to the same failover cluster resource group.

3. Run the Virtual Machine Resource Wizard to create the virtual machines and then add them to the failover cluster. Be sure that the resources for all virtual machines are configured as dependent on the disk mapped to the LUN.

Configuring SUSE Linux and RHEL 5.5 and 5.6 guests for Hyper-V

Linux guest operating systems running on Hyper-V require a timeout parameter setting to support virtual hard disks and the Linux Host Utilities to support iSCSI initiators. Windows Host Utilities provides a script for setting the timeout. You must also install the Linux Integration Components package from Microsoft.

Before you begin

Install a supported version of the Linux operating system on a Hyper-V virtual machine.

About this task

This task applies to SUSE Linux Enterprise Server and to Red Hat Enterprise Linux (RHEL) 5.5 and 5.6.

Setting timeout parameters on a Linux guest ensures correct failover behavior.

You can use an iSCSI initiator solution on a Hyper-V guest that is supported for standalone hardware. Be sure to install a supported version of Linux Host Utilities. Use the linux type for LUNs accessed with an iSCSI initiator and for raw Hyper-V LUNs. Use the windows_2008 or hyper_v LUN type for LUNs that contain VHDs.

Steps

1. Download and install the Linux Integration Components package from Microsoft. Follow the installation instructions included with the download from Microsoft.

   The package is available from the Microsoft Connect site. Registration is required.

2. Set the timeout parameter.

   You set the timeout parameter only once. The timeout parameter will be used for all existing and new SCSI disks that use IBM N series LUNs.

   a. Using the Windows Hyper-V Manager, mount the supplied .iso file on the virtual machine's virtual DVD/CD-ROM. On the **Settings** tab for the virtual machine, select the DVD/CD-ROM drive and specify the path to the .iso file in the **Image file** field. The default path is C: \Program Files\IBM\Windows Host Utilities\LinuxGuestConfig.iso.

   b. Log into the Linux guest as root.

   c. Create a mount directory and mount the virtual DVD/CD-ROM.

   Example

   ```
   linux_guest:/ # mkdir /mnt/cdrom
   linux_guest:/ # mnt /dev/cdrom /mnt/cdrom
   ```

   d. Run the script.

Example

```
linux_guest:/ # /mnt/cdrom/linux_gos_timeout-install.sh
```

3. Set all virtual network adapters for the virtual machine to use static MAC addresses.

4. If you are running an iSCSI initiator on the Linux guest, install a supported version of the Linux Host Utilities.

Related information

[Microsoft Connect](#)

Configuring RHEL 6.0 and 6.1 guests for Hyper-V

Linux guest operating systems running on Hyper-V require a timeout parameter setting to support virtual hard disks and the Linux Host Utilities to support iSCSI initiators. Windows Host Utilities provides a script for setting the timeout. You must also install the Linux Integration Components package from Microsoft.

Before you begin

Install a supported version of the Linux operating system on a Hyper-V virtual machine.

About this task

This task applies to Red Hat Enterprise Linux (RHEL) 6.0 and 6.1.

Setting timeout parameters on a Linux guest ensures correct failover behavior.

You can use an iSCSI initiator solution on a Hyper-V guest that is supported for standalone hardware. Be sure to install a supported version of Linux Host Utilities. Use the linux type for LUNs accessed with an iSCSI initiator and for raw Hyper-V LUNs. Use the windows_2008 or hyper_v LUN type for LUNs that contain VHDs.

Steps

1. Download and install the Linux Integration Components package from Microsoft. Follow the installation instructions included with the download from Microsoft.

The package is available from the Microsoft Connect site. Registration is required.

2. Set the timeout parameter.

You set the timeout parameter only once. The timeout parameter will be used for all existing and new SCSI disks that use IBM N series LUNs.

a. Create the following file:

```
/etc/udev/rules.d/20-timeout.rules
```

b. Add the following entry to the file:

```
ACTION=="add", SUBSYSTEM=="scsi" , SYSFS{type}=="0|7|14", \
        RUN+="/bin/sh -c 'echo 180 > /sys$$DEVPATH/timeout'"
```

   c. Save and close the file.

   d. Reboot the host.

3. Set all virtual network adapters for the virtual machine to use static MAC addresses.

4. If you are running an iSCSI initiator on the Linux guest, install a supported version of the Linux Host Utilities.

Related information

   Microsoft Connect

Hyper-V VHD requires alignment for best performance

A Hyper-V virtual hard drive (VHD) partitioned with a master boot record (MBR) that is used by a Window Server 2003, Windows 2000 Server, or Linux virtual machine needs to be aligned with the underlying LUN for best performance. Windows Host Utilities includes the mbralign program for aligning partitions on VHDs.

If the data block boundaries of a disk partition do not align with the block boundaries of the underlying LUN, the storage system often has to complete two block reads or writes for every operating system block read or write. The additional block reads and writes caused by the misalignment can cause serious performance problems.

The misalignment is caused by the location of the starting sector for each partition defined by the master boot record. Partitions created by Windows Server 2003, Windows 2000 Server, and Linux are usually not aligned with underlying IBM N series LUNs. Partitions created by Windows Server 2008 and Windows Server 2008 R2 should be aligned by default.

Windows Host Utilities includes the mbralign.exe program that tests and corrects MBR partition alignment on VHDs. If the partition is found to not be correctly aligned with underlying storage, the mbralign.exe program creates a new VHD file with the correct alignment and copies all partitions to it. The original VHD file is not modified or deleted. The virtual machine must be shut down while the data is copied.

The mbralign.exe program supports only fixed size VHD files with MBR type partitions. VHDs using Windows dynamic disks or GPT partitions are not supported.

The mbralign.exe program requires a minimum partition size of 4GB. Smaller partitions cannot be correctly aligned.

For Linux virtual machines using the GRUB boot loader on a VHD, you must update the boot configuration after running the mbralign program.

Checking and fixing VHD partition alignment with mbralign

Use the mbralign.exe program included in Windows Host Utilities to check and fix partition alignment for Hyper-V virtual hard disks. Aligning the partition ensures best performance.

About this task

Partitions created on VHDs by Windows Server 2003, Windows 2000 Server, and Linux usually need their alignment fixed. Partitions created by Windows Server 2008 and Windows Server 2008 R2 should be aligned by default.

Steps

1. Shut down the virtual machine.

   If you want to preserve the existing disk letter mappings for a Windows virtual machine, use the -vm option in the next step and do not shut down the virtual machine until prompted.

2. Enter the following command at the Hyper-V parent Windows command prompt:

   ```
   mbralign [-bs=size] [-preview] [-vm hostname [-vm_user username -vm_pass
   password]] SourceFile [DestinationFile]
   ```

   size is the optional block size for the file in KB. Value can be 8, 16, 32, 64, 128, or 1024. The default is 64.

   -preview checks alignment but does not change anything.

   -vm *hostname* specifies the DNS name or IP address of the Windows virtual machine using the VHD being aligned. Specify this option to preserve the drive letter mappings on the virtual machine after alignment. You are prompted to shut down the virtual machine after the current drive letter information is collected by the mbralign program.

   -vm_user *username* specifies a user account on the virtual machine. Used only with the -vm option. The default is to use the credentials you used to log into the Hyper-V parent.

   -vm_pass *password* specifies the password for the user account specified with the -vm_user option.

   SourceFile is the complete path, including file name, to the VHD on the Hyper-V parent. *SourceFile* is optional when using the -vm option, assuming the VM's host name, DNS name, and Hyper-V VM name all match; mbralign presents a list of VHDs found for that VM.

   DestinationFile is the optional complete path, including file name, to the aligned VHD. The default path is the source file with "-aligned" appended before the .vhd extension.

   For additional command options, enter

   ```
   mbralign -help
   ```

   ```
   C:\>mbralign -vm vmdc-01
   Connecting to HyperV server WSHEDC001 and gathering data for vmdc-01
   ```

```
Connecting to virtual machine vmdc-01 to determine drive mappings.
Successfully gathered drive letter information from the specified
virtual
machine. Please shutdown the Virtual Machine.
Press Enter to continue...
0: G:\ClusterStorage\Volume1\VMDC-01\VMDC-01_DE.vhd
1: G:\ClusterStorage\Volume1\VMDC-01\VMDC-01_SysVol.vhd
2: Manual Input
Select a VHD by entering its number
:0
              PARTITION TABLE SUMMARY
 Part  Type Mount    Start LBA  New Start LBA    New End LBA    Length
in KB
 ----  ---- -----    ---------  -------------    -----------
------------
   P1    07               63             64         2104516
1052226
Please review the summary above. This application is unable to
reliably detect
that the VHD file is not currently in use. It is important to verify
that there
are no virtual machines, or any other software accessing this file.
Enter "yes" to continue or "no" to exit...
:yes
The current VHD file is G:\ClusterStorage
\Volume1\VMDC-01\VMDC-01_DE.vhd.
Please specify a destination file name, or press enter to have a file
name
generated for you.
:
Creating a new VHD file with 5368891903 bytes...
Done
Copying partition P1, from LBA: 63 to LBA: 64. 100.0% of 1077479424
bytes copied.
Done
Completed copying 1077479424 bytes of partition P1
Would you like to align additional VHD files?
:n
Ready to update the Virtual Machine drive letters. Please boot the
Virtual
Machine using the newly aligned VHD file(s). Make sure it is
responding on the
network
```

After you finish

For Linux virtual machines using the GRUB boot loader, reinstall GRUB to ensure the guest operating system boots correctly.

Reinstalling GRUB for Linux guests after running mbralign

After running `mbralign` on disks for Linux guest operating systems using the GRUB boot loader, you must reinstall GRUB to ensure that the guest operating system boots correctly.

Before you begin

The `mbralign` program has completed on the on the VHD file for the virtual machine.

About this task

This topic applies only to Linux guest operating systems using the GRUB boot loader and SystemRescueCd.

Steps

1. Mount the ISO image of Disk 1 of the installation CDs for the correct version of Linux for the virtual machine.

2. Open the console for the virtual machine in Hyper-V Manager.

3. If the VM is running and hung at the GRUB screen, click in the display area to make sure it is active, then click the Ctrl-Alt-Delete toolbar icon to reboot the VM. If the VM is not running, start it, and then immediately click in the display area to make sure it is active.

4. As soon as you see the VMware BIOS splash screen, press the Escape key once.

   The boot menu is displayed.

5. At the boot menu, select CD-ROM.

6. At the Linux boot screen, enter

   `:linux rescue`

7. Take the defaults for Anaconda (the blue/red configuration screens). Networking is optional.

8. Launch GRUB by entering:

   `grub`

9. If there is only one virtual disk in this VM, or if there are multiple disks, but the first is the boot disk, then run the following GRUB commands:

   `root (hd0,0)`

   `setup (hd0)`

   `quit`

   If you have multiple virtual disks in the VM, and the boot disk is not the first disk, or you are fixing GRUB by booting from the misaligned backup VHD, enter the following command to identify the boot disk:

   `find /boot/grub/stage1`

Run the following commands:

root (*boot_disk*,0)

setup (*boot_disk*)

quit

boot_disk is the disk identifier of the boot disk.

10. Press Ctrl-D to log out.

Linux rescue shuts down and then reboots.

Installing Veritas Storage Foundation

If you are using Veritas Storage Foundation for Windows, make sure you have it installed before you install the Host Utilities software package.

Using Veritas Storage Foundation 5.1 for Windows

Veritas Storage Foundation 5.1 for Windows software requires specific fixes and settings to work with IBM N series storage systems.

About this task

The following steps are required to create a supported configuration.

Steps

1. Download and install the DDI-1 package for Veritas Storage Foundation 5.1 from the Symantec Web site.

2. For clustering environments (VCS or Microsoft Clustering-MSCS), set the SCSI setting in the Veritas Enterprise Administrator control panel to **SCSI-3**.

   For the latest information, see the Host Utilities *Release Notes*.

Related information

   Veritas DDI-1 package

Using Veritas Storage Foundation 5.1 SP1 for Windows

Veritas Storage Foundation 5.1 SP1 for Windows software requires specific fixes and settings to work with IBM N series storage systems.

About this task

The following step is required to create a supported configuration.

Step

1. For clustering environments (VCS or Microsoft Clustering-MSCS), set the SCSI setting in the Veritas Enterprise Administrator control panel to **SCSI-3**.

   For the latest information, see the Host Utilities *Release Notes*.

Running the Host Utilities installation program

The installation program installs the Host Utilities package and sets the Windows registry and HBA settings.

You must specify whether to include multipathing support when you install the Windows Host Utilities software package. The installer prompts you for the following choice. You can also run a quiet (unattended) installation from a Windows command prompt.

Multipathing support	Choose MPIO if you have more than one path from the Windows host or virtual machine to the storage system. MPIO is required with Veritas Storage Foundation for Windows. Choose no MPIO only if you are using a single path to the storage system.
	The MPIO selection is not available for Windows XP and Windows Vista systems; multipath I/O is not supported on these guest operating systems.
	For Hyper-V guests, raw (passthru) disks do not appear in the guest OS if you choose multipathing support. You can either use raw disks, or you can use MPIO, but you cannot use both in the guest OS.

The **Enable Microsoft DSM (MSDSM) support** and **Protocol Support** choices are removed from the installation program starting with Windows Host Utilities 5.2.

Note: If you are using Veritas Storage Foundation for Windows, configure either Fibre Channel paths or iSCSI paths depending on how you want to connect to the storage system. There is no support for both Fibre Channel and iSCSI protocols on the same host with Veritas Storage Foundation.

Installing the Host Utilities interactively

To install the Host Utilities software package interactively, run the Host Utilities installation program and follow the prompts.

About this task

You can install the product software either from the physical media kit or from software updates available for download. Downloads are available only to entitled IBM N series customers who have completed the registration process on the N series support website (accessed and navigated as described in *Websites* on page 7).

To obtain access to N series content on the web and to understand how this content is organized and navigated, refer to the publicly accessible web page:

Important information for N series support - www.ibm.com/support/docview.wss?uid=ssg1S1003659

Steps

1. Check the publication matrix page for important alerts, news, interoperability details, and other information about the product before beginning the installation.

2. Obtain the product software by inserting the Host Utilities CD-ROM into your host machine or by downloading the software from the N series support website (accessed and navigated as described in *Websites* on page 7).

3. Run the executable file and follow the instructions on the screen.

   Note: The Windows Host Utilities installer checks for required Windows hotfixes. If it detects a missing hotfix, it displays an error. Download and install any requested hotfixes, and then restart the installer.

4. Reboot the Windows host when prompted.

After you finish

If you add a Windows 2008 R2 host to a failover cluster after installing the Host Utilities, run the Repair option of the Host Utilities installation program to set the required ClusSvcHangTimeout parameter.

Related tasks

Installing the Host Utilities from a command line

You can perform a quiet (unattended) installation of the Host Utilities by entering the commands at a Windows command prompt.

Before you begin

The Host Utilities installation package must be in a path that is accessible by the Windows host. Follow the instructions for installing the Host Utilities interactively to obtain the installation package.

About this task

The system automatically reboots when the installation is complete.

If a required Windows hotfix is missing, the installation fails with a simple message in the event log saying the installation failed, but not why. Problems with hotfixes are logged to the msiexec log file. It is recommended that you enable logging in the `msiexec` command to record the cause of this and other possible installation failures.

Step

1. Enter the following command at a Windows command prompt:

   msiexec /i *installer*.msi /quiet

   MULTIPATHING={0 | 1}

   [INSTALLDIR=*inst_path*]

   installer is the name of the .msi file for your CPU architecture.

   MULTIPATHING specifies whether MPIO support is installed. Allowed values are 0 for no, 1 for yes.

   inst_path is the path where the Host Utilities files are installed. The default path is C: \Program Files\IBM\Windows Host Utilities\.

   Note: To see the standard Microsoft Installer (MSI) options for logging and other functions, enter **msiexec /help** at a Windows command prompt.

After you finish

If you add a Windows 2008 R2 host to a failover cluster after installing the Host Utilities, run the Repair option of the Host Utilities installation program to set the required ClusSvcHangTimeout parameter.

Related tasks

About SnapDrive for Windows

You have the option of using SnapDrive for Windows software to help you provision and manage LUNs and Snapshot copies.

If you are using SnapDrive software, install it on your Windows host after you have installed Windows Host Utilities.

Follow the instructions in the Installation and Administration Guide for your version of SnapDrive software.

Note: SnapDrive for Windows is not supported with Veritas Storage Foundation for Windows software.

Repairing and removing Windows Host Utilities

You can use the Repair option of the Host Utilities installation program to update HBA and Windows registry settings. You can remove the Host Utilities entirely, either interactively or from the Windows command line.

> **Note:** Removing the Host Utilities affects installed DSMs.

Repairing or removing Windows Host Utilities interactively

The Repair option updates the Windows registry and Fibre Channel HBAs with the required settings. You can also remove the Host Utilities entirely.

Steps

1. Open Windows **Add or Remove Programs** (Windows Server 2003) or **Programs and Features** (Windows Server 2008 or Windows Server 2008 R2).

2. Select **Windows Host Utilities**

3. Click **Change**.

4. Click **Repair** or **Remove** as needed.

5. Follow the instructions on the screen.

Repairing or removing Windows Host Utilities from a command line

The Repair option updates the Windows registry and Fibre Channel HBAs with the required settings. You can also remove the Host Utilities entirely from a Windows command line.

Step

1. Enter the following command on the Windows command line to repair Windows Host Utilities:

   msiexec {/uninstall | /f]*installer***.msi [/quiet]**

   /uninstall removes the Host Utilities entirely

   /f repairs the installation

   installer.msi is the name of the Windows Host Utilities installation program on your system

   /quiet suppresses all feedback and reboots the system automatically without prompting when the command completes

Removing Windows Host Utilities can affect DSM

Removing Windows Host Utilities can remove the registry settings needed by DSMs.

The registry settings for Windows Host Utilities affect device-specific modules (DSMs) that claim IBM N series LUNs. This includes the Data ONTAP DSM for Windows MPIO and the Veritas DMP

DSM. Removing Windows Host Utilities removes the registry settings needed by these DSMs to claim the LUNs.

If you remove Windows Host Utilities, you can restore the DSM registry settings by running the Repair option of the DSM installation program.

> **Note:** Windows Host Utilities is currently required for all supported configurations of Windows hosts that use IBM N series LUNs except if the host is running the Data ONTAP DSM 3.5 for Windows MPIO or later.

Host configuration settings

You need to collect some host configuration settings as part of the installation process. The Host Utilities installer modifies other host settings based on your installation choices.

What FC and iSCSI identifiers are

The storage system identifies hosts that are allowed to access LUNs based on the FC worldwide port names (WWPNs) or iSCSI initiator node name on the host.

Each Fibre Channel port has its own WWPN. A host has a single iSCSI node name for all iSCSI ports. You need these identifiers when manually creating initiator groups (igroups) on the storage system.

> **Note:** If you use SnapDrive for Windows software on the host, it automatically collects the FC and iSCSI identifiers it needs to create igroups on the storage system. You do not need to collect these identifiers manually.

The storage system also has WWPNs and an iSCSI node name, but you do not need them for configuring the host.

Recording the WWPN

Record the worldwide port names of all FC ports that connect to the storage system.

About this task

Each HBA port has its own WWPN. For a dual-port HBA, you need to record two values; for a quad-port HBA, record four values.

The WWPN looks like this:

```
WWPN: 10:00:00:00:c9:73:5b:90
```

Steps

1. For Windows Server 2008 or Windows Server 2008 R2, use the Windows Storage Explorer application to display the WWPNs. For Windows Server 2003, use the Microsoft `fcinfo.exe` program.

   You can instead use the HBA manufacturer's management software, such as HBAnyware for Emulex HBAs or SANsurfer for QLogic HBAs, if it is installed on the Windows host.

2. If the system is SAN booted and not yet running an operating system, or the HBA management software is not available, obtain the WWPNs using the boot BIOS.

Obtaining the WWPN using Windows Storage Explorer

For hosts running Windows Server 2008 or Windows Server 2008 R2, you can obtain the Fibre Channel World Wide Port Name (WWPN) using the Windows Storage Explorer application.

Steps

1. In Windows Server 2008 or Windows Server 2008 R2, select **Start > Administrative Tools > Storage Explorer**

2. Expand the **Servers** node of the Storage Explorer console tree and locate the HBAs.

3. Record the value of the **Port WWN** field for each HBA port.

Obtaining the WWPN using Microsoft fcinfo.exe

For hosts running Windows Server 2003, you can obtain the Fibre Channel World Wide Port Name (WWPN) using the Microsoft fcinfo.exe.

Steps

1. If not already installed, download and install the fcinfo.exe program from the Microsoft Download Center. Search the Download Center for "Fibre Channel Information Tool (fcinfo)".

   A reboot is not required.

2. In Windows Server 2003, open a command prompt and enter the following command: fcinfo / ports /details

   For more options, run the `fcinfo /??` command.

3. Record the port WWN value for each HBA port.

Related information

   Microsoft Download Center

Obtaining the WWPN using Emulex BootBIOS

For SAN-booted systems with Emulex HBAs that do not yet have an operating system, you can get the WWPNs from the boot BIOS.

Steps

1. Restart the host.

2. During startup, press **Alt-E** to access BootBIOS.

3. Select the menu entry for the Emulex HBA.

   BootBIOS displays the configuration information for the HBA, including the WWPN.

4. Record the WWPN for each HBA port.

Obtaining the WWPN using QLogic BootBIOS

For SAN-booted systems with QLogic HBAs that do not yet have an operating system, you can get the WWPNs from the boot BIOS.

Steps

1. Restart the host.

2. During startup, press **Ctrl-Q** to access BootBIOS.

3. Select the appropriate HBA and press **Enter**.

The Fast!UTIL options are displayed.

4. Select **Configuration Settings** and press **Enter**.

5. Select **Adapter Settings** and press **Enter**.

6. Record the WWPN for each HBA port from the **Adapter Port Name** field.

Recording the iSCSI initiator node name

Record the iSCSI initiator node name from the iSCSI Initiator program on the Windows host.

Steps

1. For Windows Server 2008, Windows Server 2008 R2, and Windows Vista, click **Start > Administrative Tools > iSCSI Initiator**. For Windows Server 2003 and Windows XP, click **Start > All Programs > Microsoft iSCSI Initiator > Microsoft iSCSI Initiator**.

The iSCSI Initiator Properties dialog box is displayed.

2. Copy the **Initiator Name** or **Initiator Node Name** value to a text file or write it down.

The exact label in the dialog box differs depending on the Windows version. The iSCSI node name looks like this:

```
iqn.1991-05.com.microsoft:server3
```

Overview of settings used by the Host Utilities

The Host Utilities require certain registry and parameter settings to ensure the Windows host correctly handles the storage system behavior.

The parameters set by Windows Host Utilities affect how the Windows host responds to a delay or loss of data. The particular values have been selected to ensure that the Windows host correctly handles events such as the failover of one controller in the storage system to its partner controller.

Fibre Channel and iSCSI host bus adapters (HBAs) also have parameters that must be set to ensure the best performance and to successfully handle storage system events.

The installation program supplied with Windows Host Utilities sets the Windows and Fibre Channel HBA parameters to the supported values. You must manually set iSCSI HBA parameters.

Note: Starting with Windows Host Utilities 5.3, if the installation program detects the Data ONTAP DSM for Windows MPIO software on the host, it skips most settings. It instead relies on the values set by the DSM installation program.

The installer sets different values depending on whether you specify multipath I/O (MPIO) support when running the installation program, whether you enable the Microsoft DSM on Windows Server 2008 or Windows Server 2008 R2, and which protocols you select (iSCSI, Fibre Channel, both, or none). You should not change these values unless directed to do so by technical support.

Registry values set by Windows Host Utilities

The Windows Host Utilities installer sets a number of Windows registry values based on the choices you make during installation, the operating system version, and whether Data ONTAP DSM for Windows MPIO is installed.

The following values are set by the Windows Host Utilities installer. All values are decimal unless otherwise noted. *HKLM* is the abbreviation for HKEY_LOCAL_MACHINE.

Registry key	Value	When set
HKLM\Cluster**ClusSvcHangTimeout**	240	Windows Server 2008 R2 cluster configurations, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters **\DsmMaximumRetryTimeDuringStateTransition**	120	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters\ **DsmMaximumStateTransitionTime**	120	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected

Registry key	Value	When set
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters**DsmSupportedDeviceList**	"NETAPP LUN"	MPIO support specified
	"NETAPP LUN", "NETAPP LUN C-Mode"	MPIO support specified, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Control\Class\ {*iSCSI_driver_GUID*}\ *instance_ID*\Parameters **IPSecConfigTimeout**	60	Except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Control\Class\ {*iSCSI_driver_GUID*}\ *instance_ID*\Parameters **LinkDownTime**	30	Always
HKLM\SYSTEM\CurrentControlSet\Services\ClusDisk \Parameters**ManageDisksOnSystemBuses**	1	Except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Control\Class\ {*iSCSI_driver_GUID*}\ *instance_ID*\Parameters **MaxRequestHoldTime**	120	When no multipath I/O (MPIO) support is selected
	60	Except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Control\MPDEV **MPIOSupportedDeviceList**	"NETAPP LUN"	MPIO support specified
	"NETAPP LUN", "NETAPP LUN C-Mode"	MPIO support specified, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**PathRecoveryInterval**	40	Windows Server 2008 or 2008 R2 only
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**PathVerifyEnabled**	0	MPIO support specified, except when Data ONTAP DSM is detected

Registry key	Value	When set
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters**PathVerifyEnabled**	0	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msiscdsm \Parameters**PathVerifyEnabled**	0	MPIO support specified and Windows Server 2003, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\vnetapp \Parameters**PathVerifyEnabled**	0	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**PDORemovePeriod**	130	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters**PDORemovePeriod**	130	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msiscdsm \Parameters**PDORemovePeriod**	130	MPIO support specified and Windows Server 2003, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\vnetapp \Parameters**PDORemovePeriod**	130	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\ontapdsm \Parameters**ReservationTimeout**	30	MPIO support specified and Data ONTAP DSM detected

Registry key	Value	When set
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**RetryCount**	6	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters**RetryCount**	6	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msiscdsm \Parameters**RetryCount**	6	MPIO support specified and Windows Server 2003, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\vnetapp \Parameters**RetryCount**	6	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**RetryInterval**	1	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msdsm \Parameters**RetryInterval**	1	MPIO support specified and Windows Server 2008 or 2008 R2, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\msiscdsm \Parameters**RetryInterval**	1	MPIO support specified and Windows Server 2003, except if Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\vnetapp \Parameters**RetryInterval**	1	MPIO support specified, except when Data ONTAP DSM is detected

Registry key	Value	When set
HKLM\SYSTEM\CurrentControlSet\Services\disk **TimeOutValue**	120	When no multipath I/O (MPIO) support is selected, except when Data ONTAP DSM is detected
	60	MPIO support specified, except when Data ONTAP DSM is detected
HKLM\SYSTEM\CurrentControlSet\Services\mpio \Parameters**UseCustomPathRecoveryInterval**	1	Windows Server 2008 or 2008 R2 only

Note: If you configure a Windows cluster after installing Windows Host Utilities, run the Repair option of the Host Utilities installation program to set ClusSvcHangTimeout. If Data ONTAP DSM for Windows MPIO is installed, use the Repair option of the DSM installation program instead.

ClusSvcHangTimeout setting

The ClusSvcHangTimeout setting controls the interval between heartbeats before Windows Server determines that the cluster service is not responding.

DsmMaximumStateTransitionTime and DsmMaximumRetryTimeDuringStateTransition settings

The DsmMaximumStateTransitionTime and the DsmMaximumRetryTimeDuringStateTransition settings specify the time the Windows Server 2008 or Windows Server 2008 R2 msdsm waits for an ALUA path transition before returning an I/O error to the layer above it in the stack.

The DsmMaximumStateTransitionTime and DsmMaximumRetryTimeDuringStateTransition settings allow time for a path state transition to complete after a storage system failover or other event. These settings are used for MPIO configurations on Windows Server 2008 and Windows Server 2008 R2.

DsmSupportedDeviceList setting

The DsmSupportedDeviceList setting specifies that a DSM should claim storage devices with the specified vendor identifier and product identifier (VID/PID).

This setting is set for the msdsm included in Windows Server 2008 and Windows Server 2008 R2. The msdsm always gives priority to other DSMs. If another DSM is installed and configured to claim all LUNs with a specified VID/PID, that other DSM would handle the specified LUNs, even though the msdsm has this parameter set.

IPSecConfigTimeout setting

The IPSecConfigTimeout parameter specifies how long the iSCSI initiator waits for the discovery service to configure or release ipsec for an iSCSI connection.

The supported value enables the initiator service to start correctly on slow-booting systems that use CHAP.

LinkDownTime setting

The LinkDownTime setting specifies the maximum time in seconds that requests are held in the device queue and retried if the connection to the target is lost.

If MPIO is installed this value is used. If MPIO is not installed, MaxRequestHoldTime is used instead.

ManageDisksOnSystemBuses setting

The ManageDisksOnSystemBuses parameter is used by SAN-booted systems to ensure that the startup disk, pagefile disks, and cluster disks are all on the same SAN fabric.

For detailed information about the ManageDisksOnSystemBuses parameter, see Microsoft Support article 886569.

Related information

Microsoft support article

MaxRequestHoldTime setting

The MaxRequestHoldTime setting specifies the maximum time in seconds that requests are queued if connection to the target is lost and the connection is being retried.

After this hold period, requests are failed with "error no device" and the disk is removed from the system. The supported setting enables the connection to survive the maximum expected storage failover time.

MPIOSupportedDeviceList

The MPIOSupportedDeviceList setting specifies that the Windows MPIO component should claim storage devices with the specified vendor identifier and product identifier (VID/PID).

This parameter does not determine which DSM handles the claimed devices; the DsmSupportedDeviceList setting specifies the DSM to use.

PathRecoveryInterval setting

The PathRecoveryInterval setting specifies how long in seconds the MPIO component waits before retrying a lost path.

The PathRecoveryInterval setting causes the MPIO component to try to recover a lost path that had a transient error before it decides the disk device is no longer available.

Note that this parameter affects all DSMs on the system.

PathVerifyEnabled setting

The PathVerifyEnabled parameter specifies whether the Windows MPIO driver periodically requests that the DSM check its paths.

Note that this parameter affects all DSMs on the system.

PDORemovePeriod setting

This parameter specifies the amount of time that the multipath pseudo-LUN stays in system memory after all paths to the device are lost.

ReservationTimeout setting

The ReservationTimeout parameter is equivalent to the TimeOutValue parameter, except that it is specific to persistent reservation commands within Data ONTAP DSM.

RetryCount setting

The RetryCount parameter specifies the number of times the current path to a LUN is retried before failing over to an alternate path.

The RetryCount setting enables recovery from a transient path problem. If the path is not recovered after the specified number of retries, it is probably a more serious network problem.

RetryInterval setting

The RetryInterval parameter specifies the amount of time to wait between retries of a failed path.

This setting gives the path a chance to recover from a transient problem before trying again.

TimeOutValue setting

The disk TimeOutValue parameter specifies how long an I/O request is held at the SCSI layer before timing out and passing a timeout error to the application above.

Attention: Installing the cluster service on Windows 2003 changes the disk TimeOutValue. Upgrading the Emulex or QLogic HBA driver software also changes TimeOutValue. If cluster service is installed or the HBA driver is upgraded after you install this software, use the Repair option of the installation program to change the disk TimeOutValue back to the supported value.

UseCustomPathRecoveryInterval setting

The UseCustomPathRecoveryInterval setting enables or disables use of the PathRecoveryInterval setting.

Note that this parameter affects all DSMs on the system.

FC HBA values set by Windows Host Utilities

On systems using FC, the Host Utilities installer sets the required timeout values for Emulex and QLogic FC HBAs. If Data ONTAP DSM for Windows MPIO is detected on the host, the Host Utilities installer does not set any HBA values.

For Emulex Fibre Channel HBAs, the installer sets the following parameters when MPIO is selected, unless the Data ONTAP DSM for Windows MPIO is detected.

Property Type	Property Value
LinkTimeOut	1
NodeTimeOut	10

For Emulex Fibre Channel HBAs, the installer sets the following parameters when no MPIO is selected:

Property Type	Property Value
LinkTimeOut	30
NodeTimeOut	120

For QLogic Fibre Channel HBAs, the installer sets the following parameters when MPIO is selected, unless the Data ONTAP DSM for Windows MPIO is detected.

Property Type	Property Value
LinkDownTimeOut	1
PortDownRetryCount	10

For QLogic Fibre Channel HBAs, the installer sets the following parameters when no MPIO is selected:

Property Type	Property Value
LinkDownTimeOut	30
PortDownRetryCount	120

Note: The names of the parameters may vary slightly depending on the program. For example, in the QLogic SANsurfer program, the parameter is displayed as Link Down Timeout. The Host

Utilities fcconfig.ini file displays this parameter as either LinkDownTimeOut or MpioLinkDownTimeOut depending on whether MPIO is specified. However, all of these names refer to the same HBA parameter.

Emulex HBA LinkTimeOut setting

The LinkTimeOut parameter specifies the interval after which a link that is down stops issuing a BUSY status for requests and starts issuing SELECTION_TIMEOUT error status. This LinkTimeOut includes port login and discovery time.

This LinkTimeOut includes port login and discovery time.

Emulex HBA NodeTimeOut setting

The NodeTimeOut parameter specifies the interval after which a formerly logged-in node issues SELECTION_TIMEOUT error status to an I/O request.

This setting causes the system to wait for a node that might reenter the configuration soon before reporting a failure. The timer starts after port discovery is completed and the node is no longer present.

QLogic HBA LinkDownTimeOut setting

The LinkDownTimeOut parameter specifies the interval after which a link that is down stops issuing a BUSY status for requests and starts issuing SELECTION_TIMEOUT error status.

This LinkDownTimeOut includes port login and discovery time.

QLogic HBA PortDownRetryCount setting

The PortDownRetryCount parameter specifies the number of times the I/O request is re-sent to a port that is not responding in one second intervals.

Setting up LUNs

LUNs are the basic unit of storage in a SAN configuration. The host system uses LUNs as virtual disks.

LUN overview

You can use a LUN the same way you use local disks on the host.

After you create the LUN, you must make it visible to the host. The LUN then appears on the Windows host as a disk. You can:

- Format the disk with NTFS. To do this, you must initialize the disk and create a new partition. Only basic disks are supported with the native OS stack.
- Use the disk as a raw device. To do this, you must leave the disk offline. Do not initialize or format the disk.
- Configure automatic start services or applications that access the LUNs. You must configure these start services so that they are dependent on the Microsoft iSCSI Initiator service.

LUN types to use for hosts and guest operating systems

The LUN type determines the on-disk layout of the LUN.

It is important to specify the correct LUN type to ensure good performance. The LUN type you specify depends on the Windows version and disk type and the Data ONTAP version.

Note: Not all LUN types are available when you create LUNs using the FilerView interface for some versions of Data ONTAP software. To use the hyper_v, windows_2008, windows_gpt, and windows_lhs LUN types, you might have to create the LUN using the Data ONTAP command line interface.

Use the following table to select the correct LUN type.

LUN type	Data ONTAP	Windows disk type and version
windows	All	Master boot record (MBR) on • Windows Server 2003 • Windows XP • Windows Vista

LUN type	Data ONTAP	Windows disk type and version
hyper_v	7.3.1 and later	Windows Server 2008 and Windows Server 2008 R2 Hyper-V LUNs containing virtual hard disks (VHDs). **Note:** For raw LUNs, use the type of child operating system as the LUN type.
windows_2008	7.2.5 and later 7.3.0 RC2 and later	All other disks on Windows Server 2008 and Windows Server 2008 R2
windows_gpt	7.2.1 and later	GUID Partition Type (GPT) disks on Windows Server 2003
windows_lhs	7.3.0 RC1	All disks on Windows Server 2008
linux	7.2.4 and earlier	All disks on Windows Server 2008

Overview of creating LUNs

You can create LUNs manually, or by running SnapDrive or System Manager software.

You can access the LUN using either the FC or the iSCSI protocol. The procedure for creating LUNs is the same regardless of which protocol you use. You must create an initiator group (igroup), create the LUN, and then map the LUN to the igroup.

Note: If you are using the optional SnapDrive software, use SnapDrive to create LUNs and igroups. Refer to the documentation for your version of SnapDrive for specific steps. If you are using the optional System Manager software, refer to the Online Help for specific steps.

The igroup must be the correct type for the protocol. You cannot use an iSCSI igroup when you are using the FC protocol to access the LUN. If you want to access a LUN with both FC and iSCSI protocols, you must create two igroups, one FC and one iSCSI. For Data ONTAP 8.1 operating in Cluster-Mode, you can create an igroup with the mixed protocol type.

To step through the process of creating an igroup and LUN on the storage system, you can use the lun setup command for Data ONTAP operating in 7-Mode and the vserver setup command for Data ONTAP operating in Cluster-Mode. You can also create igroups and LUNs by executing a series of individual commands (such as igroup create, lun create, and lun map). Detailed steps for creating LUNs are in the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP software.

Initiator group overview

Initiator groups specify which hosts can access specified LUNs on the storage system. You can create igroups manually, or use the optional SnapDrive for Windows software, which automatically creates igroups.

Initiator groups (igroups) are protocol-specific.

For FC connections, create an FC igroup using all WWPNs for the host.

For iSCSI connections, create an iSCSI igroup using the iSCSI node name of the host.

For systems using both FC and iSCSI connections to the same LUN, create two igroups: one for FC and one for iSCSI. Then map the LUN to both igroups. You cannot create a combined FC/iSCSI igroup for Data ONTAP 7.3 or Data ONTAP 8.x operating in 7-Mode. Data ONTAP 8.1 operating in Cluster-Mode supports mixed protocol igroups.

> **Note:** Mixed FC and iSCSI connections to the same LUN require Data ONTAP DSM for Windows MPIO. Mixed connections are not supported with the Veritas DSM or other multipathing solutions.

> **Note:** If you are using the Microsoft native DSM for Windows Server 2008 or Windows Server 2008 R2 (msdsm), you must enable ALUA for FC igroups. If you are using the Data ONTAP DSM 3.3.1 for Windows MPIO or earlier, you must disable ALUA for igroups. For later versions of the Data ONTAP DSM, see the DSM documentation for ALUA requirements.

There are many ways to create and manage initiator groups and LUNs on your storage system. These processes vary, depending on your configuration. These topics are covered in detail in the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP software.

If you use the optional SnapDrive for Windows software, it creates igroups as needed. Starting with SnapDrive 6.4 for Windows, the SnapDrive software enables ALUA when it detects Data ONTAP DSM 3.5 for Windows MPIO. Starting with SnapDrive 6.2 for Windows, the SnapDrive software enables ALUA when it detects the msdsm. For earlier versions of SnapDrive, you need to manually enable ALUA.

Related tasks

Enabling ALUA for FC with msdsm on page 40
Disabling ALUA for Data ONTAP DSM 3.3.1 and earlier on page 40

Mapping LUNs to igroups

When you map a LUN to an igroup, you assign the LUN identifier.

You must assign the LUN ID of 0 to any LUN that will be used as a boot device. LUNs with IDs other than 0 are not supported as boot devices.

If you map a LUN to both an FC igroup and an iSCSI igroup, the LUN has two different LUN identifiers.

> **Note:** The Windows operating system only recognizes LUNs with identifiers 0 through 254, regardless of the number of LUNs mapped. Be sure to map your LUNs to numbers in this range.

About mapping LUNs for Windows clusters

When you use clustered Windows systems, all members of the cluster must be able to access LUNs for shared disks.

Map shared LUNs to an igroup for each node in the cluster.

> **Attention:** If more than one host is mapped to a LUN, you must run clustering software on the hosts to prevent data corruption.

About FC targets

The host automatically discovers FC targets that are accessible to its HBAs. However, you do need to verify that the host selects only primary (optimized) paths to FC targets.

About non-optimized paths in FC configurations

Non-optimized paths are intended for use when certain storage system resources are not available.

A configuration has both optimized and non-optimized FC paths. Non-optimized paths have higher overhead and possibly lower performance. To prevent performance problems, make sure the FC paths are configured so that non-optimized paths are only used when there is a failure.

If your FC paths are not configured correctly, routine traffic can flow over a non-optimized path. The storage system measures FC traffic over optimized and non-optimized paths. If it detects significant traffic on a non-optimized path, the storage system issues a log message and triggers an AutoSupport message.

Verifying FC paths to LUNs

When you configure your host for FC, verify that the active paths are optimized paths.

About this task

You can verify the paths by mapping a LUN to the host on each storage system node, generating I/O to the LUN, and then checking the FC statistics on each node.

For Data ONTAP operating in Cluster-Mode, run the `sysstat` command through the nodeshell. You can access the nodeshell by using the `system node run` command. For information about how to use the `system node run` command, see the man page.

Steps

1. Map a LUN to the host on each node.

2. On the consoles of each node, start collecting statistics using the following command:

    sysstat -b

3. Generate I/O to the LUNs.

4. Check the FC statistics on each storage system node to verify that the non-optimized paths have essentially no traffic. The sysstat command periodically writes a line of statistics to the console. Check the Partner columns; the values should remain close to zero, while the FCP columns should show data.

    Note: Some initiators send occasional traffic over passive paths to ensure they are still available, so you typically see some traffic on non-optimized paths even when the system is correctly configured.

5. Enter **Ctrl-C** to exit the sysstat command on each console.

Result

If the Partner values remain close to zero, traffic is flowing over the correct paths. If the Partner values are high, as in the example below, the paths are not configured correctly.

Example of high partner values

In this example, all FC traffic is flowing over the non-optimized paths. Some columns from the sysstat command are removed from the example to make it easier to read.

```
CPU FCP iSCSI Partner Total FCP kB/s Partner kB/s
                             in   out      in   out
6%   0    0    124     124    0    0     5987   26
9%   0    0    186     186    0    0     9777   15
7%   0    0    147     147    0    0     6675   26
6%   0    0     87      87    0    0     3934   14
1%   0    0      6       6    0    0      257    0
```

Correcting FC path configurations with the Data ONTAP DSM

When running the Data ONTAP DSM for Windows MPIO, correct any FC path configurations that are using partner (proxy) paths to the LUNs during routine operations.

About this task

You might need to select a different load balance policy to be able to select which paths are used.

Step

1. Use the DSM management interface to check the paths to the LUNs. The detail display for each LUN shows whether it is using a proxy path. Reconfigure the paths to the LUN so that they do not use a proxy path under normal conditions.

   For more information, see the *Installation and Administration Guide* for your version of the Data ONTAP DSM.

Correcting FC path configurations with the Veritas DMP DSM

When running the Veritas DMP DSM, correct any FC path configurations that are using partner (proxy) paths to the LUNs during routine operations.

About this task

The Veritas DMP DSM selects FC paths automatically. You cannot manually select paths.

Step

1. Verify that you are running a supported version of the DSM.

   See the Host Utilities *Release Notes* for information about obtaining an updated DSM.

Correcting FC path configurations with the Microsoft msdsm

When running the Microsoft Windows Server 2008 or Windows Server 2008 R2 native DSM (msdsm), correct any FC path configurations that are using partner (proxy) paths to the LUNs during routine operations.

About this task

The Microsoft msdsm selects FC paths using ALUA.

Steps

1. Verify that you are running a supported version of Data ONTAP software with the single_image cfmode.

   Data ONTAP 7.3.0 is the first supported version.

2. Verify that ALUA is enabled on the igroup.

Related tasks

Adding iSCSI targets

To access LUNs when you are using iSCSI, you must add an entry for the storage system using the Microsoft iSCSI Initiator GUI.

About this task

For Data ONTAP 7.3 and Data ONTAP operating in 7-Mode, you only need one entry for each storage system in the configuration, regardless of the number of interfaces that are enabled for iSCSI traffic. An active/active or High Availability (HA) pair storage system configuration must have two entries, one for each storage system node in the configuration.

For Data ONTAP 8.1 operating in Cluster-Mode, create an entry for each iSCSI logical interface on each node that can access the LUN. MPIO software on the host is needed to select the correct path or paths.

The iSCSI Initiator GUI manages connections for both the software initiator and the optional iSCSI HBAs.

You can also add entries for the targets using the iscsicli interface. Enter iscsicli help on the Windows command line for more information on iscsicli.

Note: If you are using Veritas Storage Foundation for Windows for iSCSI sessions, use the Microsoft iSCSI initiator interface to log on to the iSCSI targets. Do not use the Veritas Enterprise Administrator interface to log on because it does not create iSCSI sessions with the specified source-target portals.

If you are using SnapDrive for Windows software, use the SnapDrive interface to add iSCSI targets.

To add a target, complete the following steps.

Steps

1. Run the Microsoft iSCSI Initiator GUI.

2. On the **Discovery** tab, create an entry for the storage system.

3. On the **Targets** tab, log on to the storage system.

4. If you want the LUNs to be persistent across host reboots, select the **Automatically restore this connection when the system boots** check box when logging on to the target.

5. If you are using MPIO or multiple connections per session, create additional connections to the target as needed.

    Enabling the optional MPIO support or multiple-connections-per-session support does not automatically create multiple connections between the host and storage system. You must explicitly create the additional connections.

For Windows Server 2003, see the section "Multipathing I/O" in the Microsoft *iSCSI Software Initiator 2.x Users Guide* for specific instructions on configuring multiple paths to iSCSI LUNs.

For Windows Server 2008 or Windows Server 2008 R2, see the iSCSI topics in Help.

About dependent services on the Native Stack and iSCSI

When you use disks based on iSCSI LUNs on a Host Utilities Native stack, you must reconfigure any dependent service or application to start after the iSCSI service.

The Windows disks that are based on iSCSI LUNs become available later in the startup sequence than the local disks do. This can create a problem if you have not reconfigured the dependent services or applications.

About dependent services on Veritas and iSCSI

When you use disks based on iSCSI LUNs on a Veritas stack, you must reconfigure any dependent application or service to start after the iSCSI service.

Accessing LUNs on hosts that use Veritas Storage Foundation

To enable the host running Veritas Storage Foundation to access a LUN, you must make the LUN visible to the host.

Before you begin

These steps apply only to a host running Veritas Storage Foundation. They do not apply to the hosts running the native OS stack.

Steps

1. Select **Start > All Programs > Symantec > Veritas Storage Foundation > Veritas Enterprise Administrator**.

   The **Select Profile** window is displayed.

2. Select a profile and click **OK** to continue.

   The **Veritas Enterprise Administrator** window is displayed.

3. **Click Connect to a Host or Domain**.

   The **Connect** window is displayed.

4. Select a Host from the drop-down menu and click **Browse** to find a host, or enter the host name of the computer and click **Connect**.

   The Veritas Enterprise Administrator GUI window with storage objects is displayed.

5. Select **Action > Rescan**.

All the disks on the host are rescanned.

6. Select **Action > Refresh**.

The latest data is displayed.

7. In the Veritas Enterprise Administrator, with the **Disks** expanded, verify that the newly created LUNs are visible as disks on the host.

Result

The LUNs appear on the Windows host as basic disks under Veritas Enterprise Administrator.

After you finish

You can upgrade the disks to dynamic disks by adding them to dynamic disk groups. For more information on creating basic or dynamic volumes, see the *Veritas Storage Foundation Administrator's Guide*.

Related tasks

Accessing LUNs on hosts that use the native OS stack

To access a LUN when you are using the native OS stack, you must make the LUN visible to the Windows host.

Before you begin

These steps apply only to the native OS stack only. They do not apply to the hosts running the Veritas Storage Foundation.

Steps

1. Right-click **My Computer** on your desktop and select **Manage**.

2. Expand **Storage** and double-click the **Disk Management** folder.

3. From the **Action** menu, select **Rescan Disks**.

4. From the **Action** menu, select **Refresh**.

5. In the **Computer Management** window, with **Storage** expanded and the **Disk Management** folder open, check the lower right pane to verify that the newly created LUN is visible as a disk on the host.

Related tasks

Overview of initializing and partitioning the disk

You can create one or more basic partitions on the LUN.

After you rescan the disks, the LUN appears in Disk Management as an Unallocated disk.

If you format the disk as NTFS, be sure to select the **Perform a quick format** option.

The procedures for initializing disks vary depending on which version of Windows you are running on the host. See the Windows Disk Management online Help for more information.

Setting up a SAN boot LUN for Windows Server

You can boot a host from a storage system LUN instead of an internal hard disk. SAN booting can help to improve system availability, enable centralized administration, and eliminate the costs associated with maintaining and servicing hard drives.

Before you begin

- Your system must support SAN boot LUNs. Check the N series interoperability matrix for the latest SAN booting requirements for your operating system version.
- For Windows 2003 configurations, store the pagefile.sys file on the local disk if you suspect pagefile latency issues. See the Microsoft article *Support for booting from a Storage Area Network (SAN)* for more information about pagefiles.
- For Fibre Channel HBAs, specific queue depths provide best results. It is best to tune the queue depths on the server-side HBA for Windows hosts to 254 for Emulex HBAs or 256 for QLogic HBAs.

  Note: To avoid host queuing, the host queue depths should not exceed the target queue depths on a per-target basis. For more information about target queue depths, see the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

About this task

Fibre Channel SAN booting does not require support for special SCSI operations; it is not different from any other SCSI disk operation. The HBA uses code in the BIOS that enables the host to boot from a LUN on the storage system.

iSCSI SAN booting also uses code in the BIOS that enables the host to boot from a LUN on the storage system. However, you need to set specific parameters in the BIOS to enable SAN booting.

Steps

1. Enable BootBIOS on the HBA.

   BootBIOS firmware is installed on your HBA, but it is disabled by default. For information about how to enable BootBIOS on the HBA, see your HBA vendor-specific documentation.

2. Add the HBA initiator to an igroup.

   You use this igroup to specify the host that can access the boot LUN. To add the initiator to the igroup, you can enter the WWPN for Fibre Channel HBAs or the iSCSI node name for iSCSI HBAs. For information about creating and managing igroups, see the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

3. Restrict the HBA to a single path to the boot LUN. You can add additional paths after Windows is installed and you have a multipathing solution in place.

To limit a single path to the boot LUN, you can use a Data ONTAP feature called port sets. You create a port set, add the port (or LIF) to the port set, and then bind the port set to an igroup. Port sets are supported for Fibre Channel (Data ONTAP operating in 7-Mode and Cluster-Mode) and for iSCSI (Cluster-Mode only). For more information about port sets, see the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

4. Create the LUN that you want to use as a boot device and map it to the igroup as LUN ID 0.

   For information about creating LUNs, see the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.

5. For iSCSI HBAs, configure the following boot BIOS settings:

   - Initiator IP
   - iSCSI node name
   - Adapter boot mode

   For more information about configuring the boot BIOS, refer to your HBA vendor-specific documentation.

6. Use your HBA vendor's BootBIOS utility to configure the LUN as a boot device.

   Refer to your HBA vendor-specific documentation for instructions.

7. Reboot the host and enter the host BIOS utility.

8. Configure the host BIOS to make the boot LUN the first disk device in the boot order.

   Refer to your host documentation for instructions.

9. Obtain the HBA device drivers for your version of Windows.

10. Install the Windows Server operating system and the HBA device driver on the boot LUN.

    Refer to your HBA vendor-specific documentation for instructions.

11. If you are using the Veritas Storage Foundation for Windows software, install it now. Follow the instructions in the *Veritas Storage Foundation and High Availability Solutions Installation and Upgrade Guide*.

    Be sure to install the Veritas DMP DSM when you install the Veritas Storage Foundation for Windows software. Do not install the Data ONTAP DSM for Windows MPIO with Veritas Storage Foundation.

12. Install the Windows Host Utilities.

    Note: For the latest information about SAN booting, including restrictions and configuration recommendations, refer to the *Windows Host Utilities Release Notes*.

Related information

[Microsoft support artcicle: Support for booting from a Storage Area Network (SAN)](#)

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html
FC and iSCSI Configuration Guide - www.ibm.com/storage/support/nseries/
Emulex downloads for Windows
QLogic downloads for Windows

Troubleshooting

This section describes general troubleshooting techniques for Windows Host Utilities.

Be sure to check the latest *Release Notes* for known problems and solutions.

Areas to check for possible problems

To avoid potential problems, confirm that the Host Utilities support your combination of host operating system software, host hardware, Data ONTAP software, and storage system hardware.

- Check the N series interoperability matrix.
- Verify that you have a correct iSCSI configuration. If iSCSI LUNs are not available after a reboot, verify that the target is listed as persistent on the Persistent Targets tab of the Microsoft iSCSI Initiator GUI.
  If applications using the LUNs display errors on startup, verify that the applications are configured to depend on the iSCSI service.
- For Fibre Channel paths to storage controllers running Data ONTAP 8.1 operating in Cluster-Mode, be sure the FC switches are zoned using the WWPNs of the target logical interfaces (LIFs), not the WWPNs of the physical ports on the node.
- Check for known problems. Review the *Release Notes* for Windows Host Utilities. The *Release Notes* include a list of known problems and limitations.
- Review the troubleshooting information in the *Data ONTAP Block Access Management Guide for iSCSI and FC* for your version of Data ONTAP.
- Search the IBM N series support website for recently discovered problems.
- Collect information about your system. Record any error messages displayed on the host or storage system console. Collect the host and storage system log files. Record the symptoms of the problem and any changes made to the host or storage system just before the problem appeared.
- Contact technical support. If you are unable to resolve the problem, contact IBM N series support at 1-800-IBMSERV for assistance.

Related concepts

About the diagnostic programs on page 89

Related information

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html
IBM N series support website - www.ibm.com/storage/support/nseries/

Displaying Host Utilities and HBA version information

Use the `san_version.exe` command to display the Windows Host Utilities version and the firmware and driver versions of HBAs installed in the host.

About this task

HBA information is displayed only for Emulex and QLogic FC and FCoE adapters detected in the host. Version information for other supported adapters is not displayed.

Step

1. Enter the following command at a Windows command prompt:

   `san_version`

```
C:\>san_version
Windows(R) Host Utilities 6.0.110420_1405

HBA com.qlogic-QLE8152-0:
        Manufacturer: QLogic Corporation
        Model: QLE8152
        Model Description: QLogic QLE8152 Fibre Channel Adapter
        Firmware: 5.01.03
        Driver (qlfcoe.sys): 9.1.8.25
        Hardware version:
        SerialNumber: RFC0922L02901
```

After you finish

Verify the reported versions are supported, and update the driver and firmware versions if needed.

Installing fcinfo for Windows Server 2003 FC configurations

Installing the Microsoft Fibre Channel Information Tool (fcinfo) for Windows Server 2003 enables you to collect Fibre Channel HBA troubleshooting information in a standardized format.

About this task

It is recommended that you install fcinfo before you have a problem so that it is already available if needed. Customer support will tell you what commands to run if they need the information this tool collects.

Steps

1. Download the fcinfo package for your server's processor architecture from the Microsoft Download Center.

2. Run the installation program and follow the prompts.

Related information

   Microsoft Download Center: Fibre Channel Information Tool (fcinfo)

Updating the HBA software driver

Check the version of the HBA software driver and determine whether it needs to be upgraded.

Before you begin

Current driver requirements are in the N series interoperability matrix.

About this task

To see if you have the latest driver, complete the following steps.

Steps

1. Right-click **My Computer** and select **Manage**.

   The Computer Management window is displayed.

2. Double-click **Device Manager**.

   A list of installed devices displays. Previously installed drivers are listed under SCSI and RAID controller. One installed driver appears for each port on the HBA.

   Note: If you uninstalled a device driver, a FC controller (HBA) appears under Other devices.

3. Expand **SCSI and RAID controllers** and double-click the appropriate HBA.

   The **General** dialog box is displayed.

4. Click **Driver**.

   - If the driver version is correct, then you do not need to do anything else and can stop now.
   - If the version is not correct, proceed to the next step.

5. Obtain the latest supported version from the Emulex or QLogic Web site.

Related information

   IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

Emulex support page for IBM
QLogic support page for IBM

Understanding the Host Utilities changes to FC HBA driver settings

During the installation of the required Emulex or QLogic HBA drivers on an FC system, several parameters are checked and, in some cases, modified.

The Host Utilities set values for the following parameters if Data ONTAP DSM for Windows MPIO is not detected:

- LinkTimeOut – defines the length of time in seconds that the host port waits before resuming I/O after a physical link is down.
- NodeTimeOut – defines the length of time in seconds before the host port recognizes that a connection to the target device is down.

If Data ONTAP DSM for Windows MPIO is installed on the host, the DSM installation program sets the HBA values instead. These values might be different from the values set by Window Host Utilities, depending on the DSM version.

When troubleshooting HBA issues, check to make sure these settings have the correct values. The correct values depend on two factors:

- The HBA vendor
- Whether you are using multipathing software (MPIO)

You can correct the HBA settings by running the Repair option of the Windows Host Utilities installer.

Verifying the Emulex HBA driver settings on FC systems

On FC systems, verify the Emulex HBA driver settings. These settings must exist for each port on the HBA.

Steps

1. Open HBAnyware.

2. Select the appropriate HBA from the list and click the Driver Parameters tab.

   The driver parameters appear.

3. If you are using MPIO software, ensure you have the following driver settings:

   - LinkTimeOut - 1
   - NodeTimeOut - 10

If Data ONTAP DSM for Windows MPIO is installed on the host, the DSM installation program sets the HBA values. Check the DSM documentation for the values set by the version of DSM installed on your host.

4. If you are not using MPIO software, ensure you have the following driver settings:

- LinkTimeOut - 30
- NodeTimeOut - 120

Related references

FC HBA values set by Windows Host Utilities on page 65

Verifying the QLogic HBA driver settings on FC systems

On FC systems, verify the QLogic HBA driver settings. These settings must exist for each port on the HBA.

Steps

1. Open SANsurfer and click **Connect** on the toolbar.

The **Connect to Host** dialog appears.

2. Select the appropriate host from the list and click **Connect**.

A list of HBAs appears in the FC HBA pane.

3. Select the appropriate HBA port from the list and click the **Settings** tab.

4. Select **Advanced HBA Port Settings** from the **Select Settings** section.

5. If you are using MPIO software, ensure you have the following driver settings:

- Link Down Timeout (linkdwnto) - 1
- Port Down Retry Count (portdwnrc) - 10

If Data ONTAP DSM for Windows MPIO is installed on the host, the DSM installation program sets the HBA values. Check the DSM documentation for the values set by the version of DSM installed on your host.

6. If you are not using MPIO software, ensure you have the following driver settings:

- Link Down Timeout (linkdwnto) - 30
- Port Down Retry Count (portdwnrc) - 120

Related references

FC HBA values set by Windows Host Utilities on page 65

Enabling logging on the Emulex HBA

In some unusual circumstances, your technical support engineer might request that you enable error logging on the Emulex HBA miniport driver.

Steps

1. Open HBAnyware.

2. Select the appropriate HBA from the list and click the **Driver Parameters** tab.

3. Select the **LogErrors** parameter and change the value to the desired severity level.

4. Click **Apply**.

Enabling logging on the QLogic HBA

In some unusual circumstances, your technical support engineer might request that you enable error logging on the QLogic HBA miniport driver.

Steps

1. Open SANsurfer.

2. Open the **Settings** menu and select **Options**.

3. Ensure **Log Informational Events**, **Warning Events**, and **Enable Warning display** are selected.

4. Click **OK**.

FCoE troubleshooting overview

Fibre Channel over Ethernet (FCoE) troubleshooting is similar to traditional Fibre Channel (FC) troubleshooting, with a few specific changes for this new protocol.

FCoE encapsulates FC frames within Ethernet packets. Unlike iSCSI, FCoE does not use TCP/IP.

Troubleshooting FCoE problems should be divided into several distinct areas:

• Initiator to FCoE switch connection
• FCoE switch
• Switch to target connection

In the SAN context, the initiator is always in the Windows host, and the target is always a component of the IBM N series storage system.

Troubleshooting the FCoE initiator to switch connection

To troubleshoot the FCoE initiator to FCoE switch connection, check the link lights, cabling, firmware versions, and switch port configuration.

Before you begin

You should have the manufacturer's documentation for your FCoE initiator (converged network adapter or CNA) and for your FCoE switch.

Steps

1. Verify that your CNA model is listed in the N series interoperability matrix as supported for your configuration. Note the required FCoE firmware and host operating system versions.

2. Check the link lights on the card.

    See the manufacturer's documentation for the location and meaning of each light.

    a. If the lights indicate that there is no Ethernet link, check the cables and optical module and that the card is correctly installed.

    For copper cables, be sure to use copper cables supplied by the FCoE switch manufacturer. For optical cables, be sure to use an optical modules supplied by the CNA manufacturer in the CNA and an optical module supplied by the switch manufacturer in the switch. These items are *NOT* interchangeable between different switch and CNA brands. An FCoE component disables its port if it does not recognize the cable or optical module.

    b. Verify the CNA is cabled directly to a port on a supported FCoE switch.

    c. Verify the firmware version for the NIC function of the CNA.

    The NIC firmware version can be found in Windows **Device Manager** under **Network adapter** in the properties for the CNA. Note that a CNA has two firmware versions, one for its FCoE function and one for its NIC function. Check the CNA manufacturer's support site to see if updated NIC firmware is available; if so, download and install it.

    d. If the lights indicate that there is an Ethernet link but no FCoE connection, verify the firmware version of the CNA installed on the Windows host computer.

    The FCoE firmware version can be found in Windows **Device Manager** under **Storage controllers** in the properties for the CNA. Note that a CNA has two firmware versions, one for its FCoE function and one for its NIC function. If needed, download and install a supported FCoE firmware version.

Related information

IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html

Troubleshooting the FCoE switch

You should use the manufacturer's documentation for FCoE switch troubleshooting. However, a few high-level troubleshooting steps are listed here for your convenience.

Steps

1. Verify that the switch model and its firmware version are listed on the N series interoperability matrix.

   Note that an FCoE switch, with an integrated FC name server is required. A standard data center bridging (DCB) Ethernet switch is not sufficient.

2. Verify the switch zoning. Each initiator should be in a separate zone with one or more target ports.

3. If you are also using the CNA port as a NIC for other Ethernet traffic (iSCSI, NFS, CIFS), be sure the switch port is configured for trunking.

   FCoE and other Ethernet traffic should be separated onto different VLANs.

Related information

   [IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html](www.ibm.com/systems/storage/network/interophome.html)

Troubleshooting the FCoE switch to target connection

To troubleshoot the FCoE switch to target connection, check the link lights, Data ONTAP software version, and storage system configuration.

Steps

1. Check the N series interoperability matrix to verify that you have a supported version of Data ONTAP software and a supported FC or FCoE target adapter.

   Data ONTAP 7.3.2 was required for an FCoE target adapter when this document was written. If you are using an FC target adapter, Data ONTAP 7.2.6.1 or later was required when this document was written.

2. Verify that the Fibre Channel protocol is licensed on the storage system.

3. On the console of a storage controller operating in 7-Mode, run the following command:

   `fcp show adapter -v`
   On the console of a storage controller operating in Cluster-Mode, run the following command:

   `network fcp adapter show -instance`

   The target adapter should be listed and online.

4. On the console of a storage controller running in 7-Mode, run the following command:

   `fcp show initiator -v`

On the console of a storage controller running in Cluster-Mode, running the following command:

vserver fcp initiator show

The FCoE initiator should be listed.

5. If the FCoE initiator is not listed, check the initiator group (igroup) on the storage controller and verify the initiator's world wide port name (WWPN) is configured correctly.

You can display the WWPN of the initiator on the Windows host by running the hba_info.exe command from Windows Host Utilities.

Related information

   [IBM N series interoperability matrix - www.ibm.com/systems/storage/network/interophome.html](www.ibm.com/systems/storage/network/interophome.html)

Troubleshooting FCoE failover problems

FCoE connections in a high availability configuration should fail over to paths during an outage. Verify CNA and host timeout settings if failover is not working correctly.

Steps

1. Verify you have a supported version of Windows Host Utilities installed. If you installed the CNA after installing Windows Host Utilities, run the Windows Host Utilities **Repair** option from Windows **Programs and Features**.

2. Verify you have supported multipathing software installed and that two or more paths are shown from the host to each LUN.

About the diagnostic programs

The diagnostic programs provided with earlier versions of Windows Host Utilities have been replaced by the nSANity Diagnostic and Configuration Data Collector program starting with Windows Host Utilities 5.3.

The following diagnostic programs are no longer included in Windows Host Utilities. The data that was collected by these programs is now collected by the nSANity Diagnostic and Configuration Data Collector program.

- controller_info
- hba_info
- windows_info
- brocade_info, cisco_info, mcdata_info, and qlogic_info
- msiscsi_info
- vm_info

The following program is still included with Windows Host Utilities:

- san_version. The san_version program displays the version number of the Host Utilities programs installed on the host. It also displays the model and firmware version of FC HBAs installed on the host.
- sanlun. The sanlun program displays information about LUNs and FC adapters.

Installing the nSANity data collection program

Obtain and install the nSANity Diagnostic and Configuration Data Collector program when instructed to do so by your technical support representative.

Before you begin

The nSANity program replaces the diagnostic programs included in previous versions of the Host Utilities. The nSANity program runs on a Windows or Linux system with network connectivity to the component from which you want to collect data.

About this task

Contact your technical support representative to obtain the nSANity Diagnostic and Configuration Data Collector program.

Steps

1. Obtain the Windows zip or Linux tgz version of the nSANity program from your technical support representative and copy it to the workstation or server that you want to run it on.

2. Change to the directory to which you downloaded the zip or tgz file.

3. Extract all of the files and follow the instructions in the README.txt file. Also be sure to review the RELEASE_NOTES.txt file for any warnings and notices.

After you finish

Run the specific nSANity commands specified by your technical support representative.

Related information

IBM N series support website - www.ibm.com/storage/support/nseries

Collecting diagnostic data using nSANity

Run the nSANity Diagnostic and Configuration Data Collector program when instructed by technical support to collect diagnostic data about your host, storage system, and Fibre Channel switches.

Before you begin

Obtain and install the latest version of nSANity on a Windows or Linux host. Be sure you have the user IDs and passwords of the components for which you need to collect data. In general, you need Administrator or root credentials to collect diagnostic data.

Steps

1. Open the Windows or Linux command prompt and change to the directory where you installed the nSANity program.

2. Enter the following command to display the nSANity command options:

   nsanity --help

3. Enter the commands specified by your technical support representative.

After you finish

Send the file or files generated by the nSANity program to your technical support representative.

Related tasks

About collecting information on Veritas Storage Foundation

You must use the VxExplorer tool, which is included with Veritas Storage Foundation for Windows, to collect information specific to Veritas configurations.

The nSANity program does not collect information specific to Veritas Storage Foundation configurations.

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