IBM Storage Enabler for Windows Failover Clustering
Version 1.2.0

User Guide

GA32-2240-01

Note
Before using this document and the product it supports, read the information in "Notices" on page 37.

Edition notice

Publication number: GA32-2240-01. This edition applies to version 1.2.0 of the IBM Storage Enabler for Windows Failover Clustering and to all subsequent releases and modifications until otherwise indicated in a newer publication.

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About this guide

This guide describes how to prepare for, install, and configure the IBM® Storage Enabler for Windows Failover Clustering.

Who should use this guide

This guide is intended for system administrators who are familiar with Microsoft Windows Failover Clustering and with the IBM XIV® Storage System.

Conventions used in this guide

These notices are used in this guide to highlight key information.

Note: These notices provide important tips, guidance, or advice.

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Related information sources

You can find additional information and publications related to the IBM Storage Enabler for Windows Failover Clustering on the following IBM and Microsoft websites:

- IBM XIV Storage System Information Center (publib.boulder.ibm.com/infocenter/ibmxiv/r2)
- IBM XIV Host Attachment Kit for Windows release notes and user guide, available under Host Connectivity on the IBM Storage Host Software Solutions Information Center (publib.boulder.ibm.com/infocenter/strhosts/ic)
- Microsoft Windows Failover Clustering Overview (technet.microsoft.com/en-us/library/hh831579)
- Microsoft Server Clusters Technical Reference (technet.microsoft.com/en-us/library/cc759014(WS.10).aspx)
- Failover Clusters in Windows Server 2008 (technet.microsoft.com/en-us/library/ff182326(WS.10).aspx)
- Failover Clusters in Windows Server 2008 R2 (technet.microsoft.com/en-us/library/ff182338(WS.10).aspx)
- Microsoft Support page for Windows clustering and geographically separate sites(support.microsoft.com/kb/280743)
- Microsoft Q&A: Geographically Dispersed Clusters(technet.microsoft.com/en-us/library/cc757840(WS.10).aspx)
- The Microsoft Support Policy for Windows Server 2008 Failover Clusters(support.microsoft.com/kb/943984/en-us)

- Microsoft Failover and Network Load Balancing Clustering Team Blog (blogs.msdn.com/clustering)

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Chapter 1. Introduction

The IBM Storage Enabler for Windows Failover Clustering is a software agent that runs as a Microsoft Windows Server service on the nodes of two geographically dispersed clusters, providing failover automation for IBM XIV storage provisioning on these nodes, enabling deployment of these nodes in a geo-cluster configuration.

The IBM Storage Enabler relies on the IBM XIV snapshot and synchronous mirroring features, which enable failover testing and point-in-time recovery, including cloud-based transportable snapshot recovery. The IBM Storage Enabler service uses inband XCLI management commands to control the XIV storage systems at each site.

Together, the IBM Storage Enabler (installed on each cluster node) and the IBM XIV Storage **System** support a broad range of failover scenarios in geographically dispersed Windows Server cluster environments.

Concept diagram

The following figure shows two geographically remote sites, each with Windows Server clusters that use the IBM XIV Storage System for storage provisioning. The IBM Storage Enabler is installed and runs as a service on each individual node of each cluster, enabling the continuous availability of XIV storage resources in any case of site-to-site failover and recovery operations.

In addition, for better quorum availability, the File Share Witness (FSW) hosting server is located at a third site that is connected to the same inter-site network backbone.

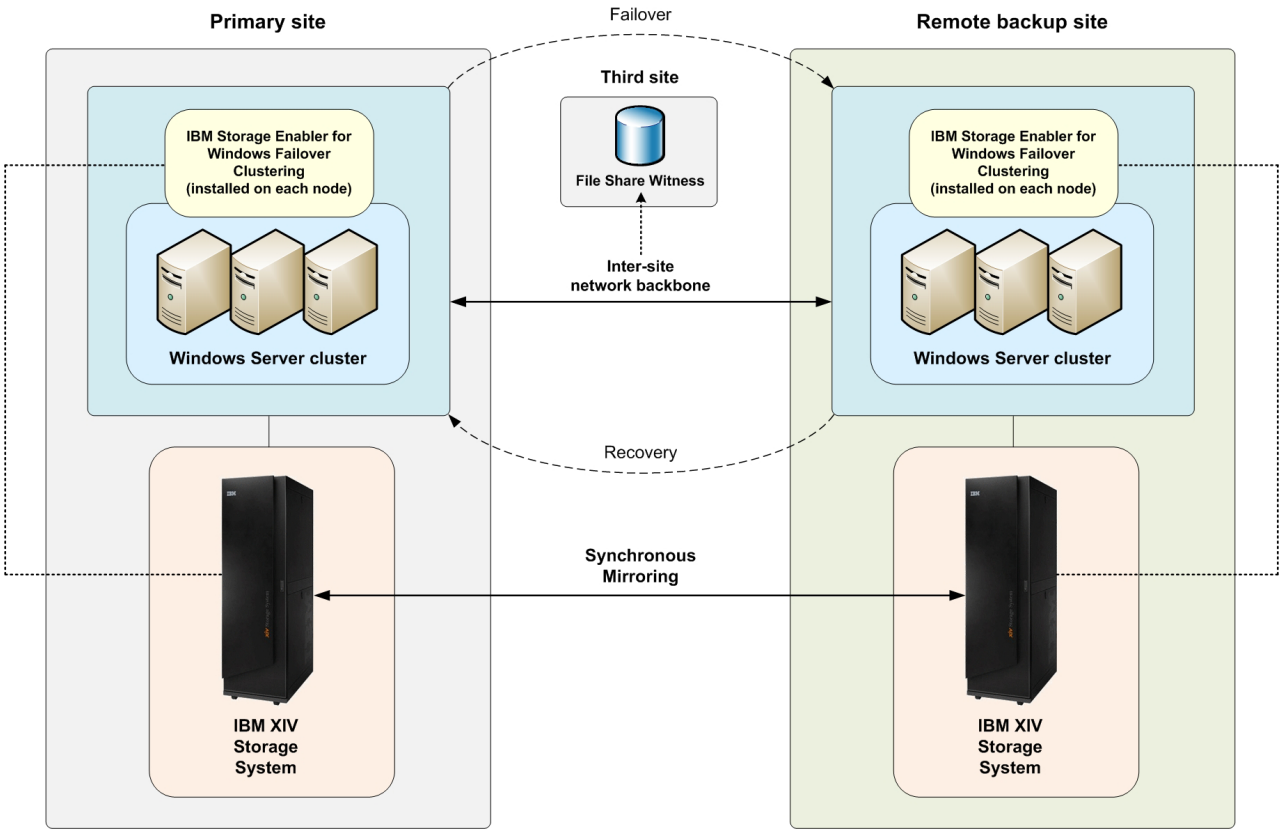

Figure 1. Concept diagram

Note: Figure 1 shows a fully redundant remote backup site deployment. However, the IBM Storage Enabler for Windows Failover Clustering also supports Disaster Recovery Planning (DRP) deployments that are not fully redundant.

Compatibility and requirements

For the complete and up-to-date information about the compatibility and requirements of the IBM Storage Enabler for Windows Failover Clustering, refer to the latest release notes.

You can find the latest release notes on the IBM Storage Host Software Solutions Information Center (publib.boulder.ibm.com/infocenter/strhosts/ic) or on the IBM Fix Central (www.ibm.com/support/fixcentral).

Download site

The IBM Storage Enabler for Windows Failover Clustering is available as a free IBM Storage software solution.

You can download the latest version at any time from IBM Fix Central (www.ibm.com/support/fixcentral).

Chapter 2. Preparation

Different preperation actions are required depending on whether you need to set up a new geo-cluster or prepare an existing cluster.

Prepare the XIV storage systems and the Windows Server clusters for site-to-site mirroring as detailed in the following sections:

- "Preparing a new geo-cluster for mirroring"
- "Preparing an existing single-copy cluster for mirroring" on page 5

Preparing a new geo-cluster for mirroring

This section describes preparation tasks that are required when deploying a new geo-cluster and making it ready for failover scenarios.

To prepare a new geo-cluster site for failover functionality that entails continuous XIV storage provisioning, ensure that all tasks in the following checklists are performed:

- Preparing each node in the cluster (see Table 1)
- Preparing XIV volumes for synchronous mirroring (see Table 2)
- Enabling volume access on each node in the cluster (see Table 3 on page 4)
- Configuring the cluster (see Table 4 on page 4)

Table 1. Tasks for preparing new cluster nodes

Task	Reference documentation
After Windows Server is installed on the node, install any required Microsoft update.	• Latest release notes of the IBM Storage Enabler for Windows Failover Clustering
Verify that the physical iSCSI or Fibre Channel connections between the cluster nodes and the IBM XIV Storage System are in place.	• IBM XIV Storage System documentation: *Product Overview* and *Planning Guide* • IBM XIV Host Attachment Kit documentation: *Host Attachment Guide* (user guide)
On each node, install the IBM XIV Host Attachment Kit for Windows, or prepare a shared location from which the portable HAK package can be accessed and used. **Note:** The portable HAK option is available only in Host Attachment Kit version 1.7.0 or later.	• IBM XIV Host Attachment Kit documentation: release notes and user guide
Attach each node to the XIV storage system that is located at the same site.	• IBM XIV Host Attachment Kit documentation: user guide
Create a cluster object on the XIV storage system and then add all the attached nodes to the cluster object.	• IBM XIV Storage System management tools documentation

Table 2. Tasks for preparing XIV volumes for synchronous mirroring

Task	Reference documentation
Create the synchronous replication connection between local XIV storage system (at the new geo-cluster site) and the remote XIV storage system.	• IBM XIV Storage System management tools documentation
Create new volumes on the XIV storage system of the primary site.	• IBM XIV Storage System management tools documentation

Table 2. Tasks for preparing XIV volumes for synchronous mirroring (continued)

Task	Reference documentation
For each new volume you have created, create a pairing mirror volume on the XIV storage system at the backup site.	• IBM XIV Storage System management tools documentation
On each XIV system, map the mirrored volumes to the nodes at the corresponding mirrored sites. These nodes are included in cluster object you have previously created (see Table 1 on page 3).	• IBM XIV Storage System management tools documentation

Attention:

- If you are using Windows Server 2003, the physical disk layout must be identical across the cluster. This means that each specific disk must have the same drive number on all cluster nodes. For example, a physical disk resource recognized as "Disk D:" must be defined as **PHYSICALDRIVE1** on all cluster nodes.
- Do not map volumes to LUN0.

Table 3. Tasks for enabling volume access on each node in the cluster

Task	Reference documentation
Use the Microsoft Disk Management utility on each node to bring the disks online.	Microsoft TechNet Library: • Overview of Disk Management (technet.microsoft.com/en-us/library/dd163558.aspx)
If you are using Windows Server 2003, create a file system on each volume, by using one of the cluster nodes that is mapped to the primary copy of the volume.	Microsoft TechNet Library: • Microsoft Windows Server 2003 technical documentation (technet.microsoft.com/en-us/windowsserver/bb512919.aspx)

Table 4. Tasks for configuring the cluster

Task	Reference documentation
Configure the appropriate quorum type. **Note:** The appropriate quorum type does not include shared physical disk quorum, but does include the following quorum types: • Majority Node Set • Majority Node Set with File Share Witness • Majority Node Set with Disk Witness	Microsoft TechNet Library: • Failover Cluster Step-by-Step Guide: Configuring the Quorum in a Failover Cluster (technet.microsoft.com/en-us/library/cc770620%28v=ws.10%29.aspx) • Reviewing Quorum Configuration Options for a Failover Cluster (technet.microsoft.com/fr-fr/library/dd197496%28v=ws.10%29.aspx)
Create the required cluster groups.	Microsoft TechNet Library: • Server Cluster groups (technet.microsoft.com/en-us/library/cc787359%28v=ws.10%29.aspx)
Create a physical disk resource for each mirrored volume, and place the resource in the appropriate cluster group.	Microsoft TechNet Library: • Checklist: Installing a Physical Disk resource (technet.microsoft.com/en-us/library/cc759225%28v=ws.10%29.aspx)

Preparing an existing single-copy cluster for mirroring

This section describes preparation tasks that are required when transforming an existing single-copy cluster to a mirrored-copy cluster and making it ready for failover scenarios.

To prepare a single-copy cluster for failover functionality that entails continuous XIV storage provisioning, ensure that all tasks in the following checklists are performed:

Attention: Because this preparation disrupts the operations of an existing cluster, all the cluster resources (except the quorum resource) must be taken offline before commencing the preparation.

- Preparing the existing cluster nodes (see Table 5)
- Preparing new cluster nodes (see Table 6)
- Preparing XIV volumes for synchronous mirroring (see Table 7)
- Configuring the cluster (see Table 8 on page 6)

Table 5. Tasks for preparing the existing cluster nodes

Task	Reference documentation
On each node, install the IBM XIV Host Attachment Kit for Windows, or prepare a shared location from which the portable HAK package can be accessed and used. **Note:** The portable HAK option is available only in Host Attachment Kit version 1.7.0 or later.	• IBM XIV Host Attachment Kit documentation: release notes and user guide

Table 6. Tasks for preparing new cluster nodes

Task	Reference documentation
On each node, install the IBM XIV Host Attachment Kit for Windows, or prepare a shared location from which the portable HAK package can be accessed and used. **Note:** The portable HAK option is available only in Host Attachment Kit version 1.7.0 or later.	• IBM XIV Host Attachment Kit documentation: release notes and user guide
Attach each node to the XIV storage system that is located at the same site.	• IBM XIV Host Attachment Kit documentation
Create a cluster object on the XIV storage system and then add all the attached nodes to the cluster object.	• IBM XIV Storage System management tools documentation
Use the Microsoft Cluster Administrator utility to join the new nodes to the cluster.	Microsoft TechNet Library: • Using Cluster Administrator (`technet.microsoft.com/en-us/library/cc778990(v=ws.10).aspx`)

Table 7. Tasks for preparing XIV volumes for synchronous mirroring

Task	Reference documentation
Create the synchronous replication connection between the local XIV storage system and the remote XIV storage system.	• IBM XIV Storage System management tools documentation
For each volume used by the cluster, create a pairing mirror volume on the XIV storage system at the backup site.	• IBM XIV Storage System management tools documentation
Map the mirrored volumes to the cluster objects.	• IBM XIV Storage System management tools documentation

Attention:

- If you are using Windows Server 2003, the physical disk layout must be identical across the cluster. This means that each specific disk must have the same drive number on all cluster nodes. For example, a physical disk resource recognized as "Disk D:" must be defined as **PHYSICALDRIVE1** on all cluster nodes.
- Do not map volumes to LUN0.

Table 8. Tasks for configuring the cluster

Task	Reference documentation
Configure the appropriate quorum type. **Note:** The appropriate quorum type does not include shared physical disk quorum, but does include the following quorum types: • Majority Node Set • Majority Node Set with File Share Witness • Majority Node Set with Disk Witness	Microsoft TechNet Library: • Failover Cluster Step-by-Step Guide: Configuring the Quorum in a Failover Cluster (technet.microsoft.com/en-us/library/cc770620%28v=ws.10%29.aspx) • Reviewing Quorum Configuration Options for a Failover Cluster (technet.microsoft.com/fr-fr/library/dd197496%28v=ws.10%29.aspx)

Chapter 3. Software installation and deployment

After the required cluster preparation is completed, you can start the installation and deployment of the IBM Storage Enabler for Windows Failover Clustering.

The software package includes the source files along with three primary components:

- IBM Storage Enabler resource DLL file – A dynamic-link library (DLL) file that is added to Windows Server. This DLL includes the necessary controls upon which the functionality of the IBM Storage Enabler service is based.
- **xiv_mscs_admin.exe** – A command-line interface (CLI) utility for carrying out administrative operations.
- **xiv_mscs_service.exe** – A CLI utility for administering the IBM Storage enabler background service (Windows Server service). For more information, see "Using the service utility" on page 28.

First-time installation vs. upgrade

If a previous version of the IBM Storage Enabler for Windows Failover Clustering is already installed on a cluster node, you can upgrade it.

When you run the installation wizard (see "Running the installation wizard") on a node with an existing installation of the IBM Storage Enabler for Windows Failover Clustering, the existing local files are replaced with new ones.

After the new files are installed, you need to run the **--upgrade** command from the Windows command prompt as follows:

```
C:\Program Files\XIV\mscs_agent\bin\xiv_mscs_admin --upgrade --yes
```

Attention:

- The upgrade operation stops the IBM Storage Enabler service (Windows Server service) and replaces its resource DLL file. This causes a temporary disruption in the cluster operation, so consider migrating the cluster group operations to another cluster before you run the **--upgrade** command. The IBM Storage Enabler service is automatically restarted after the resource DLL file is replaced.
- The **--yes** argument (typed after **--upgrade**) is required as your confirmation to perform this disruptive operation.

Running the installation wizard

Run the installation wizard to install the IBM Storage Enabler files on each cluster node.

About this task

Note:

- The installation wizard copies the required files to a local folder on the node, and registers the IBM Storage Enabler as an installed program in Windows. However, the IBM Storage Enabler starts working only after running the **--install** and **--deploy** commands, as explained in "Running the **--install** command" on page 11 and "Running the **--deploy** command" on page 12.
- If you prefer using command-line interface (CLI) instead of running the installation wizard, see "Optional: Installing from the Windows command prompt" on page 10.

Procedure

1. Depending on the operating system architecture, run the installation package file.
   - On x86 architectures, run: `IBM_Enabler_for_Win_Clustering-1.2.0-x86.exe`
   - On x64 architectures, run: `IBM_Enabler_for_Win_Clustering-1.2.0-x64.exe`

   After the initial file extraction, the language selection dialog box appears.
2. Select the language that you want to use in the installation wizard, and then click **OK**.

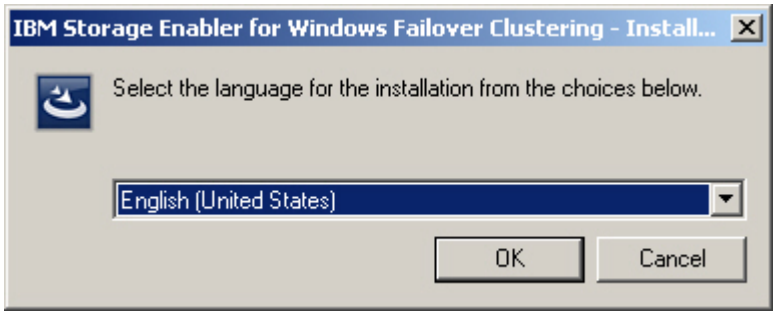

Figure 2. Language selection dialogue box

The installation wizard of the IBM Storage Enabler for Windows Failover Clustering starts.

Figure 3. IBM Storage Enabler for Windows Failover Clustering – Installation Wizard

3. Click **Next**. The License Agreement panel is displayed.
4. Read the IBM License Agreement and then select **I accept the terms in the license agreement**.
5. Click **Next**. The **Ready to Install the Program** panel is displayed.

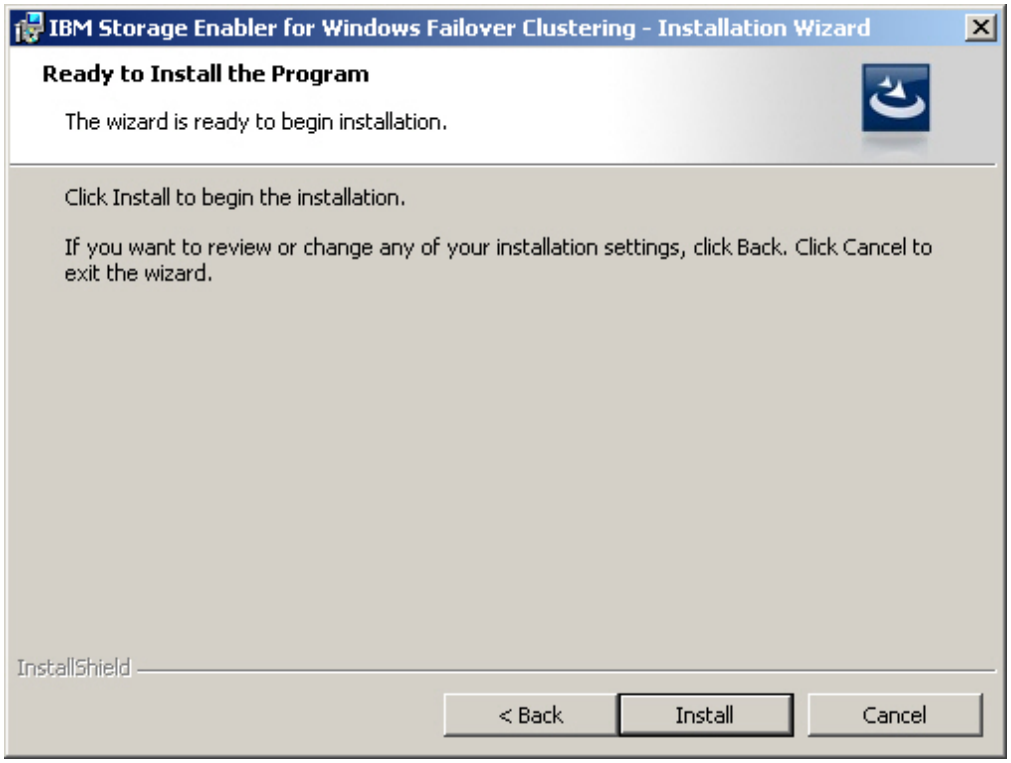

Figure 4. Installation Wizard – Ready to Install the Program

6. Click **Install** to begin the installation.

Note: The installation directory is: `C:\Program Files\XIV\mscs_agent`

7. After the installation of files is complete, click **Finish**.

Optional: Installing from the Windows command prompt

If you prefer using command-line interface (CLI) instead of running the installation wizard, you can use the Windows command prompt program (**cmd.exe**) to run the setup executable. In addition, you can use this method to install the IBM Storage Enabler with verbose logging and in different levels of unattended installation modes.

If you want to run the CLI setup with verbose logging (creates a local log file), run the installation executable in its folder location as follows:

```
<IBM_Enabler_for_Win_Clustering-1.2.0*.exe> v"/l*vx setup.log"
```

Note: The **/l*vx** argument is part of the Microsoft Windows Installer (**msiexec.exe**) syntax for verbose output. For more information, refer to the following Microsoft MSDN Library web address:

`http://msdn.microsoft.com/en-US/library/ee251019%28v=BTS.10%29.aspx`

Installing in unattended (silent) mode

If you want to run the installation in unattended (silent) mode to eliminate user interaction during the installation, run the installation executable in its folder location as follows:

```
<IBM_Enabler_for_Win_Clustering-1.2.0*.exe> /s /v"/qn"
```

If needed, you can replace or add arguments as detailed in Table 9.

Table 9. Optional CLI arguments for unattended (silent) installation

Argument	Use after **<XIV_host_attachment_windows*.exe>**
/q	Install in silent mode.
/qn	See no user prompt during the installation.
/qb	See only basic user prompt during the installation.
/qr	See reduced user prompt during the installation.
/qf	See the entire user prompt during the installation. This is the default option.
/norestart	Prevent any host restart after the installation.
/promptrestart	Prompt before any host restart during or after the installation.
/forcerestart	Force a restart of the host after the installation.

Running the `--install` command

After the installation wizard has completed placing the required files on the node, you can run the **`--install`** command.

About this task

The **`--install`** command installs the IBM Storage Enabler resource DLL file on the node (in the `Windows/System32` directory), and starts the IBM Storage Enabler background service (Windows Server service). Both the resource DLL and the background service are required for the functionality of the IBM Storage Enabler on the cluster node.

Procedure

1. Start the Windows command prompt program (**`cmd.exe`**).
2. Enter the following command: `xiv_mscs_admin --install`. The service installation starts.
3. When prompted, enter the required credentials (username and password) for accessing the XIV storage system that is used by the node.

```
Installing service...                                                    DONE
Please enter credentials for XIV System Storage 'XIV dept32b' (MN65025)
Please enter username: admin
Please enter password: xxxxxxxxxxxxxxx
XIV user credentials for XIV Storage System 'XIV dept32b' (MN65025) changed.
Verifying host...                                                        DONE
```

After the node is verified, the IBM Storage Enabler service starts running in the background.

What to do next

After the installation and initialization of IBM Storage Enabler service, it is recommended to run the **--verify** command, as described in "Running the **--verify** command" on page 31.

Running the --deploy command

After you have installed the resource DLL files and started the IBM Storage Enabler service on each cluster node, you can run the **--deploy** command.

About this task

Use the **--deploy** command once per cluster after the IBM Storage Enabler service is operational on all the nodes in the cluster. After running the **--deploy** command, all mirror resources are brought online and the cluster as a whole can start utilizing the XIV mirroring function for failover scenarios.

In the deployment operation, XIV mirror resources are associated with each cluster group that uses XIV physical disk resources, and a resource dependency is defined for each group.

Attention:

- Make sure that the credentials for accessing any newly connected XIV storage system are set on the relevant nodes (nodes that use volumes on this XIV system) before you run the **--deploy** command. For more information, see "Changing the credentials for accessing an XIV storage system" on page 28.
- As part of the resource dependency definition, the deployment operation takes the resources offline and brings them back online only after the deployment is completed.
- The **--yes** argument (typed after **--deploy**) is required as your confirmation to perform this disruptive operation.

Procedure

1. On any node in the cluster, start the Windows command prompt program (**cmd.exe**).
2. Enter the following command: `xiv_mscs_admin --deploy --yes`. The cluster deployment starts and an appropriate message is displayed for each operation as shown in the following example:

```
Deploying for group: Cluster Group
Deploying for group: group1
Deploying for group: group2
Creating XIV Mirror resource 'XIV Mirror for Group group2'
Fixing dependencies for group: group2
Making disk 'Cluster Disk 3' dependent on 'XIV Mirror for Group group2'
Making disk 'Cluster Disk 2' dependent on 'XIV Mirror for Group group2'
Deploying for group: group3
Creating XIV Mirror resource 'XIV Mirror for Group group3'
Fixing dependencies for group: group3
Making disk 'Cluster Disk 4' dependent on 'XIV Mirror for Group group3'
Deploying for group: group4
Creating XIV Mirror resource 'XIV Mirror for Group group4'
Fixing dependencies for group: group4
Making disk 'Cluster Disk 7' dependent on 'XIV Mirror for Group group4'
Making disk 'Cluster Disk 8' dependent on 'XIV Mirror for Group group4'
Making disk 'Cluster Disk 6' dependent on 'XIV Mirror for Group group4'
Deploying for group: group5
Creating XIV Mirror resource 'XIV Mirror for Group group5'
Fixing dependencies for group: group5
Making disk 'Cluster Disk 5' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 11' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 13' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 12' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 15' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 10' dependent on 'XIV Mirror for Group group5'
Making disk 'Cluster Disk 14' dependent on 'XIV Mirror for Group group5'
```

What to do next

After the deployment operation, it is recommended to run the **--verify** command, as described in "Running the **--verify** command" on page 31.

Uninstalling the IBM Storage Enabler

This section describes how to completely uninstall the IBM Storage Enabler for Windows Failover Clustering software from a cluster.

Before you begin

Attention: The uninstallation operation stops the IBM Storage Enabler service and temporarily disrupts the cluster operation.

About this task

The uninstallation procedure includes three primary tasks:

- Deleting the XIV mirror resources from the cluster
- Stopping the IBM Storage Enabler service, removing the service, and removing its resource DLL
- Running the uninstallation wizard

Note: The **--yes** argument (typed after the described commands) is required as your confirmation to perform an operation that is disruptive to the cluster operation.

Procedure

To stop the operation of the IBM Storage Enabler and completely uninstall all its associated files and resources from the cluster, perform the following operations in the specified sequence:

1. On any node in the cluster, start the Windows command prompt program (**cmd.exe**).
2. Enter the following command: `xiv_mscs_admin --delete-resources --yes`. The XIV mirror resources starts. In this process, cluster group dependencies are removed and an appropriate message is displayed for each operation as shown in the following example:

```
Deleting all XIV Mirror resources from the cluster.
Removing dependencies on XIV Mirror resource 'XIV Mirror for Group group4'
Deleting XIV Mirror resource 'XIV Mirror for Group group4' from the cluster.
Removing dependencies on XIV Mirror resource 'XIV Mirror for Group group5'
Deleting XIV Mirror resource 'XIV Mirror for Group group5' from the cluster.
Removing dependencies on XIV Mirror resource 'XIV Mirror for Group group2'
Deleting XIV Mirror resource 'XIV Mirror for Group group2' from the cluster.
Removing dependencies on XIV Mirror resource 'XIV Mirror for Group group3'
Deleting XIV Mirror resource 'XIV Mirror for Group group3' from the cluster.
All XIV Mirror resources deleted from the cluster.
```

3. After all mirror resources have been deleted, run the following command: `xiv_mscs_admin --uninstall --yes`. The IBM Storage Enabler resource DLL and service are removed and a message is displayed for each operation as shown in the following example:

```
Removing 'XIV Mirror' resource type from the cluster                    DONE
Removing the Resource DLL from this node.                               DONE
Removing service...                                                     DONE
```

4. From the Windows Control Panel, access the list of installed programs (the access method varies depending on the Windows Server version that you are using) and perform a standard removal of the IBM Storage Enabler for Windows Failover Clustering. The uninstallation wizard appears and guides you through the remaining uninstallation steps.

Chapter 4. Configuration

You can configure the IBM Storage Enabler to operate in different modes, as explained in the following sections.

Modifying settings in the Windows Server registry

You can modify the Windows Server registry in order to change some operational settings of the IBM Storage Enabler.

To modify registry settings, use the Windows registry editor (**regedit.exe**).

Attention: Perform registry changes with caution. Before making any changes, it is recommended to back up the Windows Server registry.

The IBM Storage Enabler registry settings are located in the following registry path: `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Service\XIVmscsAgent\Parameters`

Table 10 summarizes the relevant registry keys with their description and possible values.

Table 10. Registry keys for configuring the IBM Storage Enabler

Registry key	Description	Default value
`red_button`	Enables or disables forced failover. **Note:** This is a legacy registry key that was used in previous versions. Starting from version 1.1.0, it is recommended to use the **--force-fail-over** command instead, as explained in "Enabling or disabling forced failover" on page 27. A value of `False` disables forced failover. A value of `True` enables forced failover.	`False`
`log_directory`	The local directory in which the IBM Storage Enabler log files are saved.	`C:\Windows\Temp`

Table 10. Registry keys for configuring the IBM Storage Enabler (continued)

Registry key	Description	Default value
`log_targets`	Defines both the target and level of the logging operation. The target type and logging level is separated by a colon (:). By default, the log is written to the following targets: to a file: (`file`) and to the Windows Event Log (`eventlog`). The log level defines the severity of messages that can be recorded in the logs: • Information messages (`INFO`) • Warning messages (`WARNING`) • Error messages (`ERROR`) • Tracing messages (`TRACE`) **Note:** Tracing is effective only if the registry key "tracing" value is set to 1, as explained in the next row. For more information, see "Checking the Windows Event Log messages" on page 34 and "Checking the IBM Storage Enabler log files" on page 35.	`eventlog:WARNING, file:INFO`
`tracing`	Enables or disables detailed tracing in the log files. **Note:** Change the value of this key only if you are instructed to do so by IBM Support. A value of 0 disables the tracing. A value of 1 enables the tracing.	0
`interval`	The period of time between each update of the XIV resource status, in seconds.	6

Important: After you have made the required registry modifications, you do not need to restart the IBM Storage Enabler service.

Changing the pending timeout of XIV mirror resources

The default pending timeout of each XIV resource in a cluster is 180 seconds (3 minutes).

In this three-minute time period, the IBM Storage Enabler service is capable of handling approximately 18 mirrored volumes. If you have more than 18 physical disk resources (that match XIV mirrored volumes) in your cluster, you must update the pending timeout on each of the XIV mirror resources in the cluster by using the following calculation as a guide:

Pending timeout (per resource) = 10 seconds × [total number of XIV mirrored physical disk resources]

Depending on the Windows Server version that you are using, you can change the pending timeout of an XIV mirror resource in either the Cluster Administrator or the Failover Cluster Manager utility.

- In Windows Server 2003:
  1. In the Cluster Administrator utility, select a resource group.
  2. Right-click the XIV mirror resource and then click **Properties**.

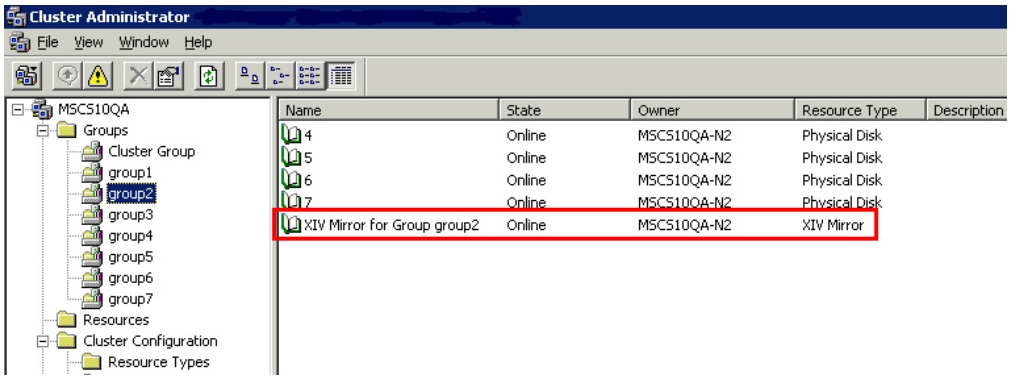

Figure 5. XIV mirror resource in the Cluster Administrator utility – Windows Server 2003

  3. Click the **Advanced** tab and then enter a value in the **Pending timeout** box.

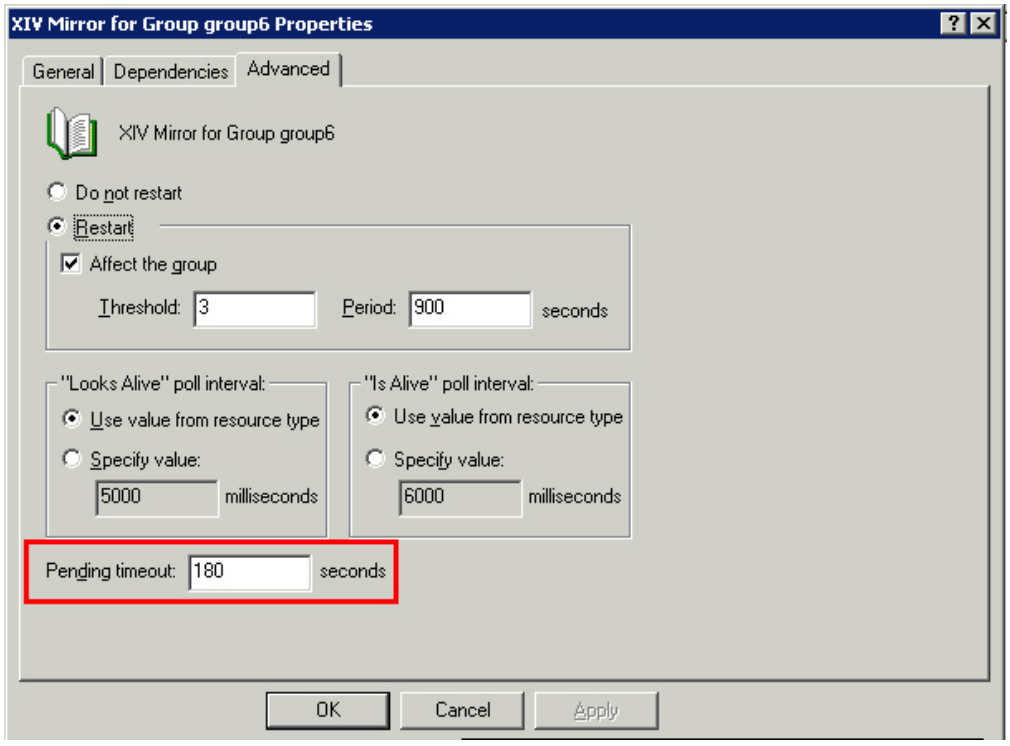

Figure 6. Resource Properties in Windows Server 2003

- In Windows Server 2008, Windows Server 2008 R2, and Windows Server 2012:
  1. In the Failover Cluster Manager utility, select a resource group.
  2. Right-click the XIV mirror resource and then click **Properties**.

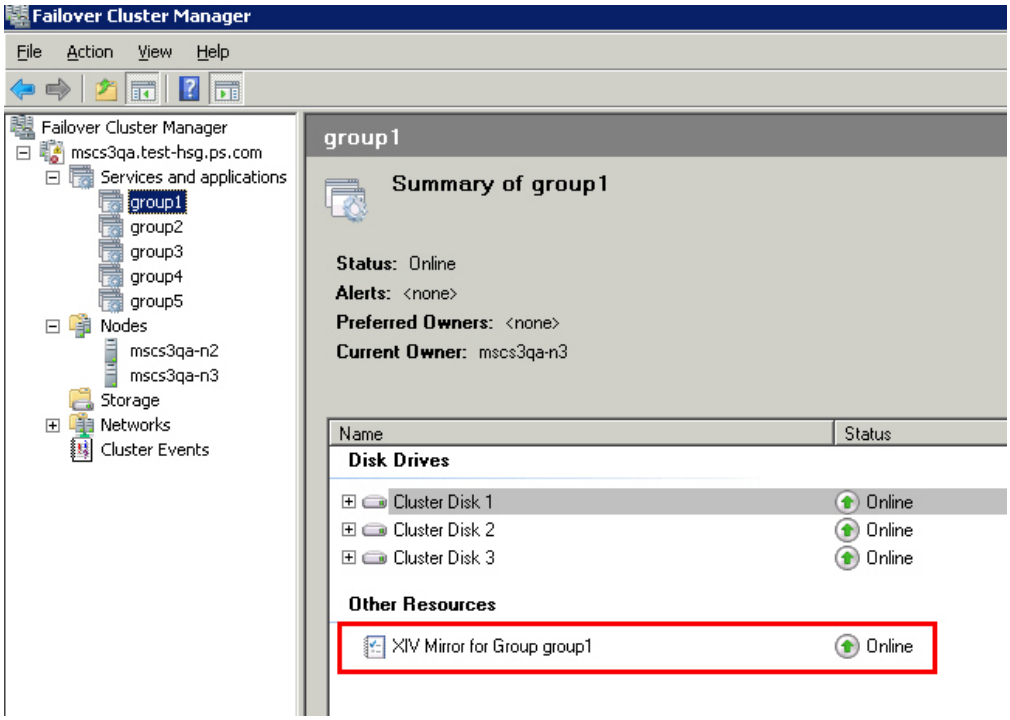

Figure 7. XIV mirror resource in the Failover Cluster Manager utility – Windows Server 2008 and Windows Server 2008 R2

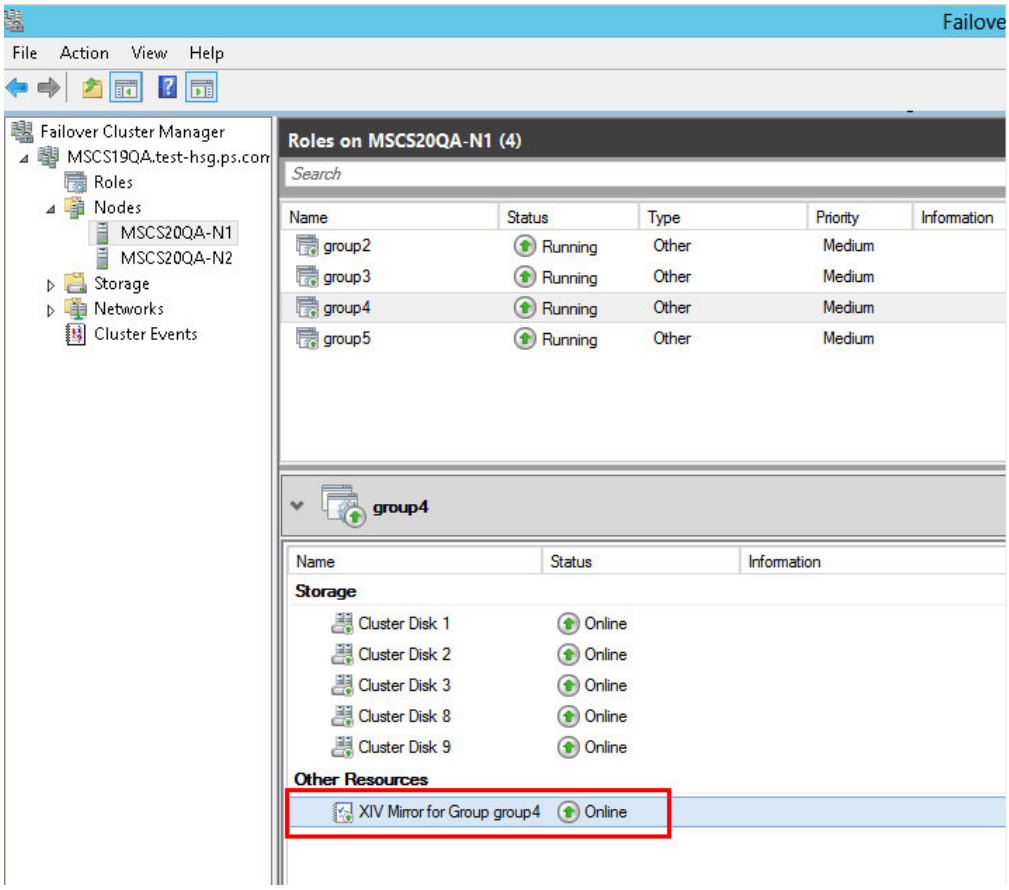

Figure 8. XIV mirror resource in the Failover Cluster Manager utility – Windows Server 2012

3. Click the **Policies** tab and then enter a value in the **Pending timeout** box.

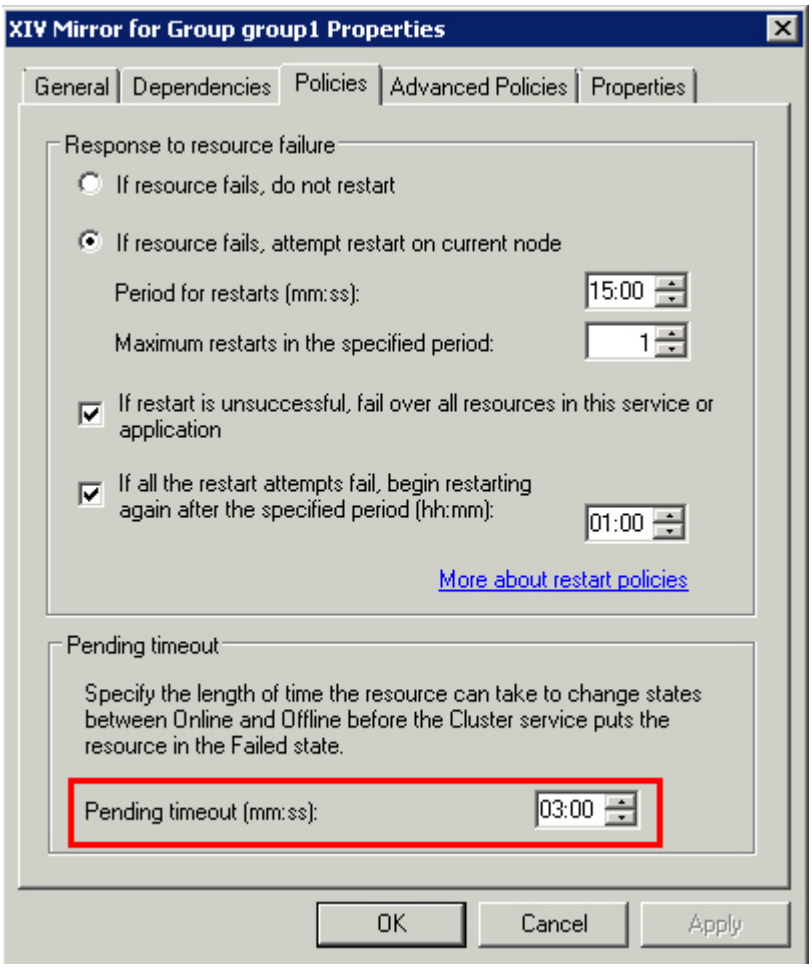

Figure 9. Resource Properties in Windows Server 2008 and Windows Server 2008 R2

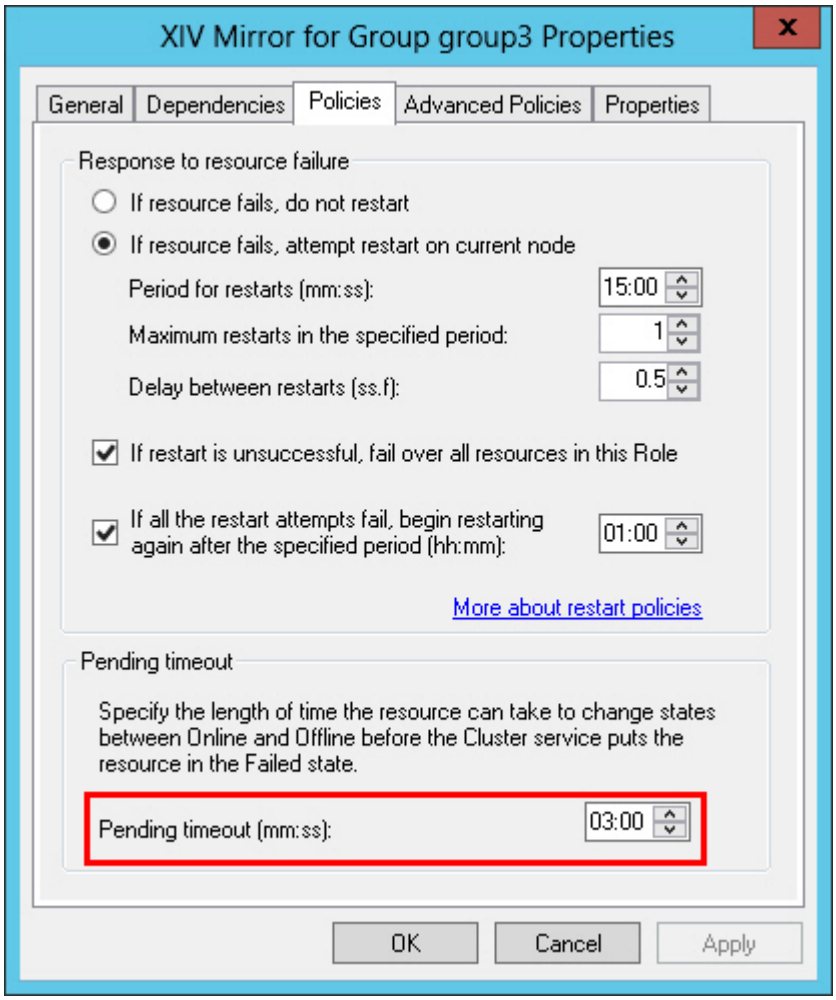

Figure 10. Resource Properties in Windows Server 2012

Chapter 5. Additional tasks

After the IBM Storage Enabler service is up and running, you can perform different administrative tasks as described in the following sections.

Running the `--report` command

You can generate a detailed report about the available disks and mirroring state on any cluster node.

About this task

Use the **--report** command to collect comprehensive information about the state and availability of storage resources on a specific node and the cluster to which the node belongs.

Procedure

1. On any node in the cluster, start the Windows command prompt program (**cmd.exe**).
2. Enter the following command: `xiv_mscs_admin --report`. The information gathering starts and a detailed report is generated as shown in the following example:

```
Validating LUN0 connection to XIV disk resources found in the cluster that are own
S3qa-n2).
Checking in-band XCLI for volume mscs3_uvol_2 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_10 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_11 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_12 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_13 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_14 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_15 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_16 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_17 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_18 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_19 over LUN0                       OK
Checking in-band XCLI for volume mscs3_uvol_1 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_3 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_4 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_5 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_6 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_7 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_8 over LUN0                        OK
Checking in-band XCLI for volume mscs3_uvol_9 over LUN0                        OK
Checking if Cluster Service is running                                         OK
Checking if Resource DLL is installed on this node                             OK
Checking if XIV Mirror Resource Type is registered                             OK
Checking if all nodes are possible owners of XIV Mirror resource type         OK
Verifying Cluster Groups and Resources                                         OK
Checking if XIVmscsAgent service in running                                    OK
Cluster Name:  mscs3qa
```

```
Cluster Nodes
=============

Name        State
-----------------
MSCS3QA-N2  Up
MSCS3QA-N3  Up


Cluster Groups
==============

Group Name     State   Current Owner  Preferred
                                      Owners
-----------------------------------------------
Cluster Group  Online  MSCS3QA-N2
Available      Online  MSCS3QA-N2
Storage
group1         Online  MSCS3QA-N2
group2         Online  MSCS3QA-N2
group3         Online  MSCS3QA-N2
group4         Online  MSCS3QA-N2
group5         Online  MSCS3QA-N2


Group Name:  Cluster Group
Group Owner:  MSCS3QA-N2

Resource Name    State   Type          Dependencies     Dependent
-------------------------------------------------------------------
Cluster IP       Online  IP Address                     Cluster Name
Address
Cluster IP       Online  IPv6 Address                   Cluster Name
Address
2001:bf8:2000:5
160::
File Share       Online  File Share
Witness                  Witness
Cluster Name     Online  Network Name  Cluster IP
                                       Address,Cluster
                                       IP Address
                                       2001:bf8:2000:5
                                       160::


Group Name:  Available Storage
Group Owner:  MSCS3QA-N2

Resource Name    State   Type           Dependencies  Dependent
-----------------------------------------------------------------
Cluster Disk 19  Online  Physical Disk


Group Name:  group1
Group Owner:  MSCS3QA-N2

Resource Name   State   Type           Dependencies    Dependent
-------------------------------------------------------------------
Cluster Disk 1  Online  Physical Disk  XIV Mirror for
                                       Group group1
Cluster Disk 3  Online  Physical Disk  XIV Mirror for
                                       Group group1
XIV Mirror for  Online  XIV Mirror                     Cluster Disk
Group group1                                           1,Cluster Disk
                                                       2,Cluster Disk
                                                       3
Cluster Disk 2  Online  Physical Disk  XIV Mirror for
                                       Group group1
```

```
Group Name:  group2
Group Owner:  MSCS3QA-N2

Resource Name   State   Type           Dependencies    Dependent
-------------------------------------------------------------------
Cluster Disk 5  Online  Physical Disk  XIV Mirror for
                                       Group group2
Cluster Disk 4  Online  Physical Disk  XIV Mirror for
                                       Group group2
XIV Mirror for  Online  XIV Mirror                     Cluster Disk
Group group2                                           4,Cluster Disk
                                                       5


Group Name:  group3
Group Owner:  MSCS3QA-N2

Resource Name   State   Type           Dependencies    Dependent
-------------------------------------------------------------------
XIV Mirror for  Online  XIV Mirror                     Cluster Disk
Group group3                                           7,Cluster Disk
                                                       8,Cluster Disk
                                                       9,Cluster Disk
                                                       6
Cluster Disk 8  Online  Physical Disk  XIV Mirror for
                                       Group group3
Cluster Disk 7  Online  Physical Disk  XIV Mirror for
                                       Group group3
Cluster Disk 9  Online  Physical Disk  XIV Mirror for
                                       Group group3
Cluster Disk 6  Online  Physical Disk  XIV Mirror for
                                       Group group3


Group Name:  group4
Group Owner:  MSCS3QA-N2

Resource Name    State   Type           Dependencies    Dependent
-------------------------------------------------------------------
Cluster Disk 10  Online  Physical Disk  XIV Mirror for
                                        Group group4
XIV Mirror for   Online  XIV Mirror                     Cluster Disk 10
Group group4


Group Name:  group5
Group Owner:  MSCS3QA-N2

Resource Name    State   Type           Dependencies    Dependent
-------------------------------------------------------------------
Cluster Disk 14  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 13  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 18  Online  Physical Disk  XIV Mirror for
                                        Group group5
XIV Mirror for   Online  XIV Mirror                     Cluster Disk
Group group5                                           11,Cluster Disk
                                                       17,Cluster Disk
                                                       18,Cluster Disk
                                                       14,Cluster Disk
                                                       12,Cluster Disk
                                                       13,Cluster Disk
                                                       16,Cluster Disk
                                                       15
```

```
Cluster Disk 12  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 17  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 15  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 11  Online  Physical Disk  XIV Mirror for
                                        Group group5
Cluster Disk 16  Online  Physical Disk  XIV Mirror for
                                        Group group5


Resource Types
==============

Name                            Possible Owners         Not Possible Owners
-------------------------------------------------------------------------------
DFS Replicated Folder           MSCS3QA-N3, MSCS3QA-N2
DHCP Service                    MSCS3QA-N3, MSCS3QA-N2
Distributed File System         MSCS3QA-N3, MSCS3QA-N2
Distributed Transaction         MSCS3QA-N3, MSCS3QA-N2
Coordinator
File Server                     MSCS3QA-N3, MSCS3QA-N2
File Share Witness              MSCS3QA-N3, MSCS3QA-N2
Generic Application             MSCS3QA-N3, MSCS3QA-N2
Generic Script                  MSCS3QA-N3, MSCS3QA-N2
Generic Service                 MSCS3QA-N3, MSCS3QA-N2
IP Address                      MSCS3QA-N3, MSCS3QA-N2
IPv6 Address                    MSCS3QA-N3, MSCS3QA-N2
IPv6 Tunnel Address             MSCS3QA-N3, MSCS3QA-N2
MSMQ                                                    MSCS3QA-N2, MSCS3QA-N3
MSMQTriggers                                            MSCS3QA-N2, MSCS3QA-N3
Microsoft iSNS                  MSCS3QA-N3, MSCS3QA-N2
NFS Share                       MSCS3QA-N3, MSCS3QA-N2
Network Name                    MSCS3QA-N3, MSCS3QA-N2
Physical Disk                   MSCS3QA-N3, MSCS3QA-N2
Print Spooler                   MSCS3QA-N3, MSCS3QA-N2
Virtual Machine                 MSCS3QA-N3, MSCS3QA-N2
Virtual Machine Configuration   MSCS3QA-N3, MSCS3QA-N2
Volume Shadow Copy Service      MSCS3QA-N3, MSCS3QA-N2
Task
WINS Service                    MSCS3QA-N3, MSCS3QA-N2
XIV Mirror                      MSCS3QA-N3, MSCS3QA-N2


XIV Mirror Resources
====================

Name                  State   Group   Owner       Properly Configured
-------------------------------------------------------------------
XIV Mirror for Group  Online  group1  MSCS3QA-N2  True
group1
XIV Mirror for Group  Online  group2  MSCS3QA-N2  True
group2
XIV Mirror for Group  Online  group3  MSCS3QA-N2  True
group3
XIV Mirror for Group  Online  group4  MSCS3QA-N2  True
group4
XIV Mirror for Group  Online  group5  MSCS3QA-N2  True
group5
```

```
XIV Mirror Resource Possible Owners
===================================

Name                         Possible Owners         Not Possible Owners
-------------------------------------------------------------------------
XIV Mirror for Group group1  MSCS3QA-N2, MSCS3QA-N3
XIV Mirror for Group group2  MSCS3QA-N2, MSCS3QA-N3
XIV Mirror for Group group3  MSCS3QA-N2, MSCS3QA-N3
XIV Mirror for Group group4  MSCS3QA-N2, MSCS3QA-N3
XIV Mirror for Group group5  MSCS3QA-N2, MSCS3QA-N3


================================
XIV Mirrors (owned by MSCS3QA-N2)
================================

Disk Resource    Volume         Mirror Role  Mirror State  Mirror Resource
-----------------------------------------------------------------------------------------
Cluster Disk 10  mscs3_uvol_10  Master       Synchronized  XIV MIRROR FOR GROUP GROUP4
Cluster Disk 11  mscs3_uvol_11  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 17  mscs3_uvol_17  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 18  mscs3_uvol_18  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 14  mscs3_uvol_14  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 12  mscs3_uvol_12  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 13  mscs3_uvol_13  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 16  mscs3_uvol_16  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 15  mscs3_uvol_15  Master       Synchronized  XIV MIRROR FOR GROUP GROUP5
Cluster Disk 4   mscs3_uvol_4   Master       Synchronized  XIV MIRROR FOR GROUP GROUP2
Cluster Disk 5   mscs3_uvol_5   Master       Synchronized  XIV MIRROR FOR GROUP GROUP2
Cluster Disk 7   mscs3_uvol_7   Master       Synchronized  XIV MIRROR FOR GROUP GROUP3
Cluster Disk 8   mscs3_uvol_8   Master       Synchronized  XIV MIRROR FOR GROUP GROUP3
Cluster Disk 9   mscs3_uvol_9   Master       Synchronized  XIV MIRROR FOR GROUP GROUP3
Cluster Disk 6   mscs3_uvol_6   Master       Synchronized  XIV MIRROR FOR GROUP GROUP3
Cluster Disk 1   mscs3_uvol_2   Master       Synchronized  XIV MIRROR FOR GROUP GROUP1
Cluster Disk 2   mscs3_uvol_1   Master       Synchronized  XIV MIRROR FOR GROUP GROUP1
Cluster Disk 3   mscs3_uvol_3   Master       Synchronized  XIV MIRROR FOR GROUP GROUP1


Force fail over is:  Disabled
```

Enabling or disabling forced failover

When required, the failover state can be manually forced on a cluster.

About this task

If, for any reason, the IBM Storage Enabler does not automatically reverse the mirroring upon a failover, the primary site is brought online as Master, and a Master-Master XIV mirroring state is initiated. In this mirroring state, the replication stops and all cluster nodes have access only to their local XIV storage resources.

In such cases, you can reverse the mirroring by enabling a forced failover state on all the nodes in the cluster. When no longer required, you can disable the forced failover state.

In addition, you can enable a forced failover state in cases when you want the cluster to comply with High Availability work mode requirements.

Starting from version 1.1.0 of the IBM Storage Enabler, the **--force-fail-over** command is available as an alternative to the `red_button` registry key modification (as explained in "Modifying settings in the Windows Server registry" on page 15).

Procedure

You can enable or disable the forced failover from the Windows command prompt of any cluster node as follows:

- To enable forced failover, enter the following command:

  ```
  xiv_mscs_admin --force-fail-over-enabled
  ```

- To disable forced failover, enter the following command:

  ```
  xiv_mscs_admin --force-fail-over-disabled
  ```

Changing the credentials for accessing an XIV storage system

If the user name and password for accessing an XIV storage system changed on the XIV system side, you can update these credentials on the node.

To change the XIV storage system credentials (XCLI access credentials) on a node:

- From the Windows command prompt of any node, enter the following command:

  ```
  xiv_mscs_admin --change-credentials
  ```

You are then prompted to specify for which XIV system the change is required, and to enter the new user name and password as shown in the following example:

```
You can change the credentials for accessing one of the following XIV storage systems:

    [MN65024]  XIV hostdev32a

Please enter the XIV system serial ID (case insensitive, appears in brackets): MN65024
Please enter the XIV system username: admin
Please enter the XIV system password: xxxxxxxxxxx
XIV user credentials for 'XIV hostdev32a' (MN65024) changed.
```

Using the service utility

You can use the **xiv_mscs_service** utility to control the operation of the IBM Storage Enabler service as it runs on the node.

The following table summarizes the commands and options that are available for the service utility (run from the Windows command prompt):

Table 11. Service utility commands and options

Command	Description	Options	Example
install	Install the IBM Storage Enabler service on the node using different options.	• **--username [domain\username]** – The username under which the service should run • **--password [password]** – The password for the specified username. • **--startup [manual|auto|disabled]** – How the service should start after the command is initiated: manually (**manual**), automatically (**auto**), or as disabled (**disabled**). • **--interactive** – Allow service interaction on the Windows desktop. • **--perfmonini file [filename]** – The `ini` file to use for registering the performance monitoring data. • **--perfmondll file [filename]** – The DLL file to use when querying the service for performance data. The default file name is: `perfmondata.dll`	**xiv_mscs_service install --username john1 --password xxxxxxx --startup auto**
update	Update the IBM Storage Enabler service on the node using different options.		**xiv_mscs_service update --username john1 --password xxxxxxx --startup manual**
remove	Remove the IBM Storage Enabler service from the node without performing the complete uninstallation procedure.	This command has no options.	**xiv_mscs_service remove**
start	Start the IBM Storage Enabler service on the node.	• **--wait seconds** – The amount of delay seconds before the command should actually be carried out (from the moment of entering the command). When used with **stop**, the delay applies to the dependent services as well.	**xiv_mscs_service start --wait seconds 30**
stop	Stop the IBM Storage Enabler service and all its dependent services on the node.		**xiv_mscs_service stop --wait seconds 30**
restart	Stop and then restart the IBM Storage Enabler service on the node.	This command has no options.	**xiv_mscs_service restart**

Chapter 6. Best practices

To ensure the proper failover of your nodes and clusters, refer to the best practices that are described in the following sections.

Running the `--verify` command

At any time, you can check the connectivity status for each volume in use, and check whether all the required resources are functional on a node.

About this task

The **`--verify`** command scans all XCLI connections to XIV-based volumes that are owned by a specific node, checks all mirror resources, and verifies that the IBM Storage Enabler service is up and running properly on the node.

To ensure that the node and its cluster environment is operating as required for possible failover scenarios, run this verification after installation and deployment operations, and on a periodic basis.

Procedure

On any node in the cluster, enter the following command in the Windows command prompt: `xiv_mscs_admin --verify`. The information gathering starts and a detailed report is displayed as shown in the following example.

```
Looking for XIV disks...
Checking in-band XCLI for volume mscs5-uvol_12 over LUN0                    OK
Checking in-band XCLI for volume mscs5-uvol_13 over LUN0                    OK
Checking in-band XCLI for volume mscs5-uvol_14 over LUN0                    OK
Checking in-band XCLI for volume mscs5-uvol_15 over LUN0                    OK
Checking in-band XCLI for volume mscs5-uvol_16 over LUN0                    OK
Checking in-band XCLI for volume mscs5-uvol_9 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_7 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_6 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_5 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_4 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_3 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_2 over LUN0                     OK
Checking in-band XCLI for volume mscs5_uvol_10 over LUN0                    OK
Checking if Cluster Service is running                                      OK
Checking if Resource DLL is installed on this node                          OK
Checking if XIV Mirror Resource Type is registered                          OK
Checking if all nodes are possible owners of XIV Mirror resource type       OK
Verifying Cluster Groups and Resources                                      OK
Checking if XIVmscsAgent service in running                                 OK
```

Performing a manual failover test

Before bringing a cluster to production state, it is recommended to perform a manual failover test in order to ensure that the failover is carried out as required.

Use the Cluster Administrator application to simulate the failover. For more information, refer to the following Microsoft TechNet information sources:

- Test whether group resources can fail over (`technet.microsoft.com/en-us/library/cc776540%28v=ws.10%29.aspx`)

- Verify the Configuration and Failover of a Clustered Service or Application (technet.microsoft.com/en-us/library/dd197543%28v=ws.10%29.aspx)

Chapter 7. Troubleshooting

The troubleshooting scenarios can help you solve technical problems that you might encounter when using the IBM Storage Enabler for Windows Failover Clustering.

Refer to the following sections for more information:

- "Fixing group dependencies in the cluster"
- "Checking the Windows Event Log messages" on page 34
- "Checking the IBM Storage Enabler log files" on page 35
- "Recovering disks from cluster failure" on page 36

Note: For up-to-date information about known issues and possible workarounds, refer to the latest release notes.

Fixing group dependencies in the cluster

If you encounter problems with the operation of cluster group mirror dependencies, use the **--fix-dependencies** command.

For example, use the command if the **--verify** report output indicates:

```
Verifying Cluster Groups and Resources      NOT OK
```

The command format (used in the Windows command prompt) is:

```
xiv_mscs_admin --fix-dependencies
```

Attention: After new physical disks are added, you must verify that the mirroring direction is set according to the owner node of both the physical disk resource and the XIV mirror resource. For example: If Node A is the owner of XIV Mirror Resource A in Group 1, the volumes to be added to Group 1 must have their master copy exposed on the site where Node A resides. Otherwise, a cluster group failure might occur after running the **--fix-dependencies** command.

When using the **--fix-dependencies** command:

- A cluster group that is currently **online** returns to be online after the dependency fix operation is complete.
- A cluster group that is currently **offline** returns to be offline after the dependency fix operation is complete.
- A cluster group that is **partially online** returns to be partially online after the dependency fix operation is complete.

Note: The IBM Storage Enabler interfaces with a certain resource in each cluster group, so that the state of the cluster group is automatically matched to the state of that resource after running the **--fix-dependencies** command.

Checking the Windows Event Log messages

The following table summarizes the events that might be reported by the IBM Storage Enabler in the Windows Event Log.

Note: "<>" stands for a dynamic content parameter that changes based on the context in which it appears.

Table 12. Windows event log messages

Event ID	Type	Message	Reference or guidance
101	Warning	Mirror is deactivated for volume <>, physical disk resource <>	See Chapter 2, "Preparation," on page 3
102	Error	No mirror found for volume <>	See Chapter 2, "Preparation," on page 3
105	Error	Bad remote sync state: <>	See Chapter 2, "Preparation," on page 3
106	Error	Remote mirror not found on target for volume <>	See Chapter 2, "Preparation," on page 3
108	Error	Both <> and <> XIV systems are defined as 'Master' for the mirroring of volume <>. As a result, and the cluster cannot determine which replica to override. According to the force-failover flag, the resource will <be/not be> brought online. Contact the storage administrator for more details.	See "Enabling or disabling forced failover" on page 27
111	Error	An error has occurred when trying to open MultipathDevice on <>.	Try using the IBM XIV Host Attachment Kit.
112	Error	Failed to open the XCLI Client on <> with username <>. Reason: <>	See "Changing the credentials for accessing an XIV storage system" on page 28
113	Error	An error has occurred when communicating with the XIV mirror resource DLL.	See Chapter 3, "Software installation and deployment," on page 7
114	Error	An error has occurred in XCLI command.	Check whether the correct credentials are defined on the node.
115	Info	IBM Storage Enabler service started. **Note:** This event is registered only if the logging level is set on 'Info'. For more information, see "Modifying settings in the Windows Server registry" on page 15.	See "Using the service utility" on page 28
116	Info	IBM Storage Enabler service stopped. **Note:** This event is registered only if the logging level is set on 'Info'. For more information, see "Modifying settings in the Windows Server registry" on page 15.	See "Using the service utility" on page 28
117	Info	IBM Storage Enabler service stopping. **Note:** This event is registered only if the logging level is set on 'Info'. For more information, see "Modifying settings in the Windows Server registry" on page 15.	See "Using the service utility" on page 28
118	Error	The XIV controller for system <> is on LUN0. LUN0 is required for the IBM Storage Enabler service to work. Volume mapping must be removed from LUN0.	See Chapter 2, "Preparation," on page 3

Table 12. Windows event log messages (continued)

Event ID	Type	Message	Reference or guidance
119	Error	XCLI on device <> failed. Reason: <>	Refer to information and guidance depending on the specified reason.
220	Error	Drive number not found for physical disk resource: <>.	See Chapter 2, "Preparation," on page 3
221	Error	XIV Storage System <> of microcode level 10.0 is not supported. The minimum supported level is 10.1.	Refer to the latest release notes of the IBM Storage Enabler for Windows Failover Clustering.
222	Error	The <> mirror sync type for volume <> is not supported. Only **sync_best_effort** is supported.	See Chapter 2, "Preparation," on page 3
223	Error	An error has occurred with the failover clustering API: <>	Refer to information and guidance depending on the specified error.
224	Error	XIV mirror <> is not <>.	Refer to information and guidance depending on the specified error.
225	Error	The following error occurred while updating cluster and mirroring information: <>	Refer to information and guidance depending on the specified error.
226	Error	The credentials for accessing the XIV storage system have changed. Check the user guide for more information about credentials.	See "Changing the credentials for accessing an XIV storage system" on page 28
227	Info	IBM Storage Enabler has been upgraded to <>.	See "First-time installation vs. upgrade" on page 7
228	Error	Failed to connect to the XIV storage system (serial: <>) with the provided credentials.	Check whether the credentials you have provided are for the specific XIV system that you tried to access.
230	Error	Switch roles failed for volume <>. Retrying switch roles in order to fix it.	See "Enabling or disabling forced failover" on page 27
231	Error	Failed to fix switch roles for volume <>. Fix the mirror manually in the XIV storage system.	See "Enabling or disabling forced failover" on page 27
232	Error	Failed to open the cluster service handle. Reason: <>	Refer to information and guidance depending on the specified reason.

Checking the IBM Storage Enabler log files

The IBM Storage Enabler service and utilities write to log files that are saved in the `c:\Windows\Temp` directory (default).

The log files can contain up to 160 MB of log data, and you can view the contents of each file in any plain-text viewer or editor such as Notepad.

The log files are:

- `xiv_mscs_admin.log` – Records the CLI command executions.
- `xiv_mscs_agent.log` – Records the service operations.

You can change the directory into which the log files are saved, as explained in "Modifying settings in the Windows Server registry" on page 15.

Recovering disks from cluster failure

When the cluster goes down, fails, or in any way gets destroyed before its mirror resources are properly removed, the disks remain under SCSI reservation for the cluster, making the disks unavailable for any other use.

To overcome this problem (a disk reserved by the cluster), you can do one of the following:

- Format the disk (all data is erased)
- In the XIV CLI (XCLI) management tool, run the reservation clear command:

```
reservation_clear vol=[vol name]
```

Important: You should perform disk reservation fixes only on resources that were removed from a cluster, or, alternatively, on destroyed clusters (destroyed or being destroyed).

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