IBM XIV Storage System

MSCS Guide

Version 1.0.x
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Introduction

Microsoft® Cluster Server (MSCS) provides the infrastructure to support advanced clustering, high system availability, and reliable disaster recovery. The objective of MSCS is to minimize the impact on users when server nodes fail or go offline.

Microsoft cluster architecture offers system redundancy across multiple systems, both for local clusters and remote clusters. The system supports nearly unlimited distances between primary and replicated sites.

MSCS uses the shared-nothing clustering model. In this model, a device or resource is *owned and managed* by only one system at a time, while other cluster nodes can access the device or resource.

The Cluster Service controls cluster activities and performs tasks such as coordinating event notification, facilitating communication between cluster components, handling failover operations, and managing the configuration.

The IBM® XIV Storage System software and MSCS work together to provide seamless high system availability and rapid recovery. The systems accommodate a broad range of failover scenarios and infrastructure components. Working together, MCMS and XIV promote one-button failover initiation for automated recovery or manual failover for step-by-step control of the recovery process.

Storage-related topology configurations are defined in the XIV-specific resource DLLs. The XIV-specific resource DLL supports flexible setups, such as defining disk resources that depend on mirroring.

MSCS relies on the snapshot feature that XIV provides for failover testing and point-in-time recovery, including cloud-based transportable snapshot recovery. To ensure data congruency after a restore operation, MSCS uses consistency groups to perform automatic application-consistent restores.

Purpose and Scope

This guide describes the XIV MSCS Agent, and provides detailed instructions and best practices regarding its deployment.
Audience
This guide is intended for users who are deploying MSCS geographically dispersed failover clusters on top of the IBM XIV Storage System.

To use the XIV MSCS Agent, you must understand:

- XIV synchronous mirroring
- Microsoft Failover Clustering
  - Clusters spanning over multiple sites

Related Documentation
All the IBM XIV Storage System customer publications are available at the following URL:

publib.boulder.ibm.com/infocenter/ibmxiv/r2/
Conventions Used in this Guide

XIV uses the following conventions for notes, warning and figures:

**Code**

These notices indicate referenced text from a source file, scripts and commands.

---

**Screen output**

These notices indicate text from the standard output of the system and/or host.

---

**Warning**

These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage can occur.

---

**Pay attention**

These notices provide important tips, guidance, or advice that might help you to avoid inconvenient or problem situations.
Before You Proceed
Before you proceed reading this document, you must have a workstation that is equipped with the IBM XIV Storage System management software: the XIV GUI and the XCLI.

For additional assistance and more information on how to get, use, and install the IBM XIV Storage System management software, see the latest version of the IBM XIV Theory of Operation.

How to Send Your Comments
Your feedback is important in helping us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, send us your comments by e-mail to xivdoc@il.ibm.com.

Be sure to include the following:

- Exact publication title
- Form number
- Page numbers to which you are referring

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Overview

This solution combines the Microsoft Failover Clusters capabilities and the XIV mirroring feature to provide failover protection for your critical services.

The XIV mirroring feature replicates your data between several sites in your organization, and the failover administration of the Microsoft Failover Clusters to allow fast and smooth recovery when failures occur.

Microsoft Failover Clusters

The Microsoft Failover Clusters solution manages services and applications across several servers and even several sites to ensure high availability. This solution is included with the Microsoft Windows Server operating systems.

You can configure several servers as one virtual server that runs the services and applications for which you require high availability. Each service or application runs on a single node in the cluster. When a node fails or if an administrator intervenes, the services and applications on that node fail over to another node in the cluster. The failover node then fulfills all requests.

For more information about MSCS, see the following pages in the Microsoft TechNet Library and Microsoft Support site:

- Microsoft’s Failover and Network Load Balancing Clustering Team Blog
- Server Clusters Technical Reference
- Failover Clusters in Windows Server 2008
- Failover Clusters in Windows Server 2008 R2
- KB280743 - Windows clustering and geographically separate sites
- Microsoft Q&A: Geographically Dispersed Clusters

XIV Synchronous Remote Mirroring

IBM XIV Storage Systems come with a synchronous mirroring feature. This feature allows the administrator to configure automatic replication of volumes and consistency groups between two IBM XIV Storage Systems.

After you setup XIV synchronous mirroring, the data that is written to the Master volume is automatically written to the Slave volume of the mirror in another group. This feature increases your data availability.

For more information about XIV synchronous remote mirroring, see the latest version of the IBM XIV Theory of Operation.
Solution Overview

The XIV MSCS Agent maintains volume mirroring between two IBM XIV Storage Systems.

The XIV MSCS Agent creates cluster resources that act as replication managers for one or more volumes. When the requested resource is online, the XIV MSCS Agent administers mirroring through in-band XCLI commands over the participating LUNs.

High Level Design

A Microsoft Failover Cluster has Physical Disk resources. Each Physical Disk resource represents an XIV volume that is to be mirrored to an XIV Storage System. The mirrored copy of the volume is mapped to one or more nodes in the cluster.

The XIV MSCS Agent introduces a new resource type in the cluster that is named XIV Mirror. An instance of this resource type manages the volume mirroring on all the Physical Disk resources that depend on it.

The mirroring is managed by in-band XCLI commands that are issued over the default LUN0 controller that the XIV Storage System maps to each host.

⚠️ The XIV MSCS Agent depends on the default LUN0 mapping on all the cluster hosts. Do not change the default map by mapping volumes to LUN0 on any other hosts.

The XIV MSCS Agent uses a user-mode service that is named XIVmscsAgent for in-band XCLI management. The XIVmscsAgent service and the resource DLL communicate over a TCP socket on port 12347.

The Windows Service does not have a user interface, and is used only for the internal work of the XIV MSCS Agent.

The resource DLL is the component that is loaded into the cluster and is designed for user interaction. The resource DLL reports information to the cluster and is configured in your cluster deployment.

When requesting a resource to go online, the resource checks if the XIV Storage System that is connected to the node has the Master replication target. If the node has the Master replication target, the resource goes online immediately.

If the node has the Slave replication target, the SwitchRoles command is run to switch the roles of the replication targets between the systems. This operation fails only if the link to the remote machine has been disrupted. In this case, the resource must run the ChangeRoles command to go online.

After an XIV mirror resource is online, the XIVmscsAgent service periodically checks the mirror state in a time interval that is defined in the registry. See the interval entry topic in the Registry entries section.

If the XIVmscsAgent service finds a problem with the XIV mirroring synchronization, it reports the error to the Windows Event Log (see the Windows Event Log messages section for the exact details of this event) and will not bring the resource down.
If the attached volume is the slave copy of the mirror, the XIV mirror resource fails with an error because the host cannot write on a slave copy.

**Highly Available Mode**

The ChangeRoles command might cause data inconsistencies between the replication targets because a Slave replication target might become the Master without the real Master knowing this and acting accordingly.

The default running mode of the XIV MSCS Agent avoids inconsistencies by:

- Disallowing the use of the ChangeRole XCLI command
- Brining all the cluster resources down and reporting that manual user intervention is required

In the default running mode, the storage administrator must manually change the role of the replication target and Slave, and re-activate the mirror. After the mirror is active, the XIV MSCS Agent allows the XIV mirror resources to come online.

The XIV MSCS Agent can run in highly available mode, which means that:

- It permits the use of the ChangeRole XCLI command.
- When the cluster requests a mirror resource to come online, the XIV MSCS Agent issues the ChangeRole command if the SwitchRoles command fails, and allows the resource to come online. It does so despite the possible data inconsistency. This event is reported in the Event Log. See the Windows Event Log messages section for the exact details of this event.

The XIV MSCS Agent uses the default running mode unless you change it to the highly available mode. To switch to the highly available mode, you must set the “red_button” flag in the registry. See the Registry entries section for more information.

⚠️ The mode capability is on a per-node basis. If you use the highly available mode, you must set the “red_button” flag on all the cluster nodes.

⚠️ After changing the registry key, you do not have to restart the XIVmscsAgent service or the Cluster service.

**Deployment Scenarios**

The following deployment scenarios are possible:

- **DRP Cluster** – with main site that is prioritized to provide service all of the time and a recovery site for backup and failover with degraded performance.
- **Full Redundancy Cluster** – with two sites that are fully capable of supporting the service that is required of the cluster.
DRP Cluster
A DRP Cluster has at least three nodes in two sites:

- **Main Site** – with at least two nodes. This site is fully capable of sustaining the services required.
- **DRP Site** – with at least one node. This site is maintained mostly for backup and rare failovers.

The main site should have at least two nodes to allow high availability, and sustain failures within the same site, so that a failure in one node in the main site will not cause a failover between sites. In MSCS this is done by creating a list of preferred nodes for a group in the cluster that is comprised of the nodes in the main site.

The role of the DRP site is to act as a backup for the data of the main site and to support failover in special cases (that is maintenance of the main site, loss of communication to the main site or failure in the main site.) The DRP site might not be as capable as the main site to sustain the services that are required during full performance. This site rarely assumes command of the cluster; therefore, it can manage with only one node.

Full Redundancy Cluster
A full redundancy cluster has at least four identical nodes in two identical sites. The Full Redundancy deployment provides the services that are required with no down-time, even in the most extreme of cases when an entire site is brought down. The cluster can operate at full capacity because each site is fully equipped to handle the load of the services.

Best Practices for Geographically Dispersed Clusters
For the best results in terms of availability and data consistency, follow these guidelines when configuring your geographically dispersed cluster:

Use the following quorum configuration for the cluster:

- **Windows 2003**
  - MNS (Majority Node Set) on clusters with three or more nodes
  - MNS and FSW (File Share Witness) for 2-node clusters
- **Windows 2008**
  - MNS with FSW

⚠️ The FSW must be used in a third site.

In accordance with Microsoft’s recommendations for deploying geographically dispersed clusters, set the quorum type for the cluster to MNS with FSW.

For Windows Server 2003 SP1 / R2 that comes only with MNS, you can install the hotfixes that Microsoft provides to enable the FSW feature.

See the XIV MSCS Agent Release Notes for more details about hotfixes.
File Share Witness

Geographically Dispersed Cluster has at least two sites regardless of how it is deployed. When it is configured to use MNS with FSW, the FSW hosting server should reside in a third site that is connected to the same network as the cluster. The FSW should not reside on any of the cluster nodes or even at the same sites; otherwise, FSW is not being used for better quorum availability.

Deployment Diagrams

The following figures provide examples of a DRP cluster deployment and a full redundancy deployment.

DRP Cluster Deployment

![DRP Cluster Deployment Diagram](image-url)

Figure 1 DRP Cluster Configuration
Full Redundancy Deployment

Figure 2 Full Redundancy Cluster Configuration
Deployment Checklists
This section provides a quick check list for the most common deployments.

Deploying a New Geographically Dispersed Cluster
The following check list describes the tasks that are involved in deploying a new MSCS geocluster with the XIV Storage System:

☐ Prepare the cluster nodes:
  ☐ Install the operating system.
  ☐ Install the Host Attachment Kit 1.5.2.
  ☐ Attach each cluster node to the XIV Storage Systems that are in the same site. See the Host Attachment Guide for further assistance.
  ☐ Create a cluster object in each of the XIV Storage Systems and join all the attached hosts into the cluster object.
  ☐ Configure the cluster with the Microsoft Cluster Administrator applet.
  ☐ Install the XIV MSCS Agent. See the section Installing the XIV MSCS Agent for more information.

☐ Prepare volumes for synchronous mirroring:
  ☐ Create the replication link between the two XIV Storage Systems.
  ☐ Create new volumes on one XIV Storage System.
  ☐ Create a mirroring pair between the two XIV Storage Systems for all the volumes that were created in the previous step.
  ☐ Map the mirrored volumes to the cluster object.

☐ Prepare the volume on the hosts:
  ☐ Bring disks online by using the Disk Management applet on each of the cluster nodes.
  ☐ Create a file-system on each volume.
    ▪ This task should only be performed by one of the cluster nodes that is mapped to the primary copy of the volume.

☐ Configure the cluster:
  ☐ Configure the appropriate quorum type.
  ☐ Create the needed cluster groups.
  ☐ Create a Physical Disk resource for each of the mirrored volumes. Place the new resources in the appropriate groups.
  ☐ Install the MSCS Resource DLL and Service on the cluster nodes. See the section Installing XIV Mirror Resource DLL, Type, and Agent for more information.
  ☐ Deploy XIV mirror resources in each cluster group. See the section Deploying XIV Mirror Resource Instances and Dependencies for more information.
Migrating a single-copy cluster to mirrored-copy cluster

The following check list describes the tasks that are involved in upgrading an existing shared-storage MSCS cluster with XIV Storage Systems to a mirrored-copy cluster:

⚠️ This process disrupts the cluster operations. During the migration process, all the cluster resources must be taken offline before proceeding (except the quorum resource).

- Prepare the existing cluster nodes:
  - Install the Host Attachment Kit 1.5.2.
  - Install the XIV MSCS Agent. See the section Installing the XIV MSCS Agent for more information.

- Prepare the new cluster nodes:
  - Install the operating system.
  - Install the Host Attachment Kit 1.5.2.
  - Attach each cluster node to the XIV Storage Systems that are in the same site. See the Host Attachment Guide for more information.
  - Create a cluster object in each of the XIV Storage Systems, and join all the attached hosts into the cluster object.
  - Join the new nodes to the cluster with the Microsoft Cluster Administrator applet.
  - Install the XIV MSCS Agent. See the section Installing the XIV MSCS Agent for more information.

- Prepare volumes for synchronous mirroring:
  - Create the replication link between the two XIV Storage Systems.
  - Create a mirroring pair between the two XIV Storage Systems for all the volumes that participated in the MSCS cluster.
  - Map the mirrored volumes to the cluster objects.

- Configure the cluster:
  - Configure the appropriate quorum type.
  - Install the MSCS Resource DLL and Service on the cluster nodes. See the section Installing XIV Mirror Resource DLL, Type, and Agent for more information.
  - Deploy XIV mirror resources in each cluster group. See the section Deploying XIV Mirror Resource Instances and Dependencies for more information.
Installation Guide

The following sections cover the installation of the XIV MSCS Agent and the configuration of the clusters.

Configuring the XIV Storage Systems

The first step in deploying geographically dispersed clusters with MSCS and XIV Storage Systems is to set up the replication relationship for the participating volumes.

Before continuing, complete the following operations using XCLI commands or the XIV GUI:

1. Set up bi-directional connectivity between the two XIV Storage Systems.
2. Create new volumes if necessary.
3. Create mirroring relationships.
4. Create cluster objects in both XIV Storage Systems and join the hosts to the cluster object.
   - Maintain any host mappings that exist.

⚠️ Do not map volumes to LUN 0 on any of the cluster nodes.

5. Map the mirrored volumes to the clusters at each side of the replication.

⚠️ For Windows 2003 clusters, the physical disk layout must be identical across the cluster. This means that each of the cluster disks will have the same drive number on all cluster nodes. For example, the physical disk resource “Disk D:” will be PHYSICALDRIVE1 on each of the cluster nodes.

Installing the software

Prerequisites

Before you start the installation process, review the release notes for the complete list of software packages that you must install before installing the XIV MSCS Agent.

Installing the XIV Host Attachment Kit and other dependencies

You must install the Host Attachment Kit and the other software dependencies that are specified in the release notes on all cluster hosts.

See the XIV Host Attachment Kit Guides and Release Notes that are in the IBM XIV Storage System Information Center.
Installing the XIV MSCS Agent

The XIV MSCS Agent ships as a single executable for each system architecture. The following executables are available:

- XIV_mscs_agent-1.0.0-x86.exe for Windows 32bit
- XIV_mscs_agent-1.0.0-x64.exe for Windows 64bit extended

You can use a setup wizard or the Windows Installer command-line utility to install the XIV MSCS Agent.

Using the setup wizard:

To install the XIV MSCS Agent, run the setup wizard by double-clicking the executable file and following the on-screen instructions. The following figures provide examples of the setup wizard:

Figure 3 Installation executable file on the Desktop
Figure 4 XIV MSCS Agent setup preparing the InstallShield Wizard

Figure 5 Windows Installer preparing to install the XIV MSCS Agent
Figure 6 Welcome page for the XIV MSCS Agent Setup Wizard
Figure 7 License Agreement for the XIV MSCS Agent
Figure 8 Setup Type selection for the XIV MSCS Agent
Figure 9 Installation confirmation for the XIV MSCS Agent
Figure 10 Successful installation confirmation
Using the Windows Installer command-line utility:

The Windows Installer command-line utility enables you to install the XIV MSCS Agent with extended logging and in different levels of unattended (automatic) modes.

If you want to run the normal wizard-attended setup with verbose logging, issue the following command:

```bash
<XIV_mscs_agent setup exe file> /v"/l*v x setup.log"
```

Windows Installer also supports silent (unattended) installations in various modes.

- /quiet
  Quiet mode, no user interaction
- /passive
  Unattended mode - progress bar only
- /qn|b|r|f
  Sets user interface level
  n = No UI
  b = Basic UI
  r = Reduced UI
  f = Full UI (default)
- /norestart
  Do not restart after the installation is complete
- /promptrestart
  Prompts the user for restart if necessary
- /forcerestart
  Always restart the computer after installation

For example, in order to install the XIV MSCS Agent in silence mode and restart the system at the end of the installation, issue the following command:

```bash
< XIV_mscs_agent setup exe file> /v"/quiet /forcerestart"
```

The upgrade is non-volatile, so no special case is required.
Configuring Quorum
As stated in the solution overview section, the recommended quorum type for the cluster is one of the following:

- Majority Node Set (supported by Windows 2003/2008/2008R2)
- File Share Witness without Majority Node Set (supported by Windows 2003 only)
- File Share Witness with Majority Node Set (supported by Windows 2008 and above)

For additional information about configuring quorum and quorum information, see the following pages in the Microsoft TechNet Library:

- Failover Cluster Step-by-Step Guide: Configuring the Quorum in a Failover Cluster
- Reviewing Quorum Configuration Options for a Failover Cluster
- Details of How Quorum Works in a Failover Cluster
- What’s New in Failover Clusters in Windows Server 2008

Installing XIV Mirror Resource DLL, Type, and Agent
In this step you will install and initialize the XIV MSCS Agent components that relate to your cluster node.

On each of the cluster nodes, open a command prompt (CMD) window and issue the following command:

```bash
xiv_mscs_admin --install [--xcli-username=USERNAME --xcli-password=PASSWORD]
```

See the xiv_mscs_admin topic in the References section for more information about this command and its usage.

⚠️ To work in highly available mode, set the red_button flag in the registry now.

See the Registry entries section under References for the specific location and values of this flag.

Deploying XIV Mirror Resource Instances and Dependencies
In this step, you will create the XIV mirror resources in the cluster.

For this solution, each mirrored volume depends on an XIV mirror resource.

If the following is true:

- All physical disk resources have been created and placed in the correct groups
- All physical disk resources within the cluster are mirrored volumes

You can issue the following command to automatically create XIV mirror resources as required:

```bash
xiv_mscs_admin --deploy-resources
```
xiv_mscs_admin topic in the References section for more information about this command and its usage.

If your cluster configuration is more complex, you must do the following:

1. Manually create an XIV mirror resource in each of the cluster groups that contains physical disk resources.

2. Set the physical disk resources in the group to depend on the new XIV mirror resource.

See the following pages in the Microsoft TechNet Library for assistance on creating resources:

- Create a new resource, applies to Windows Server 2003
- Add a Resource to a Clustered Service or Application, applies to Windows 2008 and Windows 2008 R2

### Updating the Pending Timeout for XIV Mirror Resources

The default pending timeout for each resource in an MSCS cluster is 180 seconds (3 minutes). In a three-minute time period, the XIVmscsAgent 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:

\[
\text{Pending Time-out (per Resource)} = 10 \text{ seconds} \times [\text{total number of XIV mirrored physical disk resources}]
\]

### Configuring Automatic Failover

In case of automatic failover, the first failover attempt should be to fail over to another node in the same site as the failing node. MSCS is not location-aware, so this goal can be achieved by properly configuring the preferred owners list per cluster group.
Verifying configuration
At this point, the cluster should be properly configured.

Use the following commands to verify that everything is properly configured and to generate a report and verify its output:

```
xiv_mscs_admin --verify
xiv_mscs_admin --report
```

See the xiv_mscs_admin topic in the References section for more information about this command and its usage.

⚠️ The generated report is most effective when it is generated from a cluster node that is currently an owner of an XIV mirror resource.

⚠️ It is important to run these commands and verify the report from every node that can own XIV mirror resources. Therefore, it is recommended to move the cluster groups between all the cluster nodes, and each time you want to generate a report on the owning node.

⚠️ The cluster groups and resources do not have to be brought online for the report.

⚠️ At minimum, you should move all the cluster groups to a single cluster node and generate a report for only that cluster.

Testing a manual failover
Before bringing the cluster to production, you test your cluster to ensure it can properly fail over.

Use the Cluster Administrator application to simulate the failover.

See the following pages in the Microsoft TechNet Library for more information:

- Test whether group resources can fail over
- Verify the Configuration and Failover of a Clustered Service or Application, applied to Windows 2008 and Windows 2008 R2
### Registry entries

The XIV MSCS Agent reads its configuration from the following registry key:

```
HKLM\SYSTEM\CurrentControlSet\Service\XIVmscsAgent\Parameters
```

When the configuration is not present, it uses the default hardcoded values that are described in the following table:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Default Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xcli_username</td>
<td>REG_SZ</td>
<td>admin</td>
<td>The user name to be used for XCLI commands.</td>
</tr>
<tr>
<td>xcli_password</td>
<td>REG_SZ</td>
<td>password of admin</td>
<td>The password to be used for XCLI commands.</td>
</tr>
<tr>
<td>red_button</td>
<td>REG_DWORD</td>
<td>0</td>
<td>Changes the mode to Highly Available Mode. Use a value of 0 to disable this mode. Use a value greater than 0 to enable this mode.</td>
</tr>
<tr>
<td>log_level</td>
<td>REG_SZ</td>
<td>DEBUG</td>
<td>The logging level. Acceptable values: DEBUG,WARN,ERROR,INFO</td>
</tr>
<tr>
<td>log_target</td>
<td>REG_GZ</td>
<td>eventlog,file</td>
<td>The logging targets. Accepts a list of values: console,file,eventlog</td>
</tr>
<tr>
<td>tracing</td>
<td>REG_DWORD</td>
<td>1</td>
<td>Enables tracing in the log.</td>
</tr>
<tr>
<td>interval</td>
<td>REG_DWORD</td>
<td>6</td>
<td>The High Level Design.</td>
</tr>
</tbody>
</table>
Utilities
The XIV MSCS Agent includes the utilities that are described in this section.

xiv_mscs_admin
The xiv_mscs_admin utility is the setup utility for the XIV MSCS Agent. It provides the following command-line interface:

```
xiv_mscs_admin
Usage: xiv_mscs_admin [options]

Options:
  --version             show program's version number and exit
  -h, --help            show this help message and exit
  --install             installs XIV MSCS Agent components on this node
  --upgrade             upgrades XIV MSCS Agent components on this node
  --report              generated a report on the cluster
  --verify              verifies XIV MSCS Agent deployment
  --fix-dependencies    fixes dependencies between Disks and XIV Mirrors
  --deploy-resources    deploys XIV Mirror resources in groups
  --delete-resources    deletes all existing XIV Mirror resources
  --delete-typeof      deletes the XIV mirror resource type
  --uninstall           uninstalls XIV MSCS Agent components
  --change-credentials  change XIV credentials
  --debug               enables debug logging
  --verbose             enables verbose logging
  --yes                 confirms disruptive operations

XCLI Credentials Options:
  --xcli-username=USERNAME
  --xcli-password=PASSWORD
```

The following option starts the installation process:

```
xiv_mscs_admin --install [--xcli-username=USERNAME --xcli-password=PASSWORD]
```

The --install option performs the following:

1. Verifies XCLI commands can be run against each of the mapped XIV volumes. If an error is returned, see the –verify command-line argument.

   The XIV MSCS Agent uses the built-in XCLI username ‘admin’ and its factory-default password. To use different credentials, supply them with the optional keyword arguments --xcli-username and --xcli-password.

2. Verifies that all required (if any) hotfixes are installed. See the release note documents for more details on which hotfixes are required.

3. Copies the resource DLL to the Windows System32 directory.

4. Installs and starts the XIVmscsAgent service. Any optional XCLI arguments that were provided are recorded internally in the service configuration.

5. Installs the ‘XIV Mirror’ resource type in the cluster.

Installation is required on each of the cluster nodes.
The following option upgrades the XIV MSCS Agent components in a cluster node:

```bash
xiv_mscs_admin --upgrade
```

⚠️ This operation is disruptive because you must take cluster groups, resources, or both offline. You might also have to take the cluster node offline. To ensure that this command-line is not issued by mistake or without expectation of disruption, a special keyword argument is required. If this command-line is issued without the --yes argument, a warning is printed and no operation is performed on the cluster. By supplying the --yes argument, you allow the utility to perform the disruptive operation.

The `--upgrade` option performs the following:

1. Upgrades the Resource DLL.
   a. It stops the cluster service, copies the new DLL, and starts the cluster service.
   b. The action above is performed only if the installed DLL version is lower than the one that is located in the installation directory of the product.

⚠️ During the update, the XIVmscsAgent service is restarted.

⚠️ If the cluster service is started and this node is an owner of online resources, those resources are taken offline or moved to another cluster node, depending on their configuration.

2. Upgrades the XIVmscsAgent service.
   a. It stops, updates, and restarts the XIVmscsAgent service.

⚠️ The resource DLL can sustain one minute of not communicating with the XIVmscsAgent service. The upgrade process of the service takes less than a few seconds, so there is no need to bring down the cluster service or any of the online resources before upgrading the XIV MSCS Agent.

The following option prints a comprehensive report on the whole cluster:

```bash
xiv_mscs_admin --report
```

The `--report` option includes the following information:

1. Cluster Name
2. Cluster Nodes:
   a. A table of all cluster nodes that contains the names and states (up/down).
3. Cluster Groups:
   a. A table of all groups within the cluster that contains the group name, state, name of the current owner and names of all possible owners.
   b. A detailed table for each cluster group that lists all the resources in the group with their names, states, type, their resource dependencies and dependents.
4. XIV Mirror Resources:
IBM XIV Storage System
MSCS Agent Guide

5. Resource Types:
   a. A list of all defined resource types in the cluster.

6. XIV Mirrors that are for resources owned by this node:
   a. A table of all the mirroring information for the XIV volumes that are defined in the cluster.
   b. The information that is printed includes the name of the disk resource, its volume name as defined in the XIV Storage System, the mirror role, state, and the name of the XIV Mirror resource in the cluster that manages it.

The following option verifies that all the XIV MSCS Agent components are properly installed:

```
xiv_mscs_admin --verify [--xcli-username=USERNAME --xcli-password=PASSWORD]
```

The --verify option performs the following:

1. Verifies that it is capable of running XCLI commands against each of the mapped XIV volumes. If an error is returned, see the --verify command-line argument.

The XIV MSCS Agent uses the built-in XCLI username ‘admin’ and its factory-default password. To use different credentials, supply them with the optional keyword arguments --xcli-username and --xcli-password.

1. Verifies that all required (if any) hotfixeses are installed. See the release note documents for details on which hotfixeses are required.
2. Verifies that the cluster service is running properly.
3. Verifies that the XIV Mirror Resource DLL is properly installed.
4. Verifies that the XIV Mirror resource type is registered in the cluster.
5. Verifies that the cluster groups are properly configured.
6. Verifies that the XIVmscsAgent service is installed and running.

In case of errors, the optional argument --verbose or --debug can provide additional logging information.

The following option attempts to fix dependencies between XIV Mirror resources and Physical Disk resources:
This operation is disruptive because you must take cluster groups, resources, or both offline. You might also have to take the cluster node offline. To ensure that this command-line is not issued by mistake or without expectation of disruption, a special keyword argument is required. If this command-line is issued without the --yes argument, a warning is printed and no operation is performed on the cluster. By supplying the --yes argument, you allow the utility to perform the disruptive operation.

The --fix option performs the following:

- Removes any dependency links on XIV Mirror resource instances to ensure that XIV mirror resources are not dependent on any other resource.
- Makes sure that groups with XIV mirror resource(s) and physical disk resource(s) depend on one XIV mirror resource.
  - The dependency is created if a physical disk resource and an XIV mirror resource exist in the same cluster group.
  - If there are several physical disk resources in a group with an XIV mirror resource, this option will make them all to depend on the XIV mirror.
  - If there are several XIV mirror resources in a cluster group, with one or more physical disk resources in the group, all the physical disk resources will depend on the first XIV mirror resource in the group. The other XIV mirroring resources will have not have dependencies and will be deleted.

The following option creates an XIV mirror instance in each cluster group:

```
xiv_mscs_admin --deploy-resources
```

This operation is disruptive because you must take cluster groups, resources, or both offline. You might also have to take the cluster node offline. To ensure that this command-line is not issued by mistake or without expectation of disruption, a special keyword argument is required. If this command-line is issued without the --yes argument, a warning is printed and no operation is performed on the cluster. By supplying the --yes argument, you allow the utility to perform the disruptive operation.

The --deploy option creates an XIV Mirror instance in each cluster group that meets the following criteria:

1. Has at least one Physical Disk resource
2. Does not have an XIV Mirror resource

The following option makes the physical disk resource(s) within the group depend on the new XIV mirror resource:

```
xiv_mscs_admin --deploy-resources
```
xiv_mscs_admin --delete-resources

This operation is disruptive because you must take cluster groups, resources, or both offline. You might also have to take the cluster node offline. To ensure that this command-line is not issued by mistake or without expectation of disruption, a special keyword argument is required. If this command-line is issued without the --yes argument, a warning is printed and no operation is performed on the cluster. By supplying the --yes argument, you allow the utility to perform the disruptive operation.

The following option deletes all XIV Mirror instances from the cluster.

xiv_mscs_admin --uninstall

This operation is disruptive because you must take cluster groups, resources, or both offline. You might also have to take the cluster node offline. To ensure that this command-line is not issued by mistake or without expectation of disruption, a special keyword argument is required. If this command-line is issued without the --yes argument, a warning is printed and no operation is performed on the cluster. By supplying the --yes argument, you allow the utility to perform the disruptive operation.

The --uninstall option performs the following operations:

1. Deletes the XIV Mirror resource type from the cluster.
2. Stops and deletes the XIVmscsAgent service.
3. Deletes the XIV Mirror Resource DLL from this cluster node.

This operation requires that the cluster will not have any XIV mirror resource instances (see --delete-resources).

Uninstalling the resource DLL and the XIVmscsAgent service without first deleting all the XIV Mirror instances leaves the cluster in un-healthy state, therefore this functionality is not provided with this tool.

xiv_mscs_admin --change-credentials --xcli-username=USERNAME --xcli-password=PASSWORD

This operation sets new XCLI credentials for the XIVmscsAgent service. You do not have to restart the service after updating the credentials.
xiv_mscs_service
This utility is a management application for the XIV MSCS Agent service. It provides the command-line interface for handling the service.

Usage: 'xiv_mscs_service [options] install|update|remove|start [...]|stop|restart [...]|debug [...]'

Options for 'install' and 'update' commands only:
- --username domain\username : The Username the service is to run under
- --password password : The password for the username
- --startup [manual|auto|disabled] : How the service starts, default = manual
- --interactive : Allow the service to interact with the desktop.
- --perfmonini file: .ini file to use for registering performance monitor data
- --perfdll file: .dll file to use when querying the service for performance data, default = perfmondata.dll

Options for 'start' and 'stop' commands only:
- --wait seconds: Wait for the service to actually start or stop.
- If you specify --wait with the 'stop' option, the service and all dependent services will be stopped, each waiting the specified period.

Logging

The XIV MSCS Agent uses event tracing, log files, and the Windows Event Log to log messages.

Event Tracing
The XIV Mirror Resource DLL uses the Windows tracing mechanism to debug build logs. The logs being sent through event tracing are verbose and low-level so they can be used for debugging purposes.

Log files being used
The MSCS Agent service and utilities write log files that can be found in the Windows Temp directory. These logs have a “xiv_” as a prefix, and can be up to 160MB in size.
## Windows Event Log messages

<table>
<thead>
<tr>
<th>Event ID</th>
<th>Type</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>WARN</td>
<td>Mirror is deactivated for volume '%s'; physical disk resource '%s'</td>
</tr>
<tr>
<td>102</td>
<td>ERROR</td>
<td>No mirror found for volume '%s'</td>
</tr>
<tr>
<td>106</td>
<td>ERROR</td>
<td>Remote mirror not found on target for volume '%s'</td>
</tr>
<tr>
<td>107</td>
<td>ERROR</td>
<td>Connectivity between XIV system '%s' and XIV system '%s' is broken</td>
</tr>
<tr>
<td>108</td>
<td>ERROR</td>
<td>both XIV systems '%s' and '%s' are defined as 'master' for mirroring of volume '%s'. this is a split brain; the cluster cannot decide which replica to override. According to the red_button flag; the resource will %s be brought online. Contact the storage administrator for more details.</td>
</tr>
<tr>
<td>109</td>
<td>ERROR</td>
<td>An error has occurred while updating cluster and mirroring information</td>
</tr>
<tr>
<td>110</td>
<td>ERROR</td>
<td>An error has occurred while updating cluster and mirroring information</td>
</tr>
<tr>
<td>111</td>
<td>ERROR</td>
<td>An error has occurred when tried to open MultipathDevice on %s</td>
</tr>
<tr>
<td>112</td>
<td>ERROR</td>
<td>Failed to open XCLI Client on %s with username %s; reason %s</td>
</tr>
<tr>
<td>113</td>
<td>ERROR</td>
<td>An error has occurred when communicating with the XIV Mirror Resource DLL</td>
</tr>
<tr>
<td>114</td>
<td>ERROR</td>
<td>An error has occurred in xcli command</td>
</tr>
<tr>
<td>115</td>
<td>INFO</td>
<td>XIV MSCS Agent Service started</td>
</tr>
<tr>
<td>116</td>
<td>INFO</td>
<td>XIV MSCS Agent Service stopped</td>
</tr>
<tr>
<td>117</td>
<td>INFO</td>
<td>XIV MSCS Agent Service stopping</td>
</tr>
<tr>
<td>118</td>
<td>ERROR</td>
<td>XIV controller for System %s on LUN0. LUN0 is required for MSCS Agent to work. Volume mapping must be removed from LUN0.</td>
</tr>
<tr>
<td>119</td>
<td>ERROR</td>
<td>XCLI on device %s failed; reason %s</td>
</tr>
<tr>
<td>220</td>
<td>ERROR</td>
<td>Drive number not found for Physical Disk resource &quot;%s&quot;</td>
</tr>
<tr>
<td>221</td>
<td>ERROR</td>
<td>XIV Storage System %s Microcode Level (10.0) not supported. The minimum supported level is 10.1</td>
</tr>
<tr>
<td>222</td>
<td>ERROR</td>
<td>Mirror sync type '%s' for volume '%s' is not supported. only sync_best_effort is supported</td>
</tr>
<tr>
<td>223</td>
<td>ERROR</td>
<td>An error has occurred with the MSCS clustering API: %s</td>
</tr>
<tr>
<td>224</td>
<td>WARN</td>
<td>XIV mirror %s is not %s</td>
</tr>
</tbody>
</table>
Known issues

For the complete list of known issues, see the IBM XIV Storage System MSCS Agent Release Notes document.
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