Note: Before using this document and the products it supports, read the information in “Notices” on page 98.

This publication applies to version 3.0.0 of the IBM Storage Management Console for VMware vCenter 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 install, configure, and use the IBM® Storage Management Console for VMware® vCenter™.

Who should use this guide
This guide is intended for system administrators who are familiar with the VMware vCenter and vSphere™ environments, and with the specific IBM storage product in use.

Conventions used in this guide

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

**Important:** These notices provide information or advice that might help you avoid inconvenient or difficult situations.

**Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice appears before the instruction or situation in which damage can occur.

Publications and related information
You can find additional information and publications related to the IBM Storage Management Console for VMware vCenter on the following IBM, VMware, and Microsoft websites.

- IBM Storage Management Console for VMware vCenter, Release Notes, available under **Publications** on the IBM XIV Storage System Information Center:
  

- IBM Storwize V7000 Information Center:
  

- IBM Storwize V7000 Unified Information Center:
  

- IBM SAN Volume Controller (SVC) Information Center:
  

- IBM Scale Out Network Attached Storage (SONAS) Information Center:
  

- VMware ESXi and ESX Info Center:
  
• VMware Product Support for VMware vSphere, including support for ESX, ESXi, and vCenter:  
  http://www.vmware.com/support/product-support/vsphere

• VMware Documentation:  
  http://www.vmware.com/support/pubs

• VMware Technical Resource Center:  
  http://www.vmware.com/technical-resources

• VMware Knowledge Base:  
  http://kb.vmware.com

• Microsoft Windows Server troubleshooting information:  

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• IBM Directory of Worldwide Contacts (www.ibm.com/planetwide)

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  - Exact publication title and version
  - Publication number (for example: GA32-0929-06)
  - Page, table, or illustration numbers that you are commenting on
  - A detailed description of any information that should be changed.
Chapter 1. Introduction

The IBM Storage Management Console for VMware vCenter is a software plug-in that integrates with the VMware vCenter Server platform and enables VMware administrators to independently and centrally manage their storage resources on the following IBM storage systems:

- IBM XIV® Storage System
- IBM System Storage® Storwize® V7000
- IBM Storwize® V7000 Unified Storage System
- IBM System Storage® SAN Volume Controller (SVC)
- IBM Scale Out Network Attached Storage (SONAS)

Depending on the IBM storage system in use, administrators can self-provision volumes (LUNs) in selected predefined storage pools, or self-provision file shares in selected predefined file systems. The volumes or file shares are mapped to ESX hosts, clusters, or datacenters as logical drives that can be used for storing VMware datastores (virtual machine data containers).

Main features and benefits

The IBM Storage Management Console for VMware vCenter runs as a Windows Server service on the vCenter server. Any **vSphere client** that connects to the vCenter server detects the service on the server, and automatically enables the IBM storage management features on the vSphere client.

After the plug-in is installed and configured, the IBM Storage Management Console enables full integration with the VMware vSphere graphical user interface (GUI), in the form of an IBM Storage resource management tool and a dedicated IBM Storage management tab.

When using any supported IBM storage system except SONAS, the IBM Storage Management Console features and enables the following capabilities:

- Full control over storage volumes, including volume creation, resizing, renaming, migration to a different storage pool, mapping, unmapping, multipath policy enforcement, and deletion.
- Easy and integrated allocation of volumes to VMware datastores, used by virtual machines that run on ESX hosts, clusters, or datacenters.

When using the IBM Storwize® V7000 Unified and SONAS storage systems (as opposed to the other supported storage systems), the IBM Storage Management Console features and enables the following capabilities:

- Full control over file shares, including file share creation, setting file share quota, disabling file share quota, exporting to hosts, removing from hosts, and deletion.
- Easy and integrated allocation of file shares to VMware datastores used by virtual machines that run on ESX hosts, clusters, or datacenters.
Concept diagram

The following diagram (Figure 1) illustrates how IBM storage systems are accessed and controlled through the VMware environment, and shows the primary relationships and interaction between the VMware components and the IBM storage systems that provide the storage pools and file systems in which the volumes and file shares are created.

Note: The IBM Storage Management Console for VMware vCenter can use only predefined storage pools or file systems. New storage pools or file systems cannot be created from the IBM Storage Management Console.
Chapter 2. Installation

This chapter describes:

- Compatibility and requirements
- First-time installation vs. upgrade
- Running the installation wizard
- Removing the IBM Storage Management Console software

Compatibility and requirements

For complete and up-to-date information about the compatibility and requirements of the IBM Storage Management Console for VMware vCenter, refer to the latest release notes.

You can obtain the latest release notes on the IBM Fix Central (http://www.ibm.com/support/fixcentral), or under Publications on the IBM XIV Storage System Information Center (http://publib.boulder.ibm.com/infocenter/ibmxiv/r2).

**Note:** Refer to the relevant VMware documentation for information about how to install the compatible versions of vCenter Server and vSphere Client. You should also refer to the latest installation and configuration instructions for ESX and ESXi servers.

First-time installation vs. upgrade

When you run the installation file (see Running the installation wizard) on a system with an existing installation of the IBM Storage Management Console, the uninstallation wizard is automatically invoked and you must uninstall the existing version.

The installation wizard of the new version starts only after the previous version has been uninstalled. During uninstallation, the existing database is not removed, but is kept for use by the new software version.

**Note:** The upgrade of the IBM Storage Management Console for VMware vCenter takes effect only after you close and rerun the VMware vSphere client software.

Running the installation wizard

Perform the following procedure to install the IBM Storage Management Console on the VMware vCenter server.

1. Depending on the operating system architecture, run the installation package file.
   - **On x86 architectures,** run:
     ```
     IBM_Storage_Management_Console_for_VMware_vCenter-3.0.0-x86.exe
     ```
On x64 architectures, run:

```
IBM_Storage_Management_Console_for_VMware_vCenter-3.0.0-x64.exe
```

2. From the language selection dialog box, select the language that you want to use in the installation wizard, and then click OK.

![Figure 2. Language selection dialog box](image)

**Note:** The language selection affects only the texts that are displayed on the installation wizard, including the language used in the IBM license agreement. It does not affect the configuration wizard and GUI of the IBM Storage Management Console for VMware vCenter, which are available in English only.

The installation wizard of IBM Storage Management Console for VMware vCenter starts.

![Figure 3. IBM Storage Management Console for VMware vCenter – installation wizard](image)

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 Destination Folder panel is displayed.
6. Use the default installation directory (C:\Program Files\IBM\IBM Management Console for VMware vCenter) or click **Change** to install in a different directory.

![Destination Folder panel – default installation directory](image)

7. Click **Next**. The Ready to Install the Program panel is displayed.
8. Click **Install** to begin the installation. After the installation is complete, the Completed panel is displayed.
9. Select **Launch the Configuration Wizard**, and then click **Finish**.

**Note:** Select the **CLI configuration wizard** option to start it automatically (see *Using the CLI configuration wizard*) after the installation.

### Removing the IBM Storage Management Console software

If you want to remove the IBM Storage Management Console from the vSphere client, perform the following procedure.

1. Close the vSphere client application.

   **Important:** Do not uninstall the IBM Storage Management console software before closing the vSphere application.

2. Go to **Control Panel → Programs → Programs and Features**, select the IBM Storage Management Console for VMware vCenter from the list of installed programs, and then click **Uninstall**.

   The uninstallation wizard guides you through the remaining uninstallation steps.
After the uninstallation, if you want to clear the locally saved configurations, perform the following steps.

1. Go to the Windows/Temp directory.

2. Delete the keys_temp folder, along with the following files:
   - vc_plugin.db
   - vc_plugin_reg.bck
Chapter 3. Configuration

Before you start using the IBM Storage Management Console for VMware vCenter, the following configuration and verification procedures are required:

- Using the CLI configuration wizard
- Restarting the vSphere client software and verifying the installation
- Assigning the required vCenter privileges

In addition, refer to Modifying the Management Console settings in the Windows Server registry for information about optional configuration.

Using the CLI configuration wizard

Use the command-line interface (CLI) configuration wizard to log in to the vCenter server and register extensions on the server. The CLI configuration wizard starts right after the installation if the option to launch it was selected. If the option was not selected and the wizard does not start, you can start it from the IBM folder located on the All Programs list of the Windows Start menu.

The Welcome message is displayed when the configuration wizard starts.

Welcome to the IBM Storage Management Console for VMware vCenter setup wizard, version 3.0.0. Use this wizard to configure the IBM Storage Management Console for VMware vCenter. Press [Enter] to proceed.

Perform the following steps to configure the IBM Storage Management Console for VMware vCenter.

1. Press Enter. If this is the first time that the IBM Storage Management Console is being installed on this server (otherwise, skip to step 4), the following message is displayed:

   The Wizard will now install the IBM Storage Management Console service and register the extension in the vCenter server. Do you want to continue? [default: yes]:

2. Press Y to proceed. The following message is displayed:

   The IBM Storage Management Console requires a valid username for connecting to the vCenter server. This user should have permission to register the Plug-in in the Plug-in Manager. Please enter a username:

3. Enter the user name for accessing the VMware vCenter server. Then, enter your password.

   Please enter the password for the user <username>:

   Note: You must have permission to register extensions on the vCenter server. If the password that you enter is not correct, you are prompted to enter your user name and password again.
After you successfully log in to the vCenter server with your user name and password, the following message is displayed:

The IBM Storage Management Console for VMware vCenter web component requires a valid network port number. Please enter a port number for the web component [default: 8880]:

4. Enter the port number that should be used for HTTP requests from the vSphere client. The following message is displayed:

The IBM Storage Management Console for VMware vCenter is now configured. Press [ENTER] to proceed.

5. Press Enter. An extension is registered and verified on the vCenter server and the installation is complete.

Note: If any error occurs during the configuration, a record is added to the log file (see Viewing the log file).

Restarting the vSphere client software and verifying the installation

After you install and configure the IBM Storage Management Console for VMware vCenter with the CLI configuration wizard, you must restart the vSphere client software.

After the vSphere Client restarts, the IBM Storage icon becomes available on the vSphere management tools.

![Figure 5. IBM Storage icon on the vSphere Client management tools](image)
In addition, the IBM Storage plug-in appears on the Installed Plug-ins list of the vCenter Plug-in Manager.

![Figure 6. IBM Storage plug-in listed in the Plug-in Manager](image)

When the IBM Storage Management Console is properly installed, the **IBM Storage** tab is added to the vSphere management GUI. You can access the tab from the Datacenter, Cluster, Host, Datastore, and Virtual Machine inventory views. From the IBM Storage tab, you can view and fully manage storage volumes and file shares, as explained in the next chapters.

![Figure 7. IBM Storage tab added to the vSphere GUI](image)
Modifying the Management Console settings in the Windows Server registry

You can modify different functionalities of the IBM Storage Management Console by changing registry keys of the Windows Server upon which the VMware vCenter software is installed.

**Attention:** Perform registry changes with caution. All changes that apply to the IBM Storage Management Console must be performed on the **vCenter server** and not on the vSphere client. Before making any change, it is recommended to back up the Windows Server registry.

This section describes:

- Modifying general settings
- Replacing the common SSL certificate with a private certificate
- Setting the storage pool or file system usage alert thresholds (color indications)
- Setting the maximum volume size

**Modifying general settings**

Perform the following steps to access the relevant registry keys and change general settings of the IBM Storage Management Console for VMware vCenter.

1. From the Windows taskbar, select **Start → Run**. The Run dialog box is displayed.
2. Type `regedit` and then press Enter. The Registry Editor is displayed.
3. Go to the following registry tree path:
   
   `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleForvCenter\Parameters`

   ![Windows Registry Editor](image)

   *Figure 8. Windows Registry Editor*

4. Use the following table to determine the parameters that you want to change. In addition, refer to the following subsections to change additional parameters.
### Table 1. Registry keys for general settings of the IBM Storage Management Console

<table>
<thead>
<tr>
<th>Registry key</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>cache_update_interval</td>
<td>The time interval in seconds for updating the cache with information from the vCenter server.</td>
<td>1800 (30 minutes)</td>
</tr>
<tr>
<td>log_level</td>
<td>The type of messages to be logged in the log file:</td>
<td>20 (info)</td>
</tr>
<tr>
<td></td>
<td>• 10 – Debug messages – Use this value only if instructed to do so by IBM support.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 20 – Info messages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 30 – Warning messages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 40 – Error messages</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not modify this key manually unless you are requested to do so by IBM XIV Support.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For more information, see <a href="#">Viewing the log file</a> and <a href="#">Event messages</a>.</td>
<td></td>
</tr>
<tr>
<td>log_target</td>
<td>The target of the logging operation. By default, the log is written to a file and to the Event Viewer application log.</td>
<td>eventlog, file</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Do not modify this key manually unless you are requested to do so by IBM XIV Support.</td>
<td></td>
</tr>
<tr>
<td>page_refresh_interval</td>
<td>The refresh interval in seconds for updating the information displayed on the vSphere client. This parameter does not reload cache information.</td>
<td>2</td>
</tr>
</tbody>
</table>

**Important:**
After you have made the required registry modifications:

1. Close the vSphere client application.
2. Restart (end and then start) the Windows service of the IBM Storage Management Console.
3. Start the vSphere client application.

### Replacing the common SSL certificate with a private certificate

The IBM Storage Management Console uses a Secure Socket Layer (SSL) protocol for communication between the vSphere client and the vCenter server. The installation package includes a private key and an unsigned SSL certificate.
For non-interruptible management from the vSphere client, it is recommended to replace the provided key and certificate with your own private key and a signed certificate.

Perform the following procedure to replace the SSL private key and certificate.

1. Copy a private key file and a certificate file to the SSL subdirectory of the installation directory.
2. Go to the following registry tree path:
   
   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleForvCenter\Parameters

3. Modify the following registry keys with the relative path to your own SSL files (the ones that you copied to the SSL subdirectory):
   
   - `ssl_ca_certificate_file` – Contains the relative path to the certificate file.
   - `ssl_private_key_file` – Contains the relative path to the private key file.

### Setting the storage pool or file system usage alert thresholds (color indications)

You can change the usage alert triggering thresholds for storage pools and file systems by modifying the following registry keys:

- **pool_warning_threshold** – Contains the pool size limit percentage beyond which the storage pool or file system bar color changes to yellow, notifying you about over-the-limit use of pool space. The default limit value is 80%.

- **pool_minor_threshold** – Contains the size limit percentage beyond which the storage pool or file system bar color changes to orange, notifying you about near-critical over-the-limit use of pool space. The default limit value is 90%.

- **pool_major_threshold** – Contains the size limit percentage beyond which the storage pool or file system bar color changes to red, alerting you about critical over-the-limit use of pool space. The default limit value is 95%.

These registry keys are located under the same registry path that is used for all other settings:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleForvCenter\Parameters

The following figure shows how different colors are displayed for storage pools and file systems.

Note: Storage pools are applicable to all storage systems except SONAS. File systems are applicable to Storwize V7000 Unified and SONAS.
Figure 9. Different colors displayed for storage pools and file systems

Note: For more information about storage pools and file systems, refer to Chapter 5.

Setting the maximum volume size

When using the VMware VM File System version 3 (VMFS-3), the following registry keys enable you to set the maximum allowed volume sizes for the IBM storage systems:

- **max_lun_size_gb** – For XIV storage systems; default value is 2181 GB (2 TB).
- **svc_max_lun_size_gb** – For SVC, Storwize V7000, and Storwize V7000 Unified storage systems; default value is 2048 GB (2 TB).

These registry keys are located under the same registry path that is used for all other settings:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleForvCenter\Parameters
```

Note: The maximum volume size for IBM storage systems can be larger when working with VMFS-5 (VMware VM File System, version 5).

The maximum volume size set in the vCenter Windows registry affects the following:

- If you set a volume size greater than 2181 GB (default maximum size) on an XIV storage system, an appropriate warning message is displayed (see Figure 10).
- If you set a volume size greater than 2048 GB (default maximum size) on an SVC, Storwize V7000, or Storwize V7000 Unified storage system, an appropriate warning message is displayed.
Figure 10. Warning regarding volume size (XIV storage system)

For information on how to define the volume size, refer to step 2 in *Creating a new storage volume (LUN)*.

**Assigning the required vCenter privileges**

Depending on your actual usage of the IBM Storage Management Console for VMware vCenter, you must have minimum vCenter user privileges, as detailed in the following table.

**Table 2. Required vCenter privileges**

<table>
<thead>
<tr>
<th>Actual usage</th>
<th>Required vCenter user privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring only</td>
<td>• <strong>Extension</strong> – Select all privileges in this category.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Global</strong> – In this category, select <em>Log Event</em>.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Tasks</strong> – Select all privileges in this category.</td>
</tr>
<tr>
<td>Storage provisioning</td>
<td>• All privileges required for monitoring only (see above)</td>
</tr>
<tr>
<td></td>
<td>• Host – In this category, select Configuration → Storage partition configuration.</td>
</tr>
<tr>
<td>Actual usage</td>
<td>Required vCenter user privilege</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------</td>
</tr>
</tbody>
</table>

For more detailed information about how to set vCenter privilege types, refer to the following VMware publication:

- 'Managing VMware vCenter Roles and Permissions', available on the following web address: [http://www.vmware.com/pdf/vi3_vc_roles.pdf](http://www.vmware.com/pdf/vi3_vc_roles.pdf)
Chapter 4. Connecting to (adding) IBM storage systems

Before you can create volumes or file shares for datastores, you must first connect to (add) at least one IBM storage system, by using appropriate credentials.

This chapter describes:

- Adding an IBM storage system
- Modifying access credentials for an IBM storage system
- Setting multipath policy enforcement for a storage system
- Removing an IBM storage system

Adding an IBM storage system

Perform the following procedure to add an IBM storage system on which you can create and manage storage volumes (LUNs) or file shares.

1. Click the IBM Storage icon located on the vSphere Client management tools (see Figure 5). The Storage Systems and Storage pools and file systems management panels are displayed.

   ![Figure 11. Storage Systems and Storage Pools management panels](image)

   - The **Storage Systems** panel shows the IBM Storage Systems that are currently connected to the IBM Storage Management console for VMware vCenter.
   - The **Details** panel shows the details of the selected (highlighted) storage system.
   - The **Storage Pools** panel shows for all storage systems except SONAS, the storage pools that are attached to the selected (highlighted) storage system being added. For the Storwize V7000 Unified and SONAS systems, it also shows the file systems that are attached to the selected (highlighted) storage system.

2. On the Storage Systems panel, click Add. Alternatively, right-click the storage systems table heading and click Add on the pop-up menu.
Figure 12. Clicking Add on the pop-up menu

The **Add an IBM Storage System** wizard is displayed.

![Add an IBM Storage System wizard](image)

3. From the drop-down list box, select the brand of the IBM storage system that you want to add, and then click **Next**. The Set Credentials panel is displayed.

4. If you are using an SVC or Storwize V7000 storage system, select one of the following authentication methods:

   - **Authenticate the user name with a key file** – Authenticate your user name with a key file (the default).
   - **Authenticate the user name with a password** – Authenticate your user name with a password. This option is applicable only to SVC or Storwize V7000 with microcode version 6.3 or later.
5. Enter the required credentials for the storage brand that you have selected, as detailed in the following table.

<table>
<thead>
<tr>
<th>Credential type</th>
<th>Description</th>
<th>Displayed for</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address / Hostname</td>
<td>IP address or hostname (properly formatted domain address) of the IBM storage system to which you want to connect.</td>
<td>XIV, SVC, Storwize V7000, Storwize V7000 Unified, SONAS</td>
</tr>
<tr>
<td>Credential type</td>
<td>Description</td>
<td>Displayed for</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>User Name</td>
<td>User name for accessing the specified IBM storage system.</td>
<td>XIV, SVC, Storwize V7000, Storwize V7000 Unified, SONAS</td>
</tr>
<tr>
<td></td>
<td><strong>Important:</strong> If you are using an SVC or Storwize V7000 system with microcode version 6.2 or earlier, enter &quot;admin&quot; as your user name. Using &quot;admin&quot; does not necessarily mean that you have administrator credentials, but rather a user name spelled as &quot;admin&quot;. It also does not mean that the matching user name defined on the storage system is also &quot;admin&quot;. The pairing between the vSphere user and the storage system user account is performed only by the SSH key pairing (any valid SSH key grants access; see info below).</td>
<td></td>
</tr>
<tr>
<td>Password</td>
<td>Password for accessing the specified IBM storage system.</td>
<td>XIV, SONAS, SVC, Storwize V7000, Storwize V7000 Unified</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For Storwize V7000 and SVC with microcode version 6.3 or later, this credential appears only if you chose to authenticate with a password (see step 4).</td>
<td></td>
</tr>
<tr>
<td>SSH Private Key</td>
<td>To access the specified SVC or Storwize V7000 system with a private SSH key, click <strong>Browse</strong> to locate the SSH key file.</td>
<td>SVC, Storwize V7000</td>
</tr>
<tr>
<td></td>
<td><strong>Important:</strong> The private SSH key must be in OpenSSH file format. If your key is not in OpenSSH file format, you can use a certified OpenSSH conversion utility. For more information, refer to the OpenSSH website at: <a href="http://www.openssh.org/">http://www.openssh.org/</a></td>
<td></td>
</tr>
</tbody>
</table>
6. Click **Next**. For all storage systems except SONAS, the Select Storage Pools panel is displayed (see *Figure 15*); for SONAS, the Select File Systems panel is displayed (see *Figure 16*).

![Add an IBM Storage System](image)

**Figure 15. Select Storage Pools panel**

<table>
<thead>
<tr>
<th>Credential type</th>
<th>Description</th>
<th>Displayed for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passphrase</td>
<td>If the private SSH key requires a passphrase for accessing the specified SVC or Storwize V7000 system, enter the passphrase in this text box. Otherwise, if the private SSH key does not require a passphrase, leave this text box blank.</td>
<td>SVC, Storwize V7000</td>
</tr>
</tbody>
</table>

**Note:**
- For microcode version 6.2 or earlier, this credential always appears.
- For microcode version 6.3 or later, this credential appears only if you chose to authenticate with a key file (see step 4).
7. If you have provided admin-type credentials, you can attach predefined storage pools or file systems that are available on the IBM storage system that you are adding. Select the name of the storage pool or file system that you want to add.

   **Note:** For more information about attaching or detaching storage pools and file systems, and the admin-type credentials required to do so, refer to Chapter 5.

8. Click **Next**. The Confirmation panel is displayed.

9. Review the details of the storage system that is about to be added, and then click **Finish** to confirm its addition as detailed. If you want to change any detail that was set in a previous step, click **Back**.

**Modifying access credentials for an IBM storage system**

Whenever needed, you can modify the IP address or hostname of any storage system that was added, as well as the user credentials for connecting to that storage system.

Perform the following procedure to modify the details of an added storage system.

1. Click the IBM Storage icon located on the vSphere Client management tools (see Figure 5). The Storage Systems and Storage Pools management panels are displayed.

2. Select (highlight) the name of the storage system that you want to modify, and then click **Modify**. Alternatively, right-click the name of the storage system and then click **Modify** on the pop-up menu.
3. In the Update Storage System Credentials dialog box, edit the storage system details (described in Table 3), and then click **Update**.

The modified system details appear in the Details pane. The different storage systems have different details.

Figure 17. Clicking Modify on the pop-up menu

Figure 18. Storage system details
Setting multipath policy enforcement for a storage system

By default, multipath policy is not enforced. You can set multipath policy enforcement at the Storage System level, by setting a multipath policy for a specific storage system. This policy is then enforced on any volume that you create from the management console.

Note: You can also set multipath enforcement on individual volumes. See Setting Multipath Policy Enforcement for a storage volume.

Setting the policy at the storage system level enforces it on any volume that you create from the management console from the time that this enforcement is set. It does not apply automatically to volumes that are already located on this storage system.

The Storage Systems panel displays one of the following values under the Multipath Policy column, for each defined storage system (see Figure 18):

- **Not Enforced** – Multipath policy enforcement is disabled.
- Any of the following multipath policies that has been assigned to the storage system:
  - Most Recently Used
  - Round Robin
  - Fixed

Note: For more detailed information about multipath policy enforcement, refer to the relevant VMware article on the following web address: http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1011340

For any storage system, you can do the following:

- Enable its multipath policy enforcement.
- Change its multipath policy.
- Disable its multipath policy enforcement.

Enabling Multipath Policy Enforcement

You can enable multipath policy enforcement on a storage system, so that a specified policy is enforced on newly created volumes in the storage system.

Perform the following procedure to set multipath policy enforcement on a storage system.

1. Click the IBM Storage icon located on the vSphere Client management tools (see Figure 5). The Storage Systems and Storage Pools management panels are displayed.
2. Right-click the name of the storage system for which you want to set a multipath policy, and then click Set Multipath Policy Enforcement on the pop-up menu. The Set Multipath Policy dialog box is displayed.
3. Select the **Set Multipath Policy Enforcement** option, and from the drop-down list that appears, select the policy.

4. Click **Set** to apply the policy.

**Changing the Multipath Policy**

In a storage system with multipath policy enforcement, you can change the policy that is to be enforced on newly created volumes in the storage system.

Perform the following procedure to change the multipath policy.

1. Click the IBM Storage icon located on the vSphere Client management tools (see *Figure 5*). The Storage Systems and Storage Pools management panels are displayed.

2. Right-click the name of the storage system for which you want to change the multipath policy, and then click **Set Multipath Policy Enforcement** on the pop-up menu. The Set Multipath Policy dialog box is displayed (see *Figure 19*).

3. In the drop-down list under **Set Multipath Policy Enforcement**, select a different policy.

4. Click **Set** to apply the policy.

**Disabling Multipath Policy Enforcement**

You can disable multipath policy enforcement so that a specific policy is not enforced on newly created volumes. The policy is not changed on volumes that have already been created.

**Important**: Disabling multipath policy enforcement does not modify the policy in any way.

Perform the following procedure to disable multipath policy enforcement on a storage system.

1. Click the IBM Storage icon located on the vSphere Client management tools (see *Figure 5*). The Storage Systems and Storage Pools management panels are displayed.
2. Right-click the name of the storage system for which you want to disable multipath policy, and then click **Set Multipath Policy Enforcement** on the pop-up menu. The Set Multipath Policy dialog box is displayed (see Figure 19).

3. Select the **Disable Multipath Policy Enforcement** option, and click **Set** to remove the policy.

### Removing an IBM storage system

When a storage system is no longer needed, you can remove it from the list of added storage systems.

**Attention:** If you remove a storage system that contains working volumes, file shares, and datastores, the information of these volumes, file shares, and datastores is no longer displayed in the IBM Storage tab. However, these volumes and/or file shares and datastores remain active and functional.

Perform the following procedure to remove a storage system.

1. Click the IBM Storage icon located on the vSphere Client management tools (see Figure 5). The Storage Systems and Storage Pools management panels are displayed.

2. Select (highlight) the name of the storage system that you want to remove, and then click **Remove**. Alternatively, right-click the name of the storage system and then click **Remove** on the pop-up menu.

3. In the removal confirmation dialog box, click **Yes**.

**Note:** You can add again any storage system that you have removed.
Chapter 5. Attaching and detaching storage pools or file systems

After the required IBM storage systems are added, you can start attaching the predefined storage pools or file systems with which you want to work.

This chapter describes:

- Viewing the details of currently attached storage pools and file systems
- Attaching storage pools or file systems
- Detaching storage pools or file systems

**Important:**

- When working with IBM storage systems, storage pools can be attached only with **Admin**, **StorageAdmin**, **SystemAdmin**, or **SecurityAdmin** user credentials.
- When working with Storwize V7000 Unified or SONAS, file systems can be attached only with **Admin**, **StorageAdmin+ExportAdmin**, or **SecurityAdmin** user credentials.

Any other type of user credentials (read-only, application admin) cannot perform storage pool or file system attachment. If your credentials are not sufficient to perform pool or file system attachment, contact your storage administrator for assistance.

**Viewing the details of currently attached storage pools and file systems**

Attached storage pools or file systems are predefined storage areas that were specifically chosen to be used for volumes and VMware datastores.

For each added storage system (see *Adding an IBM storage system*), you can view the details of the storage pools and file systems that are defined on that system and are currently attached to the vCenter server.

**Note:** XIV, SVC, and Storwize V7000 use storage pools. Storwize V7000 Unified and SONAS use file systems.

Click the name of a storage system to view its currently attached storage pools or file systems (see *Figure 21*).

**Note:** If the selected storage system has incorrect credentials or its system ID has been changed, an alert dialog box is displayed. In such a case, modify the storage system credentials (see *Modifying access credentials for an IBM storage system*) or remove the storage system (see *Removing an IBM storage system*).
Important: Storage pools and file systems that were not yet attached (or were detached) are not displayed, even if these pools and file systems were predefined on the storage system for use in the VMware environment.

![Figure 21. Viewing attached storage pools and file systems of the selected storage system](image)

By placing the mouse pointer over different areas of any displayed storage pool or file system, you can view different types of information. The following figures show the information that is displayed for XIV-based and SVC/Storwize-based storage pools or file systems.

![Figure 22. XIV – Amount (GB) and percentage of free hard disk space on the storage pool](image)

![Figure 23. XIV – Amount (GB) and percentage of used hard disk space on the storage pool](image)

![Figure 24. XIV – Amount (GB) and percentage of soft space used for volumes (LUNs)](image)

![Figure 25. XIV – Amount (GB) and percentage of soft space reserved for snapshots](image)
Figure 26. XIV – Amount (GB) and percentage of hard disk space currently in use by snapshots

Figure 27. XIV – Amount (GB) and percentage of free soft space remaining for thin provisioning and snapshots

Figure 28. SVC/Storwize V7000 – Amount (GB) and percentage of real used capacity on the storage pool

Figure 29. SVC/Storwize V7000/Storwize V7000 Unified – Amount (GB) and percentage of free capacity on the storage pool

Figure 30. SVC/Storwize V7000 – Amount (GB) of total capacity on the storage pool

Figure 31. Storwize V7000 Unified/SONAS – Amount (GB) of used capacity on the storage pool or file system

Figure 32. Storwize V7000 Unified/SONAS – Amount (GB) of total capacity on the file system
Important: You cannot create storage pools and file systems from the vSphere client. To create storage pools and file systems, connect directly to the IBM storage system via its dedicated storage management interface (XIV GUI, XIV CLI, Storwize V7000 GUI, or other management interface). Alternatively, contact your storage system administrator and ask for storage pools or file systems to be defined.

Attaching storage pools or file systems

You must attach to the vCenter server any predefined storage pool (predefined by the storage administrator) that you want to use for volume (LUN) and datastore management operations, as well as any predefined file system that you want to use for file share and datastore management operations.

Note: XIV, SVC, and Storwize V7000 use storage pools. Storwize V7000 Unified and SONAS use file systems.

Perform the following procedure to attach storage pools or file systems to the vCenter server.

1. In the Storage Systems management panel (see Figure 18), click the name of the storage system to which you want to attach storage pools or file systems.

2. In the Storage Pools management panel, click Attach (see Figure 33). Alternatively, right-click the name of the storage system and then click Attach Pools on the pop-up menu (see Figure 34).

The available storage pools or file systems are displayed in the Attach Storage Pools or File Systems dialog box.
3. In the Attach Storage Pools or File Systems dialog box, select the name of a storage pool(s) or file system(s) that you want to add, and then click Add Pools.

![Figure 35. Adding Storage Pools or File Systems](image)

**Note:** For the SONAS storage system, the subtitle is *Select the file system(s) that you want to add:*

4. If you are using an SVC or Storwize V7000 storage system, select one of the following authentication methods:

   - **Authenticate the user name with a key file** – Authenticate your user name with a key file (the default).
   - **Authenticate the user name with a password** – Authenticate your user name with a password. This option is applicable only to SVC or Storwize V7000 with microcode version 6.3 or later.

   The required credentials relevant to the selected authentication method are displayed.

5. Enter the required credentials for the storage system from which you are attaching storage pools or file systems, as detailed in *Table 3* on page 25.

6. Click Finish.

**Detaching storage pools or file systems**

You can detach from the vCenter server any storage pool or file system that you no longer need.
Attention:

- If you detach a storage pool that contains working volumes and datastores, the information of these volumes and datastores is still displayed in the IBM Storage tab; however, you are not able to perform volume management operations on these pools.
- If you detach a file system that contains working file shares not converted to datastores, the information of these file shares is not displayed in the IBM Storage tab. If already in datastores, the information is displayed there; however, you cannot perform file share operations on these file shares.

Perform the following procedure to detach storage pools or file systems.

1. In the Storage Pools management panel, click and highlight the name of the storage pool or file system that you want to detach, or use the CTRL or SHIFT keyboard keys to select and detach multiple storage pools or file systems.

2. Click the Detach button (located at the top right corner). Alternatively, right-click the selected storage pools or file systems, and then click Detach on the pop-up menu.

3. In the Detachment Confirmation dialog box, click Yes.
   - If you select to delete storage pools only, the following right-click pop-up menu is displayed. In this case, click Detach Storage Pool.
   - If you select to detach file systems only, the label is changed to Detach File System.

**Note:** The 'Detach' label on the pop-up menu changes depending on your selection.
Chapter 6. Creating, viewing, and managing volumes or file shares

After the IBM storage systems are added and the storage pools are attached to the vCenter server, you can start the volume (LUN) creation and management operations (relevant for all storage systems except SONAS).

For the Storwize V7000 Unified and SONAS storage systems, you can also create file shares after the file systems have been attached to the vCenter server.

This chapter describes:

- Performing a target connectivity check
- Creating a new storage volume
- Creating a new file share
- Viewing volume and file share details
- Managing storage volumes (LUNs)
- Managing file shares

Performing a target connectivity check

Before you create a new volume, verify that the iSCSI or FC target connectivity between the ESX hosts and the newly defined IBM storage system is properly set.

Perform this one-time procedure for each ESX host (you do not need to perform this more than once per host), before creating the first volume on an IBM storage system.

1. Contact the storage administrator to obtain the list of WWPNs or iSCSI IQNs of the newly connected IBM storage system.
2. From the vSphere Home page, go to Inventory → Hosts and Clusters.
3. On the left-pane Datacenter tree, click on a single host, and then click the Configuration tab.
4. Click Storage Adapters. The details of the adapters in use are displayed.
Creating a new storage volume (LUN)

On all storage systems except SONAS, you can create new volumes (LUNs) on which you can save datastores or raw mapped volumes. Any volume can be mapped to ESX hosts, clusters, or datacenters, so that the virtual machines on these hosts, clusters, or datacenters are able to save datastore information on that volume (for the concept illustration, see Figure 1).

In addition to single volume creation, starting from version 3.0.0 you can create multiple volumes simultaneously. In this case, the created volumes are assigned with different number postfixes that are automatically generated by the system in consecutive order.

Note:
- You can create volumes only on storage pools that have been attached to the vCenter server. For more information, see Chapter 5.
- The Host, Cluster, and Datacenter views in vSphere Client are similar to each other; each queries information from the relevant VMware interface.
Important:
- You must perform the target connectivity verification prior to creating a new volume. Without this verification, volumes that you create may be non-detectable. For more information, refer to *Performing a target connectivity check*.
- The ESX hosts and clusters to which you map the created volumes must be predefined on the storage system side. For more information, refer to your IBM storage system documentation.

Perform the following procedure to create a new storage volume.

1. In the Storage Pools management panel, click and highlight the storage pool on which you want to create a new volume, and then click **New Volume**. Alternatively, right-click the storage pool and click **New Volume** on the pop-up menu.

![Figure 38. Clicking New Volume on the pop-up menu](image)

**Note:** The New Volume option is not available when:
- There is no free space in the storage pool.
- More than one storage pool is selected.
- You have read-only permissions (on either vSphere or the IBM storage system).

The Create New Volume wizard is displayed.

![Figure 39. Create New Volume Wizard](image)
2. In the Volume Size text box, enter the size for the new volume (XIV – in Gigabytes; Storwize V7000/SVC/Storwize V7000 Unified – in Gibibytes). Alternatively, place the mouse pointer on the graphic image of the storage pool, and then click and slide the space marker rightward to set the new volume size (marked in yellow). The numerical value in Volume Size is automatically updated accordingly.

![Image of storage pool with volume size setting](image)

*Figure 40. Setting the volume size with the graphic space marker*

**Note:** XIV-based volume sizes are automatically rounded to the next multiple of 17 GB.

3. In the Volume Name text box, enter the name that you want to assign to the new volume. This also becomes the display name of the LUN in VMware.

4. If you want to create multiple volumes simultaneously (if not, skip to the next step): In the Number of Volumes text box, enter the number of volumes that you want to create simultaneously. Two small text boxes appear next to the Volume Name text box and display a range of postfix values (see Figure 41). You can change the postfix of the volume to be created first.

**Note:** The postfix number of the last volume is automatically displayed in the adjacent grayed-out text box, based on the total number of volumes to be created.

![Image of volume name and number of volumes](image)

*Figure 41. Creating multiple volumes*

5. Only if you are creating the volume on an SVC, Storwize V7000, or Storwize V7000 Unified storage system (otherwise, skip to next step):

- Select the I/O Group to which the volume should belong.

- Optional: Select Enable Thin Provisioning if you want the volume to be defined as thin-provisioned and not as a fixed hard disk allocation.

**Note:** XIV-based volumes are not associated with I/O groups and are always thin-provisioned.
6. Click **Next**. The Volume Mapping panel is displayed.

7. Select the host(s), cluster(s), or datacenter(s) to which you want to map the new volume. The selected host(s), cluster(s), or datacenter(s) are now able to utilize the new volume for datastores or raw mapped LUNs.

**Note:** If you select a datacenter, its member clusters and hosts are automatically selected.

---

![Volume Mapping Panel](image)

**Figure 42. SVC, Storwize V7000, or Storwize V7000 Unified Volume Properties**

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![Selecting Hosts, Clusters, or Datacenters](image)

**Figure 43. Selecting the hosts, clusters, or datacenters for LUN mapping**

**Note:** ESX hosts that were not defined on the storage system side, as well as disconnected or non-responsive hosts are grayed-out and cannot be selected.
Important: You must map the volume to at least one ESX host, cluster, or datacenter in order to enable vSphere management of the created volume.

8. Click Next. The Confirmation panel is displayed.

9. Review the details of the new volume that is about to be created, and then click Finish to confirm its creation as detailed. If you want to change any detail that was set in a previous step, click Back.

Creating a new file share

On Storwize V7000 Unified and SONAS, you can create a new file share from a selected file system, and create an NFS export of the file share to a list of ESX hosts or clusters. The created NAS file share is linked to the following path:

/<file system mount point>/<file share name>

Any file share can be exported to ESX hosts, clusters, or datacenters, so that the virtual machines on these hosts, clusters, or datacenters are able to save datastore information on that file share.

Note:

» You can create file shares only on file systems that have been attached to the vCenter server. For more information, see Viewing the details of currently attached storage pools and file systems.

» The Host, Cluster, and Datacenter views are similar to each other; each one queries information from the relevant VMware interface.

Perform the following procedure to create a new file share.

1. In the Storage Pools management panel, click and highlight the file system on which you want to create a new file share, and then click New File Share. Alternatively, right-click the file system and click New File Share on the pop-up menu.

Figure 44. Clicking New File Share on the pop-up menu
Important: The New File Share option is not available when:

- There is no free space in the file system.
- More than one file system is selected.
- You have read-only permissions (on either vSphere or the IBM storage system).

The Create New File Share wizard is displayed.

2. In the Path text box, enter the file share name.

3. If you want to set a quota for the file share (otherwise, skip to the next step), select Set Quota, and then set the maximum size of the file share by either entering a value in the text box, or by clicking and sliding the space marker rightward (marked in yellow). The numerical value in the text box is automatically updated accordingly.

   Important: Without a quota, the entire capacity of the file system is used.
4. Click **Next**. The Select Hosts panel is displayed.

**Note:** If the file share name is already used by another file share, the following error message appears: *File share with this name was already defined.* In such a case, type a different path name and click **Next** again.
5. Select the ESX host(s), cluster(s), or datacenter(s) to which you want to export the file share. The selected host(s), cluster(s), or datacenter(s) are now able to utilize the new file share for datastores.

**Note:**
- If you select a datacenter, its member clusters and hosts are automatically selected.
- Disconnected or non-responsive ESX hosts are grayed-out and cannot be selected.

**Important:** You must export the file share to at least one ESX host, cluster, or datacenter in order to enable vSphere management of the created file share.

6. Click **Next**. The Confirmation panel is displayed.

7. Review the details of the new file share that is about to be created, and then click **Finish** to confirm its creation as detailed (otherwise, click **Back**). The file share is created and exported to ESX hosts over NFS (see example in *Figure 46*).
Viewing volume and file share details

As you navigate through the different vSphere inventory views, you can view the details of existing volumes and file shares on the IBM Storage tab. This includes:

- Viewing volumes or file shares that are used by datastores
- Viewing unused volumes and file shares
- Viewing volumes or file shares that are used by virtual machines
- Choosing which volumes to show
- Viewing information in the LUN Details pane
- Viewing information in the File Share Details pane

Viewing volumes or file shares that are used by datastores

When you want to check which storage volumes or file shares are used by specific datastores or datastore clusters, and also view the specific details of these volumes or file shares, perform the following procedure.

**Note:** A datastore can have either volumes or a file share; not both. A datastore can be comprised of only one NAS file share.

1. Go to **Home** → **Inventory** → **Hosts and Clusters**.
2. On the left-pane tree of datacenters, click an icon of a datacenter, cluster, or host, and then click the **IBM Storage** tab. The table on the right pane displays the details of the datastores that are used by the element that you selected in the tree (datacenter, cluster, or host).

**Note:** If you select a datacenter, its member clusters and hosts are automatically selected.

3. On the displayed datastores list (under **View: Datastores**), click the name of a datastore to display the storage volumes or file share that it uses.

**Note:**
- If the selected datastore contains volumes, the volumes are listed in the volumes list underneath the Datastores list (see Figure 48).
- If the datastore contains a NAS file share, it is listed in the File Share list underneath the Datastores list (see Figure 49).
Figure 48. Displaying volumes of a selected datastore and the details of a selected volume (LUN)

The datastores list (above the volumes list) displays the following details per datastore:

- **Datastore** – Name of the datastore.
- **Status** – Current status of the datastore (valid per the last update time).
- **Capacity (GB)** – Total size of the datastore in Gibibyte (not Gigabyte) units.
- **Free (GB)** – Size of the free space remaining in the datastore, in Gibibyte units.

**Important:** The sizes of the total capacity and free space are displayed in Gibibyte (GiB) units and not in Gigabyte (GB) units because the datastore information is taken from the VMware hosts.

- **Type** – Type of file system used in the datastore.

If the selected datastore contains volumes (as in Figure 48), a list of its volumes appears underneath the datastores list, and the following details are displayed per volume:

- **Identifier** – Unique alphanumerical string (with a dot) that identifies the volume on the vCenter server.
- **Name** – Name of the volume. If the volume was created now and in this version, this is the name assigned by the user. Otherwise, if the volume was created in the past or with an earlier version of VC plug-in, the name displayed is a generic name assigned by VMware.
- **Storage System** – Identification name of the IBM storage system on which the volume is defined.
Note: "Unknown" is a generic array name, automatically given to any non-IBM storage system or to any IBM system that is not currently added (for more information, see Adding an IBM storage system).

- **Model** – Model of the IBM storage system on which the volume is defined.

Note: Although not technically correct, the term "LUN" is also used to refer to the volume itself, because a LUN is widely referred to as a volume in the storage administration community.

For more information about the LUN Details pane (under the volumes list), see Viewing information in the LUN Details pane.

If the selected datastore contains a file share (as in Figure 49), its details are displayed underneath the datastores list:

![Figure 49. Displaying file share of a selected datastore and file share details](image)

The following details are displayed for the file share:

- **Server** – NFS Server IP address.
- **Path** – Path to the file share.
- **Name** – Name of the file share (assigned by the user).
- **Storage System** – Identification name of the IBM storage system on which the file share is defined.

Note: "Unknown" is a generic array name, automatically given to any non-IBM storage system or to any IBM system that is not currently added (for more information, see Adding an IBM storage system).
- **Model** – Model of the IBM storage system on which the file is defined.
- **Capacity (GB)** – Total size of the file share in Gibibyte (not Gigabyte) units

For more information about the File Share Details pane (under the File Share information), see Viewing information in the File Share Details pane.

**Viewing unused volumes and file shares**

Volumes that are not assigned to datastores as Datastore Extent or Mapped Raw LUN as well as file shares that are not assigned to datastores, are listed on the Unused LUNs/File Shares list, which you can view separately under **View: Unused LUNs/File Shares**. These volumes and file shares can be accessed by the host.

![Figure 50. List of unused volumes (LUNs) and file shares](image)

Selecting (highlighting) a volume or file share in the Unused LUNs/File Shares displays its detailed information in the LUN Details pane or File Share Details pane on the bottom of the screen.

For more information about the LUN Details pane, see Viewing information in the LUN Details pane. For more information about the File Share Details pane, see Viewing information in the File Share Details pane.

**Viewing volumes or file shares that are used by virtual machines**

When you want to check which storage volumes and file shares are in use by virtual machines, perform the following procedure.

1. Go to **Home → Inventory → VMs and Templates**.
2. On the left-pane tree of virtual machines, click an icon of a virtual machine, and then click the **IBM Storage** tab. The table on the right pane displays the details of the virtual hard disks that are used by the virtual machine that you selected on the tree.
3. Click the name of a hard disk to display the storage volumes and file shares that are currently defined on it and are used by the datastores of the selected virtual machine.
Choosing which volumes to show

In the different inventory views, you can choose which storage volumes to display for the entity (datacenter, cluster, host, or virtual machine) that you select on the left-pane tree. Three viewing options are available:

- **Show All LUNs** – Show all volumes (LUNs) that are related to the selected entity.
- **Show Mapped Raw LUNs** – Show only the Mapped Raw volumes (LUNs) that are related to the selected entity.
- **Show Datastore Extent LUNs** – Show only the Datastore Extent volumes (LUNs) that are related to the selected entity.

Reference: In raw device mapping, a special file in a VMFS volume acts as a proxy for another raw storage device. The mapping file contains metadata that is used to manage and redirect disk accesses to the physical device.
Reference: The VMware file system (VMFS) allows you to extend the size of datastores whenever needed, by creating datastore extents. Volumes that contain extended datastores are regarded as Datastore Extent LUNs.

Note: NAS file shares cannot be used as “Mapped Raw LUN”. Accordingly, for an NFS datastore, the Show All LUNs and Show Mapped Raw LUNs filtering are grayed out.

Viewing information in the LUN Details pane
Depending on the IBM storage system on which the volumes reside, the LUN Details pane displays information of any recognized volume that is selected on the volumes list (see Figure 48).

XIV-based volume details
XIV-based volumes have three different information views: Summary, Snapshots, and Mirroring. Click the view that you want to display.

- Summary view (see Figure 53 and Figure 54) –

![Figure 53. Summary view for a regular XIV-based volume](image)

![Figure 54. Summary view for an XIV-based snapshot volume](image)

- **LUN pie chart** – Graphic representation of the total capacity, used space (Orange), and free space (Yellow) in the selected volume. The pie chart is not displayed for snapshot volumes.

- **Volume Name** – Name of the volume. If the volume was created now and in this version, this is the name assigned by the VMware administrator. Otherwise, if the volume was created in the past or with an earlier version of VC plug-in, the name displayed is a generic name assigned by VMware.

- **Pool Name** – Name of the storage pool on which the volume was created.

- **Serial Number** – Serial ID number of the volume.
- **Consistency Group** – Indicates whether the volume belongs to a consistency group.
- **Number of Snapshots** – Number of snapshots (if any) that exist for this volume.
- **Last Snapshot** – Date and time at which the last snapshot was taken.
- **Mirroring** – Indicates whether any mirroring is defined for this volume. Mirroring information is not available for snapshot volumes (see Figure 54) or if you do not have storage admin permissions.

- Snapshots view (see Figure 55) –

  ![LUN Details](image)

  **Figure 55. Snapshots view for XIV-based snapshots**

  - **Name** – Unique name of the snapshot file.
  - **Created** – Date and time at which the snapshot file was created.
  - **Modified** – Indicates whether the snapshot has been modified since its creation.
  - **Serial Number** – Serial ID number of the snapshot.
  - **Snapshot Group** – Indicates whether the snapshot belongs to a snapshot group. If yes, the name of the group is displayed.

- Mirroring view (see Figure 56) –

  ![LUN Details](image)

  **Figure 56. Mirroring view for an XIV-based volume**

  **Note:** The Mirroring view is not available for snapshot volumes (see Figure 54).

  - **Name** – Name of the mirroring operation.
  - **Role** – Role of the mirroring operation.
  - **Link State** – Current state of the mirroring link.
  - **Status** – Current status of the mirroring operation.
  - **Remote Volume** – Name of the mirrored remote volume.
  - **Remote System** – Name of the remote storage system on which the mirrored volume resides.
Storwize V7000, Storwize V7000 Unified, or SVC-based volume details

Storwize, Storwize V7000 Unified, and SVC-based volumes have three different information views: **Summary**, **FlashCopy®**, and **Remote Copy**. Click the view that you want to display.

- **Summary view** (see **Figure 57**) –

  ![Figure 57. Summary view for a regular Storwize V7000, Storwize V7000 Unified, or SVC-based volume](image)

  - **LUN pie chart** – Graphic representation of the total capacity, used space (red), and free space (orange) in the selected volume. The pie chart is not displayed for snapshot volumes.
  - **Volume Name** – Name of the volume (given by the VMware administrator).
  - **Storage Pool** – Name of the storage pool on which the volume was created.
  - **Status** – Status of the volume, which may be one of the following:
    - **Online** – The volume was set online by an administrator, and no failures have occurred. Authorized hosts can access the volume.
    - **Offline** – The volume was set offline by an administrator, but no failures have occurred. Hosts cannot access the volume.
    - **Degraded** – I/O errors have been detected on a region of a physical disk in the disk drive.
  - **Remote Copy** – Name of the Remote Copy relationship group to which the volume belongs.
  - **Volume UID** – The volume's unique identification number (UID).
  - **Thin Provisioned** – Indicates whether the volume is thin-provisioned.
  - **FlashCopy® Name** – Name of the volume's FlashCopy® replica. If the volume has multiple FlashCopy replicas, "Many" is displayed instead of a particular name.

- **FlashCopy® view** (see **Figure 58**) –
Figure 58. FlashCopy® replicas of a Storwize V7000, Storwize V7000 Unified, or SVC-based volume

- **Name** – Name of the FlashCopy replica.
- **Consistency Group** – Name of the consistency group to which the FlashCopy replica belongs.
- **Status** – Current status of the FlashCopy replica: `idle_or_copied`, `preparing`, `prepared`, `copying`, `stopped`, `suspended`, or `stopping`. For more information about these statuses, refer to the [IBM Tivoli® Storage FlashCopy® Manager documentation](#).
- **Source Volume** – Name of the source volume on which the original copy is located.
- **Target Volume** – Name of the target volume on which the FlashCopy replica is located.

- Remote Copy view (see Figure 59) –

Figure 59. Remote Copy details of a Storwize V7000 or SVC-based volume

- **Name** – Name of the volume's remote copy.
- **Consistency Group** – Name of the consistency group to which the remote copy belongs.
- **Status** – Current status of the remote copy: `inconsistent_stopped`, `inconsistent_copying`, `consistent_stopped`, `consistent_synchronized`, `idling`, `idling_disconnected`, `inconsistent_disconnected`, or `consistent_disconnected`. For more information about these statuses, refer to the Storwize V7000, Storwize V7000 Unified, and SAN Volume Controller product documentation.
- **Master Volume** – Name of the master volume in the remote copy.
- **Auxiliary Volume** – Name of the auxiliary volume in the remote copy.
- **Master System** – Name of the storage system on which the master volume resides.
- **Auxiliary System** – Name of the storage system on which the auxiliary volume resides.
Viewing information in the File Share Details pane

Storwize V7000 Unified and SONAS storage systems can comprise an NAS File Share. File shares have two different information views: Summary and Snapshots. Click the view that you want to display.

- Summary view (see Figure 60) –

![Figure 60. Summary view for a NAS file share with quota](image)

**Note:** For a NAS file share without a quota, the legend of the pie chart shows Capacity, i.e. the total capacity of the file system, and Quota is disabled.

- NFS pie chart –
  - For a NAS file share with quota – A graphic representation of the quota, used space (red), and free space (orange) in the selected NAS file share.
  - For a NAS file share without a quota – A graphic representation of the total capacity of the file system, used space (red), and free space (orange) in the selected NAS file share.
- Path – Path to the NFS file system.
- File System – Name of the file system, set by the user.
- Used Inodes – Number of used inodes.
- Interface IPs – IP addresses of network interfaces used to provide NAS services.
- Snapshot – Date and time at which the last snapshot was taken.
- Data in use – Size of the NAS file share used.
- Quota – Maximum size of the file share, for a file share with a quota; disabled for a file share without a quota.
- Max Inodes – Maximum number available inodes.
- Snapshots view (see Figure 61) –
Figure 61. Snapshots view for a NAS file share

- **Snapshot ID** – Identification of the snapshot, which includes the date and time at which the snapshot was created.
- **Status** – Indicates whether the snapshot is valid.
- **Rule name** – Name of the rule, if applicable.
- **Used (meta data)** – Size of the snapshot meta data.
- **Used (data)** – Size of the snapshot data.
Managing storage volumes (LUNs)

After you have created volumes, you can manage the volumes as needed. Accordingly, this section describes the following tasks:

- Extending a volume
- Increasing datastore capacity on an extended volume
- Renaming a volume
- Moving a volume to another storage pool
- Mapping a storage volume to one or more ESX hosts
- Unmapping a storage volume from one or more hosts
- Setting Multipath Policy Enforcement for a storage volume
- Changing the multipath policy enforcement for a storage volume
- Disabling the multipath policy enforcement for a storage volume
- Deleting an unused storage volume

Note: You cannot manage volumes on storage arrays that are reported as "Unknown". Unknown is a generic array name, automatically given to any non-IBM storage system or to any IBM system that is not currently added (for more information, see Adding an IBM storage system).

Important: Before you begin managing volumes:

- You must have storage admin permissions on the relevant storage system.
- Check whether the volumes that you want to manage reside on attached storage pools.
- Check whether the volumes that you want to manage are used as Extent or RDM.

The Map, Unmap, and Delete options are not available for volumes that are used by a datastore as Extent or RDM.

Extending a volume

If enough free space is available on the storage pools, you can extend the size of an existing volume. Perform the following procedure to extend the size of a volume.

1. In one of the Inventory views, right-click the row of the volume that you want to extend, and then click Extend on the pop-up menu.
Figure 62. Clicking Extend on the pop-up menu

The Extend Volume dialog box is displayed.

2. In the **Volume Size** text box, enter the new size for the volume. Alternatively, place the mouse pointer on the graphic image of the storage pool, and then click and slide the space marker rightward to set the new volume size (marked in yellow). The numerical value in Volume Size is automatically updated accordingly.

![Extend XIV Volume dialog box](image)

Figure 63. Resize Volume dialog box – using the mouse pointer

**Note:**
- The data measurement unit for the XIV storage system volume size is **Gigabytes**; for the Storwize V7000, SVC, and Storwize V7000 Unified storage systems, the data measurement unit is **Gibibytes**.
- XIV-based volume sizes are automatically rounded to the next multiple of 17 GB.

3. Click **Extend**.
**Important:** Extending the size of a volume does not automatically increase the datastore capacity. For more information, see *Increasing datastore capacity on an extended volume*.

### Increasing datastore capacity on an extended volume

After you have extended the size of a volume (LUN), you can increase the capacity of any datastore that is stored on that volume.

Perform the following procedure to increase the size of a datastore.

1. Go to **Home → Inventory → Datastores**.
2. Click the datastore that you want to extend, click the **Configuration** tab, and then click **Properties**.

![Datastore Properties dialog box](image)

**Figure 64. Datastore Configuration tab – Properties button**

The datastore Properties dialog box is displayed.
3. Click **Increase**. The Increase Datastore Capacity wizard is displayed.

4. Select the volume (referred to as Extent Device by vSphere) that you have resized, click **Next**, and then complete the remaining steps of the Increase Datastore Capacity wizard.
Figure 66. Selecting the extended volume for the datastore size increase

Note: When selecting the resized volume (Extent Device), a notification below the table indicates that the datastore already has an extent on that volume.

Renaming a volume
Whenever required, you can rename any existing volume by performing the following procedure.

Note: Renaming a volume is a logical action that does not have any physical effect on the volume or its logical connections. In vCenter plug-in v3.0, renaming a volume also changes its display name in VMware.

1. In one of the Inventory views, right-click the row of the volume that you want to rename, and then click Rename on the pop-up menu.
Figure 67. Clicking Rename on the pop-up menu to rename the volume

The Rename Volume dialog box is displayed.

2. In New Name, enter the new name that you want to assign to the volume.

3. Click Rename. The new Volume Name is updated in the LUN Details pane.

Moving a volume to another storage pool

If you want to move a volume to a different storage pool (for example, when the current storage pool has run out of space), perform the following procedure.

Attention:

- On XIV storage systems, moving a volume to another storage pool is a logical action. No data is actually moved on physical disks as a result.
- On Storwize V7000, Storwize V7000 Unified, and SVC storage systems, moving a volume to another storage pool is a physical action that causes data to move to a different physical disk. This may cause some performance overhead.
- On Storwize V7000, Storwize V7000 Unified, and SVC storage systems, moving a volume to another storage pool is an asynchronous action. The capacity of the source and target storage pools may not be updated after the task is completed in vCenter.

1. In one of the Inventory views, right-click the row of the volume that you want to move, and then click Move on the pop-up menu.
Chapter 6. Creating, viewing, and managing volumes or file shares

Figure 68. Clicking Move on the pop-up menu to move the volume to another pool

The Move Volume dialog box is displayed.

2. In the New Storage Pool drop-down list, select the storage pool to which you want to move the volume, and then click Move. The new storage pool location is updated in the LUN Details pane.

Mapping a storage volume to one or more ESX hosts

Only volumes that are mapped to one or more ESX hosts can be used for creating datastores. Without the volume mapping operation, datastores cannot be created (for more information, see Creating VMware datastores in storage volumes).

Important: You can map volumes only to ESX hosts that were predefined on the storage system. Accordingly, contact your storage administrator if the mapping option is not available on your vSphere client.

Perform the following procedure to map a storage volume to ESX hosts.

1. Access the view under View: Unused LUNs/File Shares (see Viewing unused volumes).

2. Right-click the volume that you want to map, and then click Map on the pop-up menu. The Map LUN to Hosts dialog box is displayed.
3. Select the hosts or clusters to which you want to map the volume, and then click **Map**.

**Important:**
- Although possible, avoid mapping the same volume (LUN) to multiple hosts.
- Grayed-out hosts are either already mapped or not defined on the storage system, and therefore cannot be selected. Hosts that are disconnected or not responding are also grayed-out.

### Unmapping a storage volume from one or more hosts

When volumes or ESX hosts are no longer needed, or if new ones are to replace the current ones, you can unmap volumes from the hosts.

**Important:**
- A volume (LUN) must remain mapped to at least one host. Otherwise, you cannot view the volume or perform any actions on it from the plug-in.
- If you no longer require a LUN for any host, delete the volume (see *Deleting an unused storage volume*).

Perform the following procedure to unmap a volume.

1. In one of the Inventory views, right-click the row of the volume that you want to unmap, and then click **Unmap** on the pop-up menu. The Remove LUN Mapping dialog box is displayed.
2. Select the hosts or clusters from which you want to unmap the volume, and then click **Unmap**.

**Note:** ESX hosts that are disconnected or not responding are grayed-out and cannot be selected.

**Setting Multipath Policy Enforcement for a storage volume**

By default, multipath policy is not enforced. This section describes how to set multipath policy enforcement for a single volume.

**Note:** You can also set multipath policy enforcement for a storage system. For a general explanation on multipath policy enforcement and on how to set it at the storage system level, see **Setting multipath policy enforcement**.

Perform the following procedure to set multipath policy enforcement for a volume.

1. In one of the Inventory views, right-click the row of the volume for which you want to set a policy, and then click **Set Multipath Policy Enforcement** on the pop-up menu.

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*Figure 70. Remove LUN Mapping dialog box*
Figure 71. Clicking Set Multipath Policy Enforcement on the pop-up menu

The Multipath Policy dialog box is displayed.

Figure 72. Setting Multipath Policy Enforcement on a volume

2. Select the Set Multipath Policy Enforcement option, and from the drop-down list that appears, select the required policy.

3. Click Set to apply the policy.

**Important:** After the policy is set, the management console service enforces this policy by overriding any existing policy for this volume. This means that if the policy was previously modified from outside the management console user interface, the policy is enforced back to what you have specified from the management console GUI.

**Changing the multipath policy enforcement for a storage volume**

For a volume that already has multipath policy enforcement, you can change the policy that is to be enforced on it.

Perform the following procedure to change the multipath policy.

1. In the Multipath Policy dialog box (see Figure 72), select a different policy from the drop-down list under Set Multipath Policy Enforcement.
2. Click Set.

**Disabling the multipath policy enforcement for a storage volume**

You can disable multipath policy enforcement so that a policy is not enforced on a volume.

**Note:** Disabling multipath policy enforcement does not modify the policy in any way.

Perform the following procedure to disable multipath policy enforcement on a volume.

1. In the Multipath Policy dialog box (see Figure 72), select **Disable Multipath Policy Enforcement**.

2. Click Set.

**Deleting an unused storage volume**

When a storage volume is unused (see **Viewing unused volumes and file shares**) and no longer required, you can delete it.

**Attention:** You cannot delete volumes that are currently used by datastores.

Perform the following procedure to delete an unused volume (LUN).

1. On the Unused LUNs/File Shares list, right-click the row of the volume that you want to delete, and then select **Delete** from the pop-up menu.

2. Click **Delete** to confirm the deletion, or **Cancel** to exit without deleting the volume.
Managing file shares

After you have created file shares, you can manage the file shares as needed. Accordingly, this section describes the following tasks:

- Setting a quota for a file share
- Disabling the quota of a file share
- Exporting a NAS file share to hosts
- Removing a NAS file share from hosts
- Deleting an unused file share

**Note:** You cannot manage file shares on storage arrays that are reported as "Unknown". Unknown is a generic array name, automatically given to any non-IBM storage system or to any IBM system that is not currently added (for more information, see *Adding an IBM storage system*).

**Important:** Before you begin managing file shares:

- You must have **Admin**, **StorageAdmin+ExportAdmin**, or **SecurityAdmin** permissions on the relevant storage system.
- Check whether the file shares that you want to manage reside on attached file systems.

Setting a quota for a file share

You can set an upper limit for the disk space that can be allocated to a file share, by setting a quota for the file share. Setting a quota allocates limited available disk space in a reasonable way, so that a single file share does not use up all the space of a file system, but only uses up to the amount of space set in the quota. It is especially important to set a quota for file shares of lesser importance, to ensure that important file shares have sufficient space.

Perform the following procedure to set or change the file share quota.

1. In one of the Inventory views, right-click the row of the file share for which you want to set a quota, and then click **Set Quota** on the pop-up menu.

   ![Figure 74. Clicking Set Quota on the pop-up menu](image)

   The Set Quota dialog box is displayed.

2. Select the **Set Quota** option.
3. In the **New Quota** text box, enter the new quota for the file share. Alternatively, place the mouse pointer on the graphic image of the file share, and then click and slide the space marker **rightward** to set the new quota (marked in yellow). The numerical value in New Quota is automatically updated accordingly.

![Set Quota dialog box](image)

*Figure 75. Set Quota dialog box*

4. Click **Finish**.

**Disabling the quota of a file share**

Whenever required, you can disable the quota of a file share.

Perform the following procedure to disable the file share quota.

1. In one of the Inventory views, right-click the row of the file share for which you want to disable a quota, and then click **Set Quota** on the pop-up menu (see *Figure 74*).

   The Set Quota dialog box is displayed (see *Figure 75*).

2. Clear the **Set Quota** option.

3. Click **Finish**.

**Exporting a NAS file share to hosts**

You can change the NFS client of any file share by exporting. If the file share belongs to a datastore, this allows the datastore to be shared with more hosts.

You can only select hosts that are not currently being exported to. Multiple hosts can be selected.

*Important:* You can export only to ESX hosts that were connected to vCenter server.
Perform the following procedure to export an NAS file share to hosts.

1. In one of the Inventory views, right-click the row of the file share which you want to export, and then click **Export** on the pop-up menu.

![Figure 76. Clicking Export on the pop-up menu](image)

The Export File Share to Host(s) dialog box is displayed.

![Figure 77. Export NAS file share to hosts dialog box](image)

2. Select the hosts to which you want to export the NAS file share, and then click **Export**.

**Note:** Grayed-out hosts are already exported, and therefore cannot be selected. Hosts that are disconnected or not responding are also grayed-out.
Removing a NAS file share from hosts
When a file share or ESX hosts are no longer needed, or if new ones are to replace the current ones, you can remove the hosts from the NAS file share exporting.

***Important:*** You can remove an NAS file share from hosts, provided that the file share is not being used in any datastore.

Perform the following procedure to remove the hosts from the NAS file share exporting.

1. In one of the Inventory views, right-click the row of the NAS file share from which you want to remove hosts, and then click **Remove Export** on the pop-up menu. The Remove File Share Export from Host(s) dialog box is displayed.

   ![Figure 78. Remove export of NAS file share to hosts dialog box](image)

2. Select the hosts which you want to remove from the NAS file share exporting, and then click **Remove**.

   ***Note:*** ESX hosts that are disconnected or not responding are grayed-out and cannot be selected.

Deleting an unused file share
When a file share is unused (see *Viewing unused volumes and file shares*) and no longer required, you can delete it. Deleting the file share deletes all data in the file directory, and all of its snapshot(s).

***Attention:*** You cannot delete file shares that are currently used by datastores.

Perform the following procedure to delete an unused file share.
1. On the **Unused LUNs/File Shares** list, right-click the row of the file share that you want to delete, and then select **Delete** from the pop-up menu.

![File Share Details](image)

*Figure 79. Clicking Delete on the pop-up menu*

The File Share Delete Confirmation dialog box is displayed.

2. Click **Delete** to confirm the deletion, or **Cancel** to exit without deleting the file share.
Chapter 7. Using volumes or file shares for datastores

The following sections briefly describe how to create VMware datastores on IBM storage volumes or file shares, and how to create a virtual machine that uses a datastore on an IBM storage system:

- Creating VMware datastores in storage volumes
- Creating VMware datastores in file shares
- Creating a virtual machine and connecting it to a datastore

Reference to existing VMware documentation:
VMware already provides documentation for the standard datastore and VM creation operations described in this chapter. For more detailed information about basic and advanced vSphere operations, visit the VMware Documentation website:
http://www.vmware.com/support/pubs

Creating VMware datastores in storage volumes
When the storage volumes that you have created are ready for use by datastores, you can start assigning the volumes to the new datastores that you create.

Use the vSphere Add Storage wizard to create datastores on storage volumes that you have created (for more information, see Creating a new storage volume (LUN)).

Note: The following procedure applies to VMware vCenter version 4.0 or 4.1.
For vCenter version 5.0 or later, refer to the VMware documentation (see Publications and related information).

1. Start the vSphere Add Storage wizard.
2. On the Select Host panel, select the ESX host to which storage volumes are mapped, and then click Next.
Figure 80. Add Storage wizard – Select Host panel

The Select Storage Type panel is displayed.
3. Select Disk/LUN, and then click Next. The Select Disk/LUN panel is displayed.

4. From the list of available volumes (LUNs), select the volume on which you want to create the datastore, and then click Next.
Figure 82. Add Storage wizard – Select Disk/LUN panel

The Current Disk Layout panel is displayed.

Figure 83. Add Storage wizard – Current Disk Layout panel
5. Click **Next**. The Properties panel is displayed.

6. Enter the name of the datastore that you want to create, and then click **Next**.

![Figure 84. Add Storage wizard – Entering a datastore name](image)

The 'Disk/LUN – Formatting' panel is displayed.

![Figure 85. Add Storage wizard – 'Disk/LUN – Formatting' panel](image)

7. From the drop-down list, select the maximum file size for the datastore, and specify any maximum capacity that you want to enforce on the datastore. Then, click **Next**.
The Ready to Complete panel is displayed.

8. Click Finish. The new datastore is now created on the volume that you selected (in step 4 of this procedure).

Creating VMware datastores in file shares

*Note:* This section is relevant to Storwize V7000 Unified and SONAS only.

When the file shares that you have created are ready for use by datastores, you can start assigning the file shares to the new datastores that you create.

Use the vSphere Add Storage wizard to create datastores on file shares that you have created (for more information, see Creating a new file share).

*Note:* The following procedure applies to VMware vCenter version 4.0 or 4.1. For vCenter version 5.0 or later, refer to the VMware documentation (see Publications and related information).

1. Start the vSphere Add Storage wizard.

2. On the Select Host panel, select the ESX host to which file shares have been exported, and then click Next.

Figure 86. Add Storage wizard – Select Host panel
The Select Storage Type panel is displayed.

![Select Storage Type panel](image)

**Figure 87. Add Storage wizard – Select Storage Type panel**

3. Select **Network File System**, and then click **Next**. The Locate Network File System panel is displayed.
Figure 88. Add Storage wizard – Entering a datastore name

4. Enter the information required to locate the network file system – **Server** and **Folder**, from the File Share Details panel.

   - In **Server**, enter any of the interface IPs of the file share.
   - In **Folder**, enter the path of your file share.

Figure 89. Folder and Server Information for locating network file system
5. In **Datastore Name**, enter the name of the datastore that you want to create, and then click **Next**. The Ready to Complete panel is displayed.

6. Click **Finish**. The new datastore is now created on the file share that you selected (in step 4 of this procedure).

**Creating a virtual machine and connecting it to a datastore**

After you have created the required datastores, you can assign each datastore to a virtual machine. Use the **Create New Virtual Machine** wizard to create virtual machines and select the datastores for these virtual machines.

**Note:** The following procedure applies to VMware vCenter version 4.0 or 4.1.

For vCenter version 5.0 or later, and for more detailed information about virtual machine creation, refer to the VMware documentation (see *Publications and related information*).

1. Start the vSphere Create New Virtual Machine wizard.

2. On the **Datastore** panel, select the datastore in which to store the virtual machine files, and then click **Next**.

   ![Create New Virtual Machine wizard – Datastore selection panel](image)

   **Figure 90. Create New Virtual Machine wizard – Datastore selection panel**

   The Create a Disk panel is displayed.
3. Specify the **Virtual disk size**, select the provisioning policy, and then click **Next**. The Ready to Complete panel is displayed.

4. Click **Finish**. The new virtual machine is now created on the datastore that you selected (in step 2 of this procedure).
Chapter 8.  Monitoring and troubleshooting

This chapter describes:

- Monitoring the status of recent tasks and triggered alarms
- Viewing the log file
- Event messages in vSphere
- Event messages in Windows Server
- Resolving miscellaneous issues

Monitoring the status of recent tasks and triggered alarms

As you work with the IBM Storage Management Console for VMware vCenter, use the vSphere Recent Tasks and Triggered Alarms monitoring panels to detect any possible error or malfunction in the storage usage.

![Figure 92. vSphere Recent Tasks monitoring panel](image)

![Figure 93. vSphere Triggered Alarms monitoring panel](image)

For more information about the different messages that may be displayed in the monitoring panels, see Event messages in vSphere.

In addition, any event related to IBM storage processes or components appears in the Windows Application log (on the vCenter server), available through Server Manager ➔ Diagnostics ➔ Windows Logs ➔ Application.
For more information about the different message types and IDs, see Event messages in Windows Server.

Viewing the log file
The IBM Storage Management Console log file is located at:
c:\windows\temp\ibm_console_for_vcenter.log
You can view the contents of the file in any plain-text viewer or editor such as Notepad.

Note: When the log file reaches a size of 4.76 MB, a new log file is created and named with a sequential number: ibm_console_for_vcenter.log.1, ibm_console_for_vcenter.log.2, and so on.

Event messages in vSphere
This section summarizes the different event types that may be displayed on the vSphere client, including:

- vSphere information event messages
- vSphere warning event messages
- vSphere error event messages

Note:
- The events also appear in the Event list of the vCenter server. The list is accessible from the vSphere client.
- In the following tables (Table 4 to Table 7), "<>" stands for a dynamic content parameter that changes based on the context in which it appears.
vSphere information event messages

Information event messages are non-critical messages that notify you about the different performed operations. The following table summarizes the information event messages that the IBM Storage Management Console may generate and display in the vSphere monitoring panels (see Figure 92 and Figure 93).

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

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>Multipath policy for LUN &lt;&gt; has been modified from &lt;&gt; to &lt;&gt;</td>
<td>Indicates that the multipath policy of this LUN has been set</td>
</tr>
<tr>
<td>402</td>
<td>&lt;&gt; has been created</td>
<td>Indicates that a specific LUN was created</td>
</tr>
<tr>
<td>403</td>
<td>&lt;&gt; has been deleted</td>
<td>Indicates that a specific LUN was deleted</td>
</tr>
<tr>
<td>404</td>
<td>&lt;&gt; has been renamed to &lt;&gt;</td>
<td>Indicates that a specific LUN was renamed</td>
</tr>
<tr>
<td>405</td>
<td>&lt;&gt; has been resized, new size is &lt;&gt;</td>
<td>Indicates that a specific LUN was resized</td>
</tr>
<tr>
<td>406</td>
<td>&lt;&gt; has been relocated in the storage system, details: &lt;&gt;</td>
<td>Indicates that a specific LUN was relocated within the storage system</td>
</tr>
<tr>
<td>407</td>
<td>&lt;&gt; has been mapped to hosts: &lt;&gt;</td>
<td>Indicates that a specific LUN was mapped to a host</td>
</tr>
<tr>
<td>408</td>
<td>&lt;&gt; has been unmapped from hosts: &lt;&gt;</td>
<td>Indicates that a specific LUN was unmapped from a host</td>
</tr>
<tr>
<td>409</td>
<td>&lt;&gt; has been resized, expanded by &lt;&gt; GB</td>
<td>Indicates that a specific LUN was expanded</td>
</tr>
<tr>
<td>410</td>
<td>&lt;&gt; has been created</td>
<td>Indicates that a specific file share has been created</td>
</tr>
<tr>
<td>411</td>
<td>&lt;&gt; has been added export to hosts: &lt;&gt;</td>
<td>Indicates that a specific file share export has been added to specific host(s)</td>
</tr>
<tr>
<td>412</td>
<td>&lt;&gt; has been removed export from hosts: &lt;&gt;</td>
<td>Indicates that a specific file share export has been removed from specific host(s)</td>
</tr>
<tr>
<td>413</td>
<td>&lt;&gt; has been set quota</td>
<td>Indicates that a specific file share's quota has been set</td>
</tr>
<tr>
<td>414</td>
<td>&lt;&gt; has been deleted</td>
<td>Indicates that a specific file share has been deleted</td>
</tr>
</tbody>
</table>
vSphere warning event messages

Warning messages bring to your attention any condition that may result in an error or malfunction. The following table summarizes the warning event messages that the IBM Storage Management Console may generate and display in the vSphere monitoring panels (see Figure 92 and Figure 93).

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

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>431</td>
<td>Datastore Extent &lt;&gt; is inaccessible</td>
<td>This datastore extent cannot be probed. It might indicate that your host information is not updated. Rescan the host and refresh host information, and then click the Update link in the IBM Storage tab.</td>
</tr>
<tr>
<td>432</td>
<td>Virtual Machine &lt;&gt; has a Raw Mapping LUN filename &lt;&gt; with no matching LUN</td>
<td>Information could not be retrieved regarding a Raw mapped LUN. Click the Update link in the IBM Storage tab.</td>
</tr>
<tr>
<td>433</td>
<td>VPD information could not be found for LUN. Run the Rescan operation to fix this problem.</td>
<td>It might indicate that your host information is not updated. Rescan the host and refresh host information, and then click the Update link in the IBM Storage tab.</td>
</tr>
<tr>
<td>434</td>
<td>Storage Pool &lt;&gt;, which is attached to vCenter, has been deleted from Storage Array &lt;&gt;</td>
<td>The storage pool which is attached has been deleted from the storage. Contact the Storage administrator and either detach the storage pool or recreate it using the storage GUI.</td>
</tr>
<tr>
<td>435</td>
<td>Cannot retrieve Virtual Disk attributes for virtual machine &lt;&gt;. It may be inaccessible. Run the Rescan operation to fix this problem.</td>
<td>It might indicate that your host information is not updated. Rescan the host and refresh host information, and then click the Update link in the IBM Storage tab.</td>
</tr>
<tr>
<td>436</td>
<td>Path selection policy was not configured for volume &lt;&gt;. Use the LUN menu to configure a default path selection option for this volume.</td>
<td>Indicates that a multipath policy was not set for this volume.</td>
</tr>
</tbody>
</table>
ID | Message | Description
---|---|---
437 | File System <>, which is attached to vCenter, has been deleted from Storage Array <>. Please work with the Storage Administrator to resolve this issue. Either recreate the File System in the Storage Array or detach it from vCenter. | Indicates that the file system which is attached to vCenter has been deleted from the storage. Contact the Storage Administrator and either detach the file system or recreate it using the storage GUI.

vSphere error event messages

Error event messages are critical messages regarding errors or malfunctions that have occurred. The following table summarizes the error event messages that the IBM Storage Management Console may generate and display in the vSphere monitoring panels (see Figure 92 and Figure 93).

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

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>461</td>
<td>A general error has occurred: &lt;&gt;</td>
<td>Describes a general error that has occurred</td>
</tr>
<tr>
<td>462</td>
<td>Error while setting Multipath policy for &lt;&gt;: &lt;&gt;.</td>
<td>Describes an error that has occurred during a multipath policy setting</td>
</tr>
<tr>
<td>463</td>
<td>Failed while adding LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN addition failure</td>
</tr>
<tr>
<td>464</td>
<td>Failed while deleting LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN deletion failure</td>
</tr>
<tr>
<td>465</td>
<td>Failed while extending LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN extent failure</td>
</tr>
<tr>
<td>466</td>
<td>Failed while moving LUN to another storage pool on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN move failure</td>
</tr>
<tr>
<td>467</td>
<td>Failed while mapping LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN mapping failure</td>
</tr>
<tr>
<td>468</td>
<td>Failed while unmapping LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN unmapping failure</td>
</tr>
<tr>
<td>469</td>
<td>Failed while renaming LUN on storage array &lt;&gt;: &lt;&gt;</td>
<td>LUN rename failure</td>
</tr>
<tr>
<td>470</td>
<td>Failed while trying to connect to storage array &lt;&gt;. Reason: &lt;&gt;</td>
<td>Describes an error which occurred while trying to connect to a storage array</td>
</tr>
<tr>
<td>471</td>
<td>Failed while creating File Share on storage array &lt;&gt;: &lt;&gt;</td>
<td>File Share create failure</td>
</tr>
<tr>
<td>ID</td>
<td>Message</td>
<td>Description</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>472</td>
<td>Failed while adding Export to File Share on storage array &lt;&gt;: &lt;&gt;</td>
<td>File Share add export failure</td>
</tr>
<tr>
<td>473</td>
<td>Failed while removing Export to File Share on storage array &lt;&gt;: &lt;&gt;</td>
<td>File Share remove export failure</td>
</tr>
<tr>
<td>474</td>
<td>Failed while setting Quota to File Share on storage array &lt;&gt;: &lt;&gt;</td>
<td>File Share set quota failure</td>
</tr>
<tr>
<td>475</td>
<td>Failed while deleting File Share on storage array &lt;&gt;: &lt;&gt;</td>
<td>File Share deletion failure</td>
</tr>
</tbody>
</table>

### Event messages in Windows Server

The IBM Storage Management Console for VMware vCenter generates event messages in the Windows Server application event log (located on the vCenter server), including:

- Windows information event messages
- Windows warning event messages
- Windows error event messages

#### Windows information event messages

Information event messages are non-critical messages that notify you about the different performed operations. The following table summarizes the information event messages that the IBM Storage Management Console may generate and display in the Windows Server application event log (see Figure 94).

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

**Table 7. Windows information event messages**

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Service has started</td>
<td>IBM Storage plug-in service has started.</td>
</tr>
<tr>
<td>302</td>
<td>Service has stopped</td>
<td>IBM Storage plug-in service has stopped.</td>
</tr>
<tr>
<td>303</td>
<td>Service is stopping</td>
<td>Plug-in service is in the process of stopping.</td>
</tr>
<tr>
<td>304</td>
<td>Initializing cache maintainer</td>
<td>Cache maintainer initialization has started.</td>
</tr>
<tr>
<td>305</td>
<td>Cache maintainer has been initialized</td>
<td>Cache maintainer initialization has been completed.</td>
</tr>
<tr>
<td>306</td>
<td>Running cache maintainer</td>
<td>Cache maintainer is currently running.</td>
</tr>
</tbody>
</table>
Windows warning event messages

Warning messages bring to your attention any condition that may result in an error or malfunction. The following table summarizes the warning event messages that the IBM Storage Management Console may generate and display in the Windows Server application event log (see Figure 94).

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

### Table 8. Windows warning event messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>331</td>
<td>Cache manager did not find any volume that matches extent &lt;&gt;. Please check your VMware environment for inaccessible datastore LUNs.</td>
<td>Volume not found</td>
</tr>
<tr>
<td>332</td>
<td>Datastore &lt;&gt; is of type &lt;&gt;, which is unsupported. Please notify IBM support.</td>
<td>Unsupported datastore type</td>
</tr>
<tr>
<td>333</td>
<td>Cache manager did not find any volume for Raw Mapping LUN with filename &lt;&gt;, which belongs to VM &lt;&gt;.</td>
<td>Volume has not been found by cache manager.</td>
</tr>
<tr>
<td>334</td>
<td>Cache manager reported an error that might be temporary: &lt;&gt;</td>
<td>Temporary cache problem</td>
</tr>
<tr>
<td>335</td>
<td>Cache manager found a storage volume but cannot access its properties. Volume serial = &lt;&gt; The 'Rescan' operation from the host configuration tab may resolve this problem.</td>
<td>Storage volume cannot be accessed.</td>
</tr>
<tr>
<td>336</td>
<td>Timeout occurred while waiting for Cache update. It appears that multiple updates to the Cache were initiated and did not finish within the timeout. If this persists, please notify IBM support.</td>
<td>Cache timeout problem</td>
</tr>
<tr>
<td>ID</td>
<td>Message</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>337</td>
<td>Cache manager failed to connect to IBM storage system &lt;&gt;. Reason: &lt;&gt;</td>
<td>Connection failure due to a specified reason</td>
</tr>
<tr>
<td></td>
<td>Update the system properties using the IBM Storage link.</td>
<td></td>
</tr>
<tr>
<td>339</td>
<td>Storage Pool &lt;&gt;, which is attached to vCenter, has been removed from Storage Array &lt;&gt;. Please work with the storage administrator to resolve this issue. Either recreate the storage pool in the storage array or detach it from vCenter.</td>
<td>Storage pool is not attached.</td>
</tr>
<tr>
<td>340</td>
<td>Failed to match host HBA to a SCSI LUN topology. Searching interface adapter &lt;&gt; for host ID &lt;&gt;.</td>
<td>HBA does not match the SCSI LUN topology.</td>
</tr>
<tr>
<td>341</td>
<td>Cannot retrieve virtual disk attributes for virtual machine &lt;&gt;. It may be inaccessible.</td>
<td>Virtual disk attributes are not available.</td>
</tr>
<tr>
<td>342</td>
<td>Failed to keep registry keys during uninstallation. If you are upgrading, registry keys will be overridden by the defaults.</td>
<td>Failed to keep registry values</td>
</tr>
<tr>
<td>343</td>
<td>Failed to restore registry keys during uninstallation. If you are upgrading, registry keys will be overridden by the defaults.</td>
<td>Failed to restore registry values</td>
</tr>
<tr>
<td>344</td>
<td>Failed to keep SSH keys during unconfigure. If you are upgrading, you must provide the SSH keys for SVC / Storwize V7000 again.</td>
<td>Failed to keep SSH keys</td>
</tr>
<tr>
<td>345</td>
<td>Failed to restore SSH keys from the backup. If you are upgrading, you must provide the SSH keys for SVC / Storwize V7000 again.</td>
<td>Failed to restore SSH keys</td>
</tr>
<tr>
<td>346</td>
<td>The cache manager found more than one LUN that matches SCSI LUN &lt;&gt;. Topology information is not available for this LUN. To resolve this problem, perform rescanning for host: &lt;&gt;.</td>
<td>Duplicate volumes</td>
</tr>
<tr>
<td>347</td>
<td>Cache manager found a file share but cannot access its properties. File share path = &lt;&gt;. The 'Rescan' operation from Host configuration tab might fix this problem.</td>
<td>Unrecognized file share</td>
</tr>
<tr>
<td>348</td>
<td>File System &lt;&gt;, which is attached to vCenter, has been deleted from Storage Array &lt;&gt;. Please work with the Storage Administrator to resolve this issue. Either recreate the File System in the Storage Array or detach it from vCenter.</td>
<td>File System has been deleted.</td>
</tr>
</tbody>
</table>
Windows error event messages

Error event messages are critical messages regarding errors or malfunctions that have occurred. The following table summarizes the error event messages that the IBM Storage Management Console may generate and display in the Windows Server application event log (see Figure 94).

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

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>349</td>
<td>Rescan operation for host &lt;&gt; has reached timeout of &lt;&gt;. This may result in incomplete operation depending on the rescan results.</td>
<td>Rescan host has reached timeout.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 9. Windows error event messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>361</td>
<td>An error has occurred while updating the cache: &lt;&gt;</td>
<td>Cache error</td>
</tr>
<tr>
<td>362</td>
<td>The IBM Storage Management Console failed to unregister from vCenter server with message: &lt;&gt;. You can remove the plug-in manually using the extension manager address: <a href="https://vc.server.dns.name/mob">https://vc.server.dns.name/mob</a></td>
<td>Plug-in removal failure</td>
</tr>
<tr>
<td>363</td>
<td>The IBM Storage Management Console failed to remove the service with message: &lt;&gt;</td>
<td>Service removal failure</td>
</tr>
<tr>
<td>364</td>
<td>The IBM Storage Management Console failed to register plug-in with message: &lt;&gt;</td>
<td>Plug-in registration failure</td>
</tr>
<tr>
<td>365</td>
<td>The IBM Storage Management Console failed to login to the vCenter Server with current credentials. Please run the Configuration Wizard in order to change username and password.</td>
<td>Login failure due to credentials</td>
</tr>
<tr>
<td>366</td>
<td>The IBM Storage Management Console failed to set multipath policy for &lt;&gt;: &lt;&gt;</td>
<td>Multipath setting failure</td>
</tr>
<tr>
<td>367</td>
<td>The IBM Storage Management Console failed in LUN operation: &lt;&gt;</td>
<td>LUN operation failure</td>
</tr>
<tr>
<td>368</td>
<td>The IBM Storage Management Console failed while trying to use keyring: &lt;&gt;</td>
<td>Keyring error</td>
</tr>
<tr>
<td>369</td>
<td>IBM Storage Management Console for VMware vCenter failed in File Share operation: &lt;&gt;</td>
<td>File Share operation error</td>
</tr>
</tbody>
</table>
Resolving miscellaneous issues

For up-to-date information about known issues and possible workarounds, refer to the latest release notes of the IBM Storage Management Console for VMware vCenter (see *Publications and related information*).
Chapter 9. Best practices

This chapter provides general guidance and best practices that you should apply when:

- Handling datastores
- Handling ESX hosts

Handling datastores

For best performance of VMware datastores:

- Create each datastore on a separate storage volume.
- If you use snapshots/mirroring for volumes, place all Datastore Extents volumes (the building block LUNs of a datastore) in a consistency group (defined by using the storage system GUI or CLI).

Handling ESX hosts

For the best performance of ESX hosts that use XIV-based volumes, define all ESX hosts within a cluster as cluster hosts on the IBM XIV storage system as well.

Following this practice prevents situations in which a storage volume is mapped to different ESX hosts in a cluster using different LUN numbers, thus making this LUN unusable.
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