Note: Before using this document and the products it supports, read the information in “Legal notices” on page 63.

This publication applies to version 2.5.0 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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<td>Copyright license</td>
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<tr>
<td>Trademarks</td>
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</tbody>
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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, Version 2.5.0 – Release Notes, available under Publications on the IBM XIV Storage System Information Center:
  

- IBM Storwize V7000 Information Center:
  

- IBM SAN Volume Controller (SVC) Information Center:
  

- VMware vCenter Server Performance and Best Practices:
  

- Performance Best Practices for VMware vSphere 4.1:
  

- VMware Technical Resources:
  
  [http://www.vmware.com/technical-resources](http://www.vmware.com/technical-resources)
• VMware ESXi and ESX Info Center:
• VMware knowledgebase:
  http://kb.vmware.com
• Microsoft TechNet website for Windows Server:
• Microsoft Windows Server TechCenter:

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

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- Send your comments by email to starpubs@us.ibm.com. Be sure to include the following information:
  - Exact publication title and version
  - Publication number (for example: GA32-0929-02)
  - 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 into the VMware vCenter Server platform and enables VMware administrators to independently manage their storage resources on the following IBM storage systems:

- IBM XIV® Storage System
- IBM Storwize® V7000
- IBM System Storage® SAN Volume Controller (SVC)

After a connection is established, administrators can self-provision volumes (LUNs) in selected predefined storage pools. These volumes are mapped to ESX hosts, clusters, or datacenters as logical drives that can be used for storing data of VMware datastores.

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 features and 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.
- Full control over storage volumes, including volume creation, resizing, renaming, migration to a different storage pool, mapping, unmapping, and deletion.
- Easy and integrated allocation of volumes 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 in which the volumes are created.
Note: The IBM Storage Management Console for VMware vCenter can use predefined storage pools only. New storage pools cannot be created with the IBM Storage Management Console.

Chapter 2. Installation
This chapter describes:

- Compatibility and requirements
- First-time installation vs. upgrade
- Running the installation wizard

Compatibility and requirements
This section specifies the compatibility and requirements of version 2.5.0 of the IBM Storage Management Console for VMware vCenter.

Refer to the following subsections for more specific details:
• Supported operating systems
• Supported storage systems
• Required server software
• Required client software

**Supported operating systems**
The IBM Storage Management Console for VMware vCenter is compatible with different versions of Microsoft® Windows Server®, as detailed in the following table.

*Table 1. Supported operating systems*

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Architecture</th>
<th>Compatibility note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows Server 2003</td>
<td>x86, x64</td>
<td>Tested with Service Pack 2</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008</td>
<td>x86, x64</td>
<td>Tested with Service Pack 2</td>
</tr>
<tr>
<td>Microsoft Windows Server 2008 R2</td>
<td>x64</td>
<td>Tested without and with Service Pack 1</td>
</tr>
</tbody>
</table>

**Supported storage systems**
The IBM Storage Management Console for VMware vCenter supports three different IBM storage products, as listed in the following table.

*Table 2. Supported storage systems*

<table>
<thead>
<tr>
<th>Storage system</th>
<th>Microcode version</th>
<th>Compatibility note</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM XIV Storage System</td>
<td>10.1.0 – 10.2.4x</td>
<td>N/A</td>
</tr>
<tr>
<td>IBM Storwize V7000</td>
<td>6.1</td>
<td>N/A</td>
</tr>
<tr>
<td>IBM SAN Volume Controller (SVC)</td>
<td>5.1, 6.1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Required server software**
Prior to installing the IBM Storage Management Console, VMware vCenter 4.x (4.0, 4.1) must be installed on the host server (Windows Server).

**Required client software**
The following software must be installed on the administrator client host:

• VMware vSphere Client 4.x (4.0, 4.1)
• Microsoft Internet Explorer 7.0 or later (currently, other browsers are not supported).
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 (version 1.0.0, 1.0.1, 2.0.0), 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 the uninstallation, the existing database is not removed and kept for use by the new software version.

Note: After you upgrade the IBM Storage Management Console for VMware vCenter, the upgrade takes effect only after you close and run the VMware vSphere client software again.

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-2.5.0-x86.exe
   - On x64 architectures, run: 
     IBM_Storage_Management_Console_for_VMware_vCenter-2.5.0-x64.exe

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

   ![Language selection dialog box](image)

   Figure 2. Language selection dialog box

   Note: The language selection affects only the texts that are displayed on the installation wizard, including the language used in the IBM license agreement. Other than that, the configuration wizard and GUI of the IBM Storage Management Console for VMware vCenter are available in English only.

3. If not previously installed on this Windows Server station, the IBM Storage Solutions External Runtime Components (previously code-named "XPyV") installation wizard starts automatically. In such a case, click Next, accept the IBM license agreement, and click Next again to install the components in the default directory (cannot be changed).
After the IBM Storage Solutions External Runtime Components are installed, the installation wizard of IBM Storage Management Console for VMware vCenter starts.

4. Click **Next**. The License Agreement panel is displayed.

5. Read the IBM License Agreement and then select **I accept the terms in the license agreement**.
6. Click **Next**. The Destination Folder panel is displayed.

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

![Figure 5. Destination Folder panel – default installation directory]

8. Click **Next**. The Ready to Install the Program panel is displayed.

9. Click **Install** to begin the installation. After the installation is complete, the Completed panel is displayed.

10. 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.

---

### 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
- Performing restart and verifying the installation
- Assigning the minimum privileges to the IBM Storage Management Console

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 CLI (command-line interface) 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 configuration wizard does not start, you can start it from the IBM folder located in the All Programs menu of Windows.

The Welcome message is displayed when the configuration wizard starts.

Welcome to the IBM Storage Management Console for VMware vCenter setup wizard, version 2.5.x. 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 the IBM Storage Management Console is 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 the Plug-ins 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 administrator:

   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 and shown in the log file (see Viewing the log file on page 56).

Performing restart 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.

After the restart, the IBM Storage button becomes available in the vSphere management tools.

In addition, the IBM Storage plug-in appears in the Installed Plug-ins list of the vCenter Plug-in Manager.
Figure 7. IBM Storage plug-in listed in the Plug-in Manager

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, as explained in the next chapters.

Figure 8. IBM Storage tab added to the vSphere GUI
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 maximum possible volume size
- Setting the storage pool usage alert thresholds (color indications)
- Enabling automatic setting of the multipath policy

**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:

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

   ![Figure 9. Windows Registry Editor](image)

   **Figure 9. Windows Registry Editor**
4. Use the following table to determine the parameters that you want to change. Alternatively, refer to the next subsections.

Table 3. 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>db_relative_path</td>
<td>The relative path to the database file. Do not modify this key manually.</td>
<td>data\vc_plugin.db</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>For more information, see Viewing the log file and Event messages.</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. Do not modify this key manually.</td>
<td>eventlog, file</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>300 (5 minutes)</td>
</tr>
<tr>
<td>port</td>
<td>Number of the port that the IBM Storage Management Console web service uses for HTTP requests from the vSphere clients. Do not modify this key manually. If you want to update the port number, run the configuration wizard again and restart the vSphere client.</td>
<td>8880</td>
</tr>
<tr>
<td>Registry key</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>time_to_wait_for_another_update</td>
<td>Since any new cache update is not started until after the first update is completed, this value specifies the waiting time in seconds for the current cache update to complete before a timeout occurs.</td>
<td>60 (1 minute)</td>
</tr>
<tr>
<td>tracing</td>
<td>Turns the tracing on (1) or off (0). Do not modify this key unless you are instructed to do so by IBM Support.</td>
<td>0 (off)</td>
</tr>
<tr>
<td>vcenter_fqdn</td>
<td>The fully qualified DNS name of the VMware vCenter server. Do not modify this key manually.</td>
<td>localhost</td>
</tr>
</tbody>
</table>

5. After you have made the required modifications, go to `C:\Program Files\IBM\IBM Management Console for VMware vCenter\bin`, and run `unconfigure.exe`.

6. From the same directory, run `configure.exe`.
   
The new configuration takes effect.

**Important:** Using `unconfigure.exe` followed by `configure.exe` is also required for the registry modifications that are explained in the next subsections.

**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 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 maximum possible volume size

The default maximum volume size is set to 2181 Gigabytes (2 Terabytes). When you create a new volume, it cannot be larger than the maximum allowed size.

You can change the maximum volume size (GB) by modifying the `max_lun_size_gb` registry key, located under:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleFor
vCenter\Parameters
```

Setting the storage pool usage alert thresholds (color indications)

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

- `pool_warning_threshold` - contains the pool size limit percentage beyond which the color of the storage pool bar 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 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 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\IBMConsoleFor
vCenter\Parameters
```

The following figure shows how the different colors are displayed for storage pools.
Enabling automatic setting of the multipath policy

By default, automatic setting of multipath policy is disabled because it is not supported by Windows Cluster virtual machine quorum devices.

However, if you want to enable the automatic setting of the multipath policy, set the value of the `xiv_luns_multipath_policy` registry key to `VMW_PSP_RR` (Round Robin).

The registry key path is: `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\IBMConsoleForvCenter\Parameters`

**Attention:** When you set the multipath policy in the registry of the vCenter server, it applies to all XIV LUNs that are connected to the ESX servers, and it is automatically verified and updated for each LUN **every 30 minutes**. This means that if you modify the multipath policy of a specific LUN through a VMware management tool, the modification will stay in effect for a period of up to 30 minutes, after which it will automatically be updated according to the `xiv_luns_multipath_policy` registry key value.

Other possible registry key values are:

- `VMW_PSP_FIXED_AP` (Fixed Active Passive)
- `VMW_PSP_MRU` (Most recently used)
- `VMW_PSP_FIXED` (Fixed)
Assigning the minimum privileges to the IBM Storage Management Console

Depending on the actual usage of the IBM Storage Management Console for VMware vCenter, the plug-in requires minimum privileges in order to function properly, as detailed in the following table.

*Table 4. Minimum privileges required for the IBM Storage Management Console*

<table>
<thead>
<tr>
<th>Actual usage</th>
<th>Required privilege type and path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read-only</td>
<td>• Extension</td>
</tr>
<tr>
<td></td>
<td>• Global → Log Event</td>
</tr>
<tr>
<td></td>
<td>• Tasks</td>
</tr>
<tr>
<td>Storage provisioning</td>
<td>• All privileges required for read-only (see above)</td>
</tr>
<tr>
<td></td>
<td>• Host → Configuration → Storage Partition Configuration (required for the rescan operation)</td>
</tr>
</tbody>
</table>

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

- Managing VMware vCenter Roles and Permissions –
Chapter 4. Connecting to (adding) IBM storage systems

Before you can create volumes 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
- Removing an IBM storage system

Adding an IBM storage system

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

1. Click the IBM Storage icon located on the vSphere Client management tools (see Figure 6). The Storage Systems and Storage Pools management panels are displayed.

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 11. Clicking Add on the pop-up menu](image)

The Add an IBM Storage System wizard is displayed.

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. Enter the required credentials for the storage brand you have selected, as detailed in the following table.

<table>
<thead>
<tr>
<th>Credential type</th>
<th>Description</th>
<th>Appears for</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address / Hostname</td>
<td>IP address or hostname (properly formatted domain address with full stops) of the IBM storage system to which you want to connect.</td>
<td>XIV, SVC, Storwize V7000</td>
</tr>
<tr>
<td>Credential type</td>
<td>Description</td>
<td>Appears 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. <strong>Important:</strong> If you are using an SVC or Storwize V7000 system with microcode version 6.1 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 in such cases according to the SSH key pairing only (see info below).</td>
<td>XIV, SVC, Storwize V7000</td>
</tr>
<tr>
<td>Password</td>
<td>Password for accessing the specified XIV storage system.</td>
<td>XIV</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. <strong>Important:</strong> The private SSH key must be in the OpenSSH format. If your key is not in the OpenSSH format, you can use a certified OpenSSH conversion utility.</td>
<td>SVC, Storwize V7000</td>
</tr>
<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>

5. Click **Next**. The Select Storage Pools panel is displayed.

6. If you have provided admin-type credentials, you can attach predefined storage pools that are available on the IBM storage system that you add. Click and highlight the name of a storage pool that you want to add, or use the CTRL or SHIFT keyboard keys to select multiple storage pools.

**Note:** For more information about attaching or detaching storage pools, see Chapter 5.

7. Click **Next**. The Confirmation panel is displayed.
8. 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 6). 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 5), and then click Update.

The modified system details appear in the Details pane.
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 and datastores, the information of these volumes and datastores will no longer be displayed in the IBM Storage tab. However, these volumes 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 6). 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 **Remove**. Alternatively, right-click the name of the storage system and then click **Remove** on the pop-up menu.
3. In the removal confirmation box, click Yes.

**Note:** You can add again any storage system you have removed.

---

**Chapter 5. Attaching and detaching storage pools**

This chapter describes:

- Viewing the details of currently attached storage pools
- Attaching storage pools
- Detaching storage pool

**Important:**

Storage pools can be attached only with **storage admin** user credentials. Any other type of user credentials (read-only, application admin) cannot perform storage pool attachment. If your credentials are not sufficient to perform pool attachment, contact your storage administrator for assistance.

---

**Viewing the details of currently attached storage pools**

Attached storage pools are predefined (by the storage administrator) 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 that are defined on that system and are currently attached to the vCenter server.

Click the name of a storage system to view its currently attached storage pools.

**Note:** Storage pools that were not yet attached (or were detached) are not displayed, even if these pools were predefined on the storage system for use in the VMware environment.
Figure 15. Viewing attached storage pools of the selected storage system

By placing the mouse pointer over different areas of each displayed storage pool, you can view different types of information. The following figures show the information that is displayed for XIV-based storage pools.

Figure 16. Amount (GB) and percentage of free hard disk space on the storage pool

Figure 17. Amount (GB) and percentage of used hard disk space on the storage pool

Figure 18. Amount (GB) and percentage of soft space used for volumes (LUNs)

Figure 19. Amount (GB) and percentage of soft space reserved for snapshots
Figure 20. Amount (GB) and percentage of hard disk space currently in use by snapshots

Figure 21. Amount (GB) and percentage of free soft space remaining for thin provisioning and snapshots

**Note:** You cannot create storage pools from the vSphere client. To create storage pools, connect directly to the IBM storage system via its dedicated storage management GUI, or contact your storage system administrator.

**Attaching storage pools**

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.

Perform the following procedure to attach storage pools to the vCenter server.

1. In the Storage Systems management panel (see Figure 13), click the name of the storage system from which you want to select storage pools.

2. In the Storage Pools management panel, click **Attach** (see Figure 22). Alternatively, right click the name of the storage system and then click **Attach Storage Pools** on the pop-up menu (see Figure 23).

**Figure 22. Attach button**

**Figure 23. Clicking Attach Storage Pools on the pop-up menu**
3. In the Attach Storage Pools dialog box, click and highlight the name of a storage pool that you want to add, or use the CTRL or SHIFT keyboard keys to select multiple storage pools. Then, click **Next**.

4. Enter the credentials depending on the storage system from which you are attaching storage pools:
   - For XIV-based storage pools – Enter your user name and password for accessing the storage system (storage admin permissions are required).
   - For Storwize V7000 or SVC-based storage pools – Enter your user name (must be "admin" if using microcode 6.1 or earlier) and then browse for the private SSH private key that is required for accessing the storage system. If needed, enter a Passphrase as well. For important notes regarding these credentials, refer to *Table 5* on page 19.

5. Click **Finish**.

**Detaching storage pools**

You can detach from the vCenter server any storage pool 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 will still be displayed in the IBM Storage tab, but you will not be able to perform LUN management operations on these pools.

Perform the following procedure to detach storage pools.

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

![Figure 24. Selecting multiple storage pools](image)
2. Click **Detach**. Alternatively, right-click the selected storage pools and click **Detach Storage Pool** on the pop-up menu.

![Figure 25. Clicking Detach Storage Pool on the pop-up menu](image)

3. In the detachment confirmation box, click **Yes**.

### Chapter 6. Creating, viewing, and managing volumes (LUNs) in storage pools

After the IBM storage systems are added and the storage pools are attached to the vCenter server, you can start the volume creation and management operations.

This chapter describes:

- Performing a target connectivity check
- Creating a new storage volume
- Viewing volume details
- Managing storage volumes

#### 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.

![Image of Storage Adapters](image.png)

Figure 26. Displaying the storage adapters of a host

5. Perform the following checks:
   - For Fibre Channel (FC) connected storage, click each FC host bus adapter (HBA) and then click **Paths**. Then, verify that at least one of the storage system WWPNs appear in the table.
   - For iSCSI connected storage, click on the iSCSI software adapter ports. Then, click **Properties** and verify that the storage system IQNs appear in the **Static Discovery** tab.

### Creating a new storage volume (LUN)

Create storage volumes (logical drives identified as LUNs) on which you want to save datastores or raw mapped volumes. In the creation procedure, you can map a volume to ESX hosts or datacenters, so that the virtual machines on these hosts or datacenters will be able to save datastore information on that volume (for the concept illustration, see Figure 1 on page 5).

**Note:** You can create volumes only on storage pools that have been attached to the vCenter server. For more information, see **Viewing the details of currently attached storage pools**.

**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 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.

![Image of Storage Pools panel showing New Volume option]

**Figure 27. Clicking New Volume on the pop-up menu**

**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.

2. In the **Volume Size** text box, enter the size (XIV – in Gigabytes; Storwize/SVC – in Gibibytes) for the new 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.

![Image of Storage Pool graphic space marker]

**Figure 28. Setting the volume size with the graphic space marker**
3. In the **Volume Name** text box, enter the name that you want to assign to the new volume.

4. If you are creating the volume on an SVC or a Storwize V7000 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.

5. Click **Next**. The Volume Mapping panel is displayed.

6. Select the host(s) or datacenter(s) to which you want to map the new volume. The selected host(s) or datacenter(s) will be able to utilize the new volume for datastores or raw mapped LUNs.

**Note:** If you select a datacenter, its member hosts are automatically selected.
Figure 30. Selecting the hosts or clusters 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 or datacenter in order to enable vSphere management of the created volume.

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

8. 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**.

**Viewing volume details**

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

- Viewing volumes that are used by datastores
- Viewing unused volumes
- Viewing volumes that are used by virtual machines
- Choosing which volumes to show
- Viewing information in the LUN Details pane

**Viewing volumes that are used by datastores**

When you want to check which storage volumes are used by specific datastores, and also view the specific details of these volumes, perform the following procedure.
1. Go to Home ➔ Inventory ➔ Hosts and Clusters, and then click the IBM Storage tab.

2. On the left-pane tree of datacenters, click an icon of a datacenter, a cluster, or a host. The table on the right pane displays the details of the datastores that are used by the element you selected on the tree (datacenter, cluster, or host).

3. On the displayed datastores list (under View: Datastores), click the name of a datastore to display the storage volumes that it uses. The volumes used by the selected datastore are listed on the volumes list underneath the Datastores list.

Figure 31. Displaying volume details when a datastore is selected

Figure 32. Displaying volume details when a host is selected
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.

The volumes list (underneath the datastores list) displays the following details per volume:

- **Identifier** – Unique alphanumerical string (with a dot) that identifies the volume on the vCenter server.
- **Array** – Identification name of the IBM storage system on which the volume is defined. The array name is given by the storage administrator.

**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 (see Adding an IBM storage system).

- **Model** – Model of the IBM storage system on which the volume is defined.
- **Capacity (GB)** – Total capacity of the volume, in Gibibyte (not Gigabyte) units.
- **Use** – Type of volume use: Datastore Extent or Mapped Raw LUN. For more information about these types, see Choosing which volumes to show.
- **Serial** – Unique serial number of the volume.
- **LUN** – Logical unit number of the volume.

**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.

**Viewing unused volumes**

Volumes that are not assigned to datastores as Datastore Extent or Mapped Raw LUN are listed on the Unused LUNs list, which you can view separately under View: Unused LUNs.
Figure 33. List of unused volumes (LUNs)

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

Viewing volumes that are used by virtual machines

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

1. Go to Home ➔ Inventory ➔ VMs and Templates, and then click the IBM Storage tab.
2. On the left-pane tree of virtual machines, click an icon of a virtual machine. The table on the right pane displays the details of the virtual hard disks that are used by the virtual machine you selected on the tree.
3. Click the name of a hard disk to display the storage volumes that are currently defined on it and are used by the datastores of the selected virtual machine.
Figure 34. Displaying volume details when a virtual machine is selected

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

Choosing which volumes to show

In the different inventory views, you can choose which storage volumes 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.
**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.

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

**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.

**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 in the volumes list (see Figure 31, Figure 32, and Figure 33).

**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 36 and Figure 37) –

  ![LUN Details Summary View](image)

  **Figure 36. Summary view for a regular XIV-based volume**

  ![LUN Details Summary View](image)

  **Figure 37. Summary view for an XIV-based snapshot volume**

  - **LUN pie chart** – A graphic representation of the total capacity, used space (red), and free space (orange) in selected volume. The pie chart is not displayed for snapshot volumes.
  - **Volume Name** – Name of the volume (given by the VMware administrator).
  - **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 37) or if you do not have storage admin permissions.

- Snapshots view (see Figure 38) –

  ![Figure 38. Snapshots view for XIV-based snapshots](image)

  - **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 39) –

  ![Figure 39. Mirroring view for an XIV-based volume](image)

  - **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.

**Note:** The Mirroring view is not available for snapshot volumes (see Figure 37).
Storwize V7000 or SVC-based volume details

Storwize V700 or 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 40)** –

  ![Figure 40. Summary view for a regular Storwize V7000 or SVC-based volume](image)

  - **LUN pie chart** – A graphic representation of the total capacity, used space (red), and free space (orange) in 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: **online** or **offline**.
  - **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 41)** –

  ![Figure 41. FlashCopy® replicas of a Storwize V7000 or SVC-based volume](image)

  - **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](https://www.ibm.com).  
- **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 42) –

<table>
<thead>
<tr>
<th>LN Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>View:</strong> Summary</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>fc mirrored_dis_21</td>
</tr>
</tbody>
</table>

*Figure 42. 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 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 is located.  
  - **Auxiliary System** – Name of the storage system on which the auxiliary volume is located.
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
- Deleting an unused storage volume

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

Before you begin managing volumes:
- You must have storage admin permissions on the relevant storage system.
- Check whether the volumes you want to manage reside on attached storage pools.
- Check whether the volumes 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 43. Clicking Extend on the pop-up menu](image)

   The Extend Volume dialog box is displayed.
2. In the **Volume Size** text box, enter the new size (XIV – in Gigabytes; Storwize/SVC – in Gibibytes) 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.

![Resize Volume dialog box – using the mouse pointer](image)

**Note:** 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, and then click **Properties**.
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) you have resized, click **Next**, and then complete the remaining steps of the Increase Datastore Capacity wizard.
Figure 47. Selecting the extended volume for the datastore size increase

**Note:** When selecting the resized volume (Extent Device), a notification below 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.

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.

   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 ran 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 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.

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.
   
The Move Volume dialog box is displayed.

2. From the 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 mapping operation, you will not be able to create datastores to which virtual machines can be connected (for more information, see Creating VMware datastores in storage volumes and Creating a virtual machine and connecting it to a datastore).

**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** (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.
Figure 50. Map LUN to Hosts dialog box

3. Select the hosts or clusters to which you want to map the volume, and then click Map.

**Note:** 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 unmapped volumes from the hosts.

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.

Deleting an unused storage volume
When a storage volume is unused (see *Viewing unused volumes*) 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. Access the **Unused LUNs** list.
2. Right-click the row of the volume that you want to delete, and then select **Delete** from the pop-up menu.
Clicking Delete on the pop-up menu

The Volume Delete Confirmation dialog box is displayed.

3. Click **Delete** to confirm the deletion, or **Cancel** to exit without deleting the volume.

Chapter 7. Standard vSphere Client operations

This chapter briefly explains the following standard VMware operations that can be performed on the vSphere client:

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

Reference to existing VMware documentation:

VMware already provides documentation for the 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 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 you have created (for more information, see *Creating a new storage volume* (LUN)).

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 53. 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 55. Add Storage wizard – Select Disk/LUN panel

The Current Disk Layout panel is displayed.
5. Click **Next**. The Properties panel is displayed.

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

![Add Storage wizard – Current Disk Layout panel](image)

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

The 'Disk/LUN – Formatting' panel is displayed.
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 you selected (as explained on step 4 of this procedure).

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

After you create 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:** For more detailed information about virtual machine creation, refer to the relevant VMware documentation (see *Publications and related information* on page 1).
Figure 59. Create New Virtual Machine wizard – Datastore selection panel

Figure 60. Create New Virtual Machine wizard – Create a Disk panel
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.

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:

```plaintext
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.
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 61 and Figure 62).

Table 6. vSphere information event messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>Multipath policy for LUN %s has been modified from %s to %s</td>
<td>Indicates that the multipath policy of this LUN has been set</td>
</tr>
<tr>
<td>402</td>
<td>%s has been created</td>
<td>Indicates that a LUN was created</td>
</tr>
<tr>
<td>403</td>
<td>%s has been deleted</td>
<td>Indicates that a LUN was deleted</td>
</tr>
<tr>
<td>404</td>
<td>%s has been renamed to %s</td>
<td>Indicates that a LUN was renamed</td>
</tr>
<tr>
<td>405</td>
<td>%s has been resized, new size is %s</td>
<td>Indicates that a LUN was resized</td>
</tr>
<tr>
<td>406</td>
<td>%s has been relocated in the storage system, details: %s</td>
<td>Indicates that a LUN was relocated within the storage system</td>
</tr>
<tr>
<td>407</td>
<td>%s has been mapped to hosts: %s</td>
<td>Indicates that a LUN was mapped to a host</td>
</tr>
<tr>
<td>408</td>
<td>%s has been unmapped from hosts: %s</td>
<td>Indicates that a LUN was unmapped from a host</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 61 and Figure 62).

Table 7. vSphere warning event messages

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>431</td>
<td>Datastore Extent %s 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 %s has a Raw Mapping LUN filename %s 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>
</tbody>
</table>
**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 61 and Figure 62).

<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>434</td>
<td>Storage Pool %s, which is attached to vCenter, has been deleted from Storage Array %s. 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>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 %s. 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 <strong>Update</strong> link in the IBM Storage tab.</td>
</tr>
</tbody>
</table>

Table 8. vSphere error event messages

<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: %s</td>
<td>Describing a general error that occurred.</td>
</tr>
<tr>
<td>462</td>
<td>Error while setting Multipath policy for %s: %s.</td>
<td>Describing an error that occurred during multipath policy set.</td>
</tr>
<tr>
<td>463</td>
<td>Failed while adding LUN on storage array %s: %s</td>
<td>LUN addition failure</td>
</tr>
<tr>
<td>464</td>
<td>Failed while deleting LUN on storage array %s: %s</td>
<td>LUN deletion failure</td>
</tr>
<tr>
<td>465</td>
<td>Failed while extending LUN on storage array %s: %s</td>
<td>LUN extent failure</td>
</tr>
<tr>
<td>466</td>
<td>Failed while moving LUN to another storage pool on storage array %s: %s</td>
<td>LUN move failure</td>
</tr>
<tr>
<td>467</td>
<td>Failed while mapping LUN on storage array %s: %s</td>
<td>LUN mapping failure</td>
</tr>
<tr>
<td>468</td>
<td>Failed while unmapping LUN on storage array %s: %s</td>
<td>LUN unmapping failure</td>
</tr>
<tr>
<td>469</td>
<td>Failed while renaming LUN on storage array %s: %s</td>
<td>LUN rename failure</td>
</tr>
<tr>
<td>470</td>
<td>Failed while trying to connect to storage array %s. Reason: %s</td>
<td>Describing an error which occurred while trying to connect to storage array.</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 63).

Table 9. 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 currently runs</td>
</tr>
<tr>
<td>307</td>
<td>Cache maintainer is stopping</td>
<td>Cache maintainer is in the process of stopping</td>
</tr>
<tr>
<td>308</td>
<td>Multipath policy for LUN %s has been set to %s (was %s)</td>
<td>Multipath policy set</td>
</tr>
<tr>
<td>309</td>
<td>IBM Management Console plug-in extension was unregistered</td>
<td>IBM Storage plug-in service has been unregistered</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 63).
### Table 10. 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 %s. Please check your VMware environment for inaccessible datastore LUNs.</td>
<td>Volume not found</td>
</tr>
<tr>
<td>332</td>
<td>Datastore %s is of type %s, 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 %s, which belongs to VM %s.</td>
<td>Volume not found by cache manager</td>
</tr>
<tr>
<td>334</td>
<td>Cache manager reported an error that might be temporary: %s</td>
<td>Temporary cache problem</td>
</tr>
</tbody>
</table>
| 335 | Cache manager found a storage volume but cannot access its properties.  
Volume serial = %s  
The 'Rescan' operation from the host configuration tab may resolve this problem.                                                                 | Storage volume cannot be accessed                 |
| 336 | 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.                                                                                                       | Cache timeout problem                             |
| 337 | Cache manager failed to connect to IBM storage system %s.  
Reason: %s  
Update the system properties using the IBM Storage link.                                                                                                                                         | Connection failure due to a specified reason      |
| 338 | Cache manager found a volume from an undefined IBM storage system.  
You should define this storage system in the IBM Storage Configuration tab in order to view its properties.  
Volume serial = %s  
An IBM storage system needs to be added                                                                                                       |                                                  |
| 339 | Storage Pool %s, which is attached to vCenter, has been removed from Storage Array %s.  
Please work with the storage administrator to resolve this issue. Either recreate the storage pool in the storage array or detach it from vCenter.                         | Storage pool is not attached                      |
| 340 | Failed to match host HBA to a SCSI LUN topology.  
Searching interface adapter %s for host id %s.                                                                                                                                      | HBA does not match the SCSI LUN topology          |
<table>
<thead>
<tr>
<th>ID</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>341</td>
<td>Cannot retrieve virtual disk attributes for virtual machine %. 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. Error message: %s</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. Error message: %s</td>
<td>Failed to restore registry values</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 63).

*Table 11. 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: %s</td>
<td>Cache error</td>
</tr>
<tr>
<td>362</td>
<td>The IBM Storage Management Console failed to unregister from vCenter server with message: %s. 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: %s</td>
<td>Service removal failure</td>
</tr>
<tr>
<td>364</td>
<td>The IBM Storage Management Console failed to register plug-in with message: %s</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 %s: %s</td>
<td>Multipath setting failure</td>
</tr>
<tr>
<td>367</td>
<td>The IBM Storage Management Console failed in LUN operation: %s</td>
<td>LUN operation failure</td>
</tr>
<tr>
<td>ID</td>
<td>Message</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>368</td>
<td>The IBM Storage Management Console failed while trying to use keyring: %s</td>
<td>Keyring 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.

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 build blocks LUNs of a datastore) in a consistency group (defined by using the storage system GUI or CLI).

Handling ESX hosts
For 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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