

# **MacroSAN MS Series Storage Devices Local Clone Feature GUI User Manual**

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MacroSAN Technologies Co., Ltd.

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# Manual Structure

Chapter		Description	Main content
Overview	Preface	This chapter introduces related information about the manual for your reading.	<ul style="list-style-type: none"> <li>• Intended audiences</li> <li>• Manual guidance</li> <li>• Manual conventions</li> <li>• Document acquisition</li> <li>• Feedback</li> </ul>
	Overview of MS series storage devices	This chapter introduces the basic functions and typical networking of MS series storage devices, making it easy for you to have a simple understanding of the devices.	<ul style="list-style-type: none"> <li>• Introduction to MS series storage devices</li> <li>• Introduction to typical networking of MS series storage devices</li> </ul>
	ODSP Scope+ console	This chapter introduces the ODSP Scope+ console to help you familiarize with management interface usage.	<ul style="list-style-type: none"> <li>• Introduction to ODSP Scope+</li> <li>• Running ODSP Scope+</li> <li>• Composition of ODSP Scope+ system view interface</li> <li>• Composition of ODSP Scope+ tenant view interface</li> </ul>
Local clone feature	Introduction to local clone feature	This chapter introduces related knowledge of local clone.	<ul style="list-style-type: none"> <li>• Introduction to local clone</li> <li>• Introduction to consistency group</li> </ul>
	Configuring consistency group (optional)	This chapter introduces how to configure consistency group.	<ul style="list-style-type: none"> <li>• Creating consistency group</li> <li>• Viewing consistency group</li> <li>• Modifying consistency group properties</li> <li>• Deleting consistency group</li> <li>• Adding members for consistency group</li> <li>• Removing members from consistency group</li> </ul>
	Configuring local clone	This chapter introduces how to configure local clone.	<ul style="list-style-type: none"> <li>• Activating local clone license</li> <li>• Managing LUN local clone</li> <li>• Managing consistency group local clone</li> </ul>
Appendixes	Device default configurations	This chapter introduces device's default configurations.	Device default configurations
	Device external ports summary	This chapter introduces the summary of device external ports.	Device external ports summary
	Glossaries	This chapter introduces the glossaries in this manual.	Glossaries
	Acronyms	This chapter introduces the acronyms in this manual.	Acronyms





# Part 1: Overview

## 1 Preface

### 1.1 Intended Audiences

This manual is used to guide the configuration, management and maintenance of MacroSAN MS series storage devices. It is intended for MacroSAN employees, partners, storage architects, system administrators and maintainers. Readers are required to be familiar with the basic knowledge of storage systems.

### 1.2 Manual Guidance

The manual guidance contains all the documents in the *MacroSAN MS Series Storage Devices GUI User Manual*, which helps you select the required documents.

Table 1-1 List of user manual

Name	Main content
<i>MacroSAN MS Series Storage Devices Basic Configuration GUI User Manual</i>	This manual introduces the basic configuration, management and maintenance of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Snapshot Feature GUI User Manual</i>	This manual introduces the configuration for snapshot feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Replication Feature GUI User Manual</i>	This manual introduces the configuration for replication feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices HotCache Feature GUI User Manual</i>	This manual introduces the configuration for HotCache feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Performance Statistics Feature GUI User Manual</i>	This manual introduces the configuration for performance statistics feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices QoS Feature GUI User Manual</i>	This manual introduces the configuration for QoS feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Remote Mirror Feature GUI User Manual</i>	This manual introduces the configuration for remote mirror feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Dual-Active Feature GUI User Manual</i>	This manual introduces the configuration for dual-active feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Thin Provisioning Feature GUI User Manual</i>	This manual introduces the configuration for thin provisioning feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Virtualization Feature GUI User Manual</i>	This manual introduces the configuration for virtualization feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Local Mirror Feature GUI User Manual</i>	This manual introduces the configuration for local mirror feature of MacroSAN MS series storage devices.

<i>MacroSAN MS Series Storage Devices Local Clone Feature GUI User Manual</i>	This manual introduces the configuration for local clone feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Auto-Tiering Feature GUI User Manual</i>	This manual introduces the configuration for auto-tiering feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices NDM Feature GUI User Manual</i>	This manual introduces the configuration for NDM feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Deduplication and Compression Feature GUI User Manual</i>	This manual introduces the configuration for deduplication and compression feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices VVol Feature GUI User Manual</i>	This manual introduces the configuration for VVol feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Clone Feature GUI User Manual</i>	This manual introduces the configuration for clone feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices Multi-Tenant Feature GUI User Manual</i>	This manual introduces the configuration for multi-tenant feature of MacroSAN MS series storage devices.
<i>MacroSAN MS Series Storage Devices R3DC Feature GUI User Manual</i>	This manual introduces the configuration for R3DC feature of MacroSAN MS series storage devices.

## 1.3 Manual Conventions

Some eye-catching signs are used in the manual to draw your attention. Please be careful during operation.

### 1.3.1 Conventions of Description

---

#### **NOTE**

A NOTE is a prompt, which is a supplementary explanation for operation.

---



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#### **CAUTION**

- A CAUTION indicates some important information. It explains the precautions to be taken during operation and the potential impact of improper operations.
  - Please pay special attention to this part.
- 

---

#### **WARNING**

- A WARNING indicates some vital information. Improper operation may lead to accidents, such as performance degradation, data loss or devices damage.
  - Please pay special attention to this part.
-

### 1.3.2 Other Conventions

In the following descriptions, "MacroSAN Technologies Co., Ltd." is also called "MacroSAN".

## 1.4 Document Acquisition

Please visit [www.macrosan.com](http://www.macrosan.com) for the latest document.

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### NOTE

This manual may lag behind the latest software version and may be updated irregularly due to software upgrading or other reasons.

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## 1.5 Feedback

MacroSAN Technologies Co., Ltd. sincerely appreciates your choice of our products. If you have any feedback or suggestions on the document, please email us at [document@macrosan.com](mailto:document@macrosan.com). Thanks for your support.

# 2 Overview of MS Series Storage Devices

## 2.1 Introduction to MS Series Storage Devices

MacroSAN ODSP storage devices are designed innovatively with high-performance and high-reliability hardware structure by adapting the latest chip technology. Together with the ODSP series software, these devices provide a 100G-class storage platform with large cache, high bandwidth, and high processing power for the massive concurrent applications in data centers in the era of cloud computing, and at the same time, they can also provide a safe and reliable storage platform with elastic deployment of resources for small and medium-sized data centers.

MacroSAN ODSP storage devices consist of the following modular components:

- SPU: It includes SPs, power supply modules, fan modules, battery modules, disk modules and other hardware components.
- FSU: It includes FPs, power supply modules, fan modules, battery modules, disk modules and other hardware components.
- SSU: It includes XPs, power supply modules, fan modules, battery modules, disk modules and other hardware components.
- DSU: It includes EPs, power supply modules, fan modules, battery modules, disk modules and other hardware components.

As the core module of the whole storage system, SP is used for data transmission, data processing, and data protection of storage devices. It provides multiple types of front-end business ports for connecting front-end application servers, and multiple types of back-end expansion ports

(e.g. SAS ports, PCIe ports, 25GE/100GE ports, etc.) for connecting either FSUs or SSUs or DSUs for storage expansion.

#### NOTE

- Please refer to the installation manual for the hardware features of MacroSAN ODSP storage devices.
- MacroSAN MS series storage device is called ODSP storage device, storage device or device in the following description. FSU, SSU and DSU are collectively called DSU. FP, XP and EP are collectively called EP unless stated otherwise.

## 2.2 Introduction to Typical Networking of MS Series Storage Devices

[Figure 2-1](#) shows the typical networking of MacroSAN MS series storage devices.

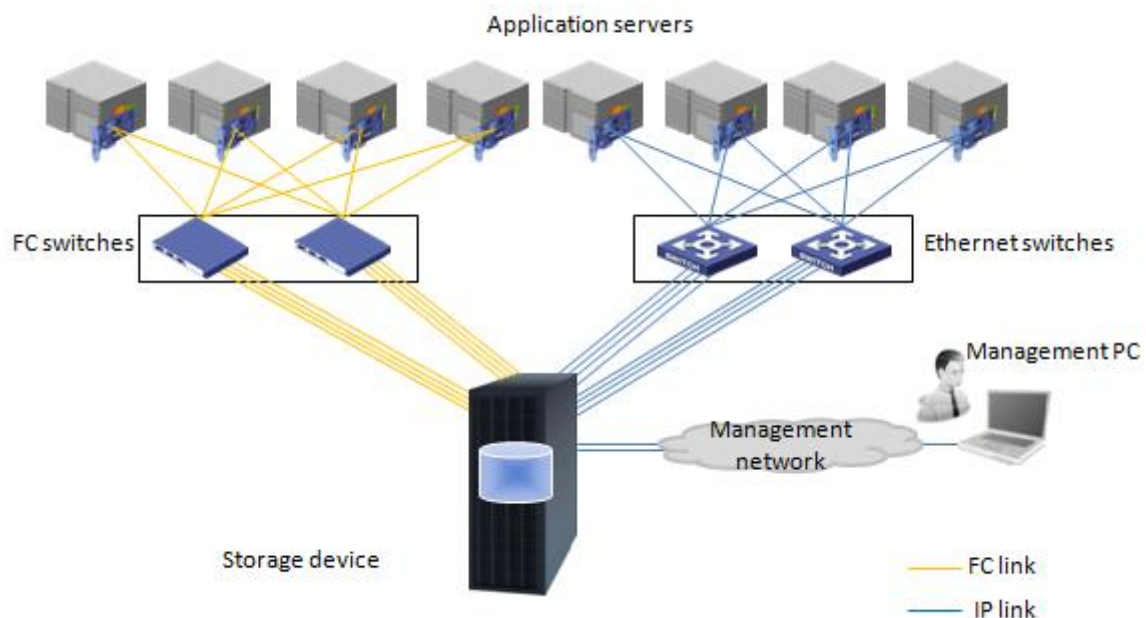


Figure 2-1 Typical networking of MS series storage devices

Networking explanation:

- Each controller of the ODSP storage device provides a dedicated management port, and the management PC can be connected to the management port of the storage device through the management network. The networks between the management PC and all controllers are required to be reachable.
- ODSP storage device can be accessed by the application server through iSCSI, FC, NVMe over RoCE and NVMe over FC. The HBA and driver software are required to be installed on the application server.
- ODSP storage devices support port aggregation in IP networks. You can either use the front-end business ports separately or bundle multiple Ethernet ports into one aggregated port.

---

**⚠CAUTION**

- The application server is required to be installed with multipath software correctly so that it can access all controllers in ODSP storage device to ensure redundancy.
  - If the client of the ODSP storage device is a multi-server application system and multiple application servers are required to have read and write permissions on the same storage resource, relevant software (such as cluster software, parallel file system software, etc.) must be correctly installed on the corresponding application server, so that multiple application servers can access the same storage area exclusively to ensure data accuracy and consistency.
- 

## 3 ODSP Scope+ Console

### 3.1 Introduction to ODSP Scope+

ODSP Scope+ is also called GUI Console (GUI for short), which provides management interface on the base of Web. Enter the IP address of ODSP storage device in the address bar of browser to run ODSP Scope+ and manage ODSP storage device.

The followings are browsers that have passed compatibility testing.

- Chrome55+
- Firefox39.0+
- IE10+ and browsers based on IE kernel
- 360 Browser (Speed Mode)
- QQ Browser (Speed Mode)
- The World Browser (Speed Mode)
- Maxthon (IE10+ kernel)

---

**📘NOTE**

ODSP Scope+ compatible browser may be updated periodically. Please consult manufacturer's technical supporters to obtain the latest browsers list that have passed compatibility testing.

---

### 3.2 Running ODSP Scope+

Open the Web browser of management PC and enter the IP address of the console ETH port (e.g. <https://172.17.243.81/>) of storage device in the address bar and refresh interface to run ODSP Scope+.

The security certificate risks (as shown in [Figure 3-1](#)) may be displayed in some browsers. In this case, please click "Continue to 172.17.243.81 (unsafe)" or the entries with similar meaning to run ODSP Scope+.

---

#### NOTE

The ODSP Scope+ is carried out based on HTTPS protocol for security. However, all security certificates are the third-party authentication for the authenticity of domain name and must be issued by certificate authority. The storage devices are on the rear of server with a dedicated private network instead of a public network. Besides, the devices are managed through LAN IP address rather than domain name, so the SSL certificate cannot be applied and it is normal that the security certificate risk message is displayed on the browser. Please ignore the prompt.

---

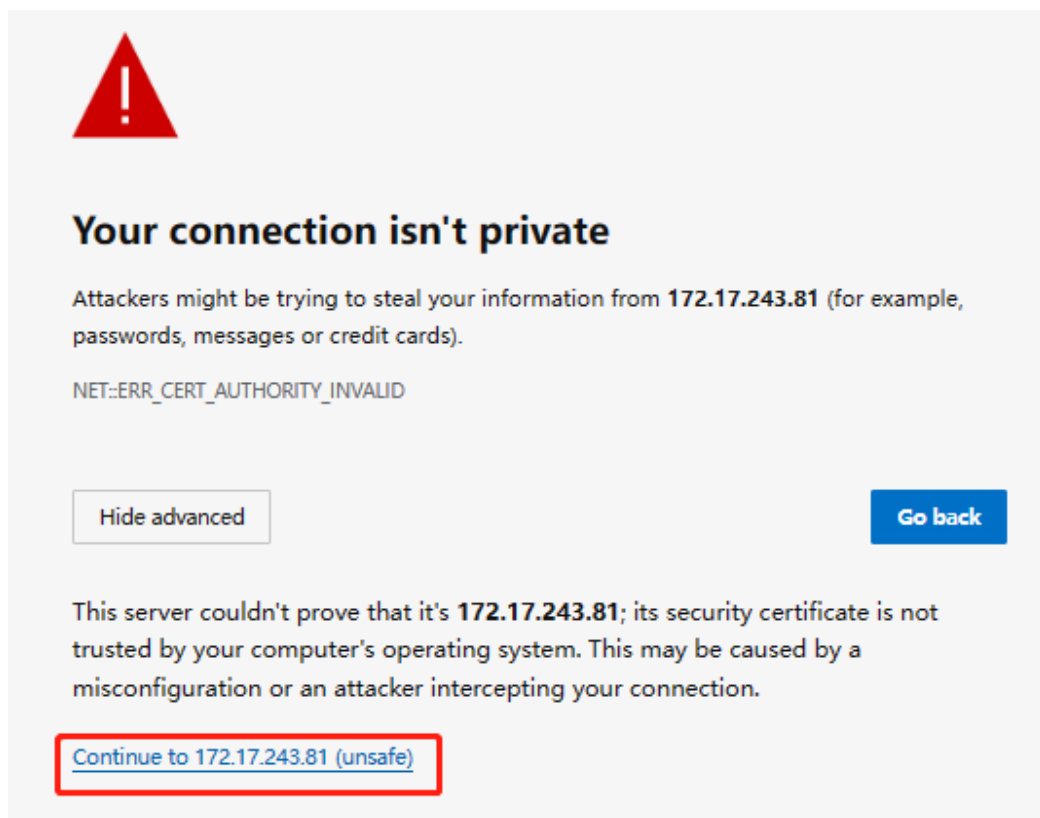


Figure 3-1 Example for prompt of certificate exception

The login interface of ODSP Scope+ is shown in [Figure 3-2](#). Local user is used by default. Click the <Advanced> button for login modes.

- LDAP user login: Enter the username, password and verification code and click the <Login> button to login system view interface.
- Tenant login: Check the "Tenant Login" option, as shown in [Figure 3-4](#), enter the tenant user's username, tenant user password, verification code and tenant name, and click the <Login> button to log in to the tenant view interface.

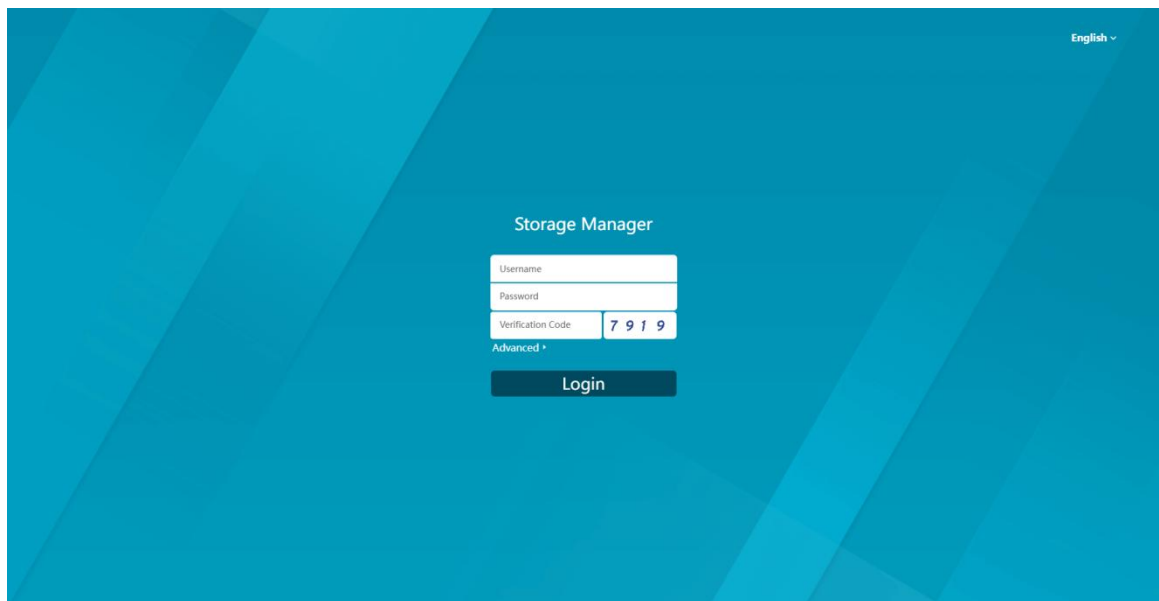


Figure 3-2 ODSP Scope+ login interface

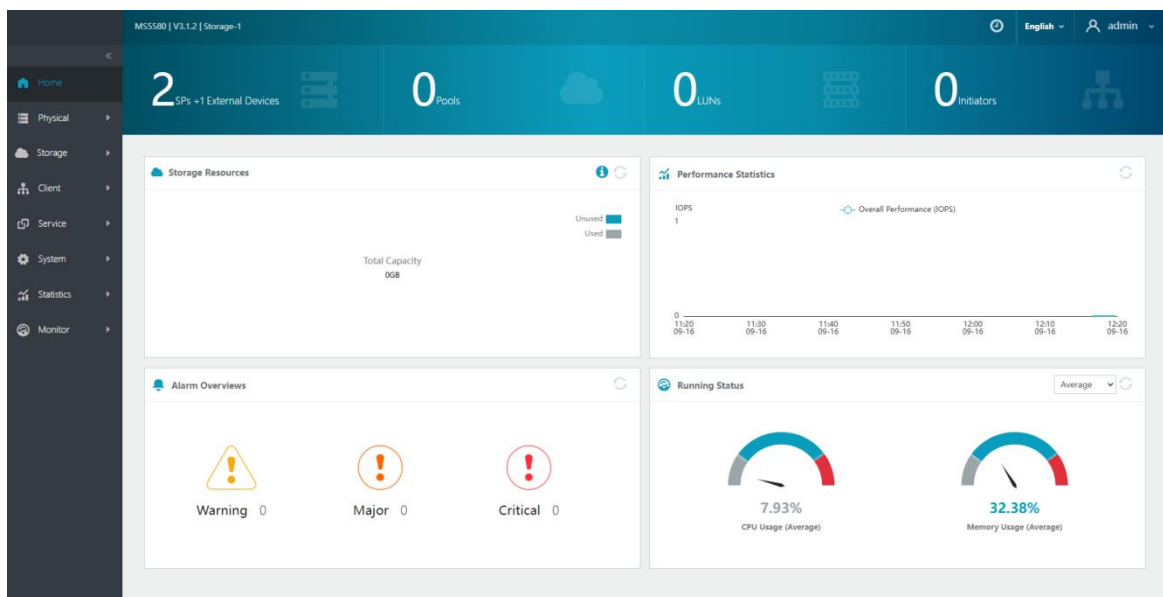


Figure 3-3 Home of ODSP Scope+ system view



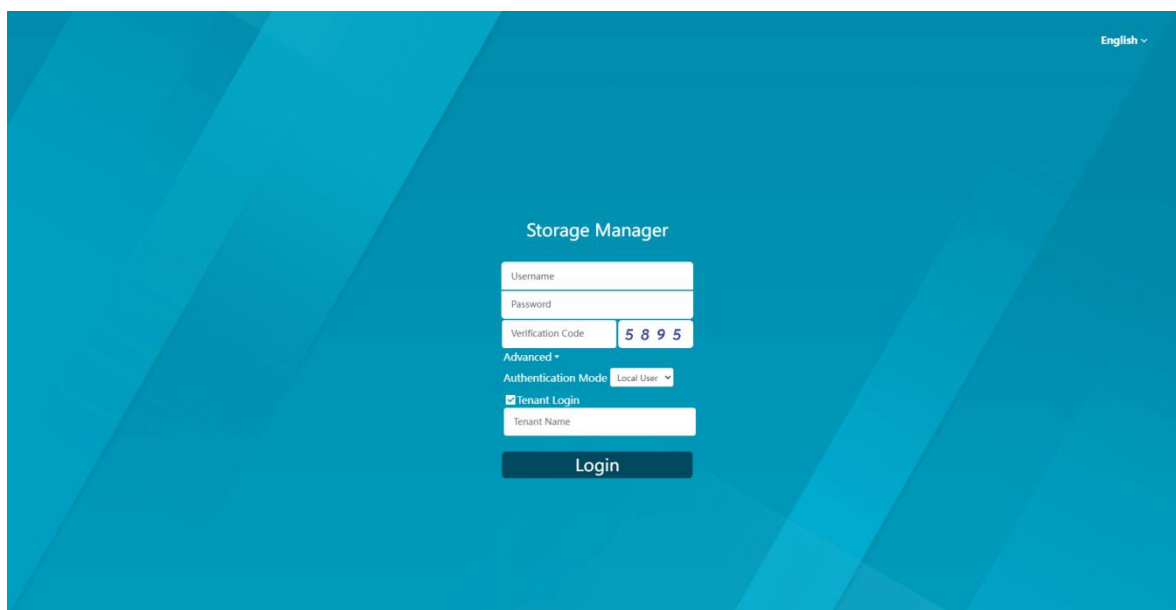


Figure 3-4 ODSP Scope+ tenant login interface

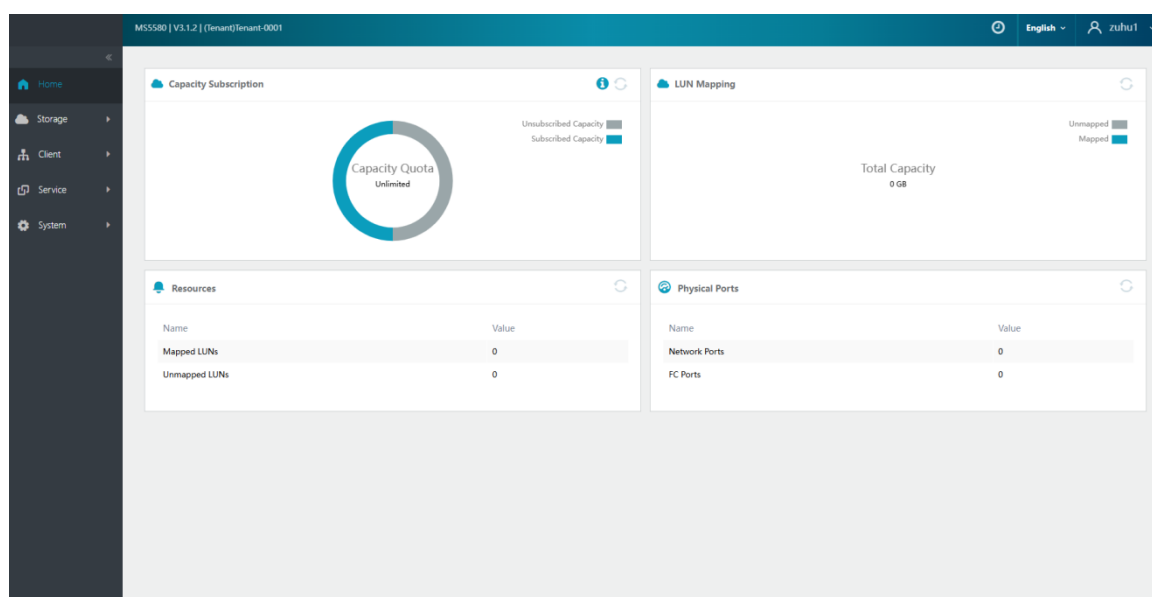


Figure 3-5 Home of ODSP Scope+ tenant view

## 3.3 Composition of ODSP Scope+ System View Interface

### 3.3.1 Interface Overview

All the information of the storage device is displayed on the typical interface of ODSP Scope+ system view interface, as shown in [Figure 3-6](#), which can be divided into five parts, including navigation tree, navigation bar, information display area, extended area and copyright display area.

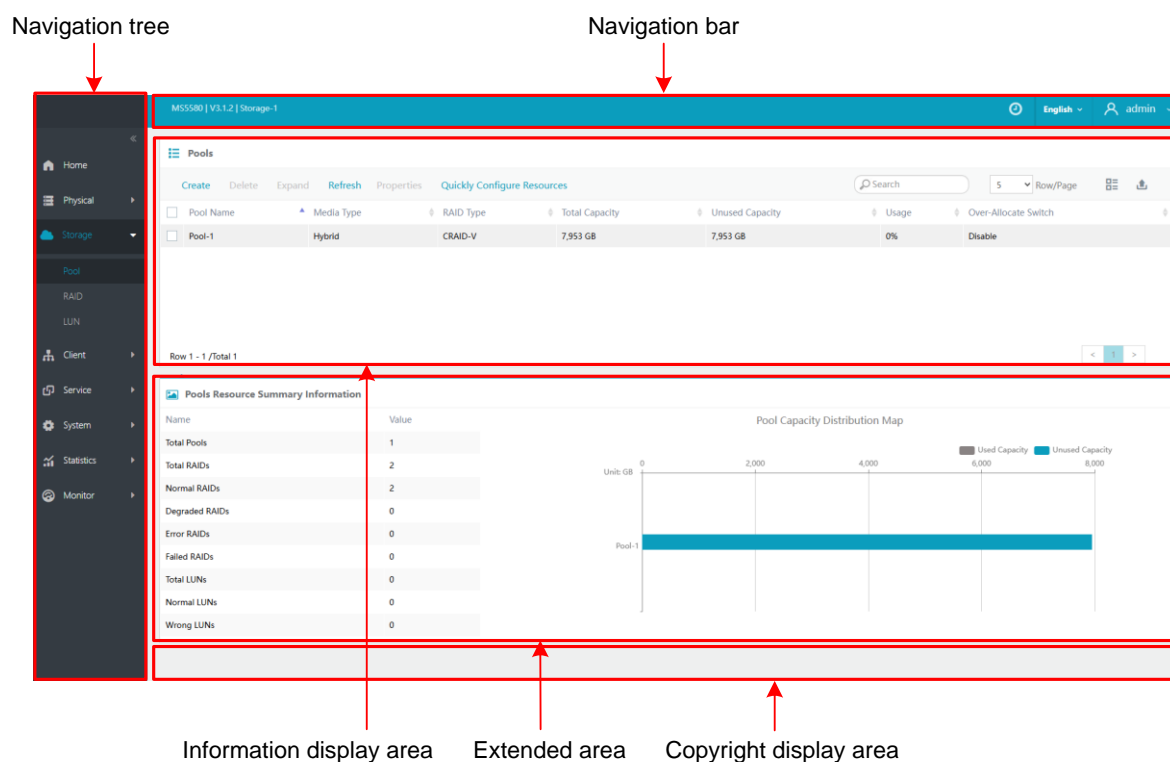


Figure 3-6 Example of ODSP Scope+ typical interface

### 3.3.2 Navigation Tree

The navigation tree is shown in [Figure 3-7](#), which displays the main nodes of storage devices with a tree view, including home, physical, storage, client, service, system, monitor, etc. Click any node can expand its sub-node, and click any sub-node to manage it.

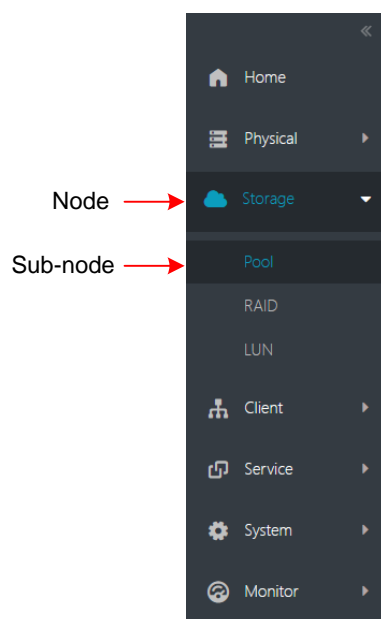


Figure 3-7 Example of ODSP Scope+ navigation tree

### 3.3.3 Navigation Bar

The navigation bar is shown in [Figure 3-8](#) and it mainly includes the following six parts.

- Device information: It displays the model, version number and name of the device.
- Time information: Click this icon to open the window of modifying device time to modify the device time.
- Concern information: It displays the summary of the concerns. Click this icon to view the concerns in the floating window, as shown in [Figure 3-9](#).
- Alarm information: It displays the summary of the current alarm of the device. Click this icon to expand the floating window to view the specific alarm items, as shown in [Figure 3-10](#).
- Language information: Both simplified Chinese and English are supported currently. Click this icon to switch languages.
- User information: It displays the current login user on the web interface. Click this icon to perform operations such as modifying login timeout, changing password and logging out of the login session.

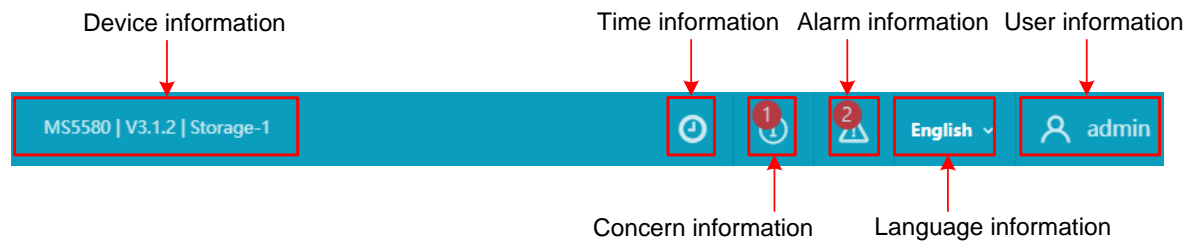


Figure 3-8 Example of ODSP Scope+ navigation bar

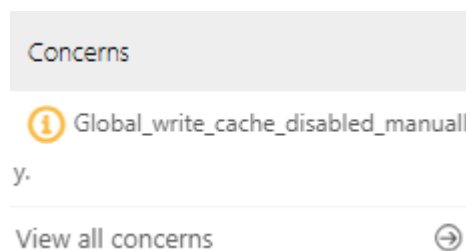


Figure 3-9 Example of ODSP Scope+ concerns

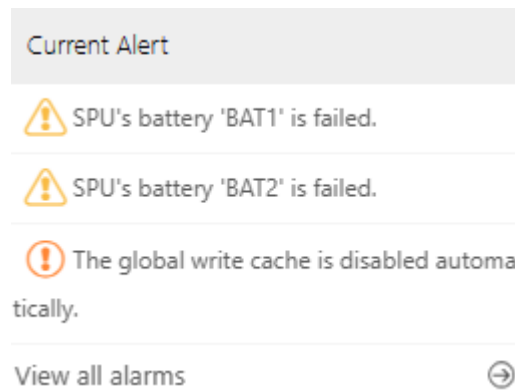


Figure 3-10 Example of ODSP Scope+ alarms

### 3.3.4 Information Display Area

The information display area is shown in [Figure 3-11](#), which visually displays the detailed information of the current selected navigation tree node through the table.

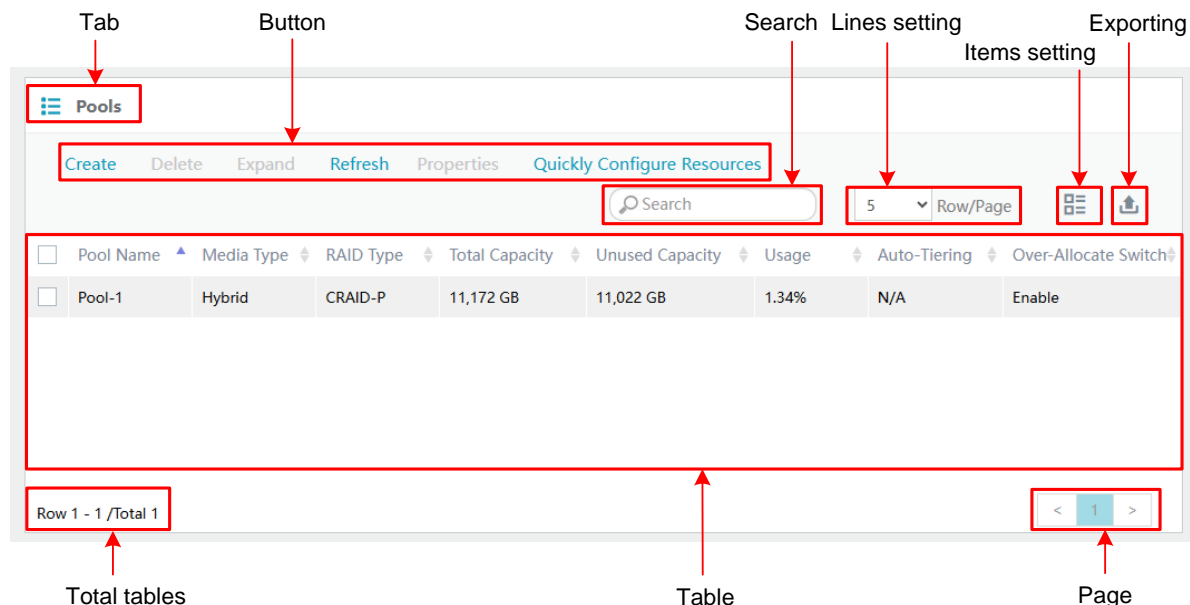


Figure 3-11 Example of ODSP Scope+ information display area

In the ODSP Scope+ information display area:

- You can click different tabs to view different tables in the case of multiple tabs.
- The supported operations will be displayed after selecting a row in the table. You can click the corresponding button to configure the operations as required. If you need to select multiple rows in the table, you can press Shift to select multiple lines at once.
- Resources can be quickly searched through the function of search. Multiple related objects including the members of Host group and consistency group are recommended to be created with the name of the same prefix for quick retrieval and usability improvement during operation.

- The display of the table can be adjusted through settings of lines and items, and the table data can also be directly exported through the export button.

### 3.3.5 Extended Area

Extended area displays the extension information of the selected node or line on the navigation tree or in the table respectively. The content of the extension area varies according to the selected item.

### 3.3.6 Copyright Display Area

The copyright display area shows the information of ODSP Scope+ copyrights.

## 3.4 Composition of ODSP Scope+ Tenant View Interface

### 3.4.1 Interface Overview

All the information of tenant is displayed on the typical interface of ODSP Scope+ tenant view interface, as shown in [Figure 3-12](#), which can be divided into four parts, including navigation tree, navigation bar, information display area and extended area.

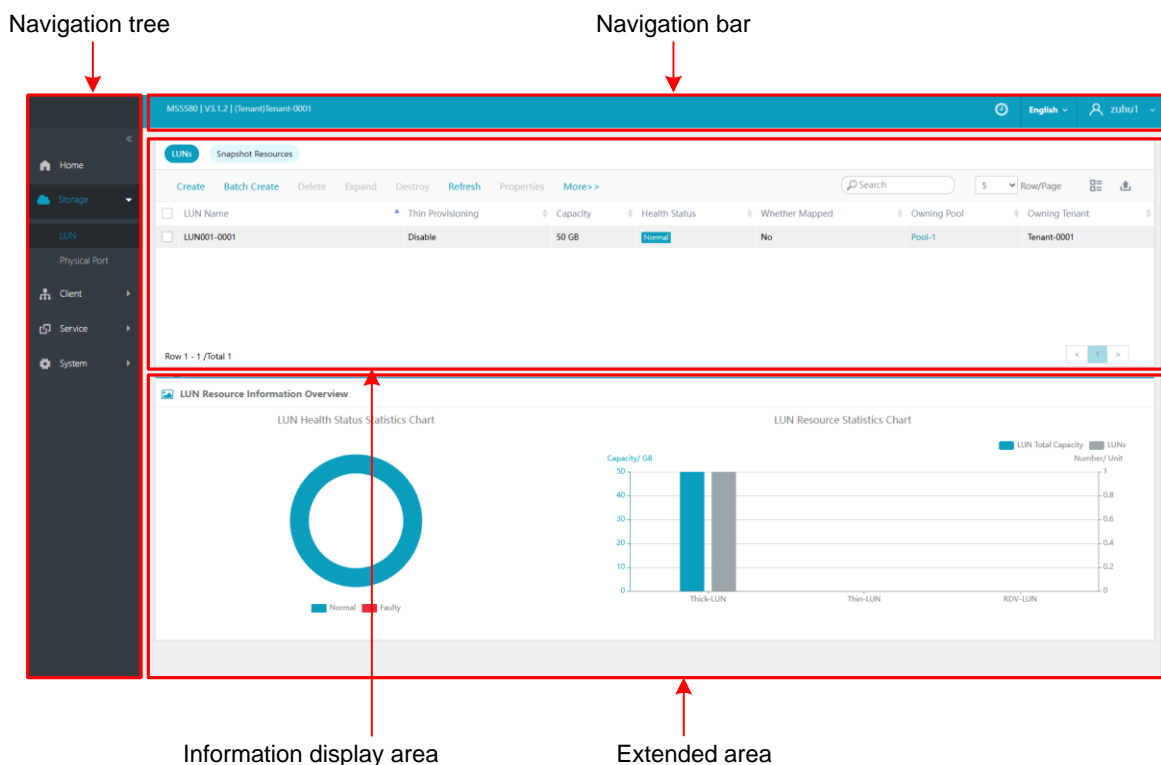


Figure 3-12 Example of ODSP Scope+ typical interface

### 3.4.2 Navigation Tree

The navigation tree is shown in [Figure 3-13](#), which displays the main nodes of tenant with a tree view, including home, storage, client, service, system, etc. Click any node can expand its sub-node, and click any sub-node to manage it.

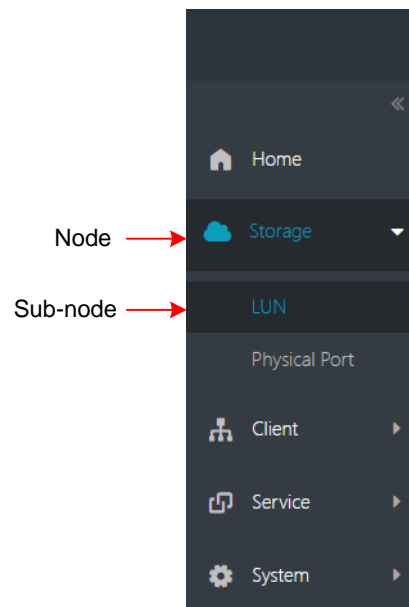


Figure 3-13 Example of ODSP Scope+ navigation tree

### 3.4.3 Navigation Bar

The navigation bar is shown in [Figure 3-14](#) and it mainly includes the following four parts.

- Device information: It displays the model, version number and name of the tenant.
- Time information: Click this icon to see the device time.
- Language information: Both simplified Chinese and English are supported currently. Click this icon to switch languages.
- User information: It displays the current login user on the web interface. Click this icon to perform operations such as changing password and logging out of the login session.



Figure 3-14 Example of ODSP Scope+ navigation bar

### 3.4.4 Information Display Area

The information display area is shown in [Figure 3-15](#), which visually displays the detailed information of the current selected navigation tree node through the table.

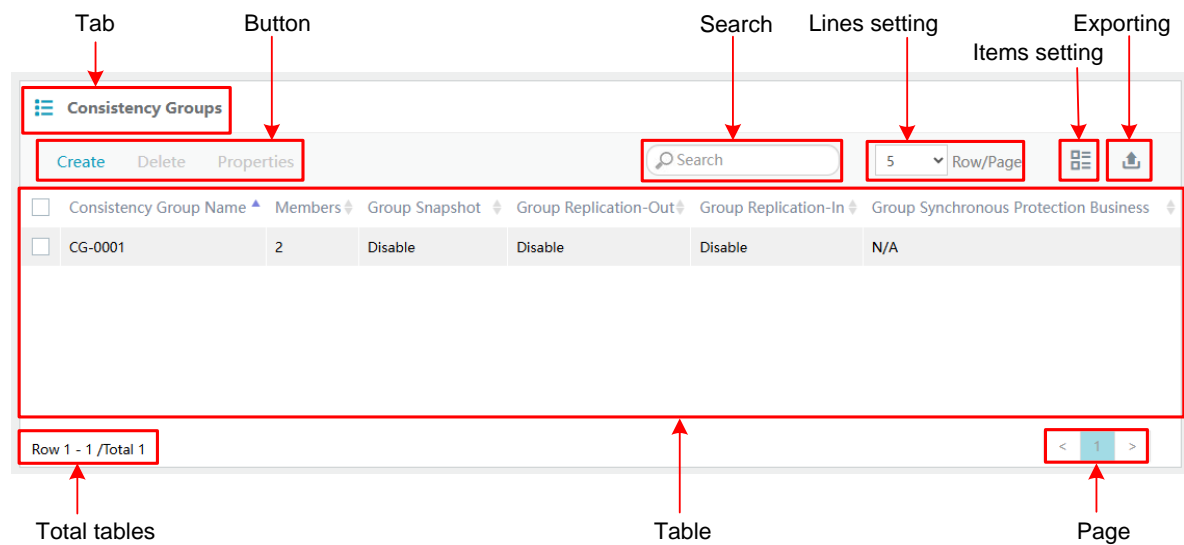


Figure 3-15 Example of ODSP Scope+ information display area

In the ODSP Scope+ information display area:

- You can click different tabs to view different tables in the case of multiple tabs.
- The supported operations will be displayed after selecting a row in the table. You can click the corresponding button to configure the operations as required. If you need to select multiple rows in the table, you can press Shift to select multiple lines at once.
- Resources can be quickly searched through the function of search. Multiple related objects including the members of consistency group are recommended to be created with the name of the same prefix for quick retrieval and usability improvement during operation.
- The display of the table can be adjusted through settings of lines and items, and the table data can also be directly exported through the export button.

### 3.4.5 Extended Area

Extended area displays the extension information of the selected node or line on the navigation tree or in the table respectively. The content of the extension area varies according to the selected item.

## Part 2: Local Clone Feature

# 4 Introduction to Local Clone Feature

### 4.1 Introduction to Local Clone

With the continuous diversification development of enterprise business, the demand of enterprises on centralized storage application have been increased, and users have put forward higher requirements on the use of online data. On the one hand, it is necessary to ensure the security of enterprise data. On the other hand, the availability of backup data also need to be improved without affecting production business. For example, if some data centers need to test and analyze the latest data generated by the business, clone technology is usually used to generate a replica data that is completely consistent with the production data for test and analysis, so as to ensure the business continuity in testing and analysing without effects on the performance of production business.

When it comes to clone, there must be a clone relationship. Assuming that the production data and backup data are corresponding to the production volume and clone volume respectively, a clone pair is formed by the production volume and the clone volume, and the former is the "source" of the clone, and the latter is the "Target" of the clone. Traditionally, the goal of clone is to completely clone the data of the production volume to the clone volume online. After the clone is completed, data of the clone volume is completely consistent with that of production volume. At this time, you can disable the clone relationship and promote the clone volume to a separated LUN, which is no longer associated with the production volume. It can be seen that the traditional clone technology can be used as a convenient solution for storage administrators to copy data online.

In the MacroSAN clone technology, the function realized by the above-mentioned traditional clone technology is positioned as the basic function of clone. When clone is enabled for the production volume, the storage administrator can select an existing LUN or create a new LUN as the clone volume. After the clone relationship is established, the online initial data synchronization from the production volume to the clone volume will be triggered immediately. During the synchronization process, the changed data on the production volume will be synchronized to the clone volume in real time because of real-time synchronization function. After the synchronization is completed, the new data will also be written to both the production volume and the clone volume at the same time, and the data on the clone volume and the production volume will always be kept in the same time plane. At this time, if you need to use the clone volume as a completely independent LUN and no longer need to maintain the relationship between clone volume and production volume, you can directly disable the clone relationship and promote the clone volume to undertake the business independently.

In addition to the basic functions of clone, MacroSAN clone technology also enhanced three major clone functions of real-time synchronization, instant separation and resume/reverse synchronization, providing a perfect supplement for the shortcomings of traditional backup technologies on flexibility, efficiency and usability, which enables clone not only a convenient way to copy data online for storage administrators, but also a preferred solution for data backup.



## 4.2 Introduction to Consistency Group

---

### NOTE

Among the members of consistency group, only one synchronous protection business (including dual-active, remote mirror, local mirror and local clone) can be enabled.

---

Some production businesses of the application server need to be operated on the base of multiple LUNs, such as database, which are usually subdivided into data LUNs, configuration LUNs, and log LUNs. If the data in a certain time plane needs to be obtained, the consistency of the obtained data must be ensured on a LUN. In other words, the data obtained on multiple LUNs is required to correspond to the same time plane. Otherwise, these data cannot be used to run business.

The consistent group function allows you to add multiple LUNs associated with data to a consistent group. These LUNs are also called members of the consistent group. When consistency is required for some operations, the system will suspend the IOs of all members in the consistency group, perform related operations to obtain the data of the current time plane, and resume the IO of all members, which ensures the consistency of the acquired data.

Combining local clone feature with consistency group function can strictly guarantee the data consistency of the multiple clone LUN members in the consistency group.

# 5

## Configuring Consistency Group (Optional)

---

### NOTE

- The consistency group is an optional function. If some production businesses on the application server need to be operated on the base of multiple LUNs with data consistency requirements, you need to create a consistency group first, and then add multiple LUNs associated with data to this consistency group. Please configure it according to actual needs.
  - To improve operation convenience, it is recommended that the member names of the consistency group contain the same prefix for quick research.
- 

## 5.1 Creating Consistency Group

This section explains how to create consistency group.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Click the <Create> button in the information display area to open the **Create Consistency Group** window, as shown in [Figure 5-1](#). Enter the suffix of the consistency group name, select LUN, and click the <OK> button to complete the configuration.

Create Consistency Group

Name: \* CG- 0001

Please Select LUNs:

<input type="checkbox"/>	Name	Capacity	Health Status	Owning Tenant
<input type="checkbox"/>	LUN-0001	100 GB	Normal	
<input type="checkbox"/>	LUN-0002	100 GB	Normal	
<input type="checkbox"/>	LUN-0003	100 GB	Normal	
<input type="checkbox"/>	LUN-0004	100 GB	Normal	

Total 4 , Selected 0

<1>

OK

Cancel

Figure 5-1 Create consistency group interface

## 5.2 Viewing Consistency Group

### 5.2.1 Viewing Properties

This section explains how to view consistency group's basic properties.

#### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area and click the <Properties> button to open the **Basic Properties** window. You can view the basic properties of the consistency group.

### 5.2.2 Viewing Members

This section explains how to view consistency group's members.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area and you can view the members of the consistency group in the extended area.

## 5.3 Modifying Consistency Group Properties

This section explains how to modify consistency group's name, group synchronous protection control business and group synchronous protection business flow control.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area and click the <Properties> button to open the **Basic Properties** window, as shown in [Figure 5-2](#). Modify the properties of consistency group and click the <OK> button to complete the configuration.

### Basic Properties

Name:*	CG- 0001
Creation Time:	2024-11-06 10:39:20
Members:	2
Group Snapshot:	Disable
Group R3DC:	Disable
Group Replication-Out:	Enable
Group Replication-In:	Disable
Group Synchronous Protection Business:	Dual-Active
Group Synchronous Protection Business Flow Control:	Medium (40-80MBps)

OK

Cancel

Figure 5-2 Consistency group basic properties interface

Table 5-1 Description of the parameters for consistency group basic properties interface

Parameter	Description
Name	It refers to the name of consistency group. The name prefix is "CG-", and only the suffix need to be entered.
Group Synchronous Protection Business	It refers to synchronous protection business of the consistency group, including N/A, Dual-Active, Remote Mirror, Local Mirror and Local Clone.
Group Synchronous Protection Business Flow Control	<p>It refers to synchronous protection business flow control of the consistency group, For consistency group members, synchronous protection business flow control can be set in units of consistency groups to avoid the effect of synchronous tasks on the front-end business performance.</p> <ul style="list-style-type: none"> <li>• Low (0-20MBps)</li> <li>• Medium (40-80MBps)</li> <li>• High (100-200MBps)</li> <li>• Highest (greater than 200MBps)</li> <li>• Custom: Setting upper limit of rate ratio manually. Valid range: 1-1024MBps.</li> </ul>

## 5.4 Deleting Consistency Group

This section explains how to delete consistency group.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area, click the <Delete> button, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

## 5.5 Adding Members for Consistency Group

This section explains how to add members for consistency group.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area and click the <Add LUN> button in the extended area to open the **Add Consistency Group Member** window, as shown in [Figure 5-3](#). Select the desired LUN and click the <OK> button to complete the configuration.

Add Consistency Group Member

Consistency group name: CG-0001

Group snapshot: Disable ; Group Replication-Out: Disable ; Group Replication-In: Disable ; Group Synchronous Protection Business: Dual-Active

Please Select LUNs:

<input type="checkbox"/>	Name	Capacity	Health Status	Owning Tenant
<input type="checkbox"/>	LUN-0003	100 GB	Normal	
<input type="checkbox"/>	LUN-0004	100 GB	Normal	

Total 2 , Selected 0

OK

Cancel

Figure 5-3 Add consistency group member interface

## 5.6 Removing Members from Consistency Group

This section explains how to remove members from consistency group.

### Steps

Step 1: Select "Service" -> "Consistency Group" on the navigation tree to open the consistency group interface.

Step 2: Select the desired consistency group in the information display area, select the desired LUN in the extended area, click the <Remove LUN> button, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

# 6 Configuring Local Clone

## 6.1 Activating Local Clone License

This section explains how to activate local clone license.

---

### NOTE

After activating successfully, the "Local Clone" sub-node will be displayed under the "Service" node on the navigation tree.

---

#### Steps

Step 1: Select "System" -> "Setting" on the navigation tree to open the system setting interface.

Step 2: Click the <License Setting> button to open the **License Setting** window, enter a valid local clone license and click the <Activate> button to complete the configuration.

## 6.2 Managing LUN Local Clone

### 6.2.1 Enabling Local Clone

This section explains how to enable local clone.

#### Prerequisites

- The capacities of primary LUN and target LUN must be the same.
- The health status of primary LUN and target LUN must be normal.
- Both default SPs and current SPs to which primary LUN and target LUN belongs must be the same.
- If snapshot resources have been created for primary LUN and target LUN, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN and target LUN, they will be created in the system automatically.
- Target LUN cannot be assigned to client servers.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Click the <Enable> button in the **LUN Local Clones** tab of the information display area to open the **Enable Local Clone** wizard.

Step 3: The first step of the **Enable Local Clone** wizard is shown in [Figure 6-1](#). Select primary LUN and click the <Next> button to enter the next interface.

## Enable Local Clone

1

/4

Please Select a Primary LUN  
When local clone is enabled, data will be synchronized from the primary LUN to the target LUN.

	Name	Capacity	Default SP	Health Status
<input type="checkbox"/>	LUN-0001	100 GB	SP1	Normal
<input type="checkbox"/>	LUN-0002	100 GB	SP2	Normal
<input type="checkbox"/>	LUN-0003	100 GB	SP1	Normal
<input type="checkbox"/>	LUN-0004	100 GB	SP2	Normal

Total 4

<

1

>

Next

Cancel

Figure 6-1 Enable local clone wizard interface (1)

Step 4: The second step of the **Enable Local Clone** wizard is shown in [Figure 6-2](#). Select target LUN and click the <Next> button to enter the next interface.

Enable Local Clone

2 / 4

Please Select a Target LUN

When local clone is enabled, data will be synchronized from the primary LUN to the target LUN.

Note: The data on the target LUN will be overwritten.

	Name	Capacity	Default SP	Health Status
<input type="checkbox"/>	LUN-0003	100 GB	SP1	Normal

Total 1

☐ Create Target LUN

Previous

Next

Cancel

Figure 6-2 Enable local clone wizard interface (2)

#### NOTE

If a target LUN has not been created in advance, you can also select the "Create Target LUN" option in this step to create a new target LUN on the device. In the next step, you will create a new target LUN through extended steps, corresponding to steps 2a/4 and 2b/4 etc. This chapter only describes content related to local clone. For the steps and parameter descriptions of creating a LUN, please refer to the relevant user manual:

- For details on creating a Thick-LUN, see *MacroSAN MS Series Storage Devices Basic Configuration GUI User Manual*.
- For details on creating a Thin-LUN, see *MacroSAN MS Series Storage Devices Thin Provisioning Feature GUI User Manual*.
- For details on creating an RDV-LUN, see *MacroSAN MS Series Storage Devices Virtualization Feature GUI User Manual*.



Step 5: The third step of the **Enable Local Clone** wizard is shown in [Figure 6-3](#). Set synchronous protection business flow control and local clone policy (see [Table 6-1](#) for details) and click the <Next> button to enter the next interface.

#### **NOTE**

No local clone policy means that the local clone can only be disabled or split manually instead of automatically.

Enable Local Clone
✕

3

Set Local Clone Policy

/4 The device will be disabled automatically or split according to the set local clone policy.

Synchronous Protection Business Flow Control:

Medium (10-20MBps) ▼

☐ Auto Split:
 

Day:
 

☒ Mon.

☒ Tues.

☒ Wed.

☒ Thurs.

☒ Fri.

☒ Sat.

☒ Sun.

Split Period:

06:00:00 - 22:00:00

i

Sync Direction:

Forward sync ▼

☐ Auto Disable:
 

☐ Disable immediately after local clone is completed

☒ Disable at the next specified time after local clone is completed

Time:

14:45:00

Previous

Next

Cancel

Figure 6-3 Enable local clone wizard interface (3)

Table 6-1 Description of the parameters for enabling local clone wizard interface (3)

Parameter	Description
Synchronous Protection Business Flow Control	<p>It is used to control the local clone rate so that the bandwidth consumed by back-end clone synchronization does not affect front-end traffic on the primary LUN.</p> <ul style="list-style-type: none"> <li>Low (0-5MBps)</li> <li>Medium (10-20MBps)</li> </ul>

6-33

	<ul style="list-style-type: none"> <li>• High (50-70MBps)</li> <li>• Highest (greater than 100MBps)</li> <li>• Custom: It refers to manually setting the upper limit of the rate, ranging from 1-1024MBps.</li> </ul>
Local Clone Policy	<p>The following two clone policies are supported and cannot be set at the same time:</p> <ul style="list-style-type: none"> <li>• Auto split: The clone pair is automatically split at a specified time period. You can set a fixed time period of every day or any number of days from Monday to Sunday to start auto split, and you can also specify the synchronization direction after the local clone is resumed.</li> <li>• Auto disable: The system will automatically disable local clone according to the set policy.</li> </ul>

Step 6: In the fourth step of the **Enable Local Clone** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

## 6.2.2 Viewing Local Clone Properties

This section explains how to view local clone pair's general information, sync information and local clone policy.

### **NOTE**

The **sync information** tab is displayed only when the local clone status is "Syncing".

### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. You can view the basic properties of the local clone pair.

## 6.2.3 Modifying Local Clone Properties

### 6.2.3.1. Modifying Synchronous Protection Business Flow Control

This section explains how to modify local clone pair's synchronous protection business flow control.

### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **Local Clone Policy** tab is shown in [Figure 6-4](#). Modify synchronous protection business flow control (see [Table 6-1](#) for details) and click the <Apply> button to complete the configuration.

Basic Properties

General

Sync Information

Local Clone Policy

Synchronous Protection Business Flow Control:

Medium (10-20MBps)

Batch modify

☐ Auto Split:

Day:

☒ Mon.
☒ Tues.
☒ Wed.
☒ Thurs.
☒ Fri.
☒ Sat.
☒ Sun.

Split Period:

06:00:00 - 22:00:00

Sync Direction:

Forward sync

☐ Auto Disable:

☐ Disable immediately after local clone is completed

☒ Disable at the next specified time after local clone is completed

Time:

14:49:00

OK

Apply

Cancel

Figure 6-4 Local clone basic properties interface

#### 6.2.3.2. Batch Modifying Synchronous Protection Business Flow Control

This section explains how to batch modify local clone pair's synchronous protection business flow control.

##### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select any desired local clone pair in the **LUN Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **Local Clone Policy** tab is shown in [Figure 6-4](#).

Step 3: Click the <Batch modify> button to open the **Batch Modify Synchronous Protection Business Flow Control** window, as shown in [Figure 6-5](#). Modify synchronous protection business flow control (see [Table 6-1](#) for details), select local clone pair, and click the <Apply> button to complete the configuration.

Batch Modify Synchronous Protection Business Flow Control

Synchronous Protection Business Flow Control:

High (50-70MBps)

Please select a local clone pair:

<input type="checkbox"/>	Local LUN Name	Local LUN Mirror Role	Peer LUN Name	Peer LUN Mirror Role	Flow Control
<input type="checkbox"/>	LUN-0001	Primary LUN	LUN-0003	Target LUN	Low (0-5MBps)
<input type="checkbox"/>	LUN-0002	Primary LUN	LUN-0004	Target LUN	Medium (10-20MBps)

Total 2 , Selected 0

OK

Cancel

Figure 6-5 Batch modify synchronous protection business flow control interface

### 6.2.3.3. Modifying Local Clone Policy

This section explains how to modify local clone policy.

#### NOTE

No local clone policy means that the local clone can only be disabled or split manually instead of automatically.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **Local Clone Policy** tab is shown in [Figure 6-4](#). Modify local clone policy (see [Table 6-1](#) for details) and click the <Apply> button to complete the configuration.

### 6.2.4 Splitting Local Clone

This section explains how to split local clone pair.

#### NOTE

Target LUN can be allocated to client server after the local clone pair is split.

### Prerequisites

The local clone status is "Synced" or "Syncing".

### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area, click the <More> button, click the <Split> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

## 6.2.5 Resuming Local Clone

This section explains how to resume local clone pair.

### Prerequisites

The local clone status is "Split".

### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area, click the <More> button, and click the <Resume> button in the drop-down menu to open the **Resume Local Clone** window, as shown in [Figure 6-6](#). Select sync direction and click the <OK> button to complete the configuration.

---

### NOTE

- Forward sync: Data is synchronized from primary LUN to target LUN, and data in target LUN will be overwritten.
  - Reverse sync: Data is synchronized from target LUN to primary LUN, and data in primary LUN will be overwritten.
-

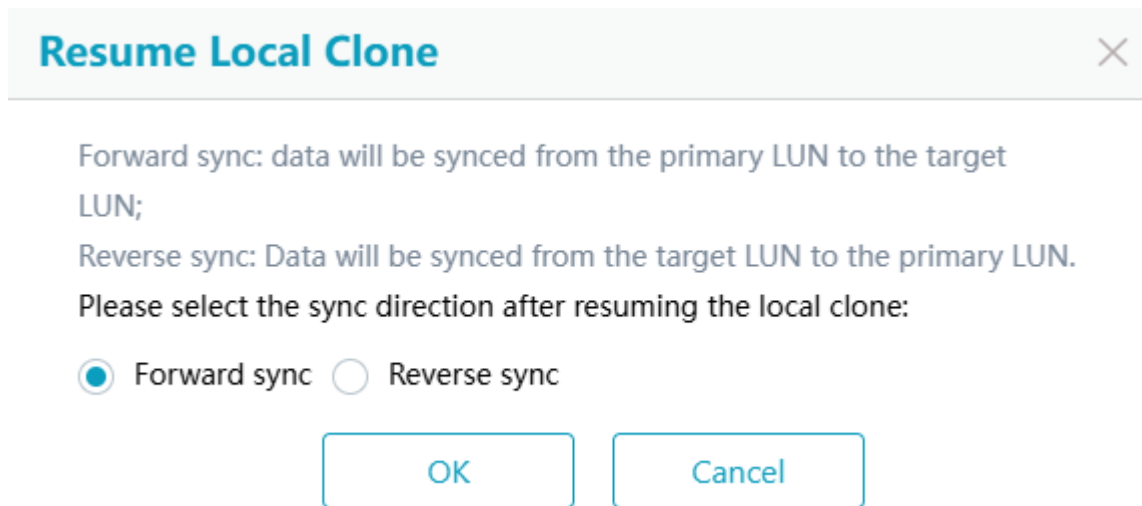


Figure 6-6 Resume local clone interface

### 6.2.6 Disabling Local Clone

This section explains how to disable local clone.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired local clone pair in the **LUN Local Clones** tab of the information display area, click the <Disable> button, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

## 6.3 Managing Consistency Group Local Clone

### 6.3.1 Enabling Group Local Clone

This section explains how to enable consistency group local clone.

#### Prerequisites

The LUN local clone in the consistency group must meet the following requirements:

- The capacities of primary LUN and target LUN must be the same.
- The health status of primary LUN and target LUN must be normal.
- Both default SPs and current SPs to which primary LUN and target LUN belong must be the same.
- If snapshot resources have been created for primary LUN and target LUN, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN and target LUN, they will be created in the system automatically.
- Target LUN cannot be assigned to client servers.

## Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Click the <Enable> button in the **Group Local Clones** tab of the information display area to open the **Enable Group Local Clone** wizard.

Step 3: The first step of the **Enable Group Local Clone** wizard is shown in [Figure 6-7](#). Select primary group and click the <Next> button to enter the next interface.

### Enable Group Local Clone

1 / 5

Please Select a Primary Group  
When local clone is enabled, data will be synchronized from the primary LUN to the target LUN.

	Group Name	Members
<input type="checkbox"/>	CG-0001	2
<input type="checkbox"/>	CG-0002	2

Total 2

< 1 >

Next Cancel

Figure 6-7 Enable group local clone wizard interface (1)

Step 4: The second step of the **Enable Group Local Clone** wizard is shown in [Figure 6-8](#). Select target group and click the <Next> button to enter the next interface.

Enable Group Local Clone

×

2

Select a Target Group

/5

The target LUN in the group is used to hold the data replica of the primary LUN.

Note:The data on the target LUN will be overwritten.

	Group Name	Members
<input type="checkbox"/>	CG-0002	1

Total 1

< 1 >

☐ Create Target Group

Previous

Next

Cancel

Figure 6-8 Enable group local clone wizard interface (2)

#### NOTE

If a clone group has not been created in advance, you can also select the "Create Target Group" option in this step to create a new target group on the device. In the next step, you will create a new local clone group through extended step, corresponding to step 2a/5. For the details about the creation method, see [5.1 Creating Consistency Group](#).

Step 5: The third step of the **Enable Group Local Clone** wizard is shown in [Figure 6-9](#). Configure local clone pairs for members and click the <Next> button to enter the next interface.



Enable Group Local Clone

3

Configure Local Clone Pairs for Members

/5 Please ensure that the member local clone relationship is consistent with the actual requirements.

Primary Group	Primary LUN	Target Group	Target LUN
CG-0001	LUN-0001	CG-0002	LUN-0003(100 GB)
CG-0001	LUN-0002	CG-0002	LUN-0004(100 GB)

Total 2

<

1

>

Previous

Next

Cancel

Figure 6-9 Enable group local clone wizard interface (3)

**NOTE**

The system will automatically match the local clone pair. In other words, it will automatically select the target LUN that meets the requirements for the primary LUN. Please check the member's local clone pair relationship to ensure that it is consistent with the actual requirements. If the primary LUN is not matched with a target LUN that meets the requirements, you can also choose to create a new target LUN. In the next step, you will create a new target LUN through extended steps, corresponding to steps 3a/5, 3b/5, etc. This chapter only describes the content related to group local clone. For the steps and parameter descriptions of creating a LUN, please refer to the relevant user manual:

- For details on creating a Thick-LUN, see *MacroSAN MS Series Storage Devices Basic Configuration GUI User Manual*.
- For details on creating a Thin-LUN, see *MacroSAN MS Series Storage Devices Thin Provisioning Feature GUI User Manual*.
- For details on creating an RDV-LUN, see *MacroSAN MS Series Storage Devices Virtualization Feature GUI User Manual*.

Step 6: The fourth step of the **Enable Group Local Clone** wizard is shown in [Figure 6-10](#). Set synchronous protection business flow control and local clone policy (see [Table 6-2](#) for details) and click the <Next> button to enter the next interface.

## NOTE

No local clone policy means that the local clone can only be disabled or split manually instead of automatically.

### Enable Group Local Clone

4

Set Group Local Clone Policy

/5 The device will be disabled automatically or split according to the set local clone policy.

Synchronous Protection Business Flow Control:

Medium (40-80MBps)

☐ Auto Split:

Day: ☒ Mon. ☒ Tues. ☒ Wed. ☒ Thurs. ☒ Fri. ☒ Sat. ☒ Sun.

Split Period: 06:00:00 - 22:00:00

Sync Direction: Forward sync

☐ Auto Disable:

☐ Disable immediately after local clone is completed

☒ Disable at the next specified time after local clone is completed

Time: 15:45:00

Previous

Next

Cancel

Figure 6-10 Enable group local clone wizard interface (4)

Table 6-2 Description of the parameters for enabling group local clone wizard interface (4)

Parameter	Description
Synchronous Protection Business Flow Control	<p>It is used to control the group local clone rate so that the bandwidth consumed by back-end clone synchronization does not affect front-end traffic on the primary LUN.</p> <ul style="list-style-type: none"><li>Low (0-20MBps)</li><li>Medium (40-80MBps)</li><li>High (100-200MBps)</li><li>Highest (greater than 200MBps)</li><li>Custom: It refers to manually setting the upper limit of the rate. Valid range: 1-1024MBps.</li></ul>

Group Local Clone Policy	<p>The following two clone policies are supported and cannot be set at the same time:</p> <ul style="list-style-type: none"> <li>• Auto split: The clone pair is automatically split at a specified time period. You can set a fixed time period of every day or any number of days from Monday to Sunday to start auto split, and you can also specify the synchronization direction after the local clone is resumed.</li> <li>• Auto disable: The system will automatically disable local clone according to the set policy.</li> </ul>
--------------------------	--

Step 7: In the fifth step of the **Enable Group Local Clone** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

### 6.3.2 Viewing Group Local Clone Properties

This section explains how to view group local clone's basic properties.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. You can view the basic properties of the group local clone pair.

### 6.3.3 Modifying Group Local Clone Properties

#### 6.3.3.1. Modifying Group Synchronous Protection Business Flow Control

This section explains how to modify group local clone pair's synchronous protection business flow control.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window, as shown in [Figure 6-11](#). Modify synchronous protection business flow control (see [Table 6-2](#) for details) and click the <Apply> button to complete the configuration.

Basic Properties

×

Synchronous Protection Business Flow Control:

Medium (40-80Mbps)

i

☐ Auto Split:
 

Day:

☒ Mon.
 ☒ Tues.
 ☒ Wed.
 ☒ Thurs.
 ☒ Fri.
 ☒ Sat.
 ☒ Sun.

Split Period:

06:00:00 - 22:00:00

i

Sync Direction:

Forward sync

▼

☐ Auto Disable:
 

☐ Disable immediately after local clone is completed
   
☒ Disable at the next specified time after local clone is completed
 

Time:

15:53:00

OK

Cancel

Figure 6-11 Group local clone basic properties interface

### 6.3.3.2. Modifying Group Local Clone Policy

This section explains how to modify group local clone's policy.

#### NOTE

No group local clone policy means that the group local clone can only be disabled or split manually instead of automatically.

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area and click the <Properties> button to open the **Basic Properties** window, as shown in [Figure 6-11](#). Modify group local clone policy (see [Table 6-2](#) for details) and click the <OK> button to complete the configuration.

### 6.3.4 Splitting Group Local Clone

This section explains how to split all members in group local clone.

---

#### **NOTE**

Target LUN can be allocated to client server after the group local clone is split.

---

#### Prerequisites

The local clone status of all members in the group is "Synced".

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area, click the <More> button, click the <Split> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

### 6.3.5 Resuming Group Local Clone

This section explains how to resume all split members in group local clone.

#### Prerequisites

The local clone status of all members in the group is "Split".

#### Steps

Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.

Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area, click the <More> button, and click the <Resume> button in the drop-down menu to open the **Resume Local Clone** window, as shown in [Figure 6-12](#). Select sync direction and click the <OK> button to complete the configuration.

---

#### **NOTE**

- Forward sync: Data is synchronized from primary LUN to target LUN, and data in target LUN will be overwritten.
  - Reverse sync: Data is synchronized from target LUN to primary LUN, and data in primary LUN will be overwritten.
-

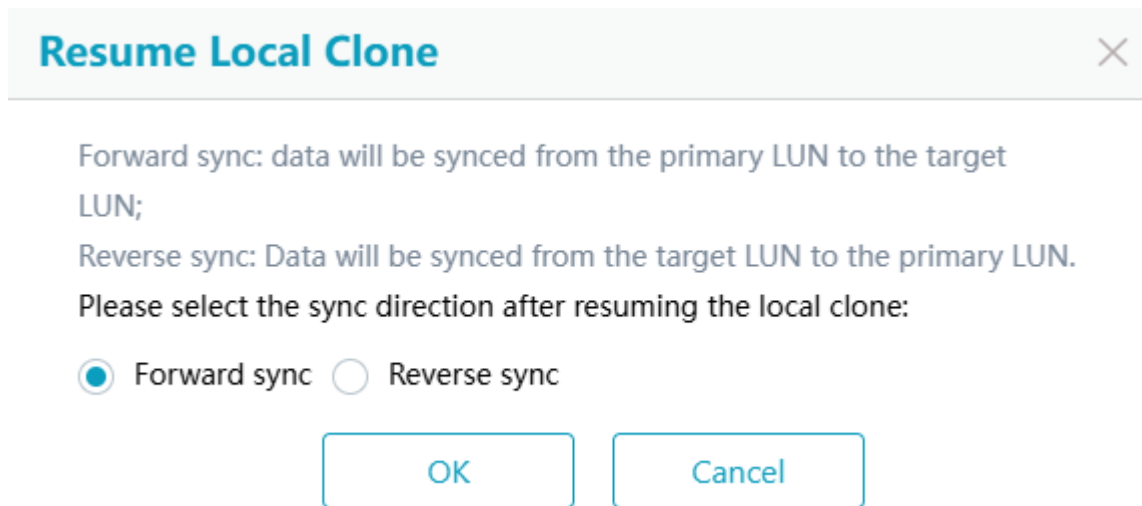


Figure 6-12 Resume group local clone interface

### 6.3.6 Disabling Group Local Clone

This section explains how to disable all members in group local clone.

#### Steps

- Step 1: Select "Service" -> "Local Clone" on the navigation tree to open the local clone interface.
- Step 2: Select the desired group local clone pair in the **Group Local Clones** tab of the information display area, click the <Disable> button, and click the <OK> button in the pop-up confirmation box to complete the configuration.

## Appendix A. Device Default Configurations

The default configurations of the device are shown in [Table 6-3](#).

Table 6-3 Device default configuration

Item	Default
Device name	Storage-1
IP address of the SP1 management network port	192.168.0.210
IP address of the SP2 management network port	192.168.0.220
IP address of the SP3 management network port	192.168.0.230
IP address of the SP4 management network port	192.168.0.240
Administrator	admin
Password	admin

## Appendix B. Device External Ports Summary

Device external ports list is shown in [Table 6-4](#).

Table 6-4 Device external ports summary

Port name	Port number	Protocol	Switch	Description
FTP listen port	21	TCP	On by default	Files cannot be uploaded/downloaded through GUI when it is off.
SSH listen port	22	TCP	On by default	SSH cannot be logged in when it is off.
DNS port	53	TCP/UDP	On by default	DNS cannot be used when it is off.
SNMP listen port	161	UDP	On by default	SNMP function on Get and Set cannot be used when it is off.
iSCSI listen port	3260	TCP	On by default	iSCSI cannot be used when it is off.
Universal VM Console port	8081	TCP	On by default	VM cannot be used when it is off.
【VVOL】 HTTPS listen port	8443	TCP	On by default	GUI cannot be used when it is off.
【VVOL】 HTTPS service listen port	8448	TCP	On by default	VVOL cannot be used when it is off.
Smart enclosure Internet configuration port	8888	TCP	On by default	Smart enclosure Internet auto configuration cannot be used when it is off.
Webservice listen port	9090	TCP	On by default	Cannot off.
	10100	TCP	On by default	Cannot off.
replication listen port	15500	TCP	On by default	Replication cannot be used when it is off.
	15510	TCP	On by default	Replication cannot be used when it is off.
mirror listen port	15550	TCP	On by default	Dual-active or mirror cannot be used when it is off.
mirror link detection port	16666	UDP	On by default	Dual-active or mirror cannot be used when it is off.
XAN Internet listen port	15775	TCP	On by default	Functions related to XAN cannot be used when it is off.



## Appendix C. Glossaries

### A

<b>Active-Backup</b>	It is a port aggregation mode. The traffic model between member ports is active/standby mode.
----------------------	---

### B

<b>Balance-RR</b>	It is a port aggregation mode. The traffic model between member ports is load balance mode.
-------------------	---

### C

<b>Cache</b>	Cache is one of the important performance optimizations for storage devices. It improves storage read/write performance by storing frequently accessed data in high-speed physical memory. At the same time, it identifies hotspots in advance and pre-reads corresponding data into high-speed physical memory, further improving storage read performance.
--------------	--

<b>Cache--Dirty Data</b>	It refers to the reserved data in the write cache yet has not been flushed to disks.
--------------------------	--

<b>Cache--Dynamic Allocation</b>	It means that the system dynamically adjusts the cache space occupied by each LUN in accordance with the corresponding traffic in the current statistical cycle to optimize overall utilization of the system cache.
----------------------------------	--

<b>Cache--Frozen Cache</b>	It means that the dirty data in the cache cannot be successfully down-flushed to the disk and is temporarily stored in the cache because of RAID failure or other reasons.
----------------------------	--

<b>Cache--Fixed Allocation</b>	It means that the system allocates cache space for LUNs based on the set percentage.
--------------------------------	--

<b>Cache--Read-ahead</b>	In the read cache field, the read-ahead function can be used to identify hotspots in advance and pre-read the corresponding data from the disk to the read cache, further improving the read performance of the storage. It is suitable for situations where the traffic model is sequential reads.
--------------------------	---

<b>CLI</b>	One of the management interfaces of the storage device, which manages the device through the command line interface.
------------	--

<b>Console ETH Port</b>	The network ports designed for management.
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### D

<b>Data Reduction</b>	It refers to the technology of reducing data storage space. In this manual, data reduction mainly means data deduplication and data compression.
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<b>Data Reduction--Compression</b>	Data compression is a data reduction technology that re-encodes data by a specific algorithm to reduce storage space.
------------------------------------	---

<b>Data Reduction--DDSR</b>	A data copy shared resource that used to store all data of reduction LUN and deduplication metadata.
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<b>Data Reduction--Deduplication</b>	Data deduplication is a data reduction technology that reduces the physical storage capacity occupied by data through deleting redundant data blocks in the storage system.
<b>Data Reduction--Reduction Ratio</b>	It refers to the ratio of the amount of data written by the user to the amount of data actually written to the disk.
<b>DSU</b>	Disk Shelf Unit (DSU), commonly refers to a disk enclosure, which consists of Expander Processors (EP), fan modules, battery modules, power supply modules and disk modules, so as to achieve storage device expansion. DSU can be divided into SAS disk enclosure and NVMe disk enclosure according to the protocol types they supported.
<b>Dual-Active LUN</b>	It consists of two LUNs, which are primary LUN and mirror LUN.
<b>Dual-Active--Mirror Role</b>	It refers to the role of the LUN in dual-active LUNs, which includes primary LUN and mirror LUN.
<b>Dual-Active--Primary LUN and Mirror LUN</b>	It refers to the two LUNs in dual-active LUN. The primary LUN is always synchronized to mirror LUN when the data in the two LUNs are different.
<b>Dual-Active--Reverse</b>	It refers to reversing the mirror role of two LUNs in the dual-active LUNs.
<b>Dual-Active--Synchronize</b>	It refers to the process of synchronizing the data in primary LUN to mirror LUN when the data in the two LUNs are different.
<b>E</b>	
<b>EP</b>	Expander Processor (EP) commonly refers to a disk enclosure controller, which can be installed in a Disk Shelf Unit (DSU) to achieve back-end data processing and distribution of storage devices.
<b>F</b>	
<b>Fabric</b>	A network topology structure in which nodes transmit data to each other through interconnection switches, such as InfiniBand, Ethernet (RoCE, iWARP), FC, etc. Fabrics in this manual are based on RDMA standards.
<b>FC Adapter</b>	It refers to the FC port that is set to Initiator mode.
<b>FC Port Working Mode</b>	It refers to the usage of the FC port, including Initiator mode, Target mode and NVMe mode, and the default mode is Target.
<b>FP</b>	Fabric Processor (FP) commonly refers to smart switch enclosure controller, which can be installed in an FSU (Fabric Switch Unit) to achieve back-end data processing and distribution of storage devices.
<b>Front-End Application Server</b>	It refers to the servers that use the storage space provided by the storage device.
<b>FSU</b>	FSU (Fabric Switch Unit) commonly refers to smart switch enclosure and consists of FPs (Fabric Processors), fan modules, battery modules, power supply modules and disk modules, so as to achieve business processing, disk swap, storage device capacity expansion and other functions.

## G

<b>Gateway</b>	A gateway refers to a network that serves as an entry node to another network.
<b>GUI</b>	Graphical User Interface (GUI) is one of the management interfaces of storage devices, which is used to manage the devices through words and figures.
<b>H</b>	
<b>HA</b>	The storage device includes dual-controller or quad-controller, and each controller is set to Active mode by default, providing external business. If one controller fails, the others will automatically take over its business to ensure business continuity. Once the faulty controller is fixed, it will resume its original tasks and all controllers will be back in Active mode.
<b>HA--Recovery</b>	It refers to the process of reloading the original business of the faulty controller after it recovers.
<b>HA--Takeover</b>	It refers to the process in which when one controller in a storage device fails, another controller automatically takes over its business.
<b>HotCache</b>	It is an important performance optimization for storage devices. SSDs are used as the second-level cache of storage devices based on their high-speed access feature, improving the overall read performance of storage devices.
<b>HotCache--LUN</b>	It refers to the LUN created based on HotCache-RAID and dedicated by HotCache function.
<b>HotCache--Pool</b>	It refers to the pool to which HotCache-RAID and HotCache-LUN belong.
<b>HotCache--RAID</b>	It refers to the RAID created through SSD and dedicated by HotCache function.
<b>Hot Spare Disk</b>	It refers to disks that can be used for rebuilding after redundant RAID degradation.
<b>Hot Spare Disk--Blank Hot Spare Disk</b>	When RAID needs to be rebuilt in the case of blank disk hot spare is enabled, if there is no dedicated hot spare or available global hot spare, a blank disk that meets the requirements in the storage device will be used for rebuilding, and there is no need to manually set the disk as a hot spare, greatly simplifying the operations of the storage administrator.
<b>Hot Spare Disk--Dedicated Hot Spare Disk</b>	Dedicated hot spare disk can only be used by corresponding RAID.
<b>Hot Spare Disk--Global Hot Spare Disk</b>	A global hot spare can be used by all RAIDs in the system, provided that the type and capacity of the global hot spare meet the requirements of the RAID that needs to be rebuilt.
<b>I</b>	
<b>Initiator</b>	It usually means the application server, which is the Initiator of commands and requests in SCSI protocol.
<b>iSCSI</b>	It is a standard network protocol for high-speed data transmission based on Ethernet.

**iSCSI--Bi-directional CHAP Authentication**

It means Initiator and Target can authenticate each other. Bi-directional CHAP authentication is enabled on the base of uni-directional CHAP authentication. Set specified authentication username and password for the Initiator on the application server; Enable bi-directional CHAP authentication for iSCSI Target on the storage device, and enter this user name and password; When the application server initiates an iSCSI connection request, it will determine whether the CHAP authentication information returned by the storage device is consistent with the authentication information preset by the Initiator, if yes, the connection can be established; if not, the establishment fails.

**iSCSI--CHAP Authentication**

It is a password-based query response authentication protocol.

**iSCSI--Uni-directional CHAP Authentication**

It means authentication of Target on Initiator. Enable CHAP authentication for Initiator on the storage device, and set username and password; When using the Initiator on the application server to connect to the storage device, enter the corresponding username and password; When the storage device receives the iSCSI connection request, it checks whether the authentication information carried in the iSCSI connection request is consistent with the preset authentication information in the storage device. If yes, the connection can be established. If not, the connection establishment fails.

**L**

**LUN**

It refers to logical storage space accessible to client servers.

**LUN--Owing SP**

The default ownership of a LUN is set by the user, which means that the created LUN is assigned to a certain controller. When HA switches, it will be automatically switched to the peer controller for management, and the current ownership will change; When the HA status returns to normal, it will be automatically switched back to the local controller for management.

**M**

**Management PC**

It refers to the laptop, PC or server that is used to run ODSP Scope.

**Multi-Tenant**

Multi-tenant is a new resource management technology, the core of which is to provide shared storage resources for multiple branches or departments based on the same physical storage system.

**N**

**NDM**

Non-interrupt Data Migration.

**NVMe**

Non-Volatile Memory express, which is an interface specification for logical device. It is used to access to non-volatile storage media through PCIe bus, greatly improving the storage performance.

**NVMf**

NVMe over fabrics, which is a technology that access to NVMe through the fabric such as RDMA or optical fiber channel architecture on the base of NVMe protocol.

**O**

<b>ODSP</b>	Open Data Storage Platform (ODSP) is a special storage software platform developed by MacroSAN Technologies Co., Ltd independently. It is applicable to all series of MacroSAN storage devices, providing advanced data security, business continuity, flexible scalability, open customization and rich storage features for storage devices.
<b>ODSP Scope</b>	Open Data Storage Platform Scope (ODSP Scope) is a GUI management tool for storage devices based on MacroSAN ODSP software platform. It adopts CS architectures and provides a Java-based management interface.
<b>ODSP Scope+</b>	Open Data Storage Platform Scope+ (ODSP Scope+) is an upgraded version of ODSP Scope featured by BS architectures with web-based management interface, providing easier management of the entire system for administrators.
<b>P</b>	
<b>Pool</b>	A pool is a resource zone, which contains a group of disks, RAIDs and LUNs. The data can flow within the pool by Cell to implement dynamic allocation and management of storage resources.
<b>Port Aggregation</b>	It refers to binding two or more physical network ports into one aggregated port, where any member port disconnection does not affect business continuity.
<b>Power Off Disk Safely</b>	The sudden power failure of the disk may cause the magnetic head to scratch the disk surface, resulting in disk media errors. Therefore, software is used to stop and power off the disk normally, and then prompt the user to manually remove the disk to protect the disk.
<b>R</b>	
<b>R3DC</b>	It refers to create XANs between three data centers, and then enabling dual-active/synchronous + asynchronous replication to achieve a multi data center disaster recovery. The coexistence of three data centers ensures the continuity of business in the event of a disaster in any two data centers, greatly improving the availability of disaster recovery solutions.
<b>RAID</b>	RAID is a protection mechanism that combines multiple independent physical disks in different ways to form a disk group, providing higher storage performance than a single disk and supporting data redundancy.
<b>RAID Level</b>	It refers to different data organization ways, commonly including RAID0, RAID1, RAID5, RAID6, RAID10, RAIDx-3, etc.
<b>RAID--Non-redundant</b>	Non-redundancy means that there is no redundancy protection for data in a RAID array. If a member disk of the RAID array fails or is removed, some or all data in the RAID array becomes inaccessible.
<b>RAID Rebuild</b>	It refers to the process of using a hot spare to rebuild and restore RAID redundancy after a redundant RAID is downgraded.
<b>RAID--Redundant</b>	Redundancy means that data in a RAID array is redundant. If a member disk fails or is removed from the RAID array, data availability in the RAID array is not affected.

<b>RDV Initialization</b>	The volumes on the back-end storage device are directly provided to the front-end application server and the original data is reserved.
<b>RDV-LUN</b>	It refers to the LUNs that are created based on volumes initialized in RDV mode and can be directly accessed by front-end application servers.
<b>Reduction LUN</b>	It refers to the LUN with enabled deduplication and/or compression, including deduplication LUN, compression LUN and deduplication and compression LUN.
<b>Replication</b>	Replication is one of the commonly used data protection methods, which refers to the process of replicating data from the primary resource to the replica resource according replication mode initiated by source device after the replication relationship is configured.
<b>Replication--Activate/Suspend Replication Policy</b>	Replication policies can be manually suspended or activated for replication pairs. After suspending the replication policy, replication will not be performed when the policy is met next time. The policy will not take effect until it is activated again. Suspending operation does not affect the current replication in progress.
<b>Replication—Activate/Suspend Replication Mode Switching Policy</b>	Replication pair's replication mode switching policy can be suspended or activated manually. After suspending a replication mode switching policy, replication mode will not be switched automatically until the policy is reactivated in the case of its replication mode switching policy is met.
<b>Replication-in and Replication-out</b>	It means the replication direction. The primary resource is replication-out and the replica resource is replication-in in one replication pair.
<b>Replication--Initial Replication</b>	It refers to the first replication process between primary resource and replica resource.
<b>Replication--Local Replication and Remote Replication</b>	Local replication refers to the replication in one device, which means both the primary resource and the replica resource are in the same device. Remote replication refers to the replication in different devices, which means the primary resource and the replica resource are in different devices. The link of remote replication is usually on wide-area network.
<b>Replication Mode Switching Policy</b>	Replication is switched automatically according to the set replication mode switching policy.
<b>Replication Pair</b>	It refers to the primary resource and replica resource of replication.
<b>Replication Policy</b>	It refers to the time policy configured by the user, and when the time policy is met, replication function will be triggered automatically by the replication source device.
<b>Replication--Primary Resource and Replica Resource</b>	The primary resource refers to the production data volume in the production center, while the replica resource refers to the data replica in the disaster recovery center. When replication is triggered, the data in primary resource is always replicated to the replica resource.
<b>Replication--Scan</b>	For replication pairs, the scanning operation allows you to obtain the differential data of the primary and replica resources, so that only the differential data is replicated in the next replication, thus reducing the amount of replicated data.
<b>Replication--Scan Difference Before Initial Replication</b>	This parameter specifies whether to scan before the initial replication. If yes, the scan is automatically started to obtain the differential data between the primary resource and the replica resource. Only the differential data is

	replicated during the initial replication to reduce the amount of replicated data. If you select No, all data in the primary resource is replicated during the initial replication.
<b>Replication--Source Device and Target Device</b>	The source device refers to the storage device to which the primary resource belongs, and the target device refers to the storage device to which the replica resource belongs. The source and target devices are relative to a certain replication pair. There can be multiple replication pairs between the two devices at the same time, and the replication direction can be the same or different.
<b>Replication—Synchronous Replication and Asynchronous Replication</b>	Synchronous replication refers to synchronizing data in real-time, which means data of the primary LUN is synchronously written to the replica LUN, strictly ensuring real-time consistency. Asynchronous replication refers to synchronizing data periodically, which means the changing data in the primary LUN is replicated to the replica LUN periodically based on the preset replication policy.
<b>Replication--Update</b>	It means that the replication relationship is disabled and the replica resource is promoted to a Thick-LUN.
<b>S</b>	
<b>SDAS</b>	Symmetrical Dual Active Storage system, also known as SDAS system. In order to address business interruption caused by natural disasters or software and hardware failures, a read-write replica is created for a specific LUN in the storage device. When one of the LUNs experiences a disaster, the business can be quickly switched to the replica LUN, achieving the dual purpose of "data protection" and ensuring "business continuity".
<b>Snapshot</b>	Snapshot is one of the commonly used methods of data protection. After configuring snapshots, multiple time points can be created to provide "soft disaster" protection for production data volumes.
<b>Snapshot Policy</b>	It refers to the time policy configured by the user. When the time policy is met, the device will automatically create a snapshot time point.
<b>Snapshot Resource</b>	Snapshot resource relies on LUN. It is used to save data at a snapshot time point on a LUN.
<b>Snapshot Resource Auto-expansion</b>	Snapshot resource auto-expansion is triggered automatically when the resource usage reaches the threshold to avoid invalid snapshot resource caused by full capacity.
<b>Snapshot Resource Data Validity</b>	It is a logical state, which indicates whether the data in the snapshot resource is available, including valid and invalid.
<b>Snapshot Rollback</b>	It is usually called rollback. If the data is damaged because of "soft disaster", the data of the front-end business corresponding to the LUN or view can be rolled back to attempt to recover the business. Snapshot rollback supports rollbacks on time point, view and LUN.
<b>Snapshot Time Point</b>	It is usually called time point. Data on the historical time plane of a LUN is saved by using snapshot. One time point is corresponding to a time plane.
<b>Snapshot View</b>	By creating a snapshot view, the data of the time plane corresponding to the time point associated with the view can be read. At the same time, the view also supports enabling snapshot, creating time points and views.

<b>SNSD</b>	Combining SNSD with the iNoF of the switch can achieve plug-and-play and fast fault detection in NVMF environments, achieving second level switching in case of path failures, improving the reliability of the storage system.
<b>SP</b>	Storage Processor (SP) commonly refers to storage controller, which can be installed in a Storage Processor Unit (SPU) to achieve data sending and receiving, processing and protection of storage devices.
<b>SPU</b>	Storage Processor Unit (SPU) commonly refers to main control cabinet which consists of Storage Processors (SP), fan modules, battery modules, power supply modules, etc. It can be connected to the application server through the front-end network and also to the Storage Switch Unit (SSU), Fabric Switch Unit (FSU) and Disk Shelf Unit (DSU) through the back-end network, which enables the functions of data reading, writing and protection.
<b>SSU</b>	Storage Switch Unit (SSU) is a special disk enclosure and commonly refers to switch enclosure, which consists of Exchange Processors (XP), fan modules, battery modules, power supply modules, disk modules and other modules to achieve disk swapping, storage device capacity expansion and other functions.
<b>T</b>	
<b>Target</b>	Target usually refers to the storage device, which is the receiver of commands and requests in the SCSI protocol.
<b>Thick-LUN</b>	It refers to the LUN without thin provisioning.
<b>Thin-LUN</b>	It refers to the LUN with thin provisioning.
<b>Thin-LUN Data Area</b>	It is used to store Thin-LUN user data.
<b>Thin-LUN Extent</b>	It is the smallest unit of Thin-LUN space management. The smaller the extent, the higher the space utilization.
<b>Thin-LUN Logical Capacity</b>	It refers to the size of Thin LUN shown on the client server.
<b>Thin-LUN Physical Capacity</b>	It refers to the physical space allocated to Thin-LUN.
<b>Thin-LUN Private Area</b>	It is used to store Thin-LUN management data.
<b>Thin Provisioning</b>	Thin Provisioning is a new storage management feature, with the core principle of "deceiving" the operating system into recognizing that there is a large amount of storage space when the actual physical storage space is small; As applications write more and more data, the storage system will automatically expand physical storage space in the background, achieving on-demand allocation and resulting in higher utilization of physical storage space and saving users' investment.
<b>V</b>	
<b>Virtualization Device</b>	It refers to a storage device that provides virtualization function and centrally manages the storage space provided by the virtualized devices.
<b>Virtualized Device</b>	It is external device, also called back-end storage device, whose resources



	are allocated to virtualization devices for unified management of storage devices.
<b>Volume</b>	It refers to the LUN created on a back-end storage device is recognized as a volume after it is assigned to the virtualization device.
<b>Volume Attach Status</b>	The attach status of the volume is determined by user operations.
<b>Volume Online Status</b>	It means whether the virtualization device can access the volume and is determined by the path state.
<b>Volume--Owing SP</b>	It refers to the controller of the virtualization device that can access the volume and is determined by the path state.
<b>X</b>	
<b>XP</b>	Exchange Processor (XP) is a special disk enclosure controller, commonly refers to switch enclosure controller, which can be installed in Storage Switch Units (SSU) to achieve back-end data processing and distribution of the storage device.

## Appendix D.Acronyms

### A

<b>ATA</b>	Advanced Technology Attachment
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### C

<b>CHAP</b>	Challenge Handshake Authentication Protocol
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<b>CLI</b>	Command-Line Port
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<b>COW</b>	Copy on Write
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<b>CRAID</b>	RAID based Cell
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### D

<b>DDSR</b>	Data Duplicate Shared Resource
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<b>DSU</b>	Disk Shelf Unit
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### E

<b>EP</b>	Expander Processor
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### F

<b>FC</b>	Fiber Channel
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### G

<b>GE</b>	Gigabit Ethernet
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<b>GUI</b>	Graphical User Port
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### H

<b>HA</b>	High Availability
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### I

<b>IE</b>	Internet Explorer
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<b>iNoF</b>	Intelligent Lossless NVMe over Fabrics
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<b>IP</b>	Internet Protocol
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<b>iSCSI</b>	Internet Small Computer Systems Port
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## **J**

**JRE** Java Runtime Environment

## **L**

**LUN** Logical Unit Number

## **N**

**NDM** Non-interrupt Data Migration

**NGUID** Namespace Globally Unique Identifier

**NVMe** Non-Volatile Memory Express

**NVMf** NVMe over Fabrics

## **Q**

**QoS** Quality of Service

## **R**

**RAID** Redundant Array of Independent Disks

**RDV** Reserved Data Virtualize

**ROW** Redirect on Write

## **S**

**SAN** Storage Area Network

**SAS** Serial Attached SCSI

**SATA** Serial ATA

**SCSI** Small Computer System Port

**SDAS** Symmetrical Dual Active Storage

**SMI-S** Storage Management Initiative Specification

**SMTP** Simple Mail Transfer Protocol

**SNMP** Simple Network Management Protocol

**SNSD** Storage Network Smart Discovery

**SP** Storage Processor

**SPU** Storage Processor Unit

**SSD** Solid State Drive

**SSU** Storage Switch Unit

**W**

**WWN**

World Wide Name/World Wide Name

**X**

**XAN**

eXchange Area Network

**XP**

Exchange Processor