MacroSAN MS Series Storage Devices Thin Provisioning Feature

GUI User Manual

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Statement

This manual is only for operational reference. Due to upgrades of software version or other reasons, this manual may lag behind the latest software version or device configuration. MacroSAN Technologies Co., Ltd. reserves the right of modify the manual without inform or notice.

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

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

⚠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 for the latest document.

ⓘNOTE

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

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. 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.

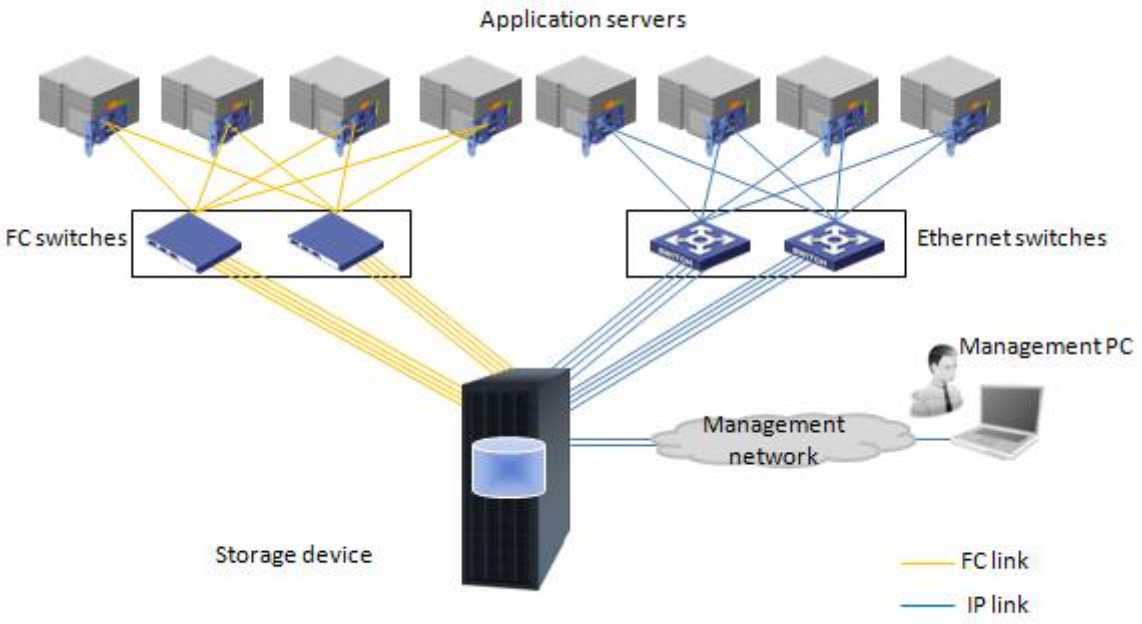

Figure 2-1 Typical networking of MS series storage devices

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.

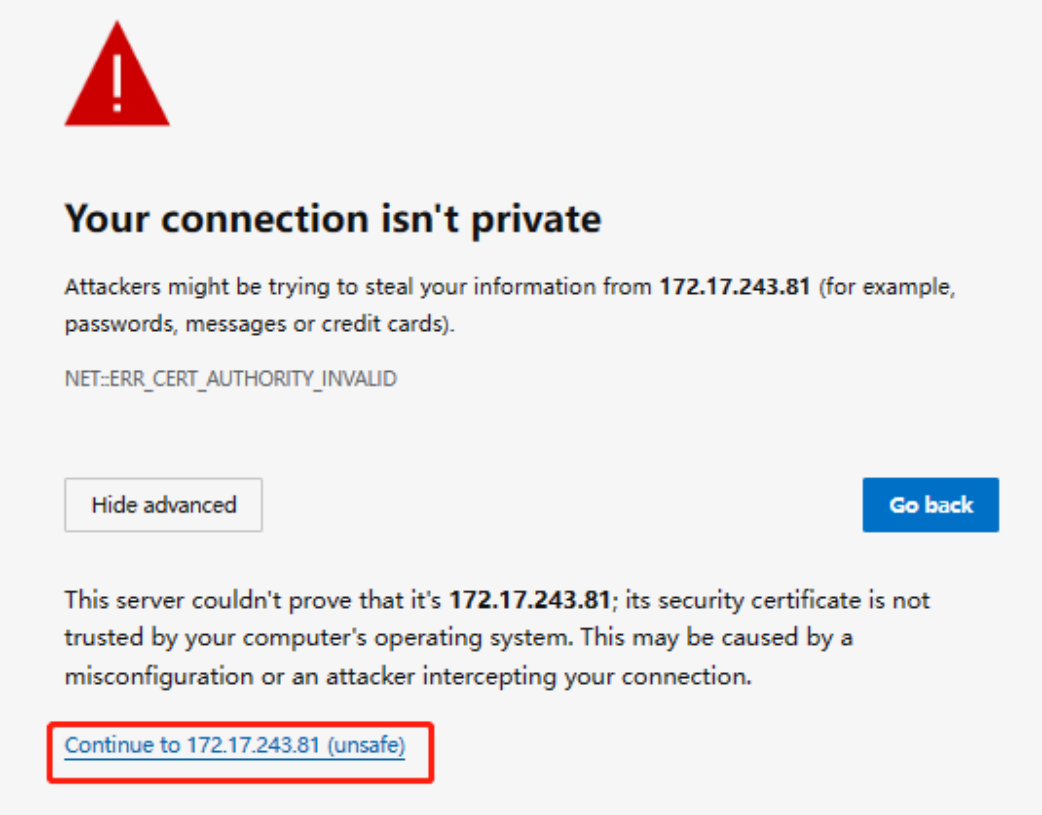

Figure 3-1 Example for prompt of certificate exception

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.

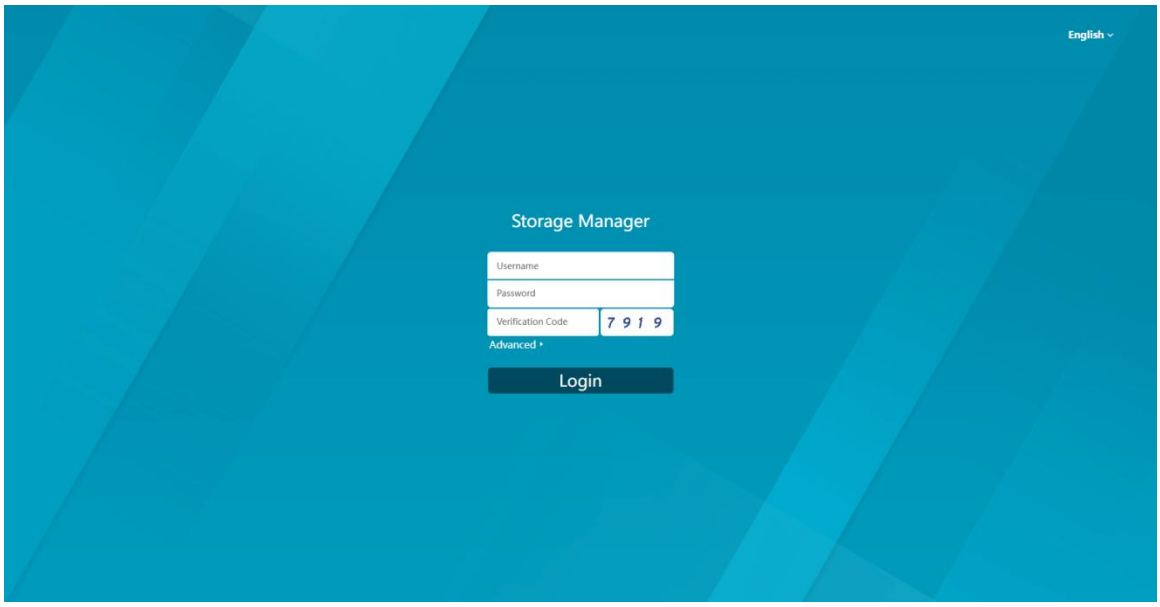

Figure 3-2 ODSP Scope+ login interface

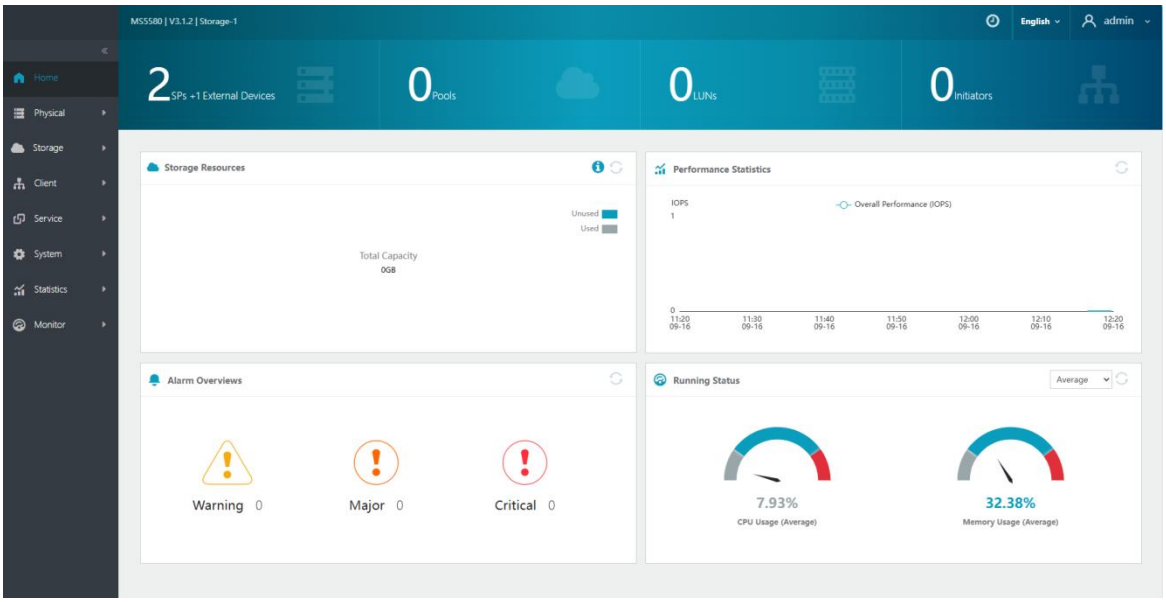

Figure 3-3 Home of ODSP Scope+ system view

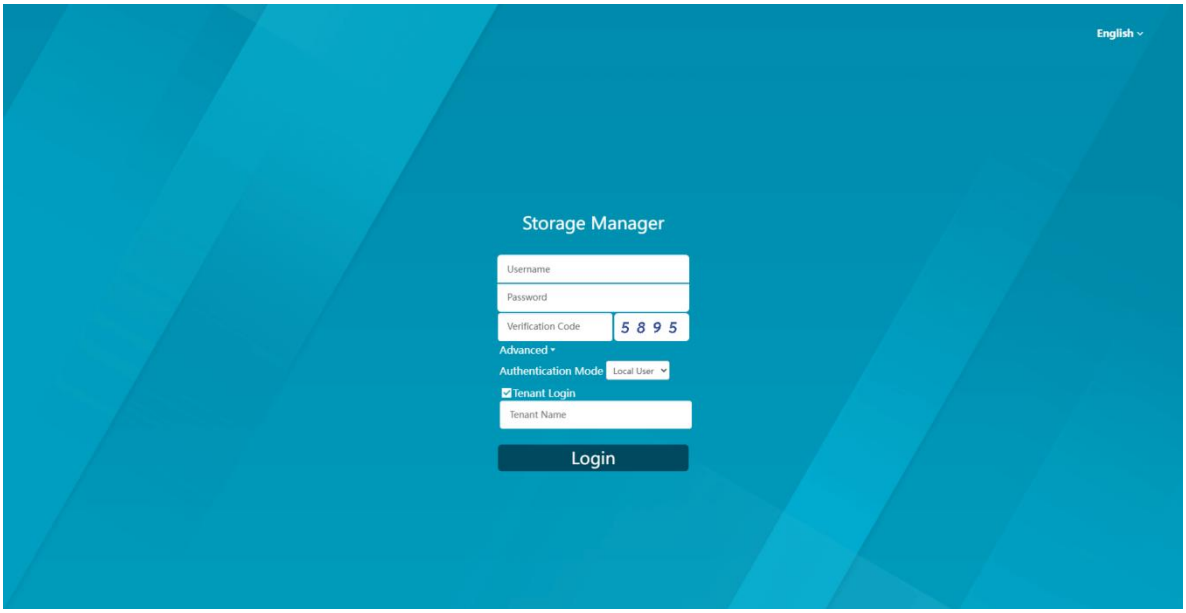

Figure 3-4 ODSP Scope+ tenant login interface

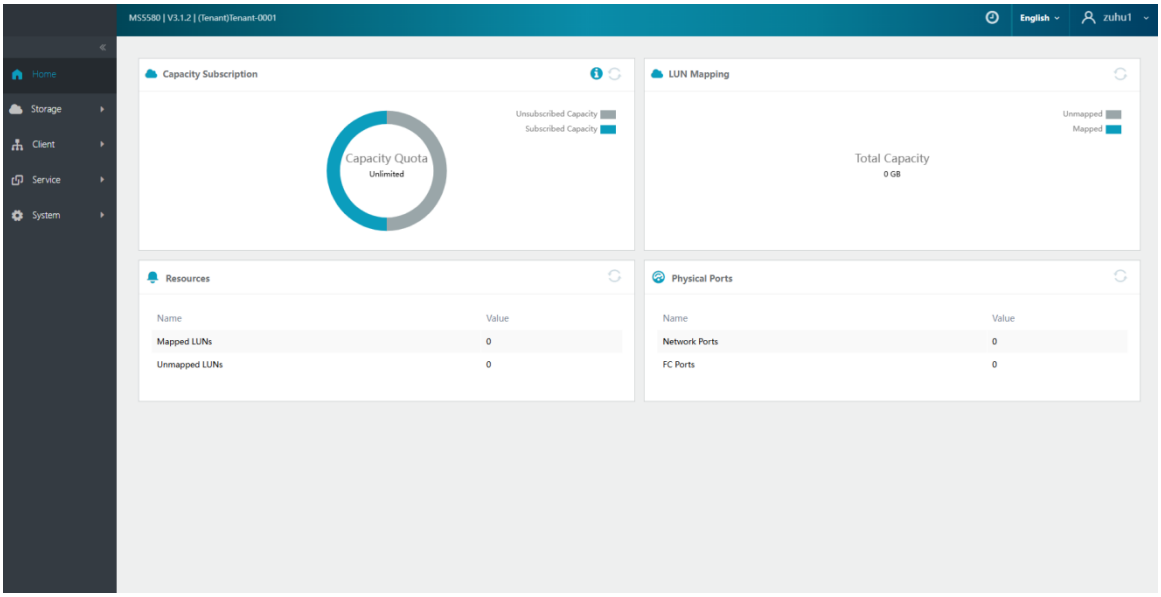

Figure 3-5 Home of ODSP Scope+ tenant view

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.

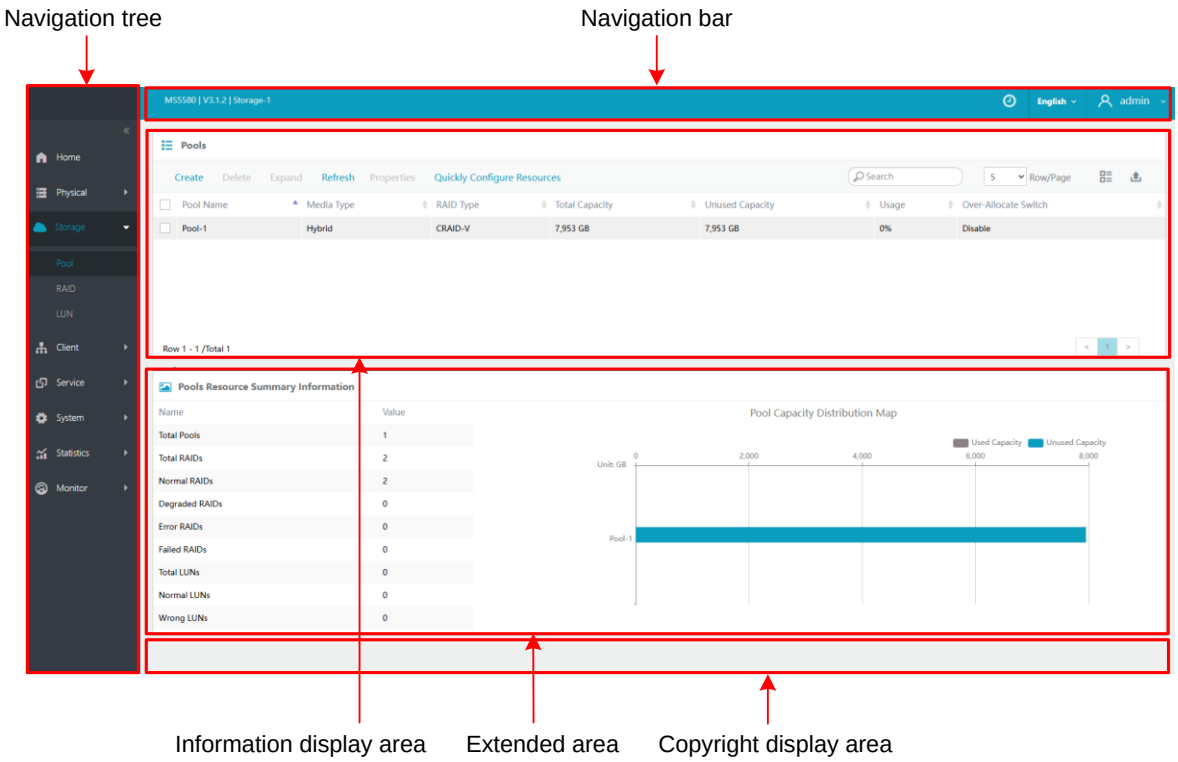

Figure 3-6 Example of ODSP Scope+ typical interface

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.

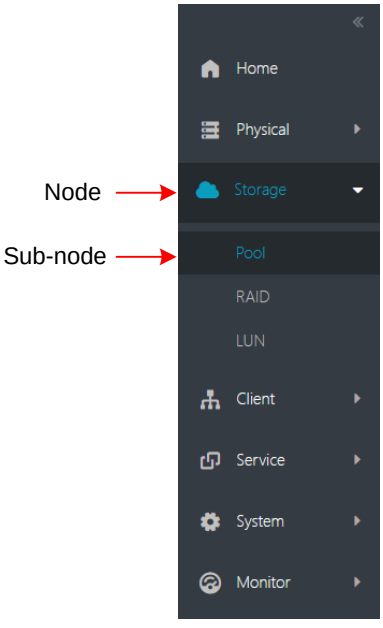

Figure 3-7 Example of ODSP Scope+ navigation tree

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.

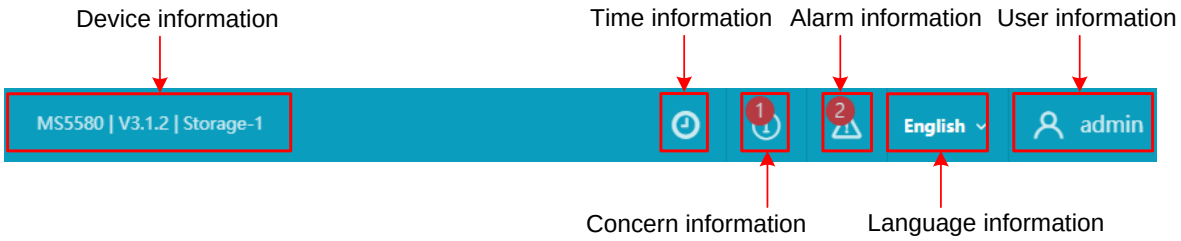

Figure 3-8 Example of ODSP Scope+ navigation bar

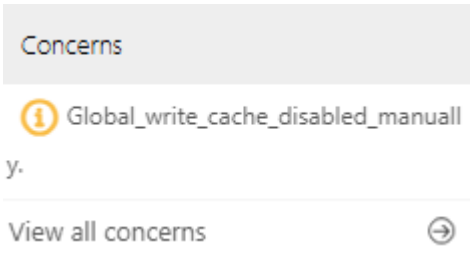

Figure 3-9 Example of ODSP Scope+ concerns

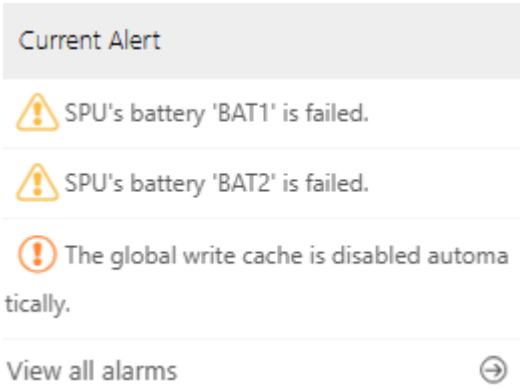

Figure 3-10 Example of ODSP Scope+ alarms

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.

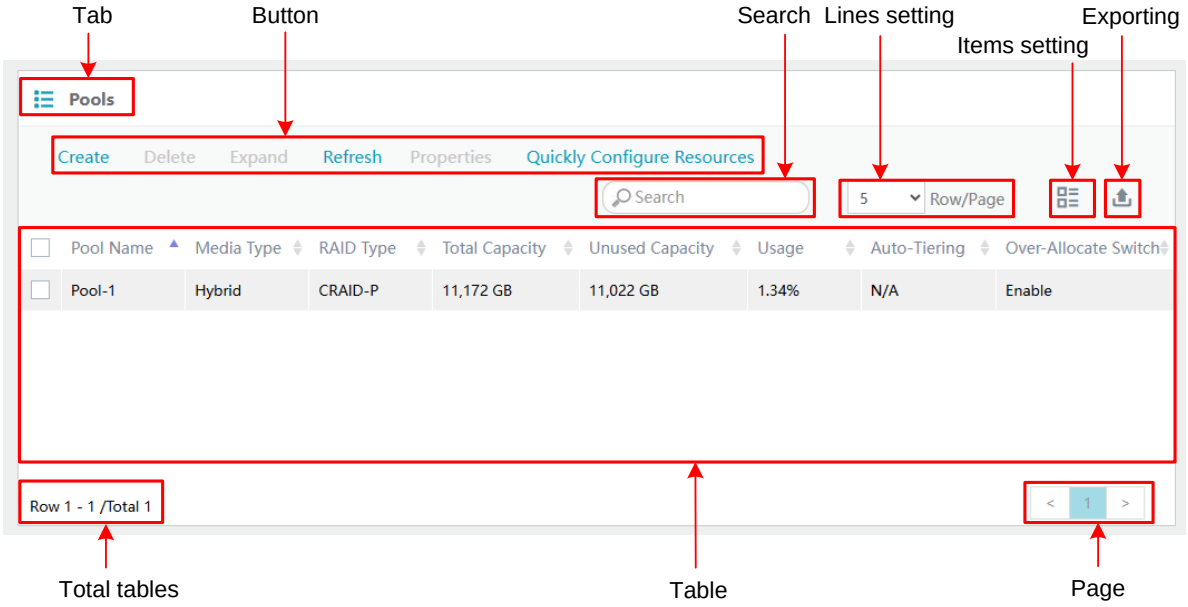

Figure 3-11 Example of ODSP Scope+ information display area

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.

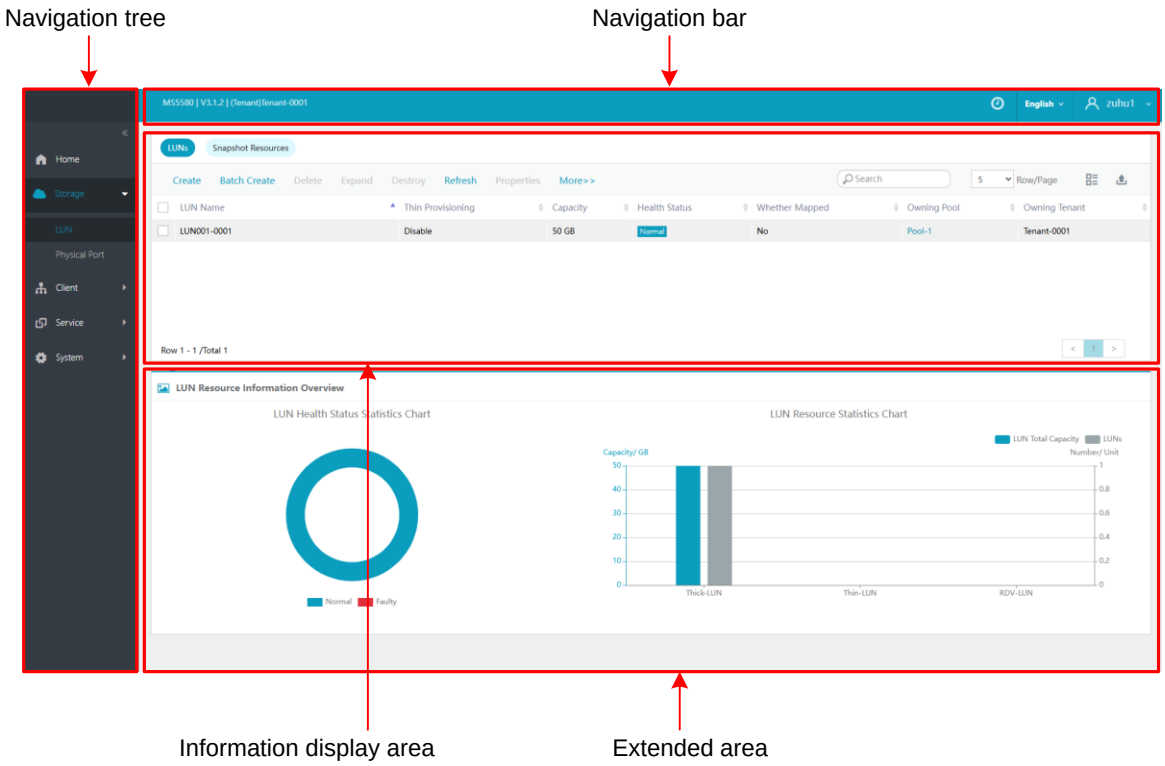

Figure 3-12 Example of ODSP Scope+ typical interface

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.

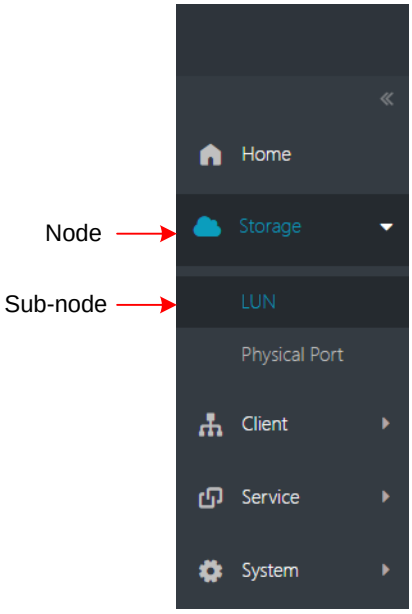

Figure 3-13 Example of ODSP Scope+ navigation tree

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.

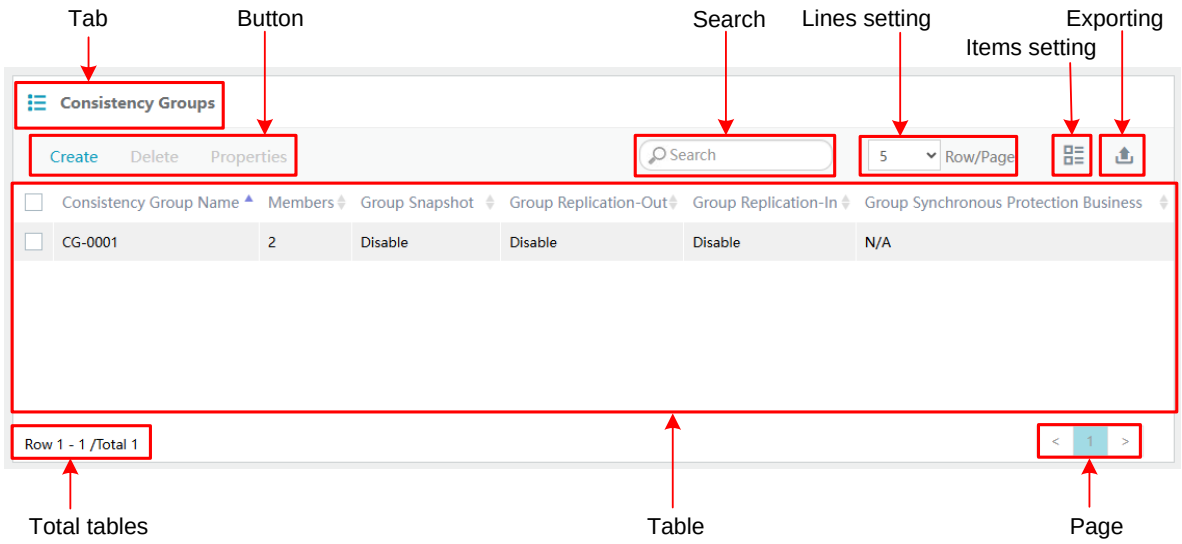

Figure 3-15 Example of ODSP Scope+ information display area

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: Thin Provisioning Feature

4 Introduction to Thin Provisioning Feature

4.1 Introduction to Thin Provisioning

The capacity of the storage space in traditional storage space allocation and identification is fixed. In other words, if the user needs 2TB space, he or she will directly allocate 2TB of physical storage space. Therefore, the pre-allocation and planning of storage space is a huge challenge for the storage administrator. Over large allocation will cause capacity waste. Over small allocation will cause frequent expansion of storage space.

Thin provisioning is a new storage management feature with the core principle of "deceiving". In other words, the allocated capacity seems to be larger than actual physical capacity for the operating system. For example, if a user needs 2TB space and creates a thin provisioning LUN with 2TB capacity on the storage system after deploying thin provisioning feature, only hundreds of GB of physical storage space will be pre-allocated. As more and more data is written to the application program based on the thin provisioning LUN, more and more physical storage space is taken up, and the storage system automatically expands the physical storage space in the background without effect on application program, for the application program does not aware of the expansion. Thanks to thin provisioning, the storage system automatically implements allocation on-demand, which simplifies storage management on the one hand, and improves the utilization of physical storage space and saves users' investment on the other hand.

4.2 Description of Thin Provisioning LUN Properties

Based on MacroSAN thin provisioning, you can create a LUN (also called Thick-LUN) or a thin provisioning LUN (also called Thin-LUN). Thin-LUN can be divided into the following two types according to distribution modes:

- Independent mode Thin-LUN: Each independent mode Thin-LUN allocates and manages physical storage space independently. Only part of the physical storage space is initially allocated after creating a Thin-LUN in independent mode, and the physical storage space is automatically expanded according to the expansion threshold and expansion step. The properties are shown in Table 4-1.

Table 4-1 List for Properties of independent mode Thin-LUNs

Property	Description
Thin-LUN extent size	It refers to the basic unit for Thin-LUN to manage storage space.
Thin-LUN capacity	It refers to the size of Thin-LUN logical capacity.
Thin-LUN used capacity	It refers to the used capacity of Thin-LUN logical capacity.
Thin-LUN usage	It refers to Thin-LUN used capacity/Thin-LUN logical capacity.
Thin-LUN expansion threshold	When the free capacity of the Thin-LUN is less than or equal to this value, automatic physical capacity expansion will be triggered.

Thin-LUN expansion step	It refers to the size of physical capacity of a Thin-LUN in each expansion.
Thin-LUN private area	It is used to store management data in Thin-LUN.
Thin-LUN data area	It is used to store user data in Thin-LUN.
Thin-LUN allocated physical space	It refers to the physical space actually allocated to the Thin-LUN.
Thin-LUN allocated/capacity	It refers to Thin-LUN allocated capacity/Thin-LUN capacity.
Thin-LUN used physical space	It refers to the used capacity in Thin-LUN physical capacity, which is no more than allocated physical space.
Thin-LUN used/allocated	It refers to Thin-LUN used physical capacity/Thin-LUN allocated physical space.
Thin-LUN free physical capacity	It refers to the unused capacity of the Thin-LUN allocated physical space.
Thin-LUN free/allocated	It refers to Thin-LUN free physical space/ Thin-LUN allocated physical space.

- Sharing mode Thin-LUN: The data of all sharing Thin-LUNs is stored in the DDSR of the pool. Each sharing Thin-LUN no longer occupies physical storage space separately. The properties are shown in Table 4-2.

Table 4-2 List for properties of sharing mode Thin-LUNs

Property	Description
Thin-LUN extent size	It refers to the basic unit for Thin-LUN to manage storage space.
Thin-LUN capacity	It refers to the size of Thin-LUN logical capacity.
Thin-LUN used capacity	It refers to the used capacity of Thin-LUN logical capacity.
Thin-LUN usage	It refers to Thin-LUN used capacity/Thin-LUN logical capacity.
Thin-LUN Deduplication Function	It refers to enabling/disabling deduplication function supported by Thin-LUN.
Thin-LUN Compression Function	It refers to enabling/disabling compression function supported by Thin-LUN.

5 Configuring Thin Provisioning LUN

5.1 Setting Pool DDSR

ⓘNOTE

- DDSR (Data Duplicate Shared Resource) is a shared resource pool, which manages storage space in units of pool granularity. After DDSR is enabled, a sharing mode Thin-LUN will be automatically created after creating a Thin-LUN in the pool. All sharing mode Thin-LUNs will use DDSR to store data according to the granularity of the pool to optimize the overall resource usage and performance of the pool.
- DDSR can only be enabled in all-flash pools and is enabled by default.

⚠CAUTION

- If you need to use a sharing mode Thin-LUN or deduplication and compression, make sure that DDSR is enabled for the pool.
- If you need to use an independent mode Thin-LUN, make sure that DDSR is disabled for the pool.

5.1.1 Enabling DDSR

This section explains how to enable pool's DDSR.

ⓘNOTE

Please set a reasonable pool granularity when enabling DDSR. Pool granularity is the unit of deduplication and compression of IO processing, which has influence on resource management and further affects performance. It is recommended to keep pool granularity the default value.

Prerequisites

- DDSR can only be enabled in all-flash pools.
- The unallocated capacity of the pool for the devices of both dual-controller and four-controller is required to be no less than 5TB and 10TB respectively during enabling DDSR.

Steps

Step 1: Select "Storage" -> "Pool" on the navigation tree to open the pool interface.

Step 2: Select the desired pool in the information display area and click the <Properties> button to open the **Basic Properties** window. Click the <Show Advanced Parameters> button and the **General** tab is shown in Figure 5-1. Set pool granularity, turn on DDSR, and click the <Apply> button to complete the configuration.

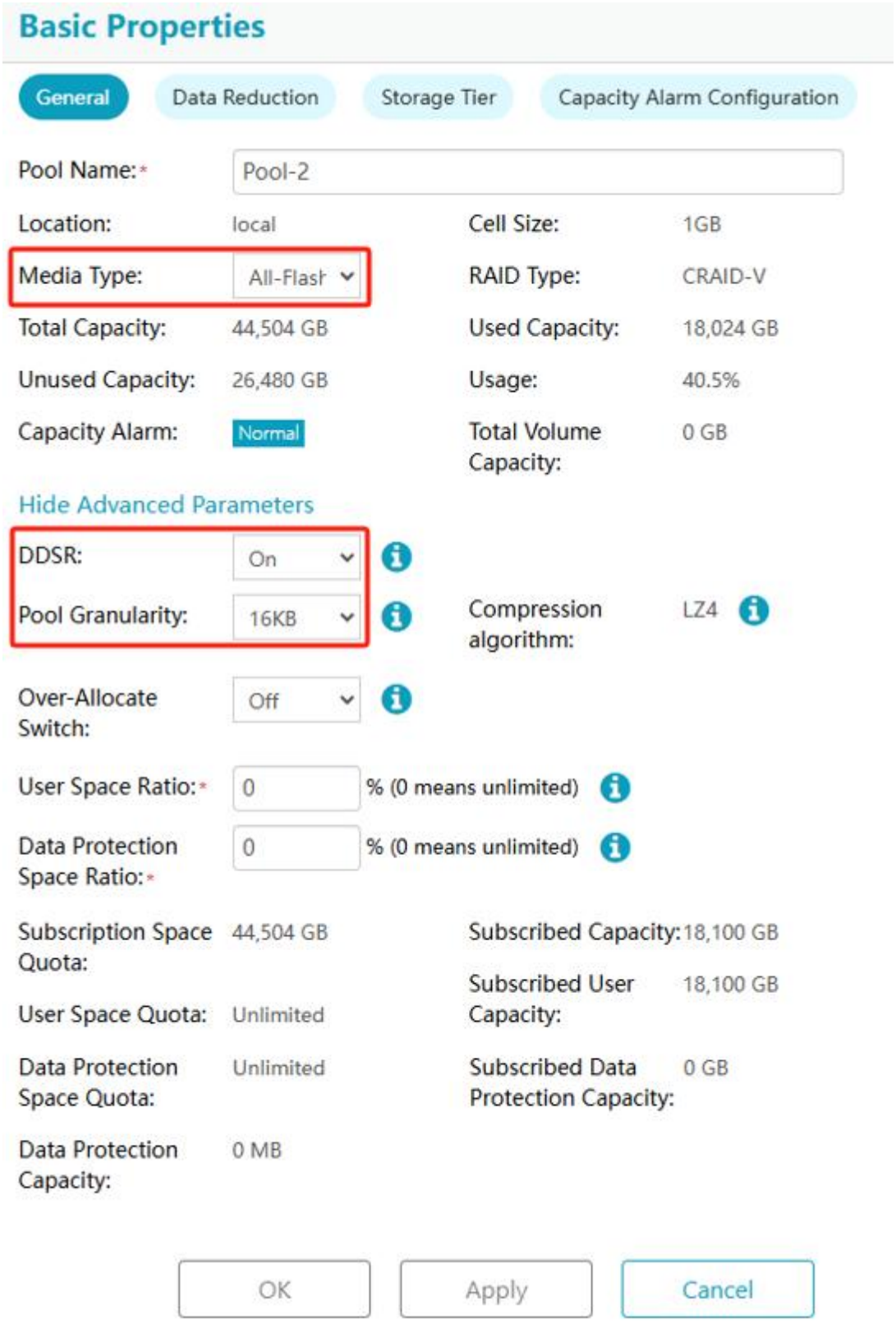

Figure 5-1 Pool basic properties interface

5.1.2 Disabling DDSR

This section explains how to disable pool's DDSR.

Prerequisites

There is no sharing mode Thin-LUN in the pool.

Steps

Step 1: Select "Storage" -> "Pool" on the navigation tree to open the pool interface.

Step 2: Select the desired pool in the information display area and click the <Properties> button to open the **Basic Properties** window. The **General** tab is shown in Figure 5-1. Turn off DDSR and click the <Apply> button to complete the configuration.

5.2 Managing Thin-LUN

5.2.1 Creating Independent Mode Thin-LUN

5.2.1.1 Creating a Single LUN

This section explains how to create a single independent mode Thin-LUN.

Prerequisites

Independent mode Thin-LUN can only be created in hybrid pool and all-flash pool without DDSR function.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Click the <Create> button in the **LUNs** tab of the information display area to open the **Create LUN** wizard.

Step 3: The first step of the **Create LUN** wizard is shown in Figure 5-2. Select the pool and "Thin Provisioning" option in the bottom-left part and click the <Next> button to enter the next interface.

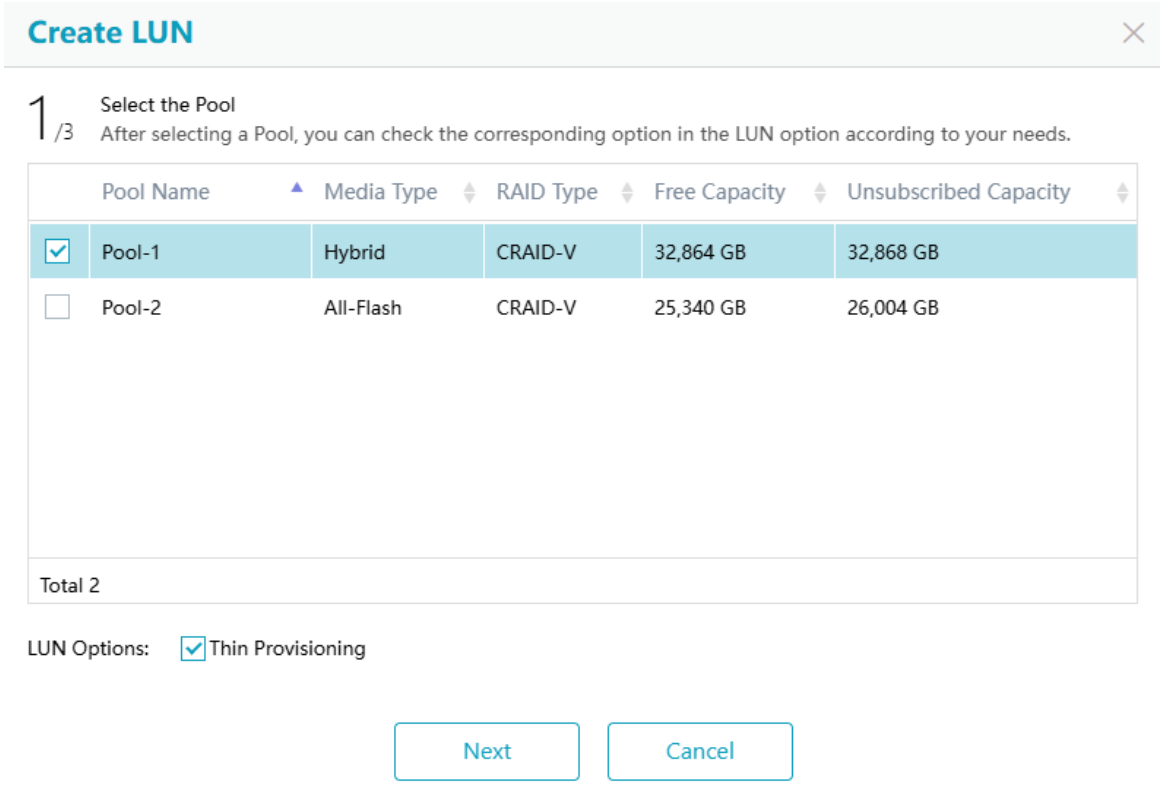

Figure 5-2 Create Thin-LUN wizard interface (1)

Step 4: The second step of the **Create LUN** wizard is shown in Figure 5-3. Set LUN capacity and thin provisioning parameters (see Table 5-1 for details) and click the <Next> button to enter the next interface.

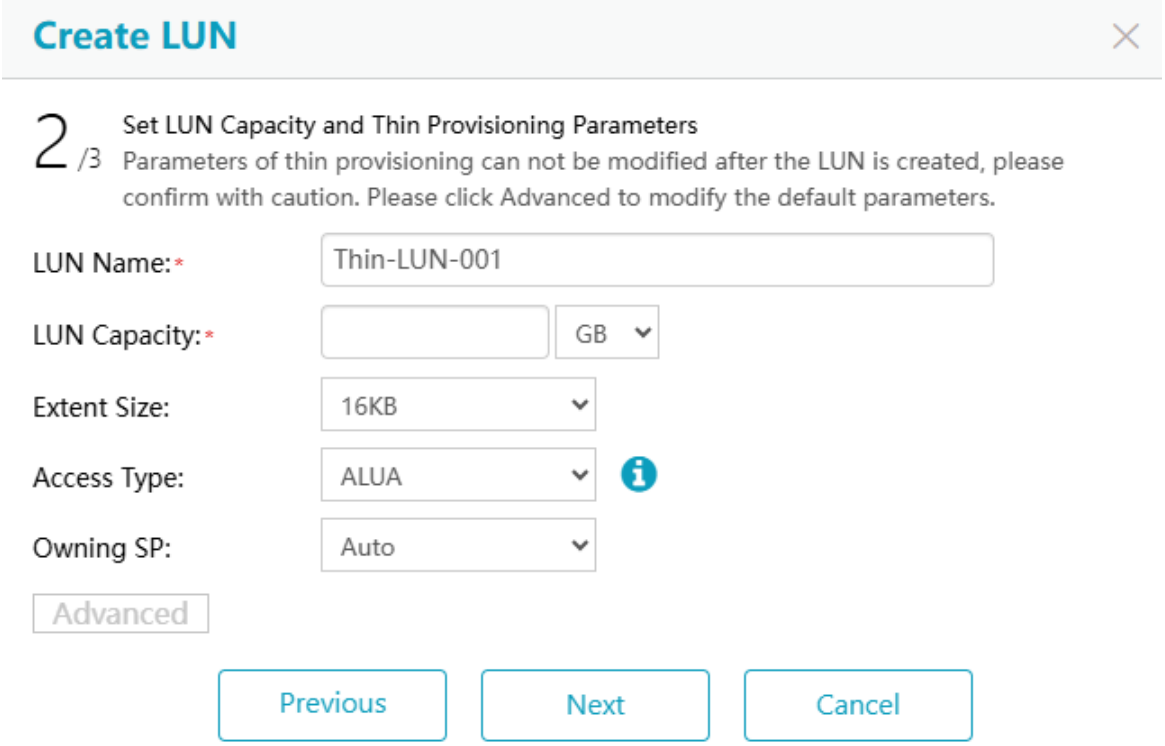

Figure 5-3 Create Thin-LUN wizard interface (2)

Table 5-1 Description of the parameters for creating Thin-LUN wizard interface (2)

Parameter	Description
LUN Name	It refers to the name of LUN. • Length: 1-63 characters. • Valid character range: [a-zA-Z0-9.-_:]. • It is recommended that the prefix of LUN name is "Thin-LUN".
LUN Capacity	It is corresponding to the logical capacity, which refers to the size of the Thin-LUN for the client server.
Extent Size	It refers to the basic unit for Thin-LUN to manage storage space.
Access Type	It refers to the access type of LUN: • ALUA (Asymmetric Logical Unit Access): Only the SP to which the LUN belonging reports optimized path and all other SPs report non-optimized paths. • SLUA (Symmetric Logical Unit Access): All SPs report optimized paths.
Owning SP	The system provides two methods for setting the default controller of LUN: • Auto: The system will automatically select the optimal default controller for the newly created LUN according to the distribution of the default controllers of the existing LUN in the environment. • Manual: You can manually set the default controller of the newly created LUN.

ⓘNOTE

Click the <Advanced> button in this step to set advanced Thin-LUN parameters, including the followings:

- Initial Allocation Capacity: It refers to the physical capacity allocated for the first time, and it is recommended to use the default value.
- Expansion Threshold: When the free capacity of the Thin-LUN is less than or equal to this value, automatic physical capacity expansion will be triggered. It is recommended to use the default value.
- Expansion Step: It refers to the size of the Thin-LUN physical capacity expansion each time. It is recommended to use the default value.
- Private Area Allocation Policy: It includes "Prefer SSD RAID" and "Prefer HDD RAID". Please choose according to the actual situation.
- Data Area Allocation Policy: It includes "Prefer SSD RAID" and "Prefer HDD RAID". Please choose according to the actual situation.

Step 5: In the third step of the **Create LUN** wizard, you can check the configuration information, and click the <Finish> button to complete the configuration.

5.2.1.2 Batch Creating LUNs

This section explains how to create independent mode Thin-LUN in batches.

Prerequisites

Independent mode Thin-LUN can only be created in hybrid pool and all-flash pool without DDSR function.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Click the <Batch Create> button in the **LUNs** tab of the information display area to open the **Batch Create LUN** wizard.

Step 3: The first step of the **Batch Create LUN** wizard is shown in Figure 5-4. Select the pool and "Thin Provisioning" option in the bottom-left part and click the <Next> button to enter the next step interface.

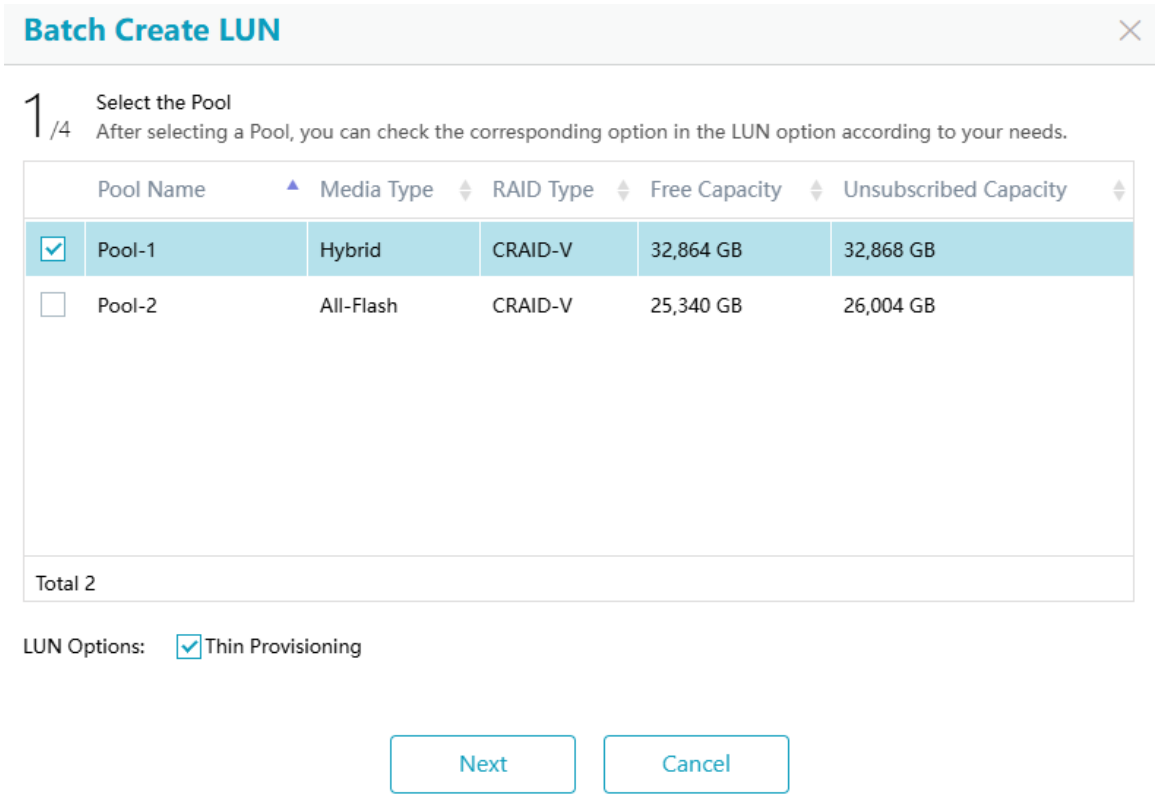

Figure 5-4 Batch create Thin-LUNs wizard interface (1)

Step 4: The second step of the **Batch Create LUN** wizard is shown in Figure 5-5. Set the number and capacity of Thin-LUNs (see Table 5-2 for details) and click the <Next> button to enter the next interface.

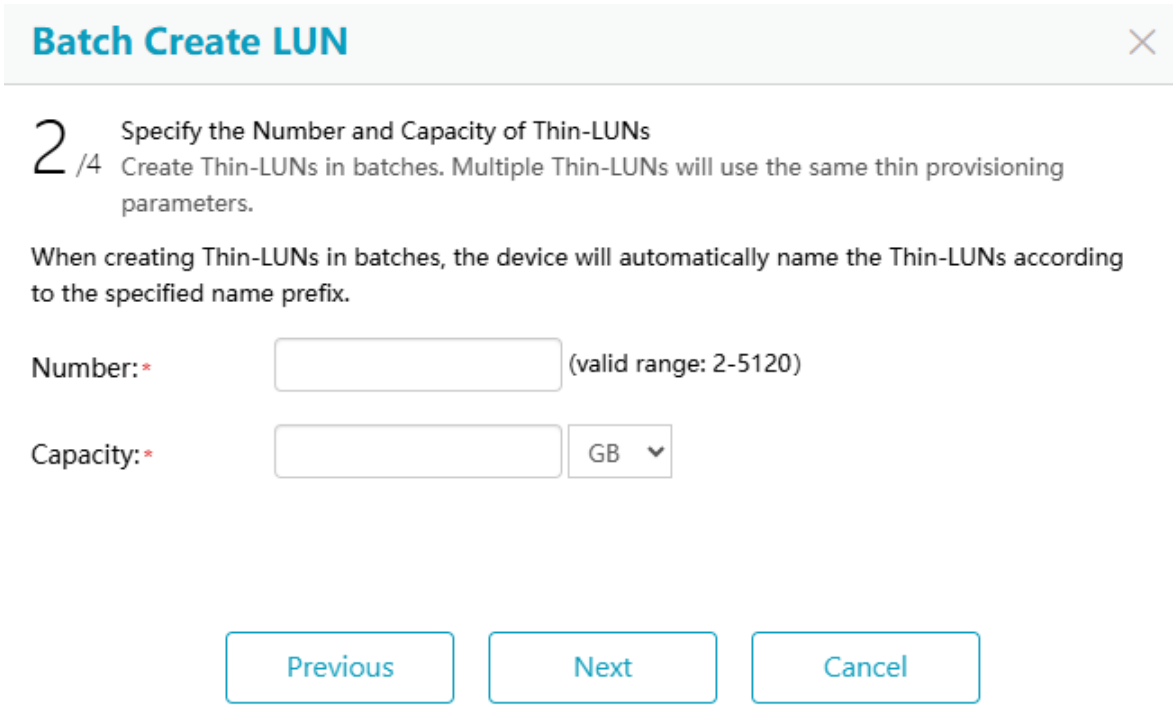

Figure 5-5 Batch create Thin-LUNs wizard interface (2)

Table 5-2 Description of the parameters for batch creating Thin-LUNs wizard interface (2)

Parameter	Description
Number	It refers to the number of Thin-LUNs to be created. **NOTE** Different types of storage devices support different numbers of Thin-LUNs. For specific specifications, please refer to the actual GUI interface.
Capacity	It refers to the logical capacity of a single Thin-LUN.

Step 5: The third step of the **Batch Create LUN** wizard is shown in Figure 5-6. Set LUN name and thin provisioning parameters (see Table 5-3 for details) and click the <Next> button to enter the next interface.

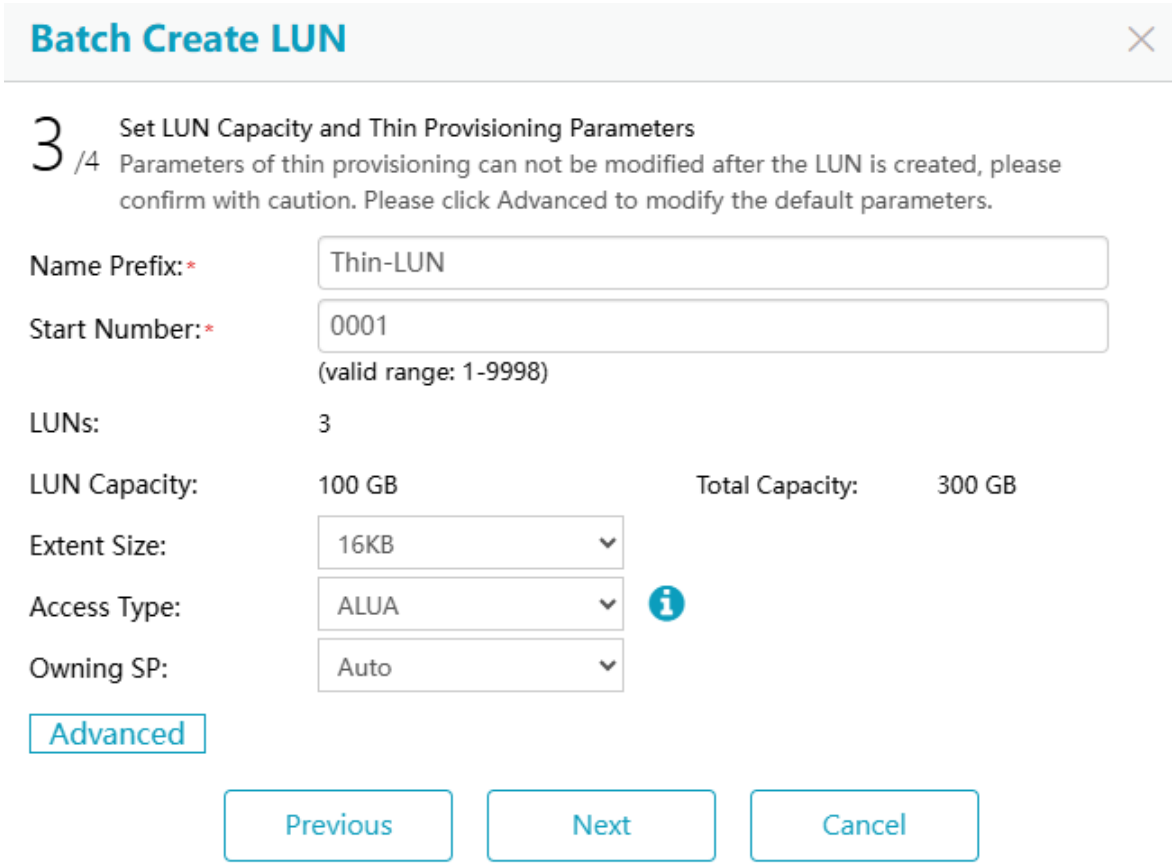

Figure 5-6 Batch create Thin-LUNs wizard interface (3)

Table 5-3 Description of the parameters for batch creating Thin-LUNs wizard interface (3)

Parameter	Description
Name Prefix	It refers to the prefix of LUN name. • Length: 1-57 characters. • Valid character range: [a-zA-Z0-9.-_:]. • It is recommended that the prefix of LUN's name is "Thin-LUN".
Start Number	It refers to the start number of LUN name. The name is formed by "Name Prefix"+"-"+"Start Number".
Extent Size	It refers to the basic unit for Thin-LUN to manage storage space.
Access Type	It refers to the access type of LUN: • ALUA (Asymmetric Logical Unit Access): Only the SP to which the LUN belonging reports optimized path and all other SPs report non-optimized paths. • SLUA (Symmetric Logical Unit Access): All SPs report optimized paths.
Owing SP	The system provides two methods for setting the default controller of LUN: • Auto: The system will automatically select the optimal default controller for the newly created LUN according to the distribution of the default controllers of the existing LUN in the environment. • Manual: You can manually set the default controller of the newly

	created LUN.

ⓘNOTE

Click the <Advanced> button in this step to set advanced Thin-LUN parameters, including the followings:

- Initial Allocation Capacity: It refers to the physical capacity allocated for the first time, and it is recommended to use the default value.
- Expansion Threshold: When the free capacity of the Thin-LUN is less than or equal to this value, automatic physical capacity expansion will be triggered. It is recommended to use the default value.
- Expansion Step: It refers to the size of the Thin-LUN physical capacity expansion each time. It is recommended to use the default value.
- Private Area Allocation Policy: It includes "Preferred SSD RAID" and "Preferred HDD RAID". Please choose according to the actual situation.
- Data Area Allocation Policy: It includes "Preferred SSD RAID" and "Preferred HDD RAID". Please choose according to the actual situation.

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

5.2.2 Creating Sharing Mode Thin-LUNs

5.2.2.1 Creating a Single LUN

This section explains how to create a single sharing mode Thin-LUN.

Prerequisites

Sharing mode Thin-LUN can only be created in all-flash pool with DDSR function.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Click the <Create> button in the **LUNs** tab of the information display area to open the **Create LUN** wizard.

Step 3: The first step of the **Create LUN** wizard is shown in Figure 5-7. Select desired all-flash pool and "Thin Provisioning" option in the bottom-left part and click the <Next> button to enter the next step interface.

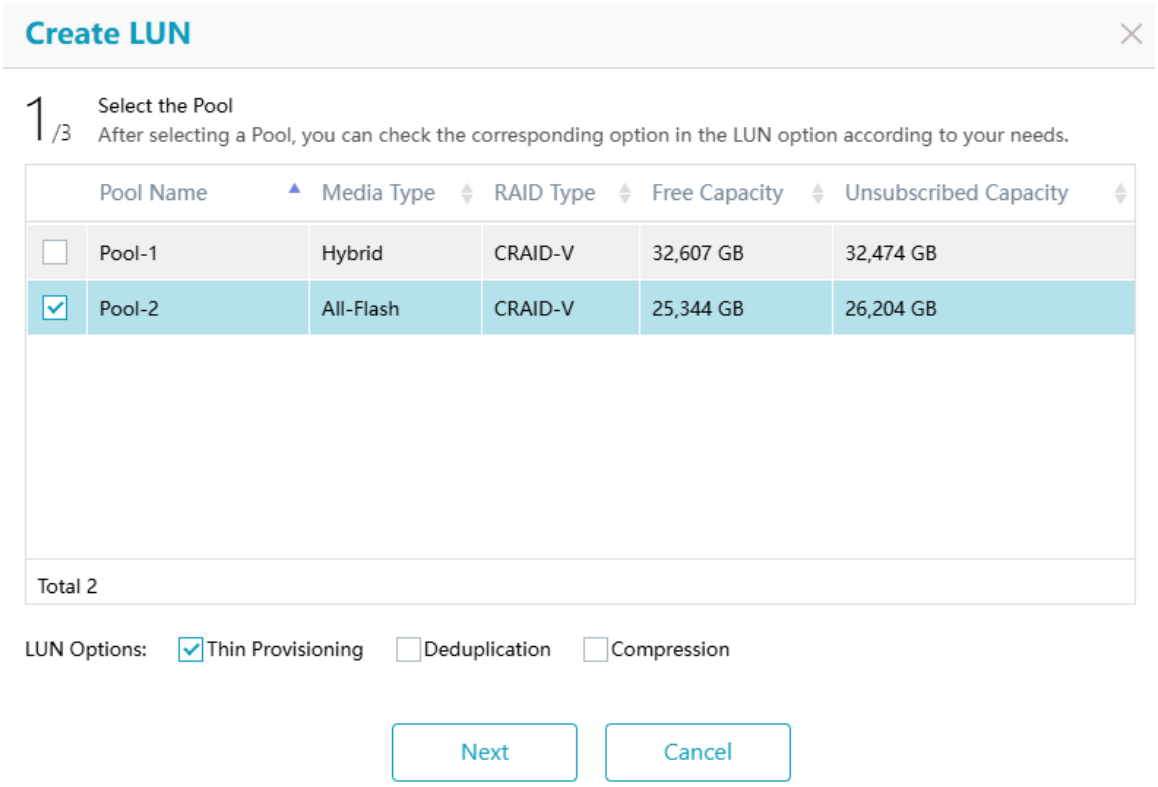

Figure 5-7 Create Thin-LUN wizard interface (1)

Step 4: The second step of the **Create LUN** wizard is shown in Figure 5-8. Set LUN capacity and thin provisioning parameters (see Table 5-1 for details), and click the <Next> button to enter the next interface.

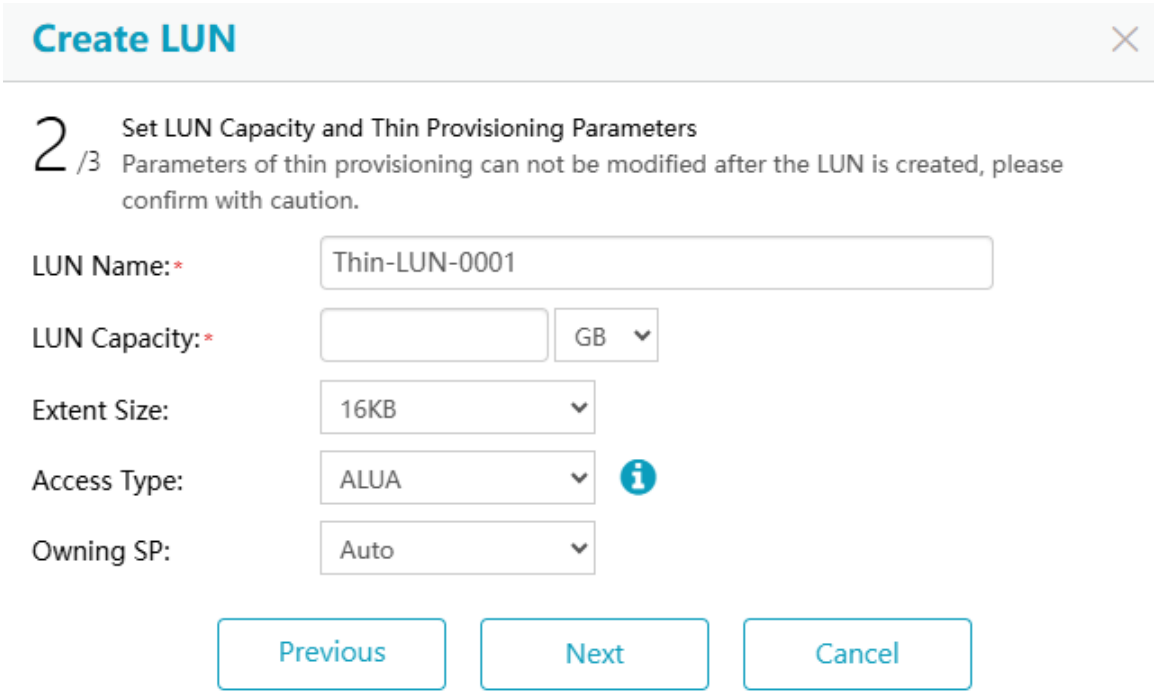

Figure 5-8 Create Thin-LUN wizard interface (2)

Step 5: In the third step of the **Create LUN** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

5.2.2.2 Batch Creating LUNs

This section explains how to create sharing mode Thin-LUNs in batches.

Prerequisites

Sharing mode Thin-LUN can only be created in all-flash pool with DDSR function.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Click the <Batch Create> button in the **LUNs** tab of the information display area to open the **Batch Create LUN** wizard.

Step 3: The first step of the **Batch Create LUN** wizard is shown in Figure 5-9. Select desired all-flash pool and the "Thin Provisioning" option in the bottom-left part and click the <Next> button to enter the next interface.

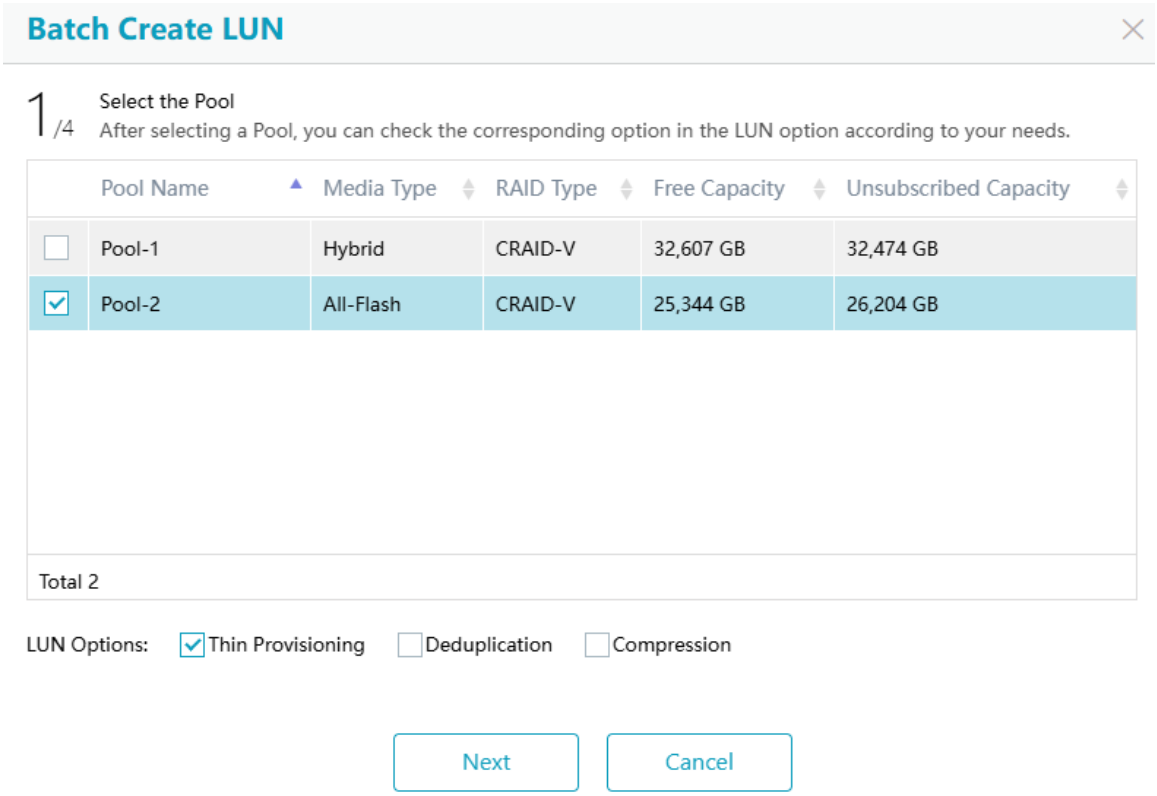

Figure 5-9 Batch create Thin-LUNs wizard interface (1)

Step 4: The second step of the **Batch Create LUN** wizard is shown in Figure 5-10. Set the number and capacity of Thin-LUNs (see Table 5-2 for details) and click the <Next> button to enter the next interface.

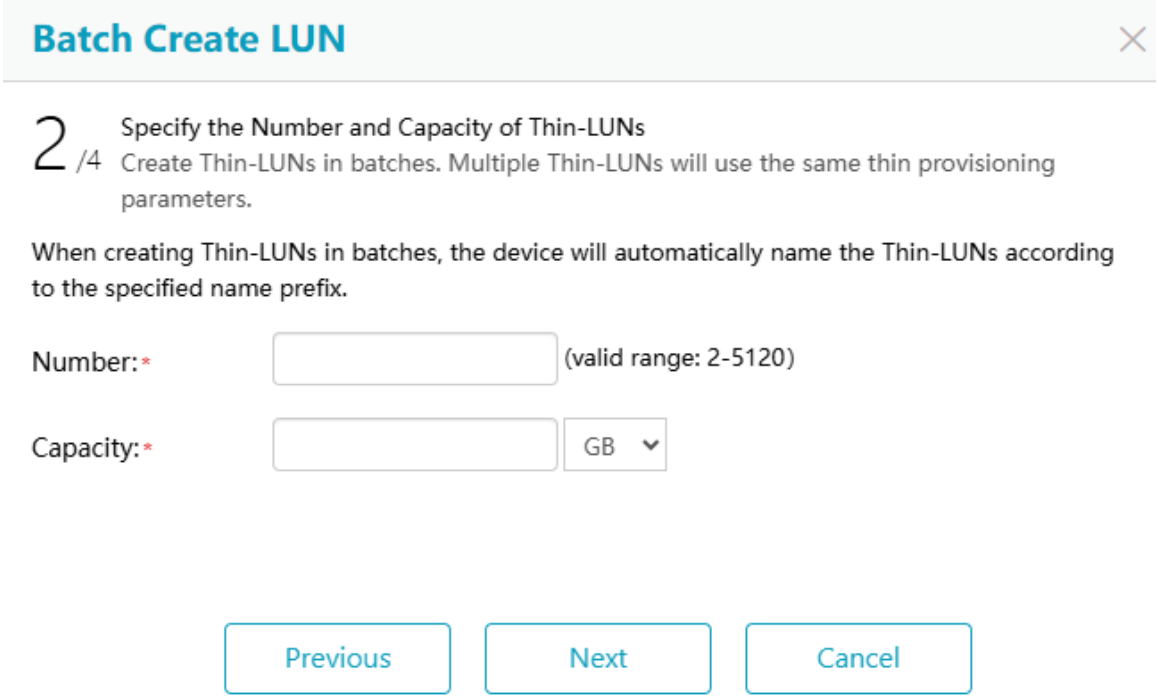

Figure 5-10 Batch create Thin-LUNs wizard interface (2)

Step 5: The third step of the **Batch Create LUN** wizard is shown in Figure 5-11. Set LUN name and thin provisioning parameters (see Table 5-3 for details) and click the <Next> button to enter the next interface.

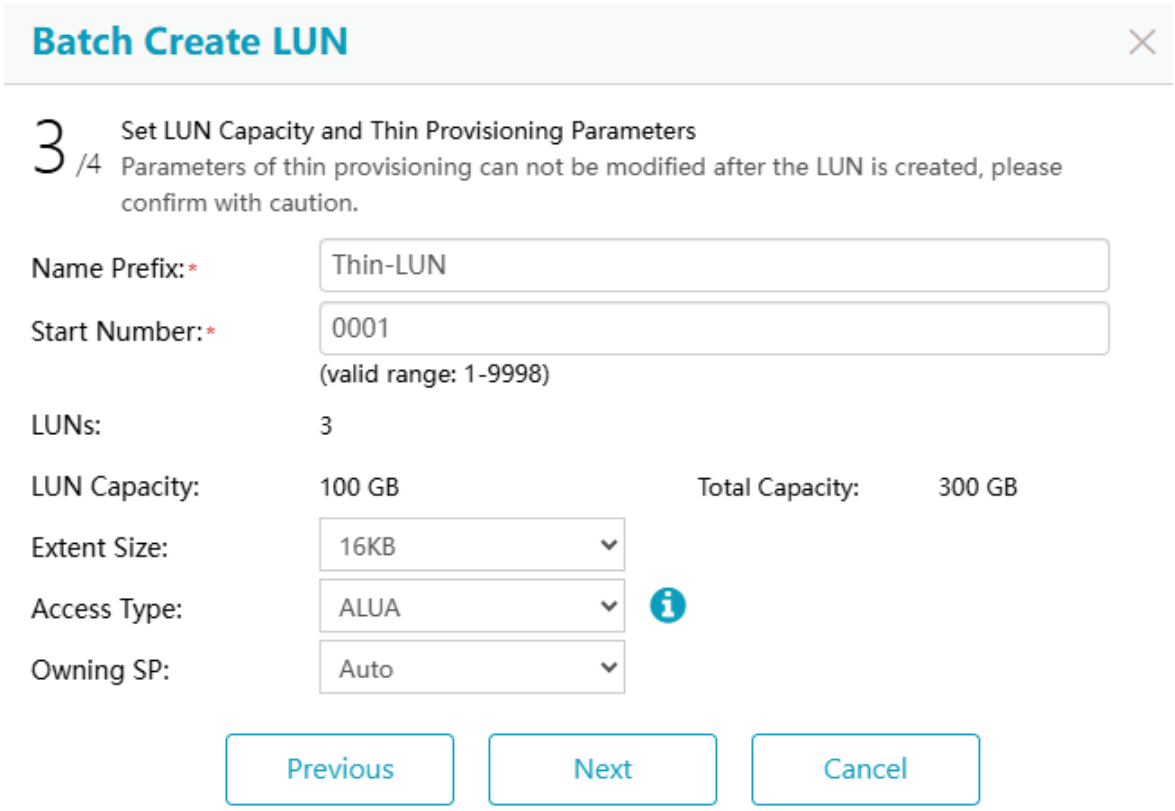

Figure 5-11 Batch create Thin-LUNs wizard interface (3)

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

5.2.3 Viewing Thin-LUN

This section explains how to view Thin-LUN's thin provisioning information.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Select the desired Thin-LUN in the **LUNs** tab of the information display area and click the <Properties> button and open the **Basic Properties** window. You can view the thin provisioning information of the Thin-LUN in the **Thin Provisioning** tab.

5.2.4 Expanding Logical Capacity of Thin-LUN

This section explains how to expand logical capacity of Thin-LUN.

⚠CAUTION

The physical capacity of the independent mode Thin-LUN will not be expanded immediately during the process of logical capacity expansion, but will be triggered automatically according to parameters such as free capacity, expansion threshold and expansion step when writing new IO.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Select the desired Thin-LUN in the **LUNs** tab of the information display area and click the <Expand> button to open the **Thin-LUN Expansion** window, as shown in Figure 5-12. Enter expansion capacity and click the <OK> button to complete the configuration.

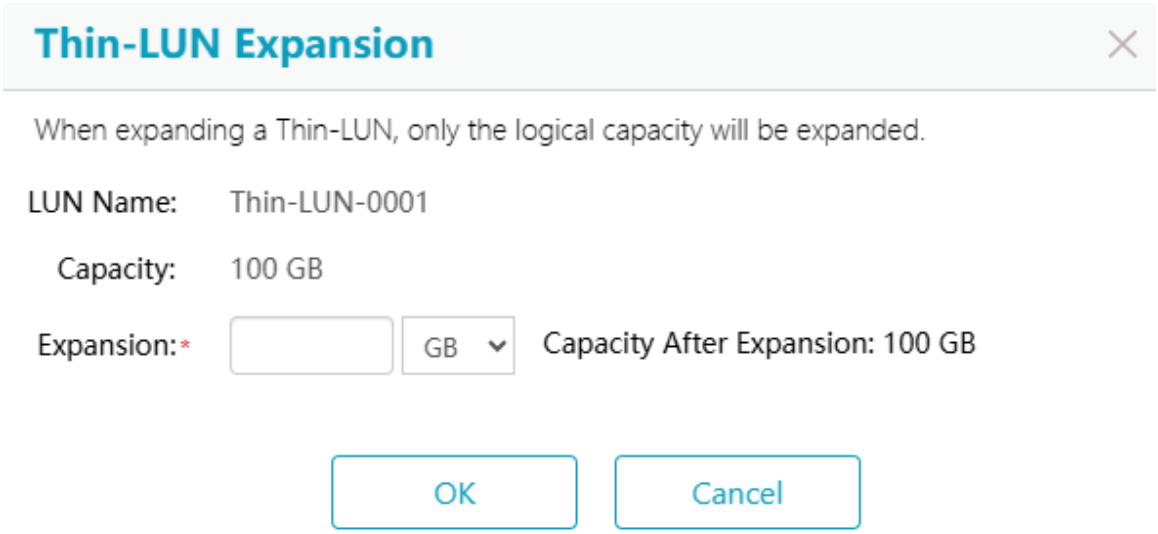

Figure 5-12 Thin-LUN expansion interface

5.2.5 Managing Physical Capacity of Thin-LUN

ⓘNOTE

This chapter applied to independent mode Thin-LUN only.

5.2.5.1 Auto Expansion on Physical Capacity of Thin-LUN

The parameters of Thin-LUNs such as used capacity and free capacity change as the data is written to the client server after mapping a Thin-LUN to a Target or a NVMf port. Automatic expansion of physical capacity will be triggered when the Thin-LUN's free capacity is less than or equal to its expansion threshold and space will be automatically allocated from the pool according to the expansion step.

ⓘNOTE

The process of auto expansion of a Thin-LUN physical capacity does not affect the business on the client server unless the expansion fails.

5.2.5.2 Manual Expansion on Physical Capacity of Thin-LUN

This section explains how to manually expand physical capacity of Thin-LUN.

ⓘNOTE

If the auto expansion of Thin-LUN physical capacity fails, data will be written on the client server continuously and the value of Free/Allocated may become 0%. In this case, please check the available space of RAID in the pool. If there is space in it, manually re-expand the Thin-LUN physical capacity.

Steps

Step 1: Select "Storage" -> "LUN" on the navigation tree to open the LUN interface.

Step 2: Select the desired Thin-LUN in the **LUNs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. Click the <Retry scaling> button corresponding to "Free/Allocated" in the **Thin Provisioning** tab to complete the configuration.

5.2.5.3 Auto Reclaim on Physical Capacity of Thin-LUN

Thin-LUN supports unmap command issued by the client server to reclaim physical space. The corresponding used capacity in the unmap part of Thin-LUN will be converted into free capacity once they receiving the unmap command. Then, the new free capacity will be judged to determine whether have met the reclaim requirements. If yes, auto reclaim of Thin-LUN physical capacity will be triggered and the released physical capacity will be returned to the pool.

⚠CAUTION

Auto reclaim of Thin-LUN physical capacity is decided by assigned client server. Physical capacity can be reclaimed only if when client server supports the unmap command. Auto reclaim of Thin-LUN physical capacity does not affect business on the client server.

5.3 Other Thin-LUN Operations

Thin-LUN is a LUN enabled with thin provisioning and supports related operations of Thick-LUN. For details, see *MacroSAN MS Series Storage Devices Basic Configuration GUI User Manual*.

6 Thin Provisioning Alarms

After creating a Thin-LUN, the storage device will automatically monitor the capacity of the Thin-LUN and remaining capacity in the pool. An alarm will be triggered when predetermined alarm conditions are met. Please refer to the alarm handling suggestions to deal with alarms as soon as possible after receiving the alarm. For details about definitions of relating thin provisioning alarms, see Table 6-1.

Table 6-1 Definitions of thin provisioning alarms

Alarm name	Scope of application	Alarm reason	Alarm handling suggestions
ThinLUN_metadata_abnormal	Independent mode Thin-LUN, sharing mode Thin-LUN	The metadata in the Thin-LUN private zone is abnormal.	Please contact the manufacturer's technical supporters as soon as possible.
ThinLUN_physical_capacity_expand_failed	Independent mode Thin-LUN	Auto expansion of Thin-LUN physical capacity failed.	Please expand the pool as soon as possible.
ThinLUN_physical_capacity_has_usedup	Independent mode Thin-LUN	Free capacity percentage Thin-LUN is 0%.	• Please ensure that the pool has enough available free space. • Please try to manually expand the physical capacity of the Thin-LUN. If the expansion fails, please contact the manufacturer's technical supporters as soon as possible. • If the expansion is successful, try to rescan the disk on the server.

7 Thin Provisioning and Other Features

7.1 Thin-LUN and Snapshot

The operations of configuring snapshots on Thin-LUN are the same as those on Thick-LUN. For details, see *MacroSAN MS Series Storage Devices Snapshot Feature GUI User Manual*.

⚠CAUTION

Before enabling Thin-LUN snapshot, it is required to configure relevant business on the client server. Otherwise, snapshot will record data changes during business configuration and occupy a lot of snapshot resource space.

7.2 Thin-LUN and Replication

The operations of configuring replications on Thin-LUN are the same as those on Thick-LUN. For details, see *MacroSAN MS Series Storage Devices Replication Feature GUI User Manual*.

⚠CAUTION

- Before enabling Thin-LUN replication, it is required to configure relevant business on the client server. Otherwise, snapshot will record data changes during business configuration and occupy a lot of snapshot resource space.

- If both primary LUN and replica LUN are Thin-LUN, it is recommended that the thin-provisioning parameters of replica LUN be consistent with those of primary LUN.

7.3 Thin-LUN and Deduplication and Compression

Deduplication and compression function can only be enabled in sharing mode Thin-LUN.

7.4 Others

The operations of combining Thin-LUN with other features are the same as those of Thick-LUN. For details, see corresponding user manual.

Appendix A. Device Default Configurations

The default configurations of the device are shown in Table 7-1.

Table 7-1 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 7-2.

Table 7-2 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

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

B

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

C

Cache	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.
Cache--Dirty Data	It refers to the reserved data in the write cache yet has not been flushed to disks.
Cache--Dynamic Allocation	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.
Cache--Frozen Cache	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.
Cache--Fixed Allocation	It means that the system allocates cache space for LUNs based on the set percentage.
Cache--Read-ahead	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.
CLI	One of the management interfaces of the storage device, which manages the device through the command line interface.
Console ETH Port	The network ports designed for management.

D

Data Reduction	It refers to the technology of reducing data storage space. In this manual, data reduction mainly means data deduplication and data compression.
Data Reduction--Compression	Data compression is a data reduction technology that re-encodes data by a specific algorithm to reduce storage space.
Data Reduction--DDSR	A data copy shared resource that used to store all data of reduction LUN and deduplication metadata.

Data Reduction--Deduplication	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.
Data Reduction--Reduction Ratio	It refers to the ratio of the amount of data written by the user to the amount of data actually written to the disk.
DSU	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.
Dual-Active LUN	It consists of two LUNs, which are primary LUN and mirror LUN.
Dual-Active--Mirror Role	It refers to the role of the LUN in dual-active LUNs, which includes primary LUN and mirror LUN.
Dual-Active--Primary LUN and Mirror LUN	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.
Dual-Active--Reverse	It refers to reversing the mirror role of two LUNs in the dual-active LUNs.
Dual-Active--Synchronize	It refers to the process of synchronizing the data in primary LUN to mirror LUN when the data in the two LUNs are different.

E

EP	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.

F

Fabric	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.
FC Adapter	It refers to the FC port that is set to Initiator mode.
FC Port Working Mode	It refers to the usage of the FC port, including Initiator mode, Target mode and NVMf mode, and the default mode is Target.
FP	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.
Front-End Application Server	It refers to the servers that use the storage space provided by the storage device.
FSU	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

Gateway	A gateway refers to a network that serves as an entry node to another network.
GUI	Graphical User Interface (GUI) is one of the management interfaces of storage devices, which is used to manage the devices through words and figures.

H

HA	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.
HA--Recovery	It refers to the process of reloading the original business of the faulty controller after it recovers.
HA--Takeover	It refers to the process in which when one controller in a storage device fails, another controller automatically takes over its business.
HotCache	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.
HotCache--LUN	It refers to the LUN created based on HotCache-RAID and dedicated by HotCache function.
HotCache--Pool	It refers to the pool to which HotCache-RAID and HotCache-LUN belong.
HotCache--RAID	It refers to the RAID created through SSD and dedicated by HotCache function.
Hot Spare Disk	It refers to disks that can be used for rebuilding after redundant RAID degradation.
Hot Spare Disk--Blank Hot Spare Disk	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.
Hot Spare Disk--Dedicated Hot Spare Disk	Dedicated hot spare disk can only be used by corresponding RAID.
Hot Spare Disk--Global Hot Spare Disk	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.

I

Initiator	It usually means the application server, which is the Initiator of commands and requests in SCSI protocol.
iSCSI	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	

ODSP

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.

ODSP Scope

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.

ODSP Scope+

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.

P

Pool

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.

Port Aggregation

It refers to binding two or more physical network ports into one aggregated port, where any member port disconnection does not affect business continuity.

Power Off Disk Safely

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.

R

R3DC

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.

RAID

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.

RAID Level

It refers to different data organization ways, commonly including RAID0, RAID1, RAID5, RAID6, RAID10, RAIDx-3, etc.

RAID--Non-redundant

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.

RAID Rebuild

It refers to the process of using a hot spare to rebuild and restore RAID redundancy after a redundant RAID is downgraded.

RAID--Redundant

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.

RDV Initialization	The volumes on the back-end storage device are directly provided to the front-end application server and the original data is reserved.
RDV-LUN	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.
Reduction LUN	It refers to the LUN with enabled deduplication and/or compression, including deduplication LUN, compression LUN and deduplication and compression LUN.
Replication	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.
Replication--Activate/Suspend Replication Policy	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.
Replication—Activate/Suspend Replication Mode Switching Policy	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.
Replication-in and Replication-out	It means the replication direction. The primary resource is replication-out and the replica resource is replication-in in one replication pair.
Replication--Initial Replication	It refers to the first replication process between primary resource and replica resource.
Replication--Local Replication and Remote Replication	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.
Replication Mode Switching Policy	Replication is switched automatically according to the set replication mode switching policy.
Replication Pair	It refers to the primary resource and replica resource of replication.
Replication Policy	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.
Replication--Primary Resource and Replica Resource	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.
Replication--Scan	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.
Replication--Scan Difference Before Initial Replication	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.
Replication--Source Device and Target Device	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.
Replication—Synchronous Replication and Asynchronous Replication	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.
Replication--Update	It means that the replication relationship is disabled and the replica resource is promoted to a Thick-LUN.

S

SDAS	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".
Snapshot	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.
Snapshot Policy	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.
Snapshot Resource	Snapshot resource relies on LUN. It is used to save data at a snapshot time point on a LUN.
Snapshot Resource Auto-expansion	Snapshot resource auto-expansion is triggered automatically when the resource usage reaches the threshold to avoid invalid snapshot resource caused by full capacity.
Snapshot Resource Data Validity	It is a logical state, which indicates whether the data in the snapshot resource is available, including valid and invalid.
Snapshot Rollback	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.
Snapshot Time Point	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.
Snapshot View	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.

SNSD	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.
SP	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.
SPU	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.
SSU	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.

T

Target	Target usually refers to the storage device, which is the receiver of commands and requests in the SCSI protocol.
Thick-LUN	It refers to the LUN without thin provisioning.
Thin-LUN	It refers to the LUN with thin provisioning.
Thin-LUN Data Area	It is used to store Thin-LUN user data.
Thin-LUN Extent	It is the smallest unit of Thin-LUN space management. The smaller the extent, the higher the space utilization.
Thin-LUN Logical Capacity	It refers to the size of Thin LUN shown on the client server.
Thin-LUN Physical Capacity	It refers to the physical space allocated to Thin-LUN.
Thin-LUN Private Area	It is used to store Thin-LUN management data.
Thin Provisioning	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.

V

Virtualization Device	It refers to a storage device that provides virtualization function and centrally manages the storage space provided by the virtualized devices.
Virtualized Device	It is external device, also called back-end storage device, whose resources

	are allocated to virtualization devices for unified management of storage devices.
Volume	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.
Volume Attach Status	The attach status of the volume is determined by user operations.
Volume Online Status	It means whether the virtualization device can access the volume and is determined by the path state.
Volume--Owing SP	It refers to the controller of the virtualization device that can access the volume and is determined by the path state.

X

XP	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	
ATA	Advanced Technology Attachment
C	
CHAP	Challenge Handshake Authentication Protocol
CLI	Command-Line Port
COW	Copy on Write
CRAID	RAID based Cell
D	
DDSR	Data Duplicate Shared Resource
DSU	Disk Shelf Unit
E	
EP	Expander Processor
F	
FC	Fiber Channel
G	
GE	Gigabit Ethernet
GUI	Graphical User Port
H	
HA	High Availability
I	
IE	Internet Explorer
iNoF	Intelligent Lossless NVMe over Fabrics
IP	Internet Protocol
iSCSI	Internet Small Computer Systems Port

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