MacroSAN MS Series Storage Devices R3DC Feature

GUI User Manual

Document version: V2.11.00

MacroSAN Technologies Co., Ltd.

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400-650-5527

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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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.

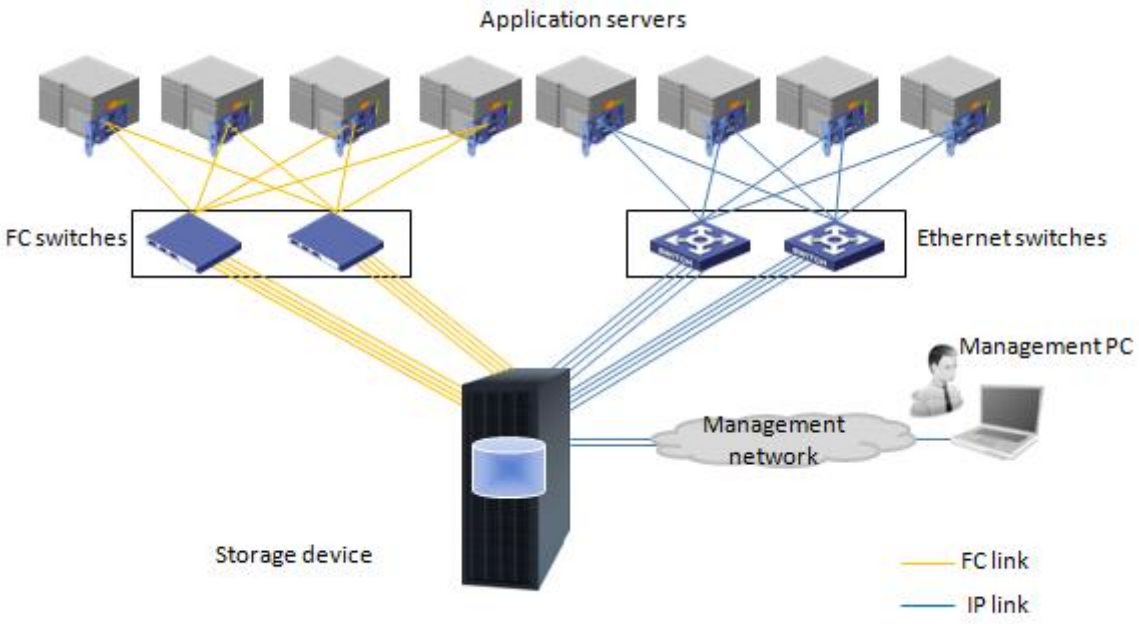

Figure 2-1 Typical networking of MS series storage devices

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.

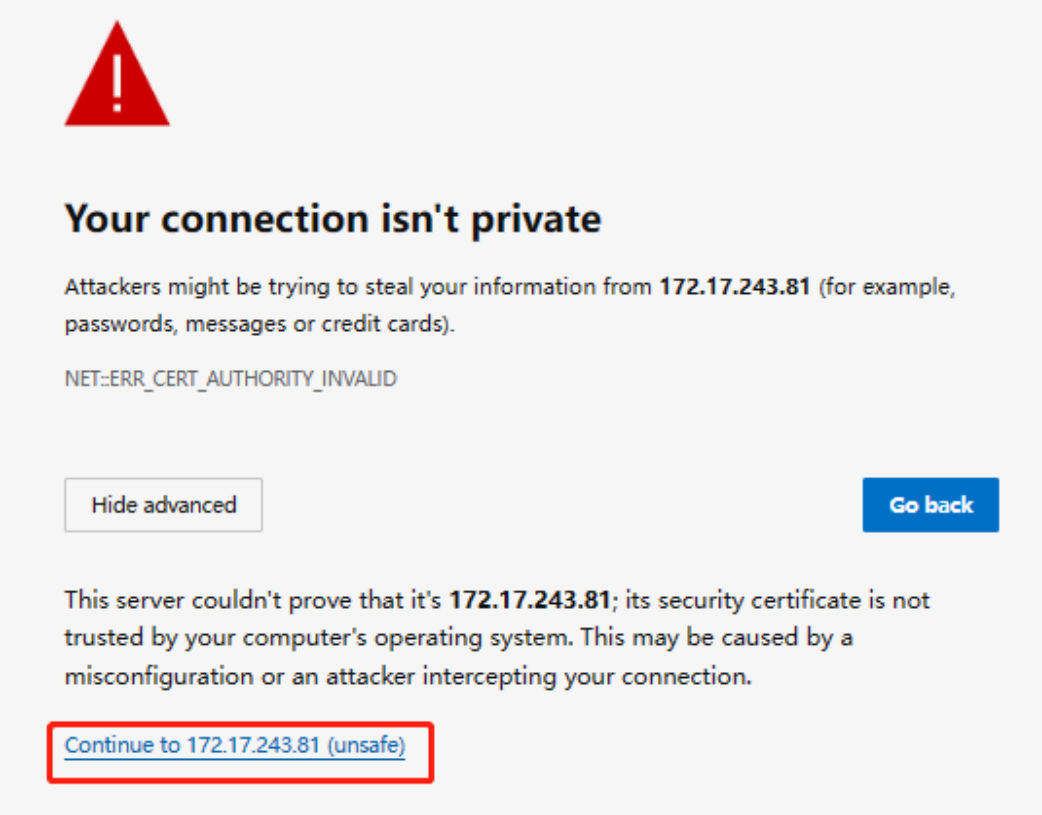

Figure 3-1 Example for prompt of certificate exception

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.

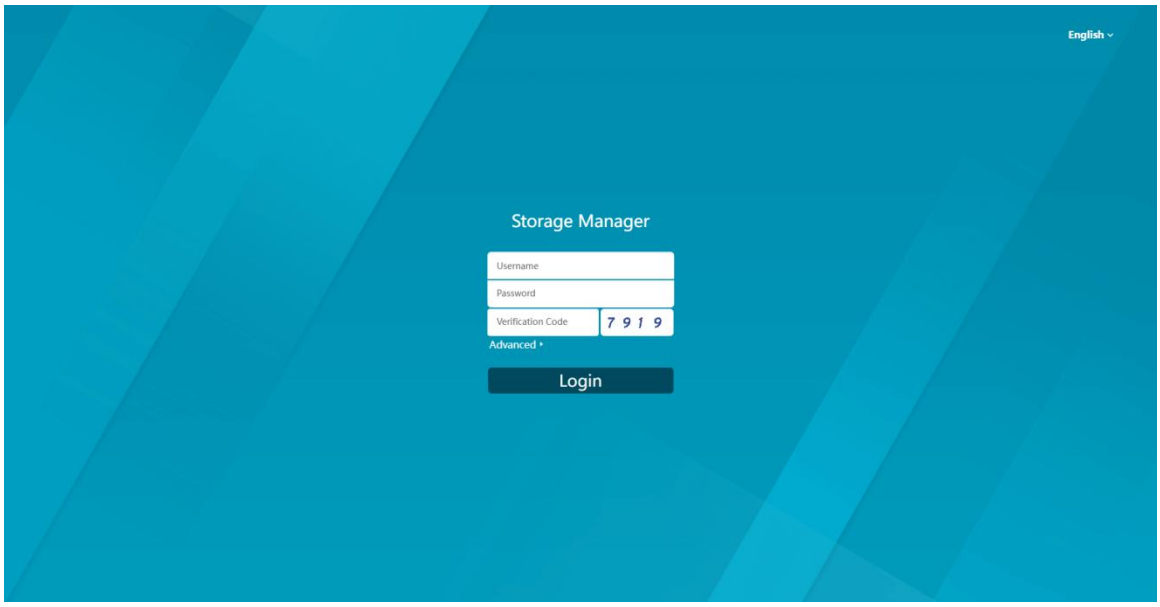

Figure 3-2 ODSP Scope+ login interface

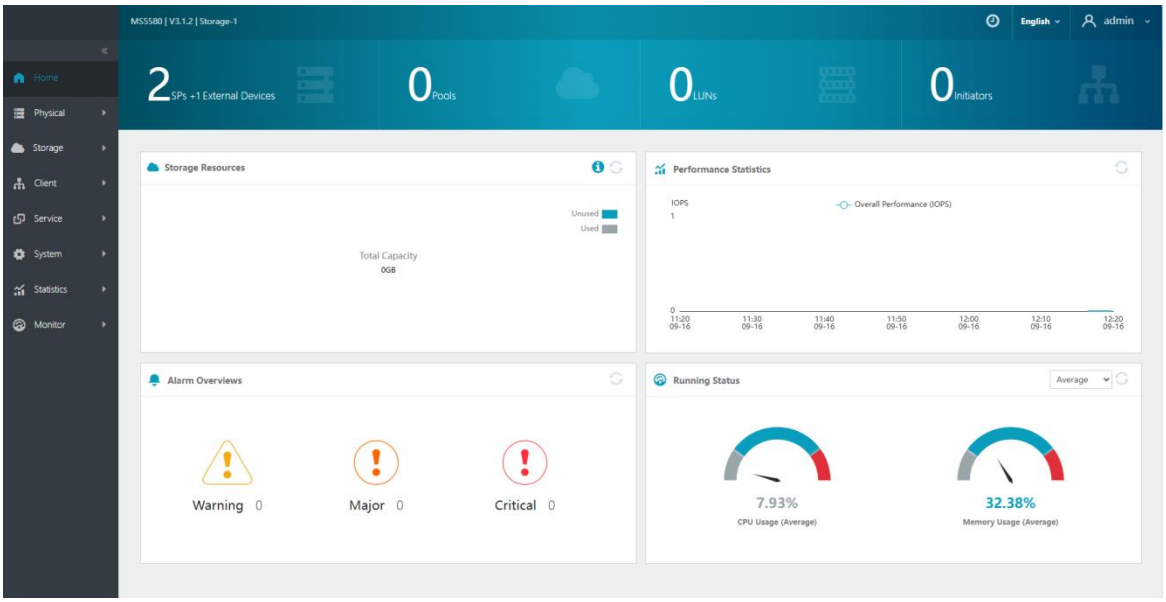

Figure 3-3 Home of ODSP Scope+ system view

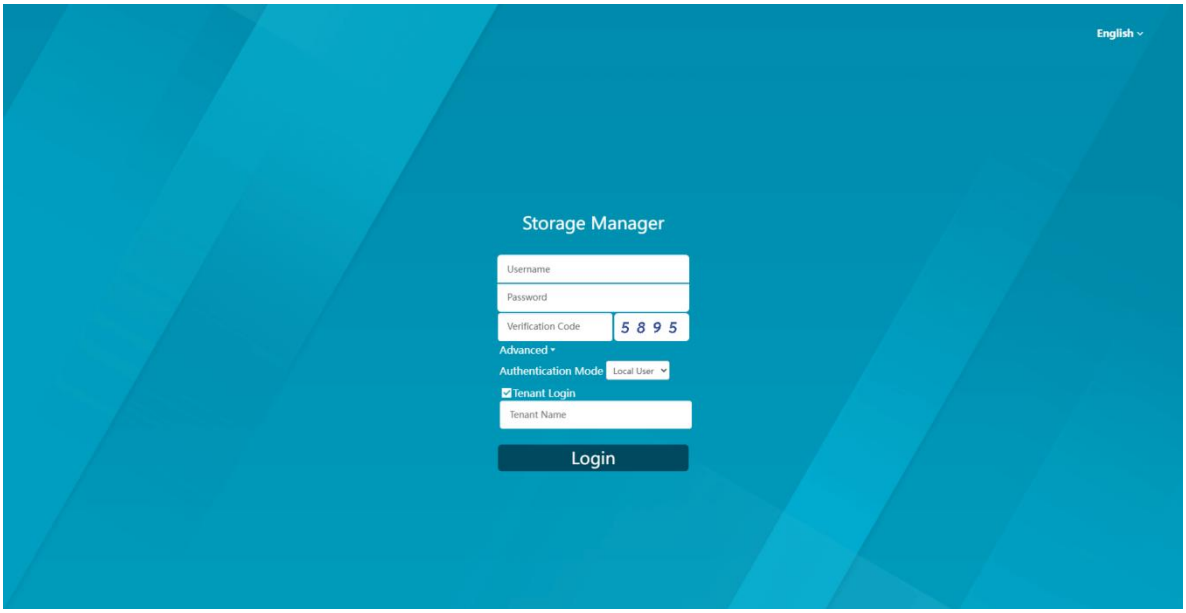

Figure 3-4 ODSP Scope+ tenant login interface

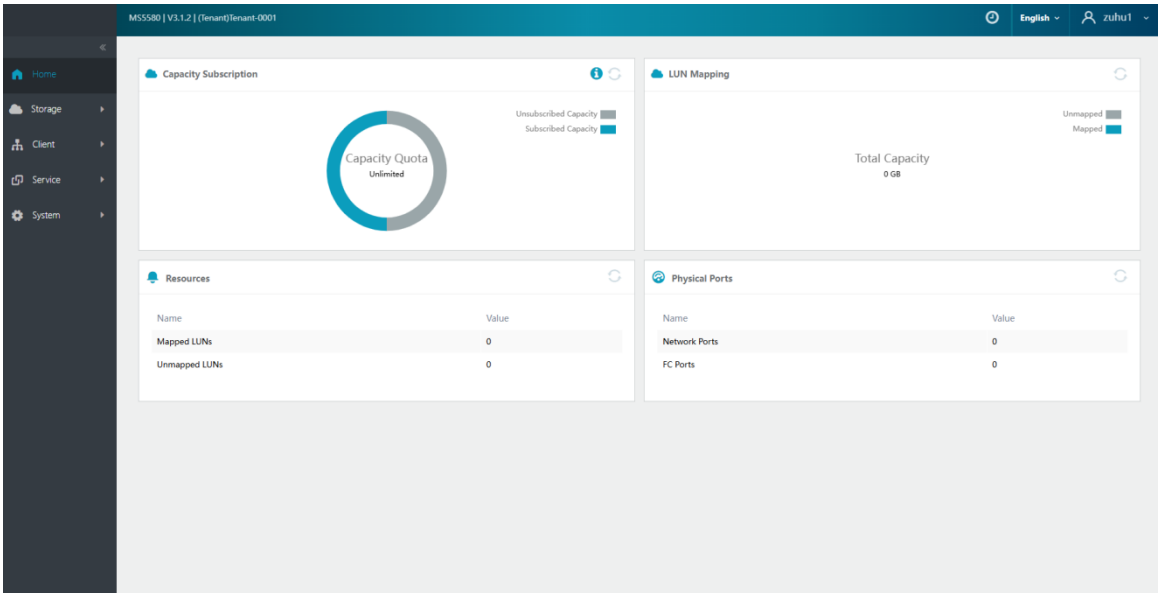

Figure 3-5 Home of ODSP Scope+ tenant view

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.

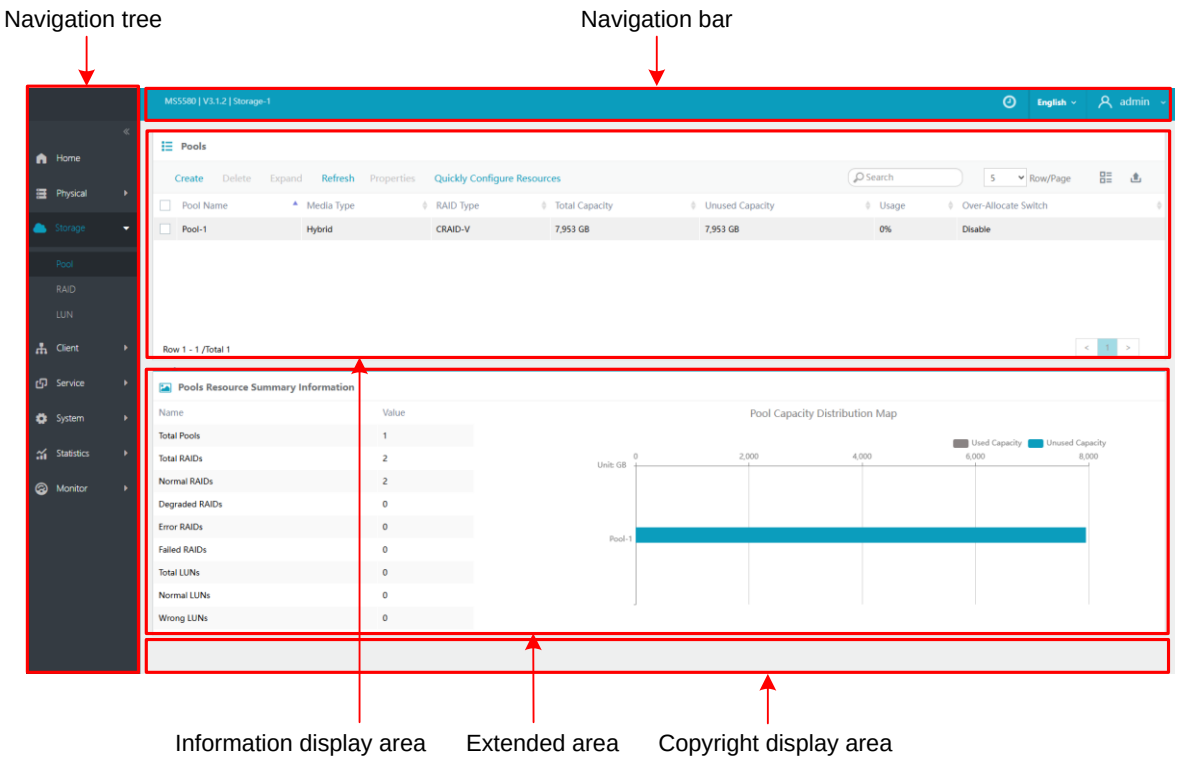

Figure 3-6 Example of ODSP Scope+ typical interface

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.

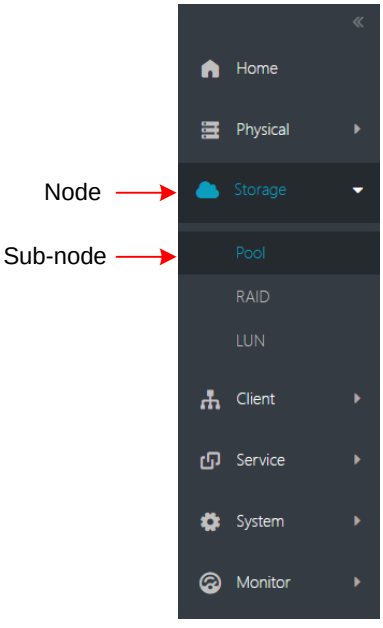

Figure 3-7 Example of ODSP Scope+ navigation tree

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.

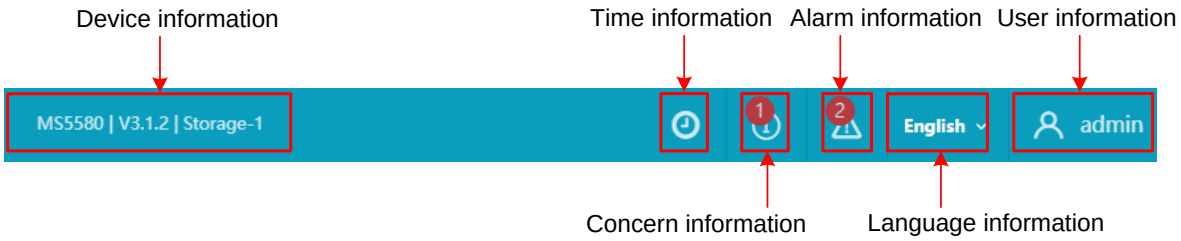

Figure 3-8 Example of ODSP Scope+ navigation bar

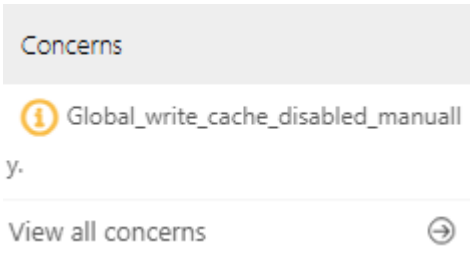

Figure 3-9 Example of ODSP Scope+ concerns

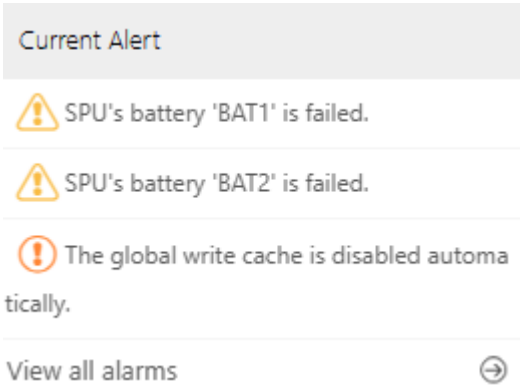

Figure 3-10 Example of ODSP Scope+ alarms

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.

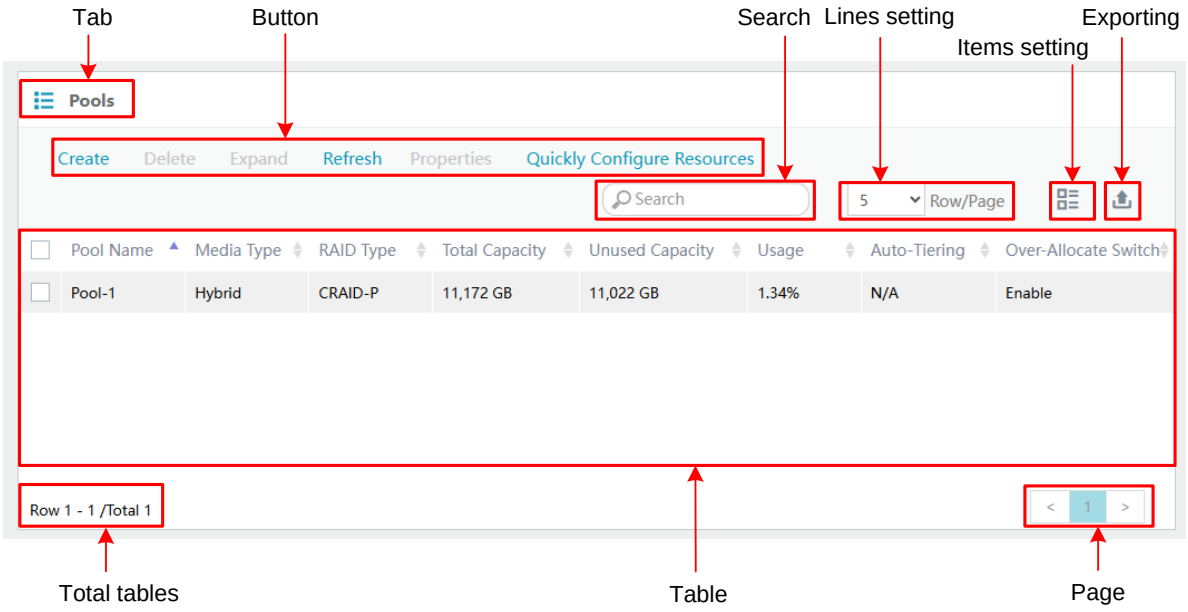

Figure 3-11 Example of ODSP Scope+ information display area

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.

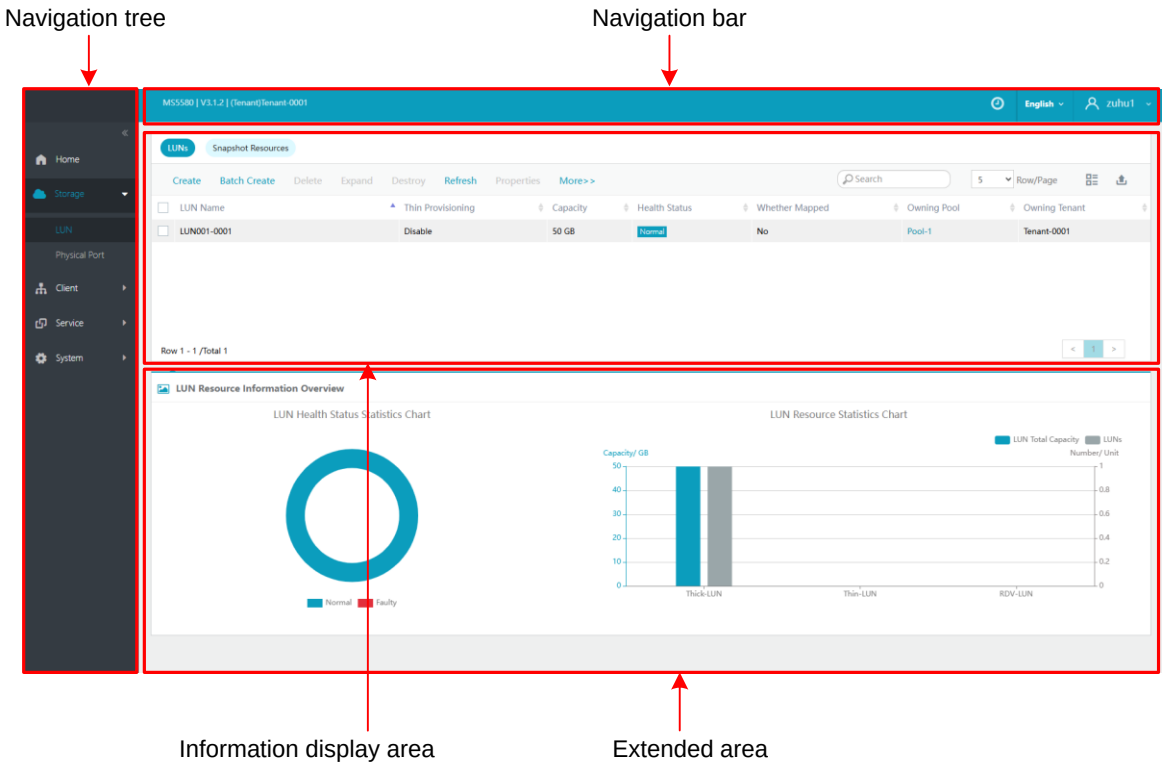

Figure 3-12 Example of ODSP Scope+ typical interface

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.

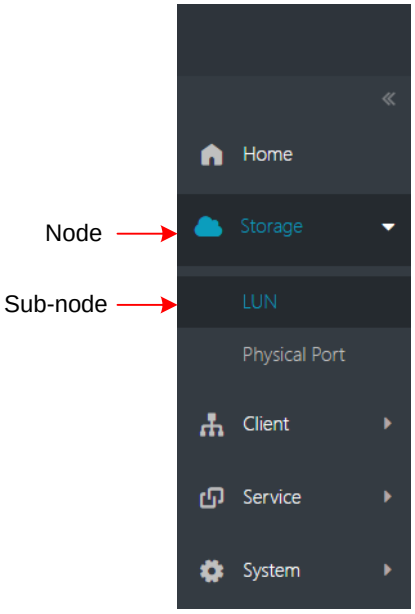

Figure 3-13 Example of ODSP Scope+ navigation tree

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.

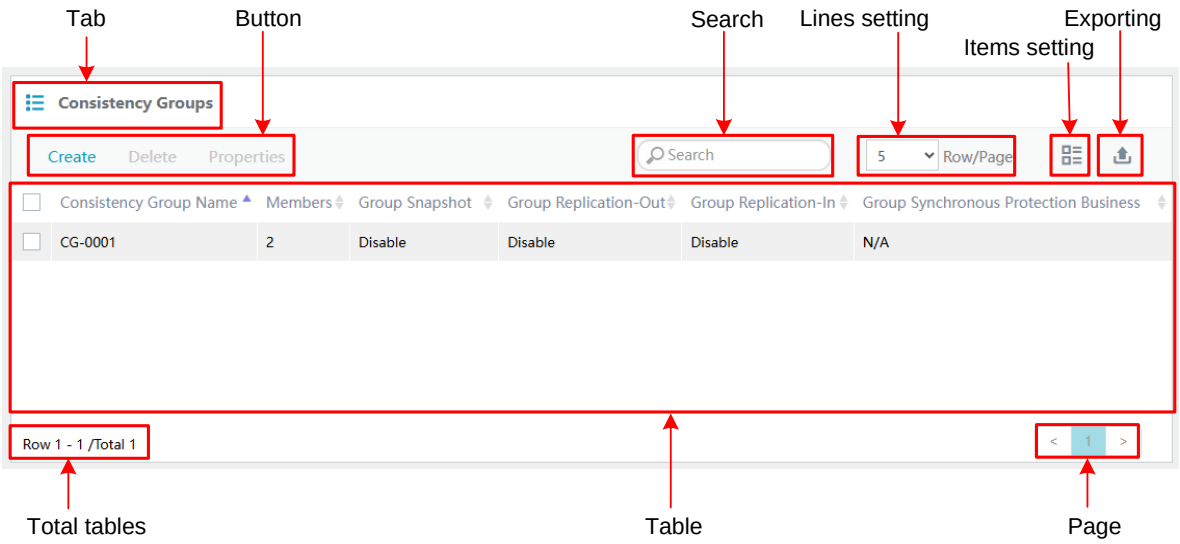

Figure 3-15 Example of ODSP Scope+ information display area

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: R3DC Feature

4 Introduction to R3DC Feature

4.1 Introduction to R3DC

With the cornerstone of data, information system has become a major support for social production capacity and normal operation of enterprises in today's society. In the face of various potential threats, such as natural disasters (fires, earthquakes, typhoons, tsunamis, etc.), man-made disasters (misuses, hacker attacks, etc.), failures on software and hardware, power supply failures, etc., disaster backup of production data has become a top priority.

In single data center or dual data center scenarios, features such as dual-active, synchronous replication and asynchronous replication can be deployed to achieve user data protection and business protection. In a triple-data center scenario, MacroSAN R3DC technology can be used to achieve the linkage of multiple business features between multiple data centers and improve the availability of the disaster recovery solution.

There are three devices in R3DC, which can be located in one, two, or three data centers. Assuming that the three devices are Device A, Device B, and Device C, which are created with LUN-A, LUN-B, and LUN-C respectively, typical implementations are as follows:

- Dual active + async replication

Lun-A and LUN-B is a dual-active pair and both are asynchronously replicated to LUN-C. When either LUN-A or LUN-B is faulty, front-end business is automatically switched over to ensure service continuity. At the same time, the dual-active switchover does not affect the asynchronous replication, which means LUN-C always saves the latest replica data according to the replication policy.

- Sync replication + async replication

Lun-A and LUN-B is a synchronous replication pair and both are asynchronously replicated to LUN-C. When either LUN-A or LUN-B is faulty, manual intervention will be performed. At the same time, the synchronous replication reversion does not affect the asynchronous replication, which means LUN-C always saves the latest replica data according to the replication policy.

ⓘNOTE

Please refer to *MacroSAN MS Series Storage Devices Dual-Active Feature GUI User Manual* and *MacroSAN MS Series Storage Devices Replication Feature GUI User Manual* for configurations before using R3DC.

4.2 Introduction to Consistency Group

Some production businesses of 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 businesses.

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 replication feature with consistency group function can strictly guarantee the data consistency of the replica LUNs of multiple members in the consistency group.

4.3 Introduction to XAN

ⓘNOTE

- Multiple XANs can be created on one device. In the typical networking diagram, only the XAN between two devices is used as an example. The front-end networking is just an example, and the actual networking can be adjusted according to actual situation.
- Arbiter is required to be deployed in order to solve the split-brain problem. The arbiter network is required to be independent of XAN, and please ensure that the network between each SP and the arbiter is reachable.

XAN (eXchange Area Network) refers to a dedicated high-speed network for data transfer between MacroSAN storage devices and supports either MESH direct connection or switch connection.

4.3.1 Dual-Controller XAN Typical Networking

4.3.1.1 MESH Direct Connection

MESH direct connection of dual-controller devices means that two SPs of one storage device and that of another storage device are directly connected in pairs, and each SP occupies two identical high-speed Ethernet ports (including 10GE, 25GE, 100GE, etc.) or FC ports (including 16G FC, 32G FC, etc.). Taking dual-controller + front-end FC connection as an example, Figure 4-1 shows a typical XAN networking of MESH direct connection.

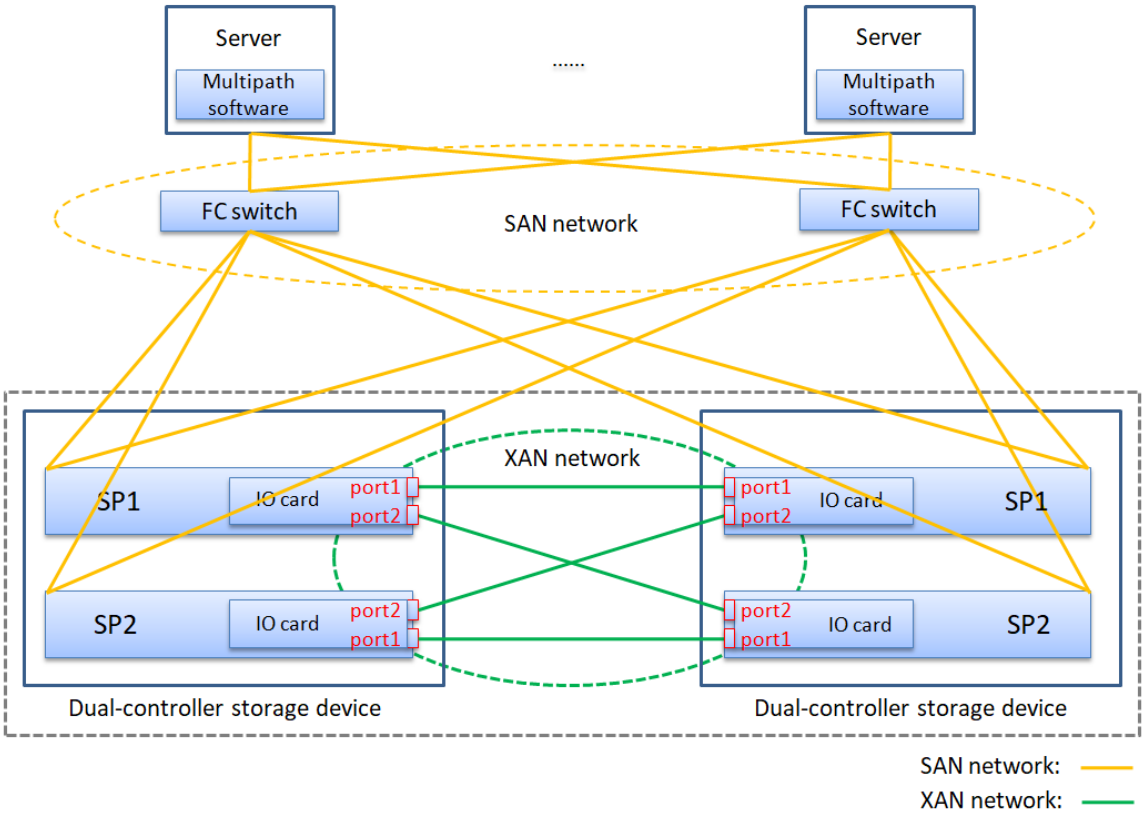

Figure 4-1 XAN typical networking diagram of dual-controller (MESH direct connection)

4.3.1.2 Switch Connection

⚠CAUTION

Switches used for XAN connection cannot be stacked.

Switches connection of dual-controller devices means that the four SPs of two storage devices are connected through two switches to ensure data redundancy. Each SP occupies two identical high-speed Ethernet ports (including 10GE, 25GE, 100GE, etc.) or FC ports (including 16G FC, 32G FC, etc.). Taking dual-controller + front-end FC connection as an example, Figure 4-2 shows a typical XAN networking of switch connection.

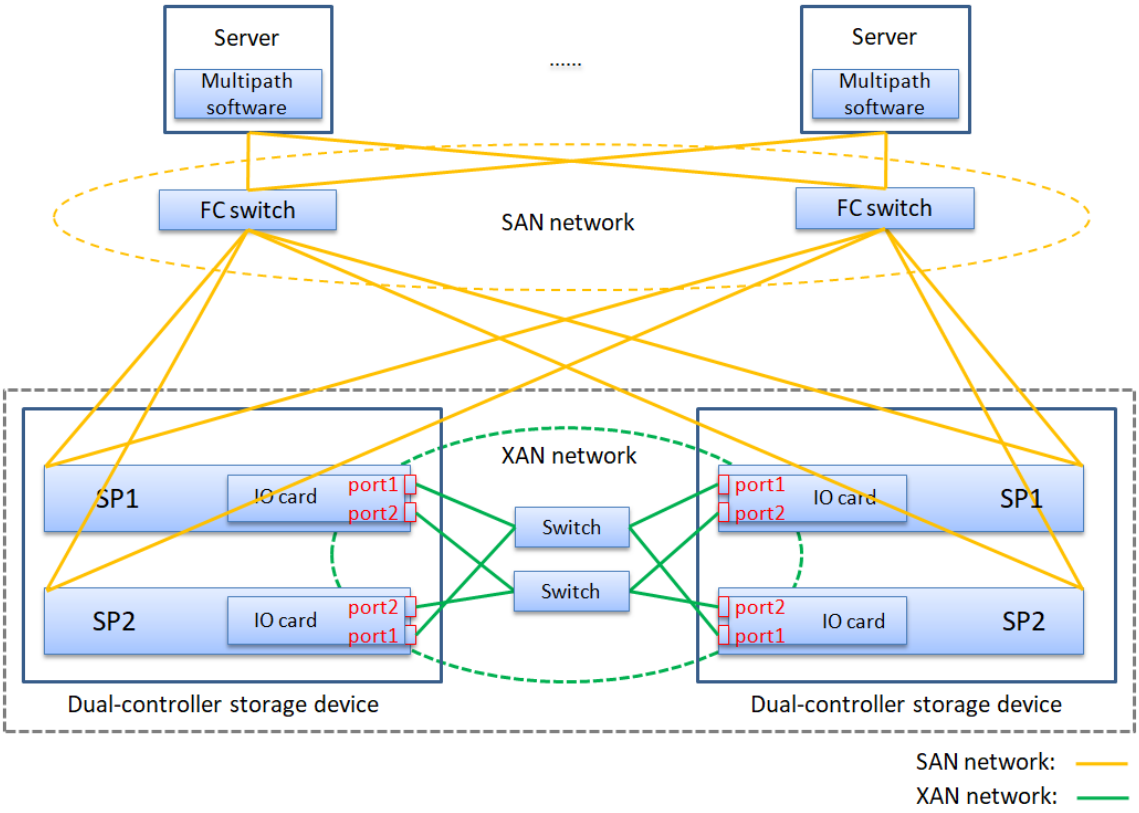

Figure 4-2 XAN typical networking diagram of dual-controller (switch connection)

4.3.2 Four-Controller XAN Typical Networking

4.3.2.1 MESH Direct Connection

MESH direct connection of four-controller devices means that the four SPs of one storage device are cross-connected with the four SPs of another storage device, and each SP occupies four identical high-speed Ethernet ports (including 10GE, 25GE, 100GE, etc.) or FC ports (including 16G FC, 32G FC, etc.). Taking four-controller + front-end FC connection as an example, Figure 4-3 shows a typical XAN networking of MESH direct connection.

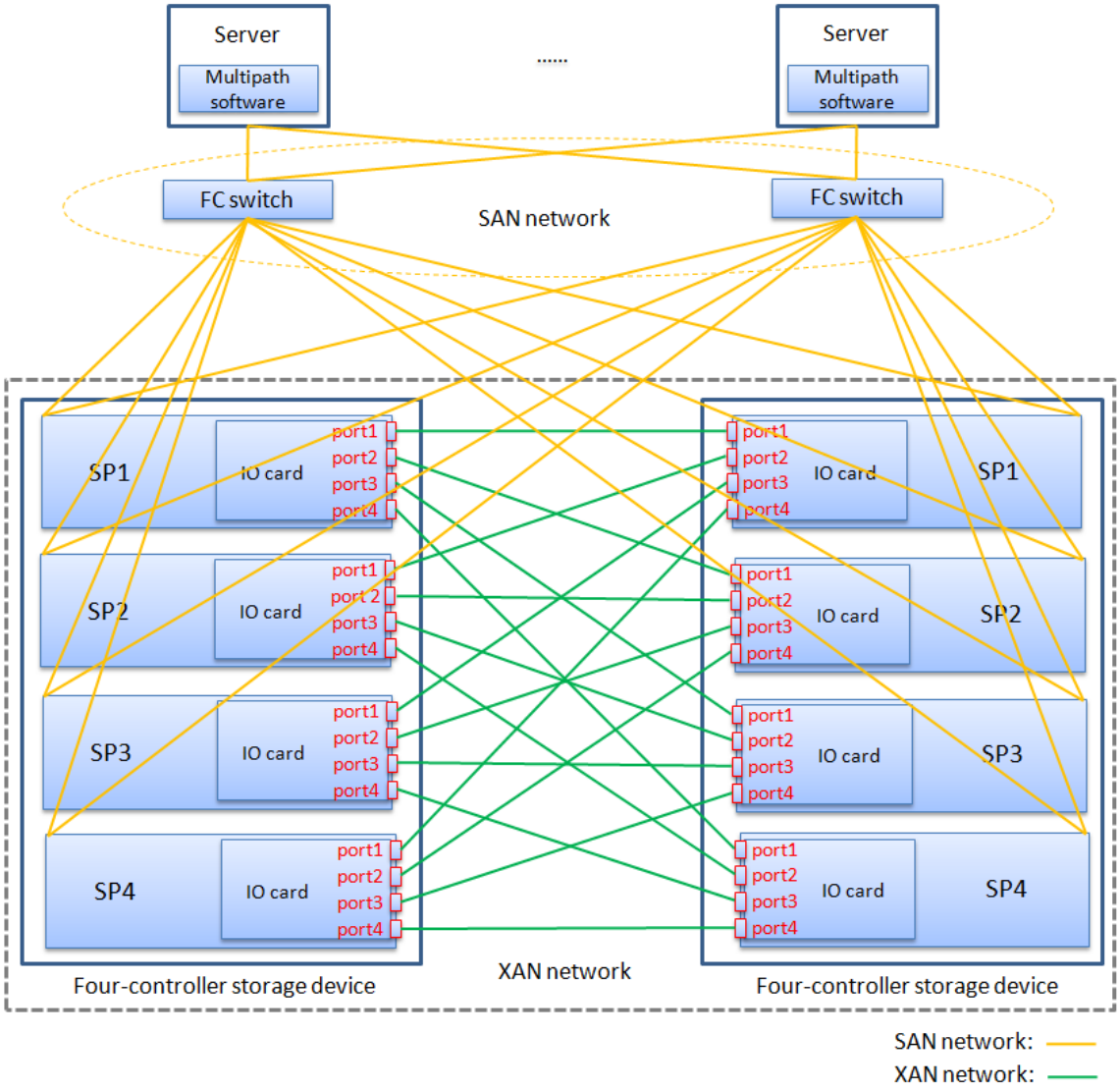

Figure 4-3 XAN typical networking diagram of four-controller (MESH direct connection)

4.3.2.2 Switch Connection

⚠CAUTION

Switches used for XAN connection cannot be stacked.

Switches connection of four-controller devices means that the eight SPs of two storage devices are connected through two switches to ensure data redundancy. Each SP occupies two identical high-speed Ethernet ports (including 10GE, 25GE, 100GE, etc.) or FC ports (including 16G FC, 32G FC, etc.). Taking four-controller + front-end FC connection as an example, Figure 4-4 shows a typical XAN networking of switch connections.

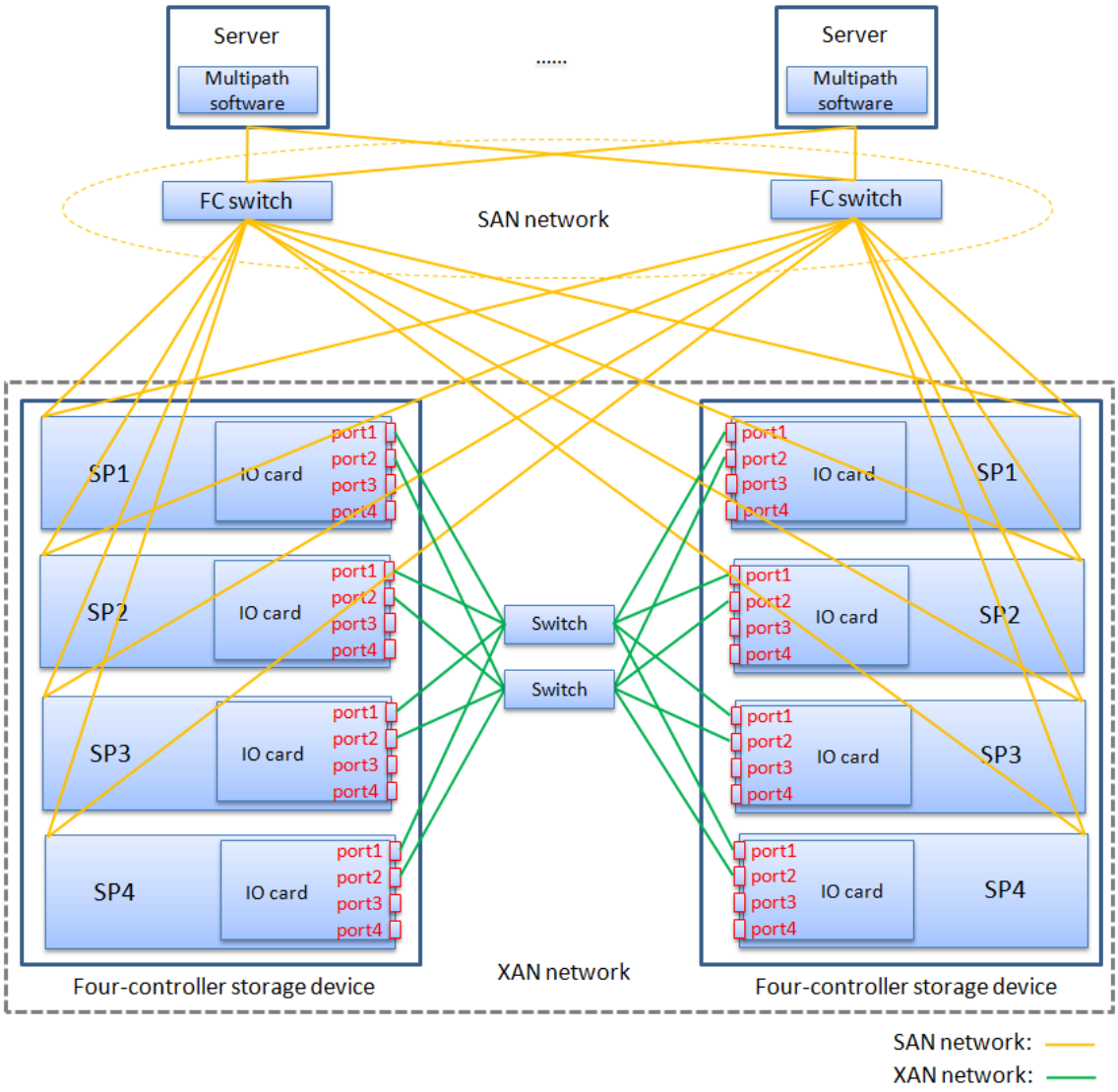

Figure 4-4 XAN typical networking diagram of four-controller (switch connection)

4.3.3 XAN Terms

- XAN device pair: It refers to the two storage devices that form the XAN.
- XAN logical link: For dual-controller devices, there must be at least four logical links between the four SPs of the two devices; for four-controller devices, there must be at least sixteen logical links between the eight SPs of the two devices.
- XAN physical link: Multiple ports can be used for XAN in a SP. Therefore, each logical link can also have multiple physical links.

ⓘNOTE

- The logical link naming rule is "link XY", whose X represents the controller ID of the local device, and Y represents the controller ID of the peer device. The controller IDs are marked with letters A-D. In other words, A-D represents SP1-SP4 respectively.

- Example: Link AA indicates the logical link between SP1 on the local device and SP1 on the peer device, and link AB indicates the logical link between SP1 on the local device and SP2 on the peer device.

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.

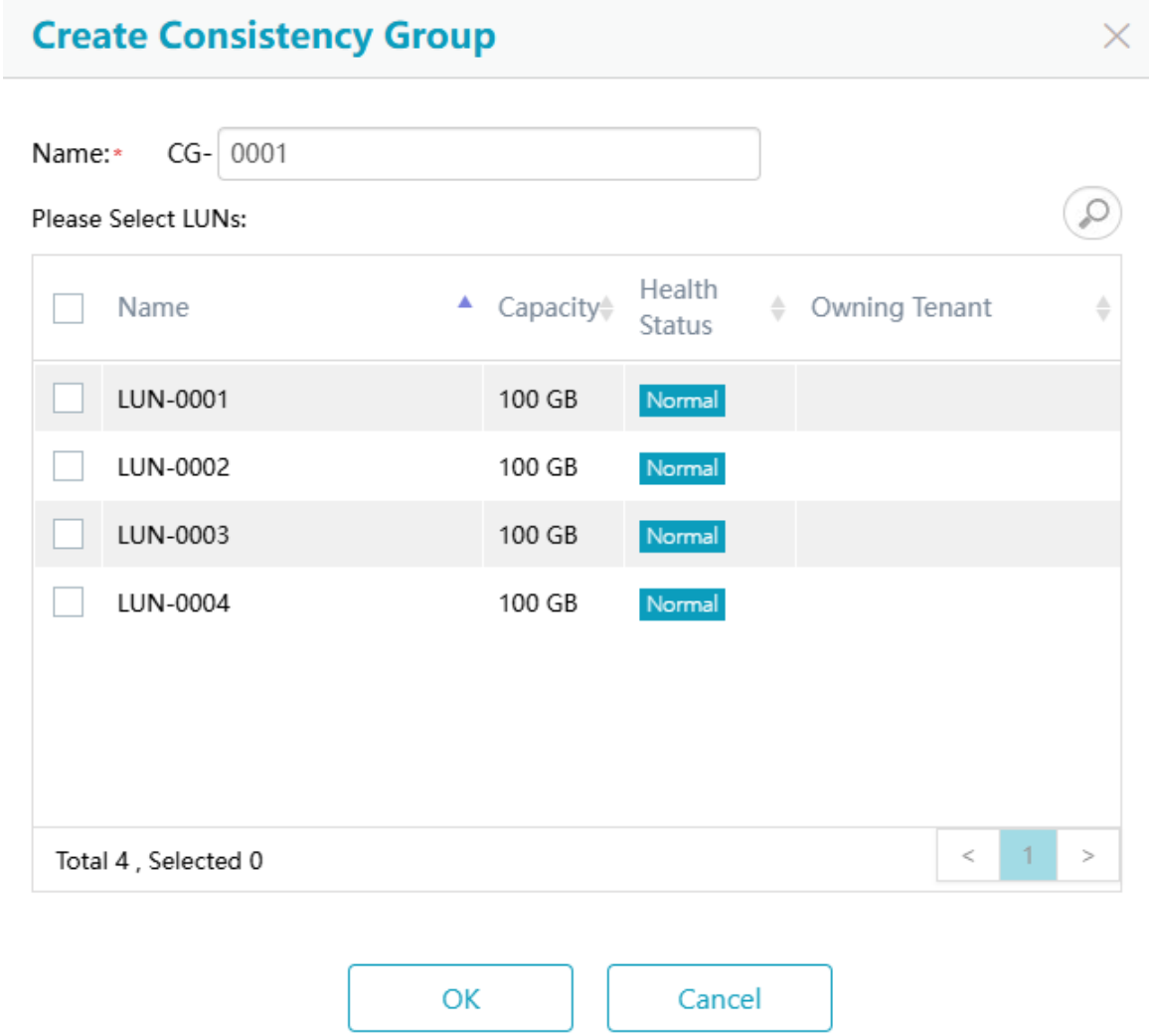

Figure 5-1 Create consistency group interface

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.

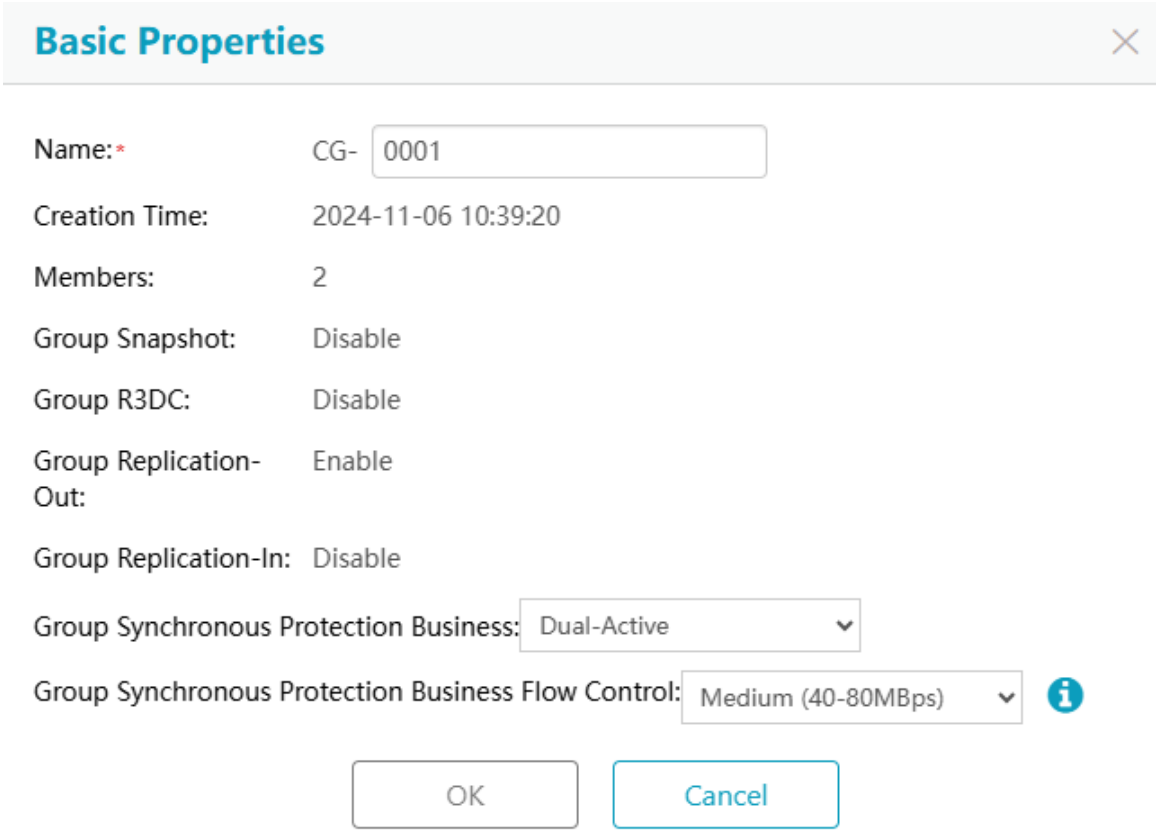

Figure 5-2 Consistency group basic properties interface

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	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. • Low (0-20MBps) • Medium (40-80MBps) • High (100-200MBps) • Highest (greater than 200MBps) • Custom: Setting upper limit of rate ratio manually. Valid range: 1-1024MBps.

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, and 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.

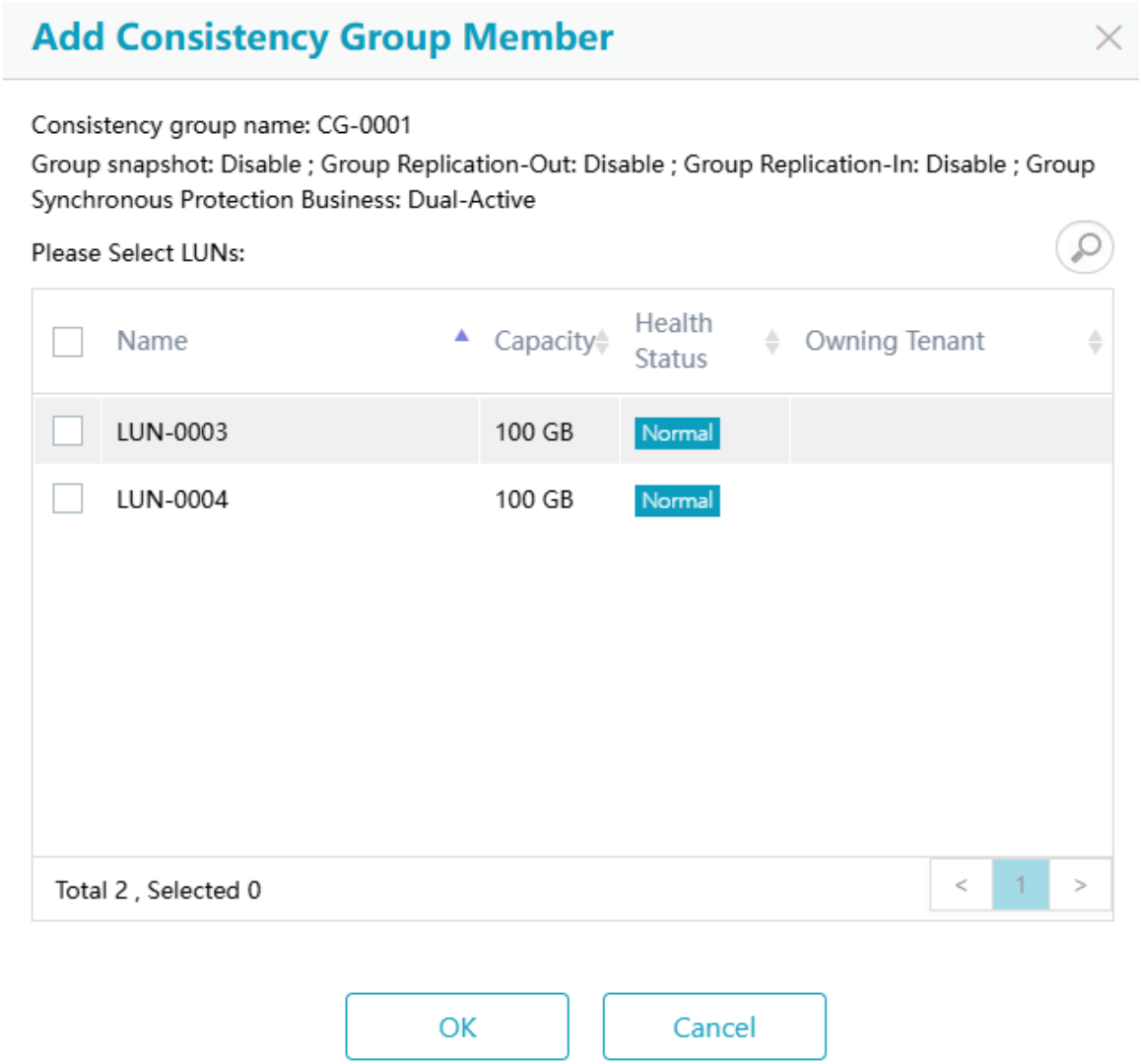

Figure 5-3 Add consistency group member interface

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 Preparations before Configuring R3DC

6.1 Activating License

6.1.1 Activating Replication License

This section explains how to activate replication license.

ⓘNOTE

After activating successfully, the "R3DC" 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 replication license, and click the <Activate> button to complete the configuration.

6.1.2 Activating Dual-Active License

This section explains how to activate dual-active license.

ⓘNOTE

Please activate the dual-active license before creating R3DC based on dual-active + async remote replication.

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 dual-active license, and click the <Activate> button to complete the configuration.

6.2 Configuring XAN

ⓘNOTE

Please activate the replication license on the three storage devices respectively before configuring XANs.

6.2.1 Managing Remote Device

6.2.1.1 Adding Remote Device

This section explains how to add remote device.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Click the <Add> button in the **Remote Devices** tab of the information display area to open the **Add Device** window, as shown in Figure 6-1. Enter the device information (see Table 6-1 for details) and click the <OK> button to complete the configuration.

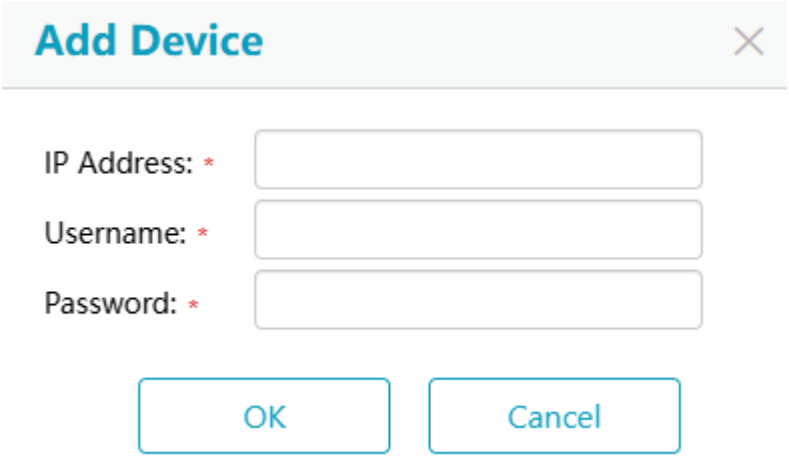

Figure 6-1 Add device interface

Table 6-1 Description of the parameters for adding device interface

Parameter	Description
IP Address	It refers to the IP address of remote device.
Username	It refers to the username of remote device.
Password	It refers to the user's password of remote device.

6.2.1.2 Viewing Remote Device Properties

This section explains how to view remote device's basic properties.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired remote device in the **Remote Devices** 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 remote device.

6.2.1.3 Refreshing Remote Device

This section explains how to refresh remote device.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Click the <Refresh> button in the **Remote Devices** tab of the information display area to complete the configuration.

6.2.1.4 Deleting Remote Device

This section explains how to delete remote device.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired remote device in the **Remote Devices** tab of 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.

6.2.2 Creating XAN

6.2.2.1 Creating XAN Based on IP Management Link + IP Data Link

This section explains how to create XAN based on IP management link + IP data link.

ⓘNOTE

XAN will be automatically created on the two devices on the base of IP management link.

Prerequisites

Before creating an XAN, configure the IP addresses of the XAN link ports on the two devices and ensure that the network is reachable.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

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

Step 3: The first step of the **Create XAN** wizard is shown in Figure 6-2. Configure the management link between devices to IP, select the target device, and click the <Next> button to enter the next interface.

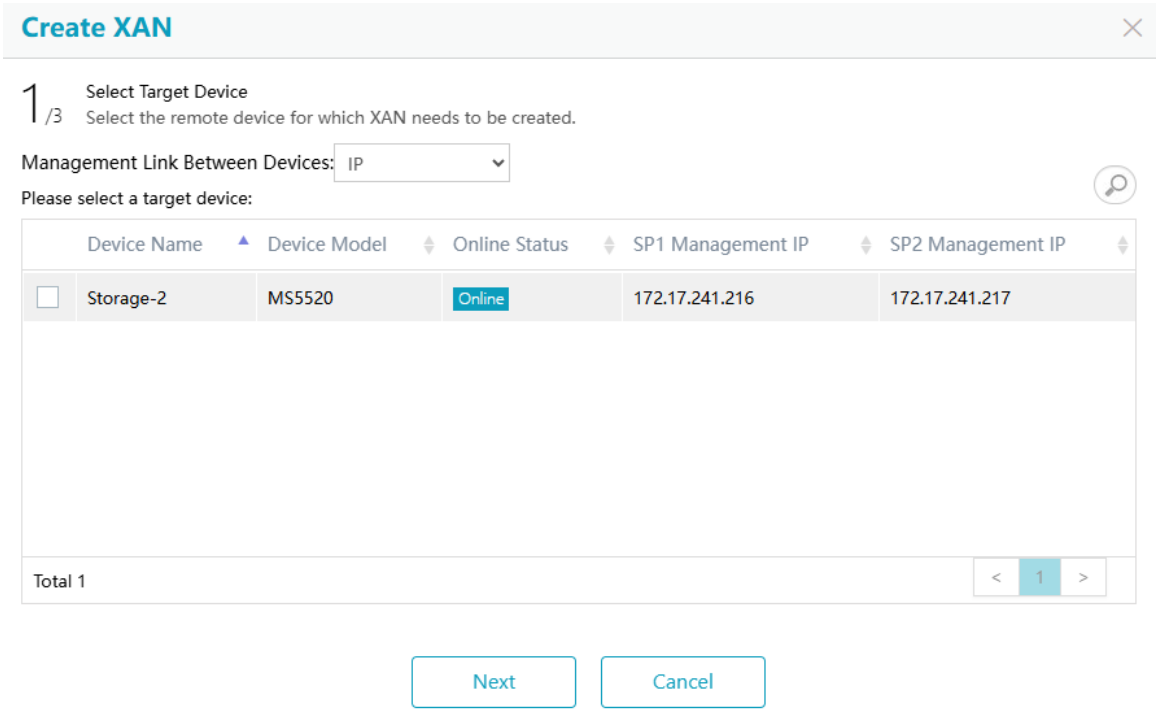

Figure 6-2 Create XAN (IP management link + IP data link) wizard interface (1)

Step 4: The second step of the **Create XAN** wizard is shown in Figure 6-3. Configure the XAN link type to IP, select the local port and peer port, and click the <Test> button to ensure that the network is reachable. Click the <Next> button to enter the next interface.

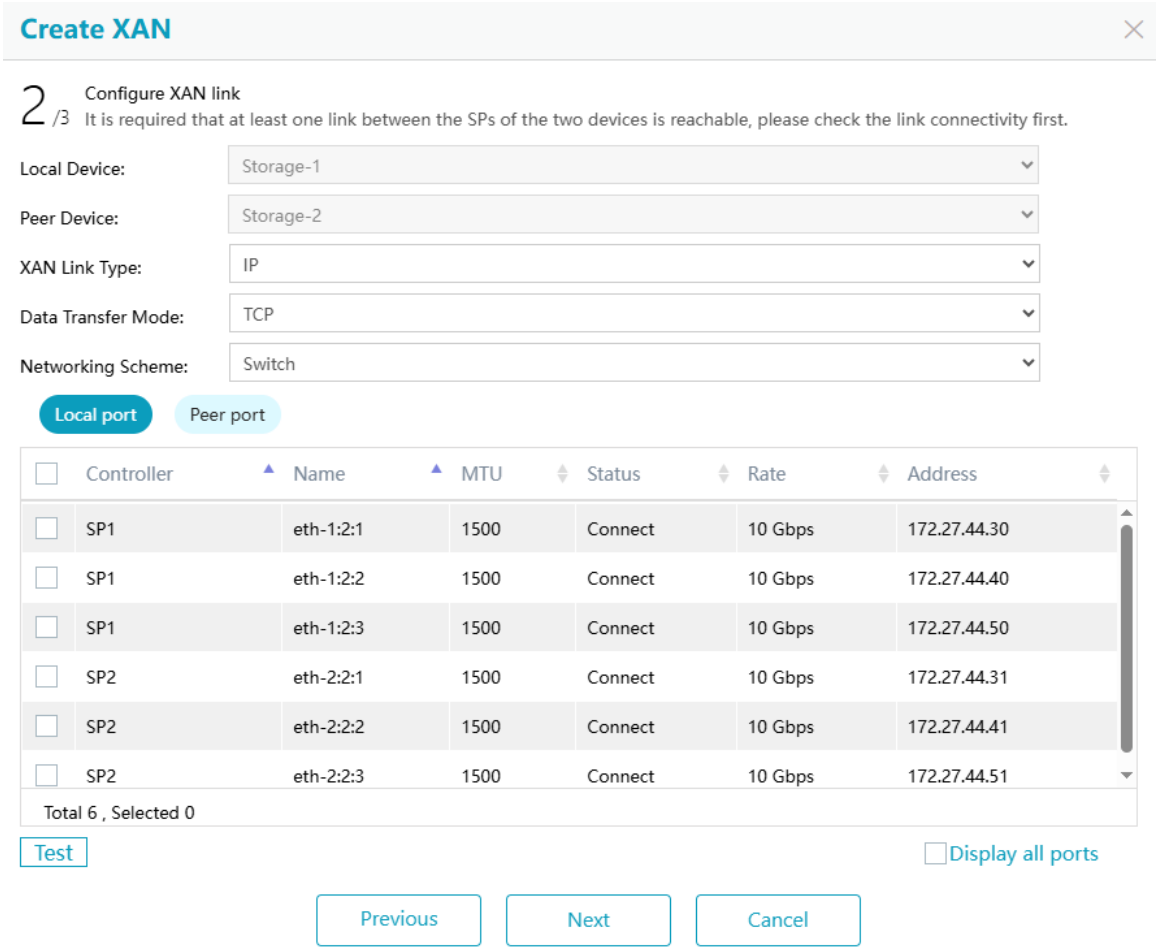

Figure 6-3 Create XAN (IP management link + IP data link) wizard interface (2)

Table 6-2 Description of the parameters for creating XAN (IP management link + IP data link) wizard interface (2)

Parameter	Description
Local Device	It refers to the name of the local device.
Peer Device	It refers to the name of the peer device.
XAN Link Type	It refers to the type of XAN link established between the local device and the peer device. Please select IP.
Data Transfer Mode	It refers to the XAN data transfer mode established between the local device and the peer device. • TCP: It refers to data transfer through the TCP protocol. • RDMA: It refers to data transfer through the RDMA protocol. • ALL: It refers to auto-negotiation transport protocol.
Networking Scheme	It refers to the networking scheme established between local device and peer device, including switch and mesh.

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

Step 6: After creating the XAN, you can see the XAN link status become "Link" in the **XAN Topology** tab of the extended area, as shown in Figure 6-4.

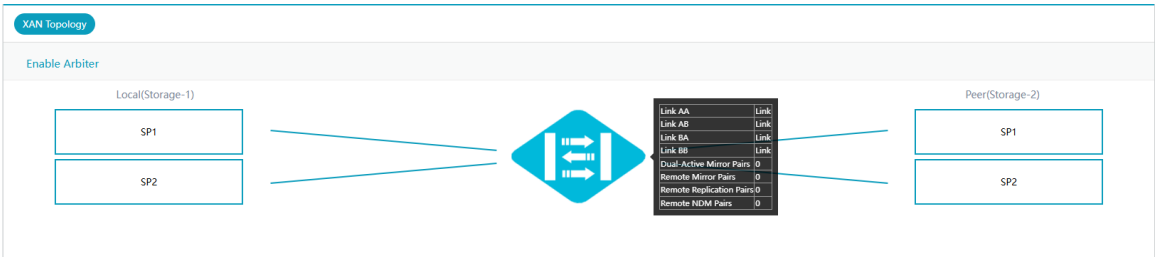

Figure 6-4 XAN topology interface

6.2.2.2 Creating XAN Based on IP Management Link + FC Data Link

This section explains how to create XAN based on IP management link + FC data link.

ⓘNOTE

XAN will be automatically created on the two devices on the base of IP management link.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

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

Step 3: The first step of the **Create XAN** wizard is shown in Figure 6-5. Configure the management link between devices to IP, select the target device, and click the <Next> button to enter the next interface.

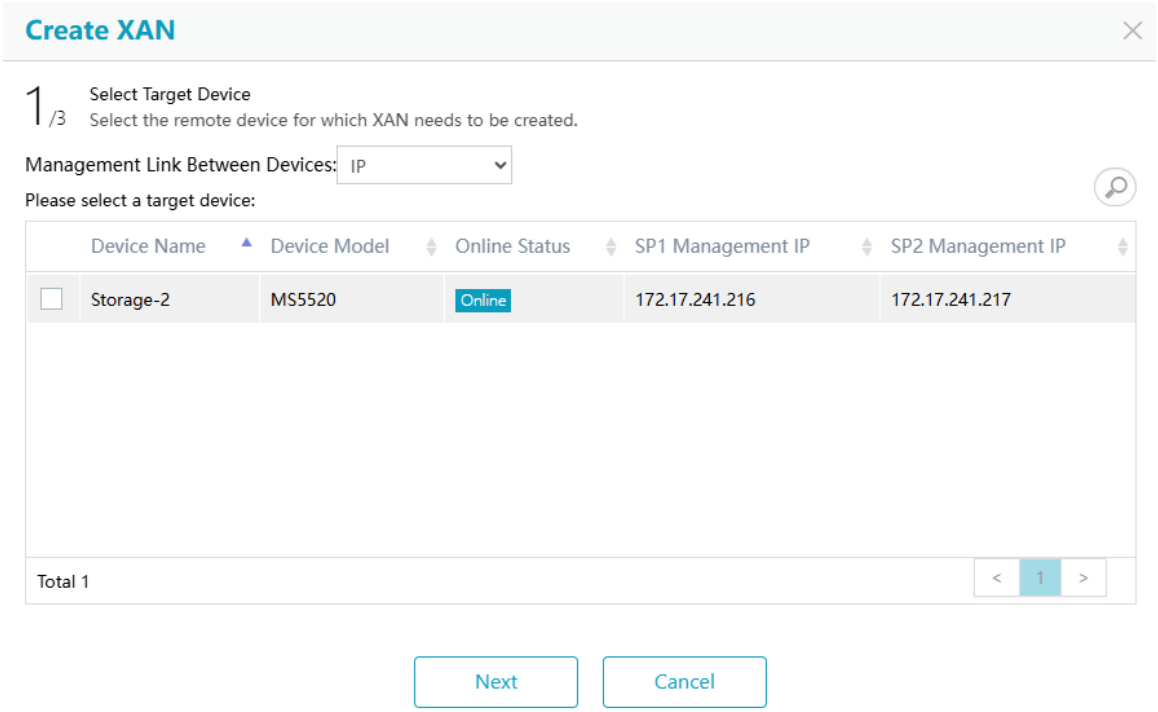

Figure 6-5 Create XAN (IP management link + FC data link) wizard interface (1)

Step 4: The second step of the **Create XAN** wizard is shown in Figure 6-6. Configure the XAN link type to FC, select the local port and peer port, and click the <Next> button to enter the next interface.

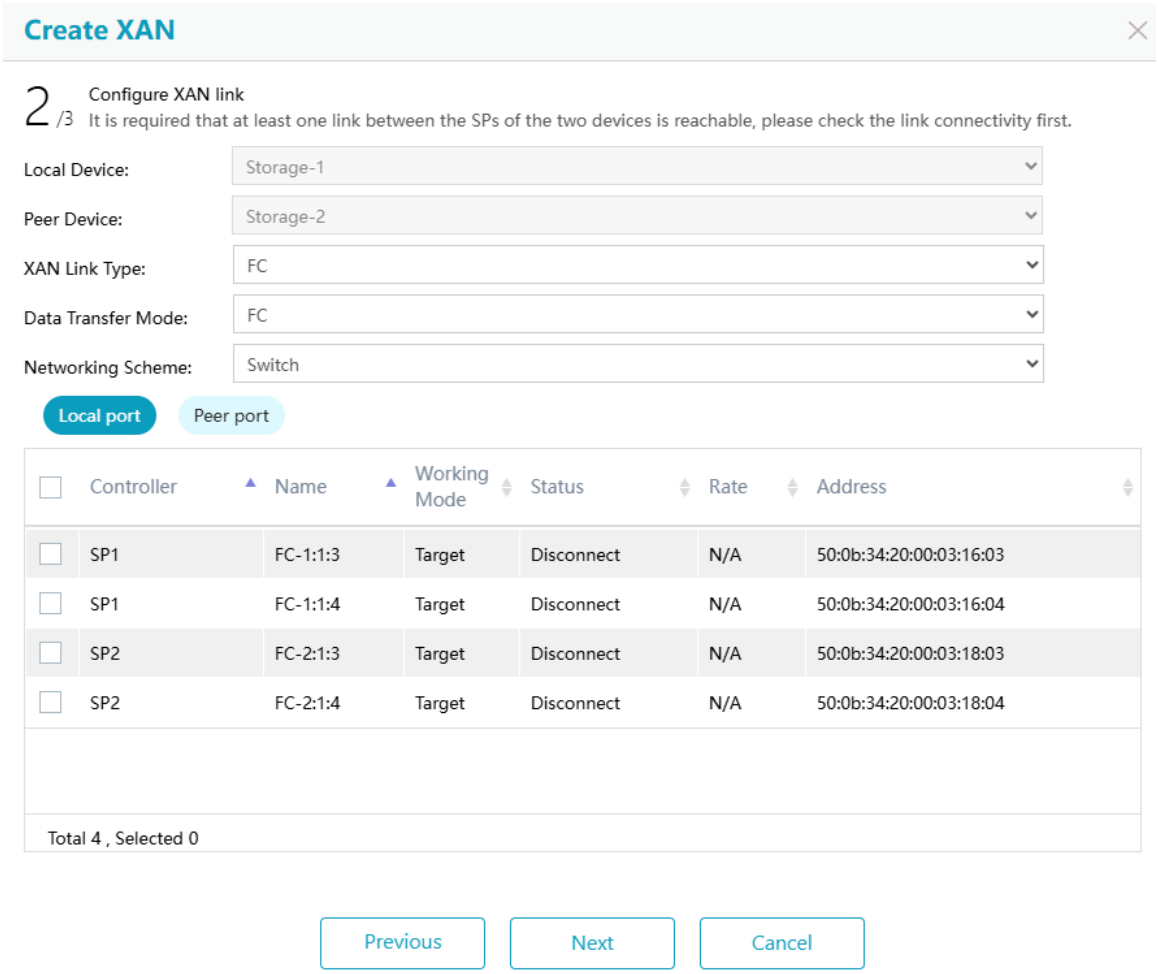

Figure 6-6 Create XAN (IP management link + FC data link) wizard interface (2)

Table 6-3 Description of the parameters for creating XAN (IP management link + FC data link) wizard interface (2)

Parameter	Description
Local Device	It refers to the name of the local device.
Peer Device	It refers to the name of the peer device.
XAN Link Type	It refers to the type of XAN link established between the local device and the peer device. Please select FC.
Data Transfer Mode	It refers to the XAN data transfer mode established between the local device and the peer device. • FC: It refers to data transfer through the FC protocol. • ALL: It refers to auto-negotiation transport protocol.
Networking Scheme	It refers to the networking scheme established between local device and peer device, including switch and mesh.

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

Step 6: After creating the XAN, you can see the XAN link status become "Link" in the **XAN Topology** tab of the extended area, as shown in Figure 6-4.

6.2.2.3 Creating XAN Based on FC Management Link + FC Data Link

This section explains how to create XAN based on FC management link + FC data link.

⚠CAUTION

If there is no IP management link between two devices, XAN will be created only on the local device on the base of FC management link, and you need to log in to the target device to create XAN under this circumstance.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

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

Step 3: The first step of the **Create XAN** wizard is shown in Figure 6-7. Configure the management link between devices to FC and click the <Next> button to enter the next interface.

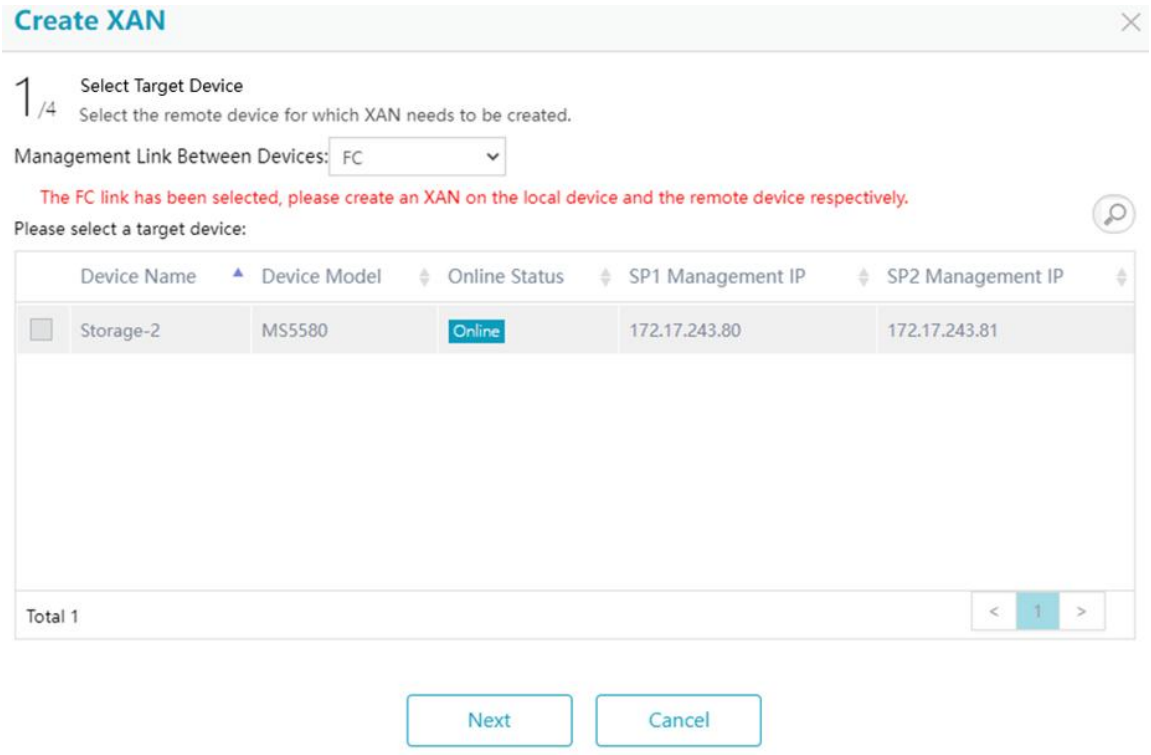

Figure 6-7 Create XAN wizard interface (FC management link + FC data link) (1)

Step 4: The second step of the **Create XAN** wizard is shown in Figure 6-8. Select the local FC port and click the <Next> button to enter the next interface.

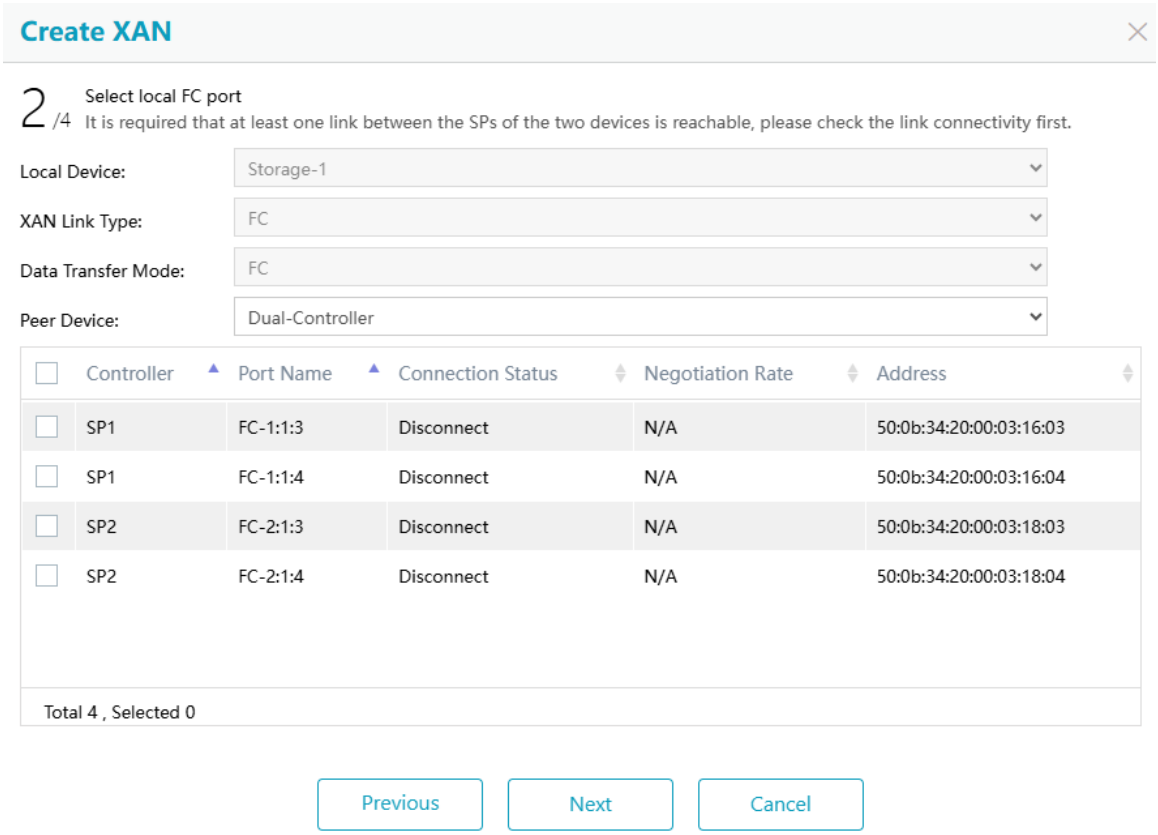

Figure 6-8 Create XAN wizard interface (FC management link + FC data link) (2)

Table 6-4 Description of the parameters for configuring XAN link (3)

Parameter	Description
Local Device	It refers to the name of the local device.
XAN Link Type	It refers to the type of XAN link established between the local device and the peer device. The type is fixed at FC in this scenario.
Data Transfer Mode	It refers to the XAN data transfer mode established between the local device and the peer device. The mode is fixed at FC in this scenario.
Peer Device	It refers to the type of the peer device, including dual-control and four-control.

Step 5: The third step of the **Create XAN** wizard is shown in Figure 6-9. Select the peer FC port and click the <Next> button to enter the next interface.

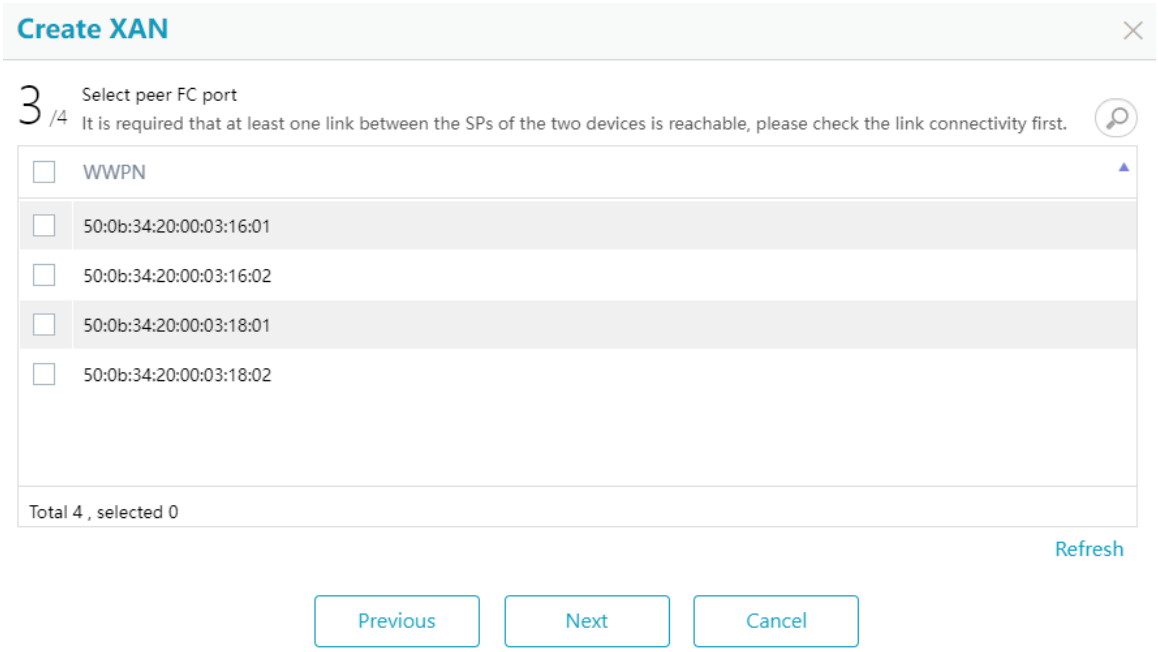

Figure 6-9 Create XAN wizard interface (FC management link + FC data link) (3)

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

Step 7: Refer to Step 1 to Step 5 to create an XAN based on the FC management link on the target device.

Step 8: After creating the XAN, the XAN link status will become "Link" in the **XAN Topology** tab of the extended area, as shown in Figure 6-4.

6.2.3 Viewing XAN Properties

This section explains how to view XAN's general information and XAN link.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired XAN in the **XANs** 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 XAN.

6.2.4 Modifying XAN Properties

6.2.4.1 Adding XAN Port

This section explains how to add XAN port.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired XAN in the **XANs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **XAN Link** tab is shown in Figure 6-10.

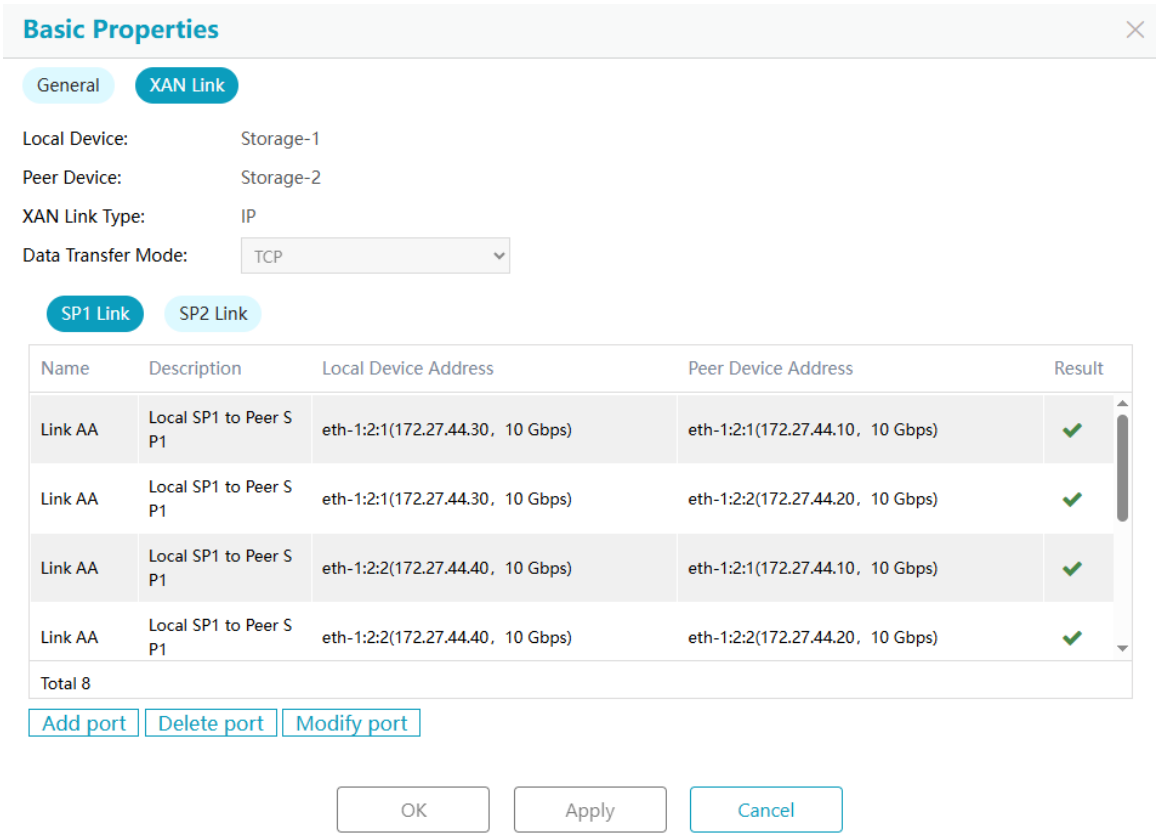

Figure 6-10 XAN basic properties interface

Step 3: Click the <Add port> button to open the **Add XAN Port** window, as shown in Figure 6-11. Select the desired port and click the <OK> button to complete the configuration.

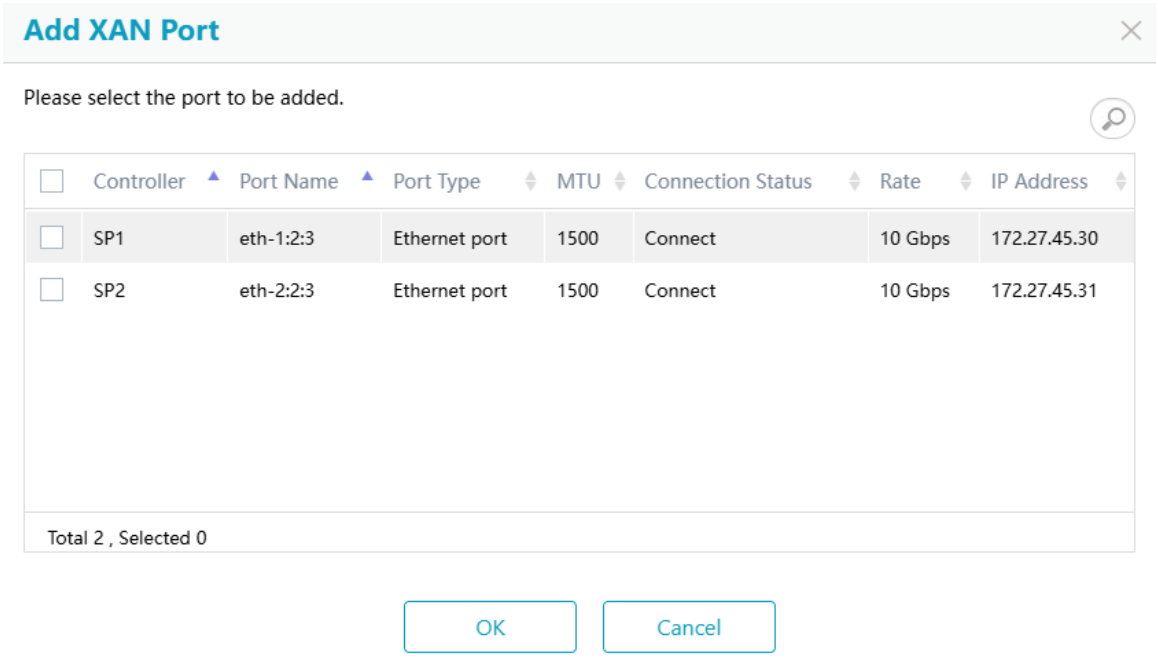

Figure 6-11 Add XAN port interface

6.2.4.2 Modifying XAN Port

This section explains how to modify XAN port's IP address and subnet mask.

Prerequisites

XAN ports modification is supported only for the XAN with IP management link + IP data link.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired XAN in the **XANs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **XAN Link** tab is shown in Figure 6-10.

Step 3: Click the <Modify port> button to open the **Modify XAN Port** window, as shown in Figure 6-12. Select the desired port, modify its IP address and subnet mask, and click the <OK> button to complete the configuration.

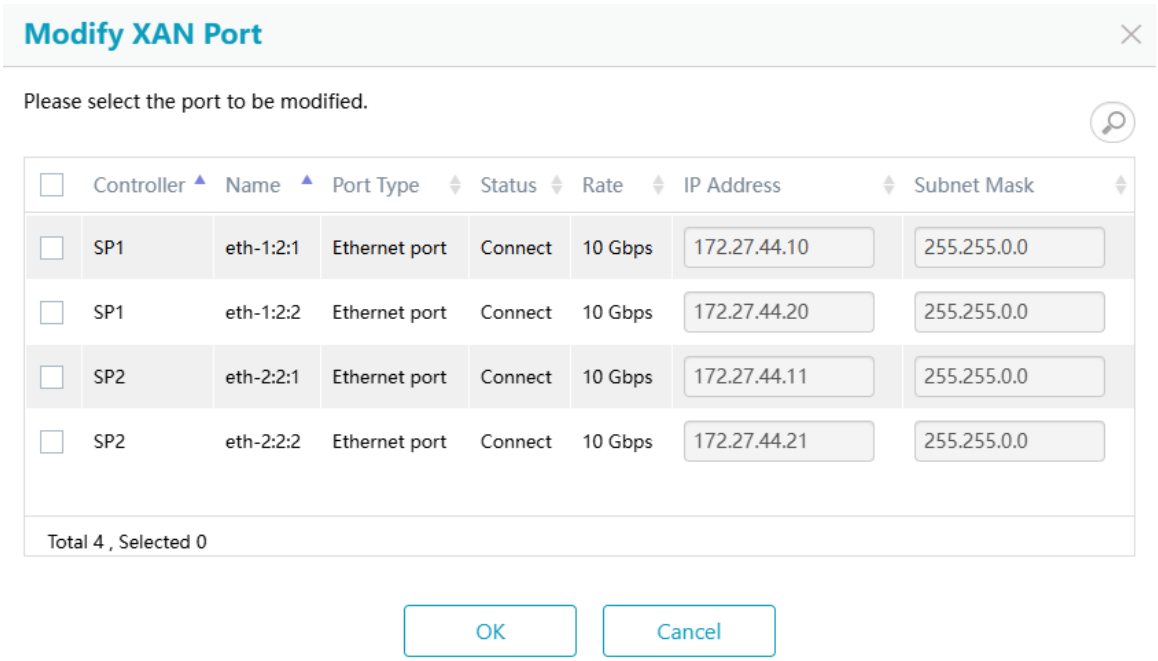

Figure 6-12 Modify XAN port interface

6.2.4.3 Deleting XAN Port

This section explains how to delete XAN port.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired XAN in the **XANs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window. The **XAN Link** tab is shown in Figure 6-10.

Step 3: Click the <Delete port> button to open the **Delete XAN Port** window, as shown in Figure 6-13. Select the desired port and click the <OK> button to complete the configuration.

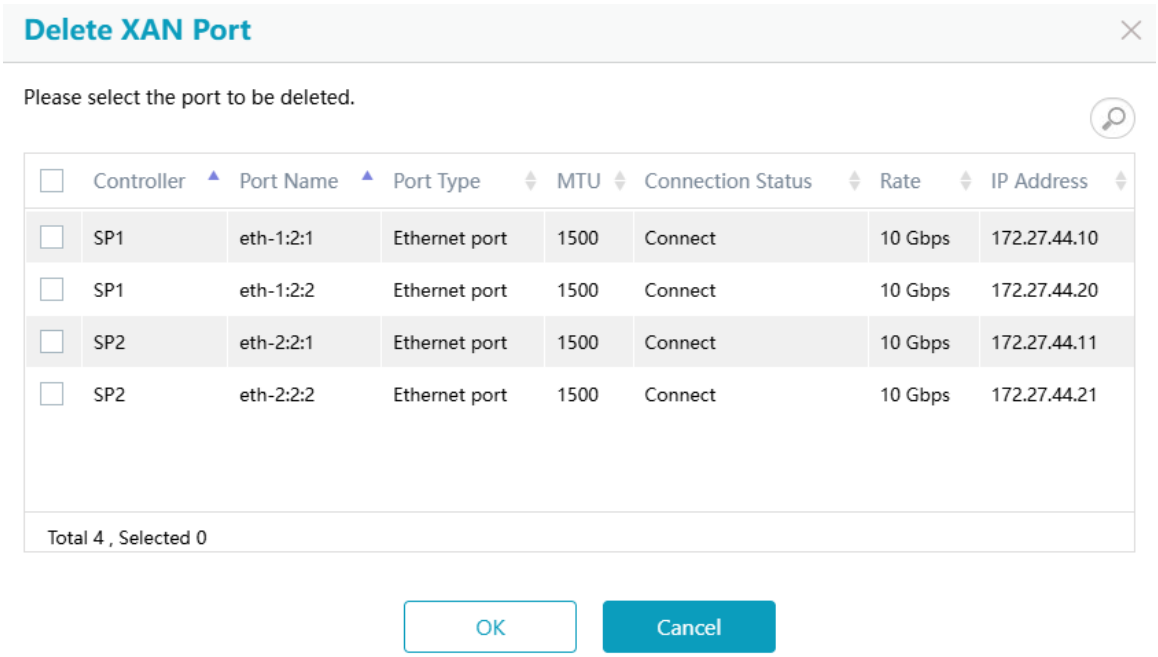

Figure 6-13 Delete XAN port interface

6.2.5 Deleting XAN

This section explains how to delete XAN.

⚠CAUTION

- If the XAN link is reachable, it will be deleted at both ends simultaneously.
- If the XAN link is unreachable, it will be forcibly deleted at the local end, and its configuration information will be remained at the peer end. Do not forcibly delete XAN at one end unless necessary or the legality of the operation has been confirmed.

Prerequisites

There is no business that depends on XAN, such as remote migration pair, remote replication pair, remote mirror pair, dual-active pair, etc.

Steps

Step 1: Select "Service" -> "Remote Device" on the navigation tree to open the remote device interface.

Step 2: Select the desired XAN in the **XANs** tab of 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.

7 Configuring R3DC

7.1 Managing LUN R3DC

7.1.1 Creating LUN R3DC

7.1.1.1 Creating LUN R3DC Based on Dual-Active + Asynchronous Replication

This section explains how to create LUN R3DC based on dual-active + asynchronous replication.

Prerequiistes

- The XAN is well configured and reachable.
- The health status of primary LUN, mirror LUN and replica LUN must be normal.
- The access types of primary LUN, mirror LUN and replica LUN must be the same.
- If snapshot resources have been created for primary LUN, mirror LUN and replica LUN, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN, mirror LUN and replica LUN, they will be created in the system automatically.
- The capacities of primary LUN and mirror LUN must be the same.
- Mirror LUN cannot be assigned to client servers.
- Replica LUN can only be assigned to client servers in read-only mode.
- If snapshots are enabled on replica LUN, all time points must be deleted. Otherwise, a large amount of data will be written to replica LUN in the initial replication process, causing great expansion on snapshot resource space of replica LUN.
- If dual-active has already been enabled on primary LUN and mirror LUN, its status cannot be negotiate.
- If replication has already been enabled on primary LUN and replica LUN, its status cannot be split; If replication has already been enabled on mirror LUN and replica LUN, its status cannot be split.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Click the <Create> button in the **LUN R3DCs** tab of the information display area to open the **Create R3DC** wizard.

Step 3: The first step of the **Create R3DC** wizard is shown in Figure 7-1. Select dual-active + async remote replication and local LUN and click the <Next> button to enter the next interface.

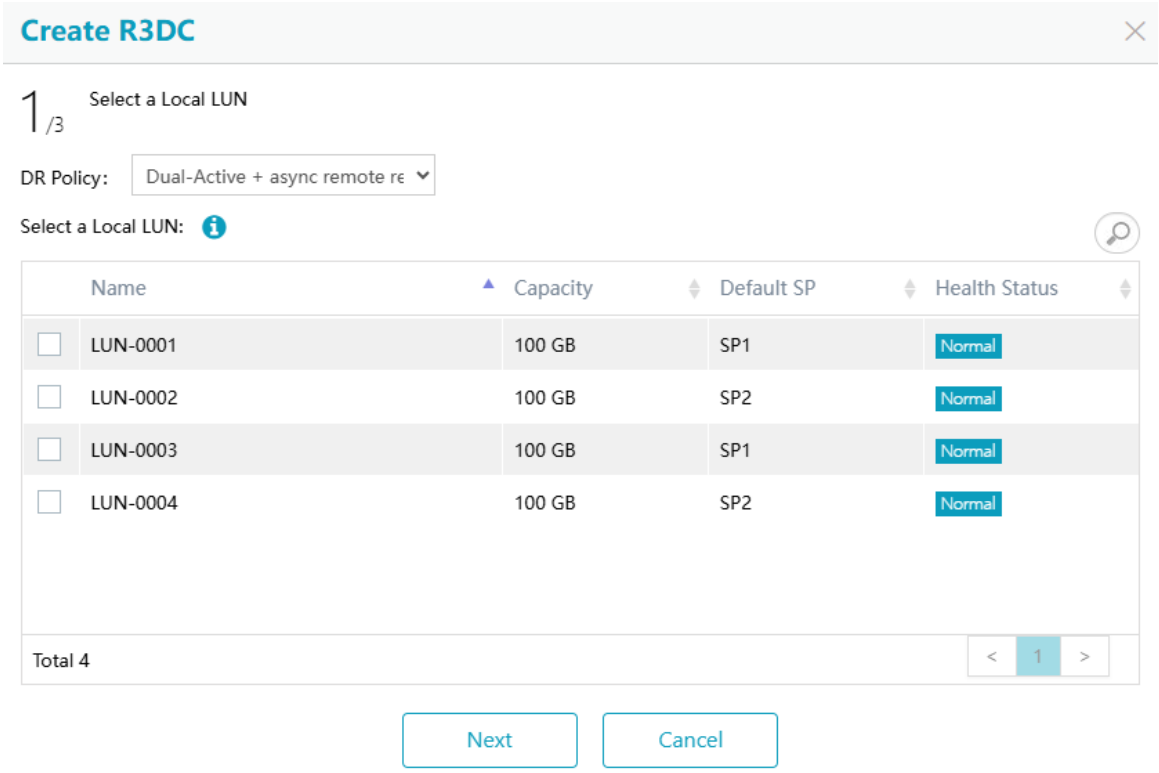

Figure 7-1 Create R3DC (dual-active + async replication) wizard interface (1)

Step 4: The second step of the **Create R3DC** wizard is shown in Figure 7-2. Please follow Step 4.1 to Step 4.4 to configure.

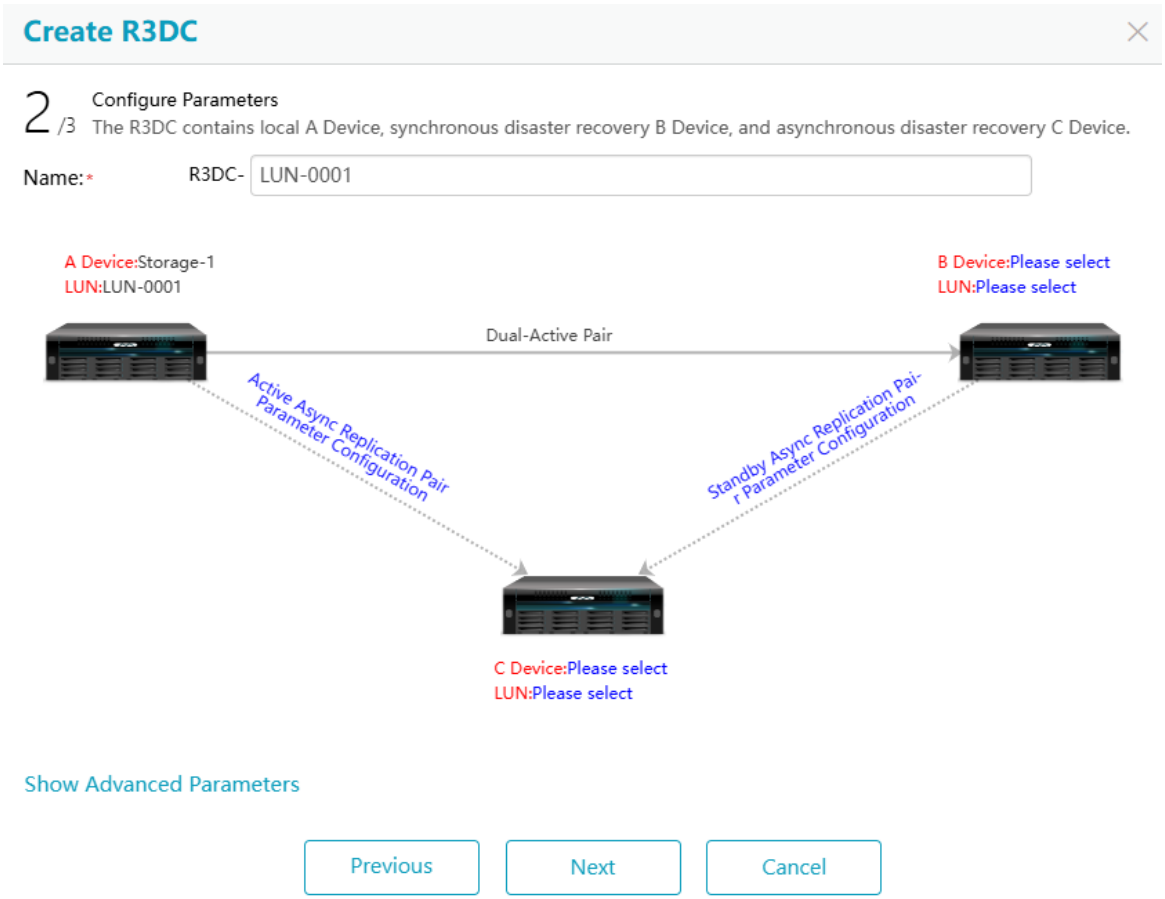

Figure 7-2 Create R3DC (dual-active + async replication) wizard interface (2)

Step 4.1: Click the <Please select> button of Device B or LUN to open the **Specify Dual-Active Pair Mirror LUN** window, as shown in Figure 7-3. Select Device B and mirror LUN and click the <Finish> button to complete the choice.

ⓘNOTE

If dual-active has already been enabled on the primary LUN, the corresponding Device B and mirror LUN will be displayed automatically in Figure 7-2, which cannot be modified.

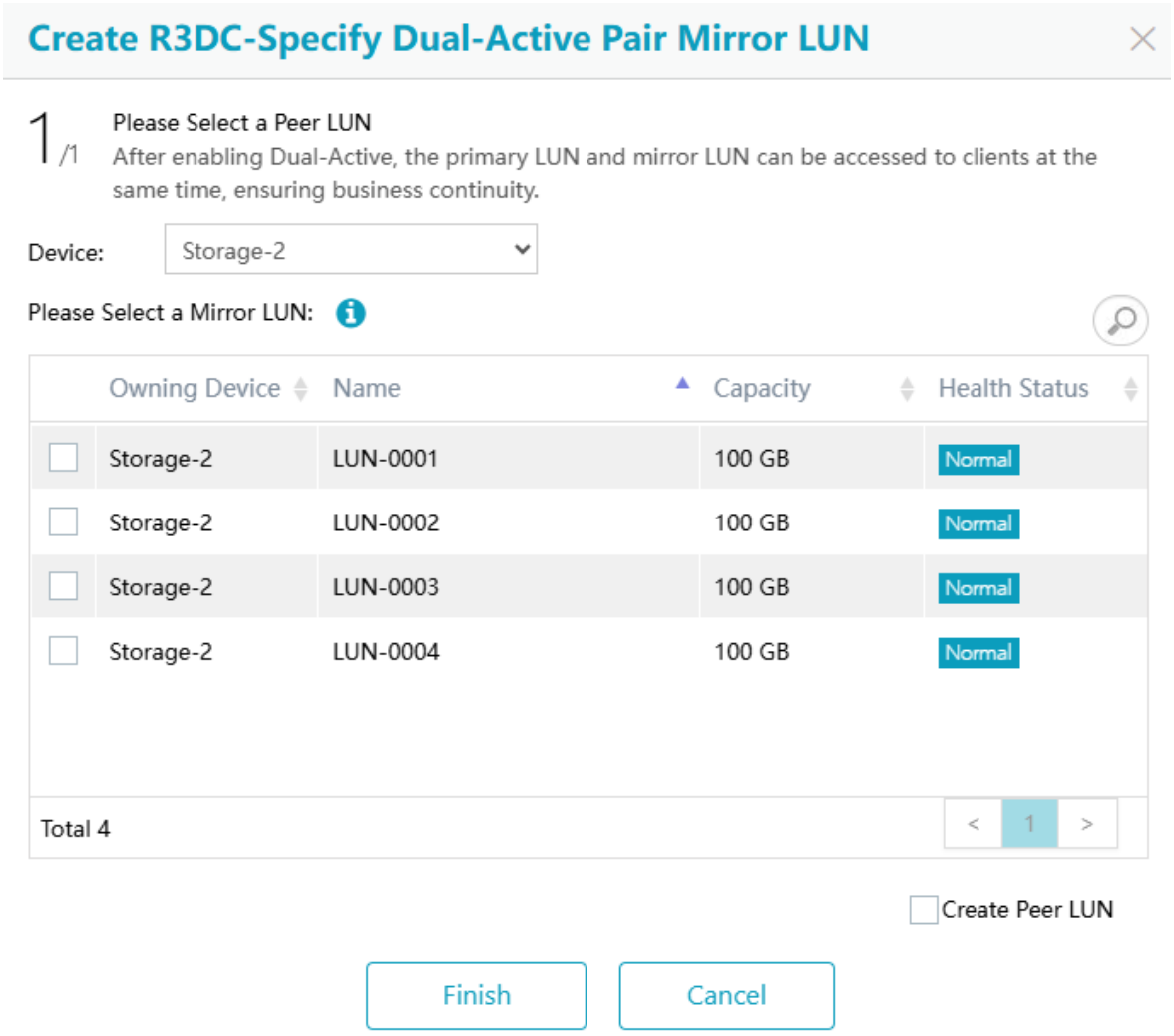

Figure 7-3 Specify dual-active pair mirror LUN interface

ⓘNOTE

If a mirror LUN has not been created in advance, you can also select the option of "Create Peer LUN" in this step to create a new mirror LUN on Device B. In the next steps, you will create a new mirror LUN through extended steps, corresponding to steps 2/5, 3/5 etc. This chapter only describes the content related to R3DC. 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 4.2: Click the <Please select> button of Device C or LUN to open the **Specify Asynchronous Replication Pair Replica LUN** window, as shown in Figure 7-4. Select Device C and replica LUN and click the <Finish> button to complete the choice.

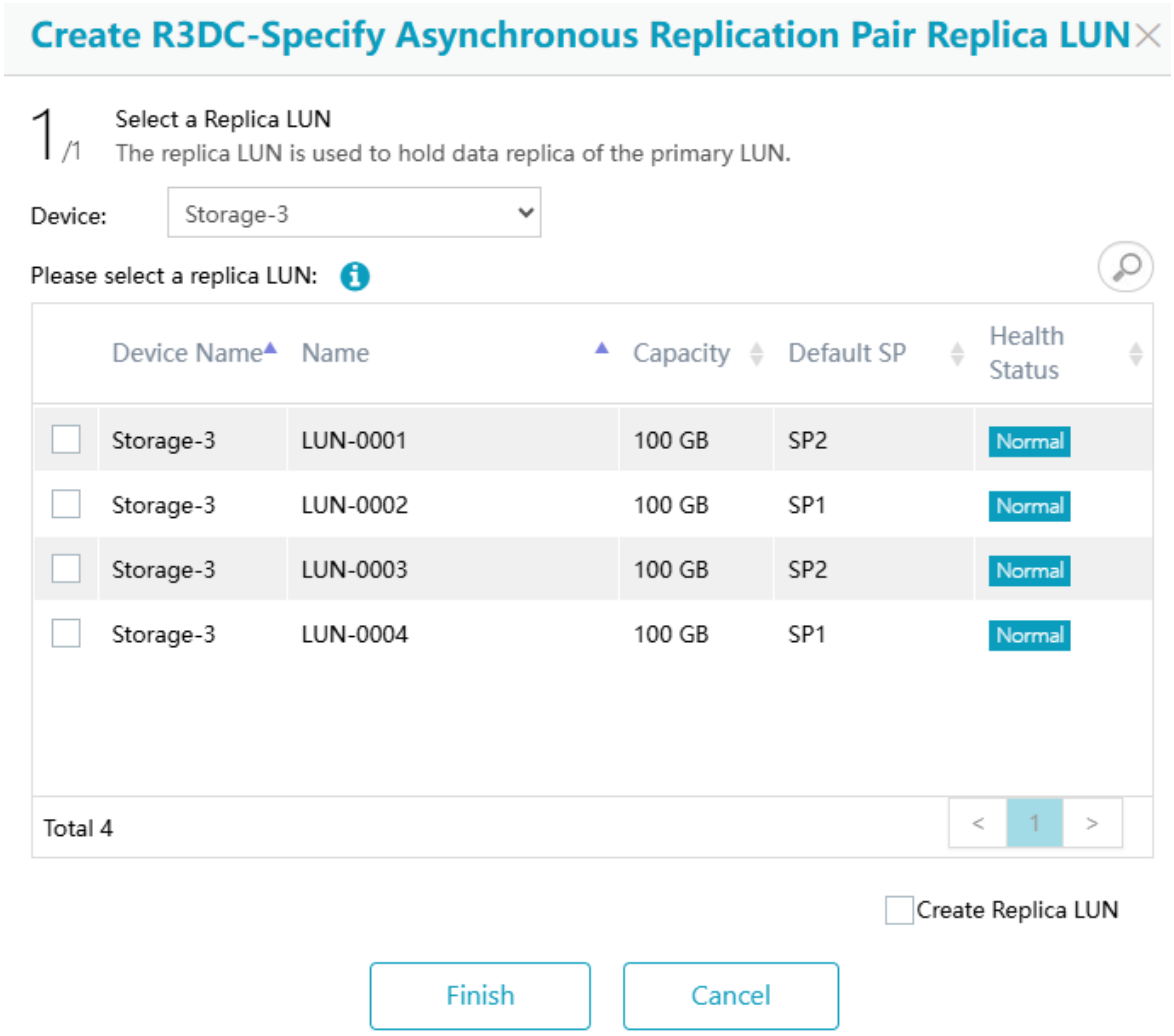

Figure 7-4 Specify asynchronous replication pair replica LUN interface

---

ⓘNOTE

If a replica LUN has not been created in advance, you can also select the option of "Create Replica LUN" in this step to create a new replica LUN on the target device. In the next steps, you will create a new replica LUN through extended steps, corresponding to steps 2/5, 3/5 etc. This chapter only describes the content related to R3DC. 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 4.3: Set the parameters for active asynchronous replication pair and standby asynchronous replication pair. The following is an example of setting active asynchronous replication pair and please follow Step 4.3.1 to Step 4.3.3 to configure.

ⓘNOTE

If replication has already been enabled on the primary LUN and replica LUN, please modify relevant parameters on the replication sub-node.

Step 4.3.1: Click the <Active Async Replication Pair Parameter Configuration> button to open the **Set the Active Asynchronous Replication Pair Options** window, as shown in Figure 7-5. Set replication parameters (see Table 7-1 for details) and click the <Next> button to enter the next interface.

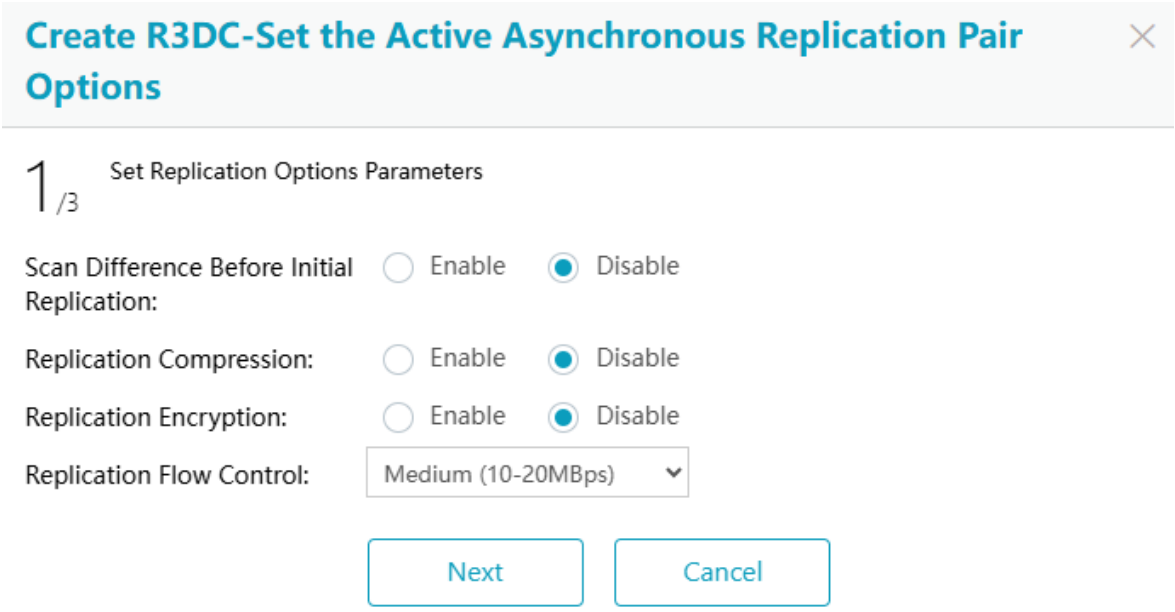

Figure 7-5 Set the active asynchronous replication pair options wizard interface (1)

Table 7-1 Description of the parameters for setting the active asynchronous replication pair options wizard interface (1)

Parameter	Description
Scan Difference Before Initial Replication	It refers to enabling or disabling scanning difference before initial replication. The default value is disabling. **ⓘNOTE** If there are small differences between primary LUN and replica LUN, for example, the replication has been done before, please enable the option. After enabling, the differential data between primary LUN and replica LUN will be scanned first when the initial replication is triggered. Only the differential data will be replicated during initial replication, greatly reducing the amount of replicated data.
Replication Compression	It refers to enabling or disabling replication compression. The default value

	is disabling.
Replication Encryption	It refers to enabling or disabling replication encryption. The default value is disabling.
Replication Flow Control	It is used to control the replication rate so that the synchronous bandwidth consumption of the back-end replication does not affect the front-end traffic on the primary LUN. • Low (0-5MBps) • Medium (10-20MBps) • High (50-70MBps) • Highest (greater than 100MBps) • Custom: It refers to manually setting the upper limit of the rate. Valid range: 1-1024MBps.

Step 4.3.2: Set replication policy, as shown in Figure 7-6. Set relevant parameters (see Table 7-2 for details) and click the <Next> button to enter the next interface.

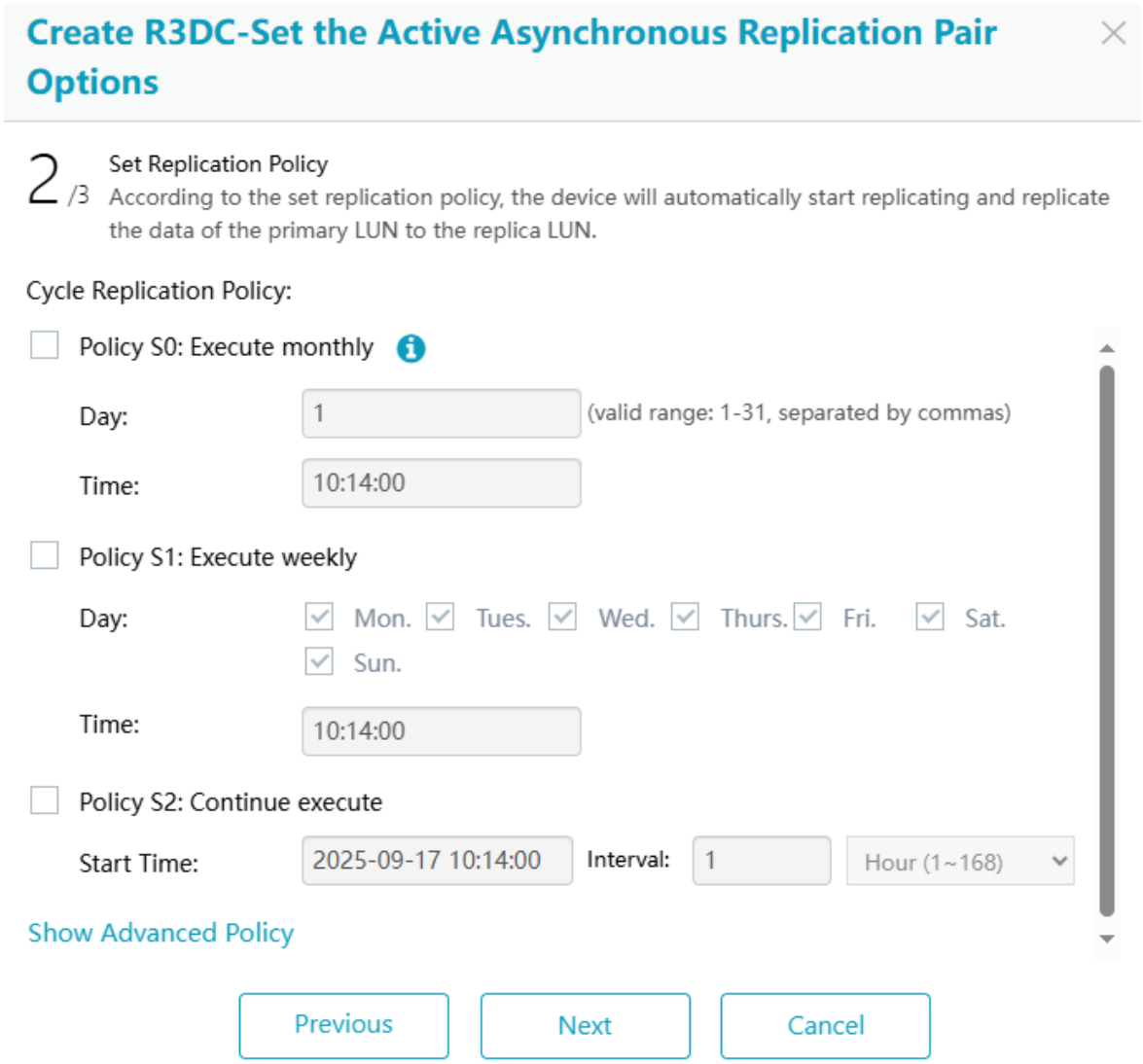

Figure 7-6 Set the active asynchronous replication pair options wizard interface (2)

Table 7-2 Description of the parameters for setting the active asynchronous replication pair options wizard interface (2)

Parameter	Description
Cycle Replication Policy	Replication is started automatically according to the set cycle replication policy. The following cycle replication policies are supported: ● Policy S0: Replication is started automatically at a fixed time every month. ● Policy S1: Replication is started automatically at some time of every day/week. ● Policy S2: Replication is started automatically at a certain time with a specified interval. **ⓘNOTE** Click the <Show Advanced Policy> button and you can also set advanced policy A0~A3 according to actual needs, and automatically start replication at specific time interval within a specified period of time per day/week.

Step 4.3.3: Check the configuration information and click the <Finish> button.

Step 4.4: Click the <Show Advanced Parameters> button to configure R3DC parameters (see Table 7-3 for details) and click the <Next> button to enter the next interface.

Table 7-3 Description of the parameters for configuring R3DC interface

Parameter	Description
Name	It refers to the name of R3DC.
Switchover Policy	It refers to the active/standby switchover policy of R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".
Local LUN	It refers to the snapshot resource capacity of local LUN, which can be configured manually and automatically.
Dual-Active Remote LUN	It refers to the snapshot resource capacity of dual-active remote LUN, which can be configured manually and automatically.
Async Replication Remote LUN	It refers to the snapshot resource capacity of async replication remote LUN, which can be configured manually and automatically.

Step 5: In the third step of the **Create R3DC** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

7.1.1.2 Creating LUN R3DC Based on Synchronious Replication+ Asynchronous Replication

This section explains how to create LUN R3DC based on synchronous replication + asynchronous replication.

Prerequiistes

- The XAN is well configured and reachable.
- The health status of primary LUN and two replica LUNs must be normal.
- The access types of primary LUN and two replica LUNs must be the same.
- If snapshot resources have been created for primary LUN and two replica LUNs, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN and two replica LUNs, they will be created in the system automatically.
- Two replica LUNs can only be assigned to client servers in read-only mode.
- If snapshots are enabled on two replica LUNs, all time points must be deleted. Otherwise, a large amount of data will be written to replica LUNs in the initial replication process, causing great expansion on snapshot resource space of replica LUNs.
- If replication has already been enabled on primary LUN and two replica LUNs, its status cannot be split; If replication has already been enabled on two replica LUNs, its status cannot be split.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Click the <Create> button in the **LUN R3DCs** tab of the information display area to open the **Create R3DC** wizard.

Step 3: The first step of the **Create R3DC** wizard is shown in Figure 7-7. Select sync + async remote replication and local LUN and click the <Next> button to enter the next interface.

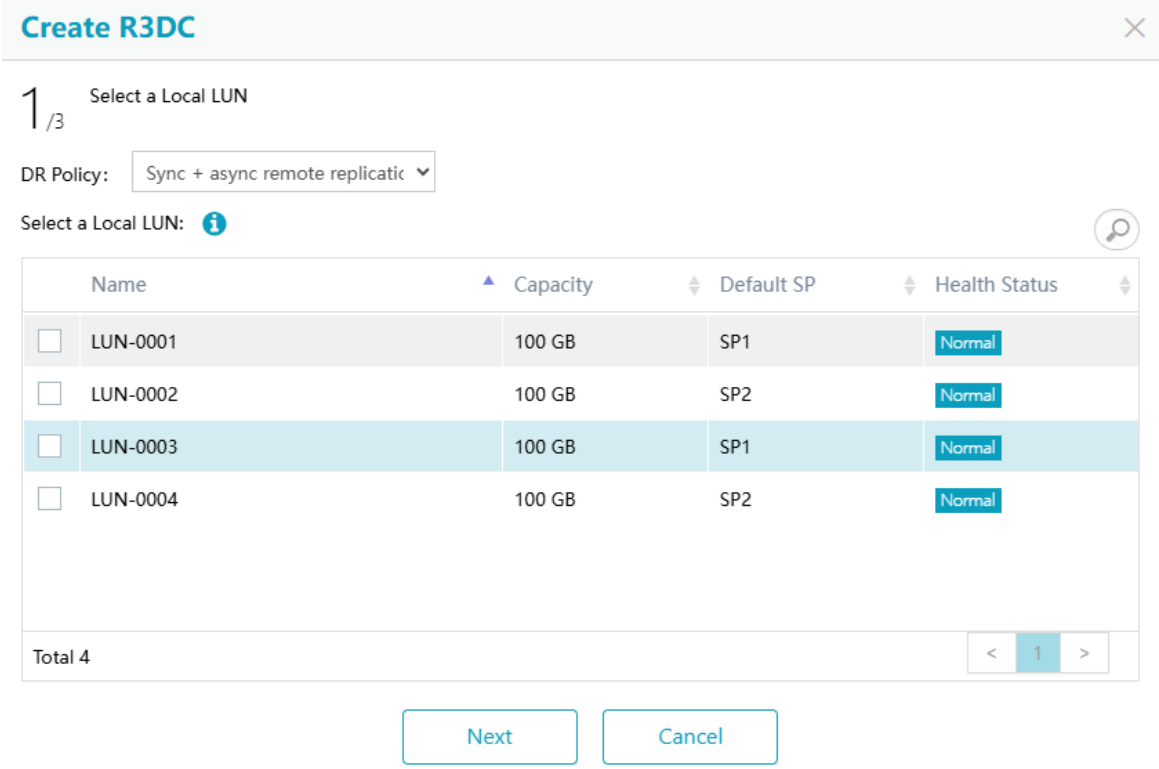

Figure 7-7 Create R3DC (sync replication + async replication) wizard interface (1)

Step 4: The second step of the **Create R3DC** wizard is shown in Figure 7-8. Please follow Step 4.1 to Step 4.5 to configure.

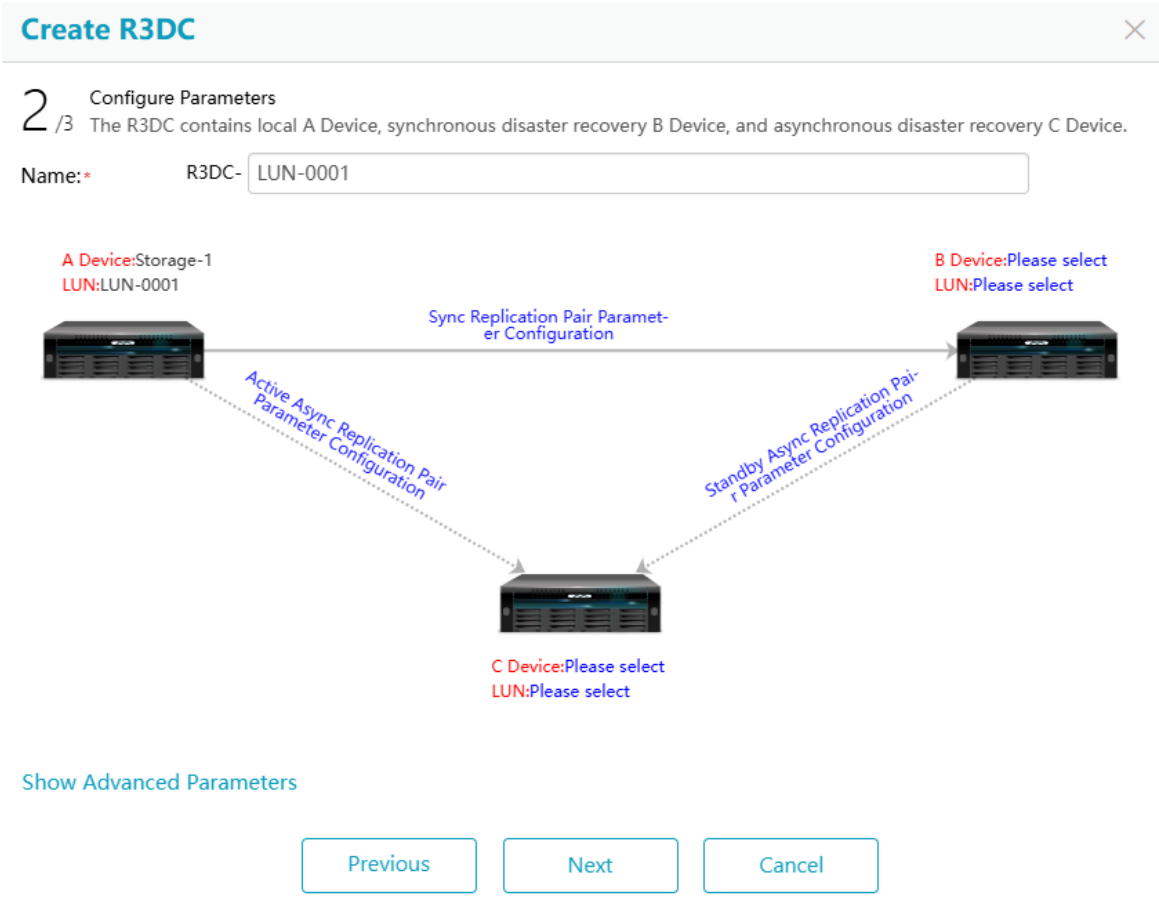

Figure 7-8 Create R3DC (sync replication + async replication) wizard interface (2)

Step 4.1: Click the <Please select> button of Device B or LUN to open the **Specify Synchronous Replication Pair Replica LUN** window, as shown in Figure 7-9. Select Device B and replica LUN and click the <Finish> button to complete the choice.

ⓘNOTE

If synchronous replication that in active status has already been enabled on the primary LUN, the corresponding Device B and replica LUN will be displayed automatically in Figure 7-8, which cannot be modified.

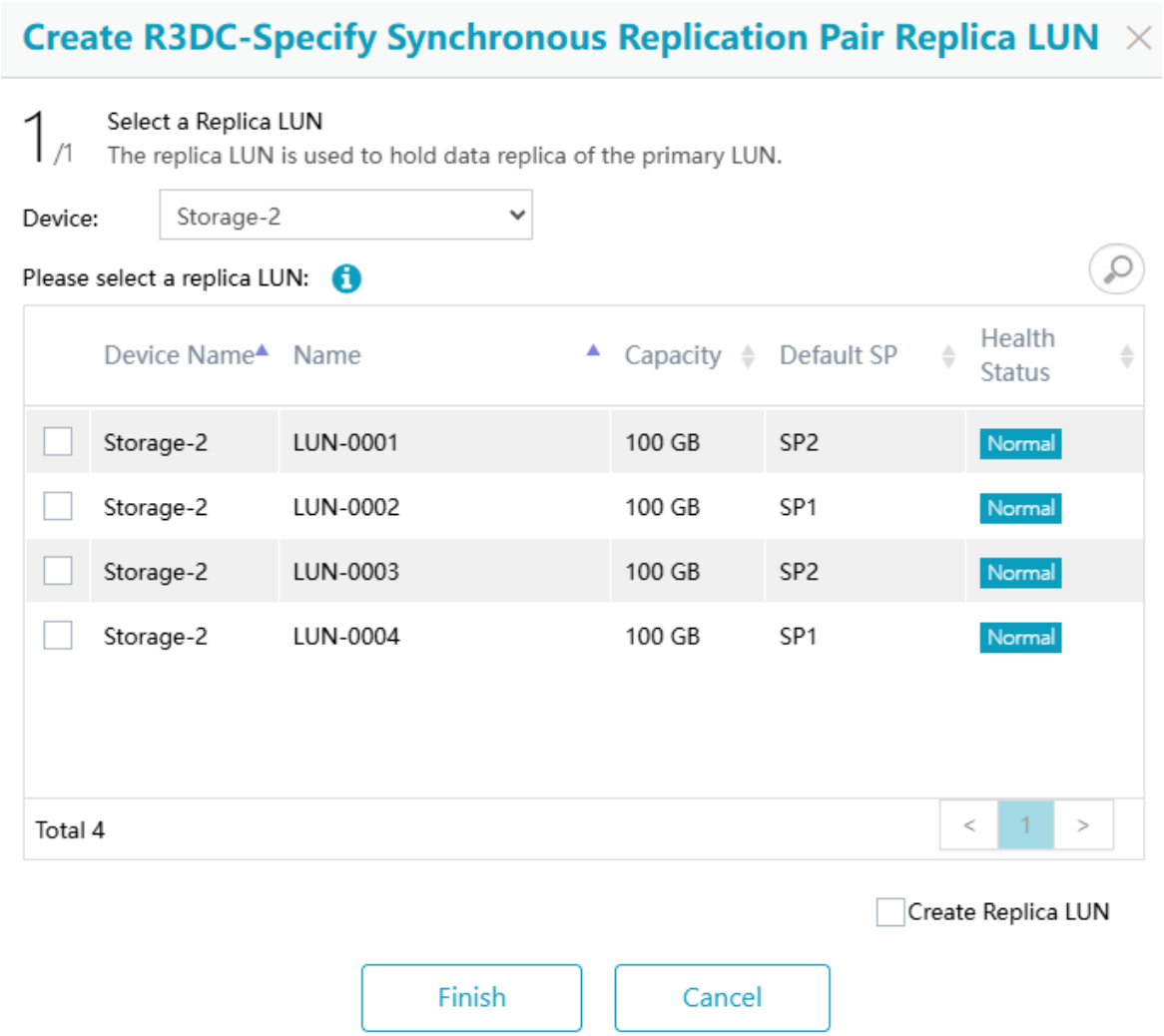

Figure 7-9 Specify synchronous replication pair replica LUN interface

ⓘNOTE

If a replica LUN has not been created in advance, you can also select the option of "Create Replica LUN" in this step to create a new replica LUN on Device B. In the next steps, you will create a new replica LUN through extended steps, corresponding to steps 2/5, 3/5 etc. This chapter only describes the content related to R3DC. 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 4.2: Click the <Please select> button of Device C or LUN to open the **Specify Asynchronous Replication Pair Replica LUN** window, as shown in Figure 7-10. Select Device C and replica LUN and click the <Finish> button to complete the choice.

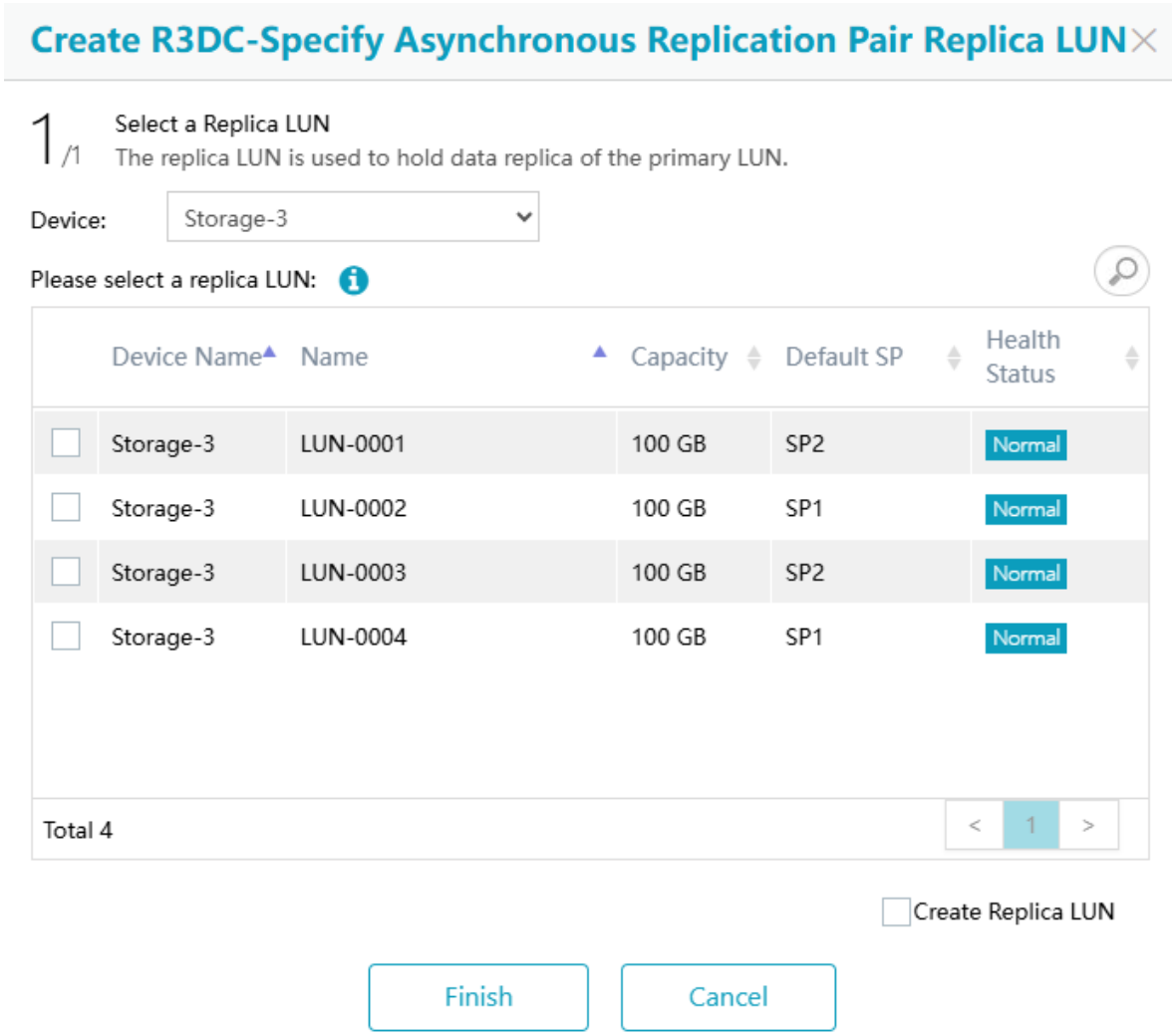

Figure 7-10 Specify asynchronous replication pair replica LUN interface

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ⓘNOTE

If a replica LUN has not been created in advance, you can also select the option of "Create Replica LUN" in this step to create a new replica LUN on Device C. In the next steps, you will create a new replica LUN through extended steps, corresponding to steps 2/5, 3/5 etc. This chapter only describes the content related to R3DC. 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 4.3: Click the <Sync Replication Pair Parameter Configuration> button to open the **Set the synchronous replication pair options** window, as shown in Figure 7-11. Set synchronous replication pair paremeters (see Table 7-1 for details) and click the <Finish> button.

ⓘNOTE

If replication has already been enabled on the primary LUN and replica LUN of synchronous replication pair, please modify relevant parameters on the replication sub-node.

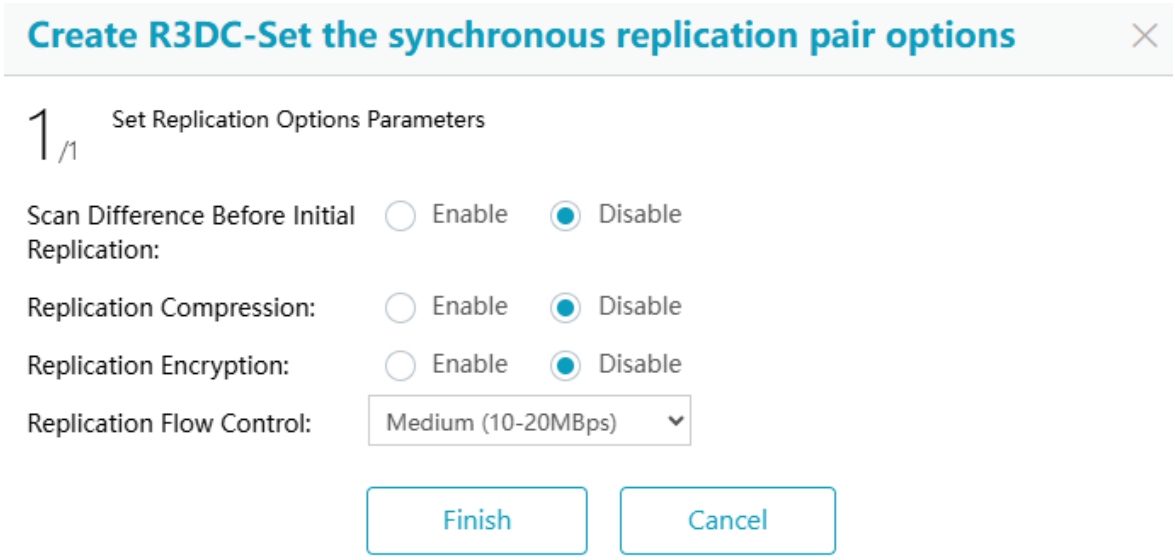

Figure 7-11 Set the synchronous replication pair options interface

Step 4.4: Set the parameters for active asynchronous replication pair and standby asynchronous replication pair. The following is an example of setting active asynchronous replication pair and please follow Step 4.4.1 to Step 4.4.3 to configure.

ⓘNOTE

If replication has already been enabled on the primary LUN and replica LUN of asynchronous replication pair, please modify relevant parameters on the replication sub-node.

Step 4.4.1: Click the <Active Async Replication Pair Parameter Configuration> button to open the **Set the Active Asynchronous Replication Pair Options** window, as shown in Figure 7-12. Set replication parameters (see Table 7-1 for details) and click the <Next> button to enter the next interface.

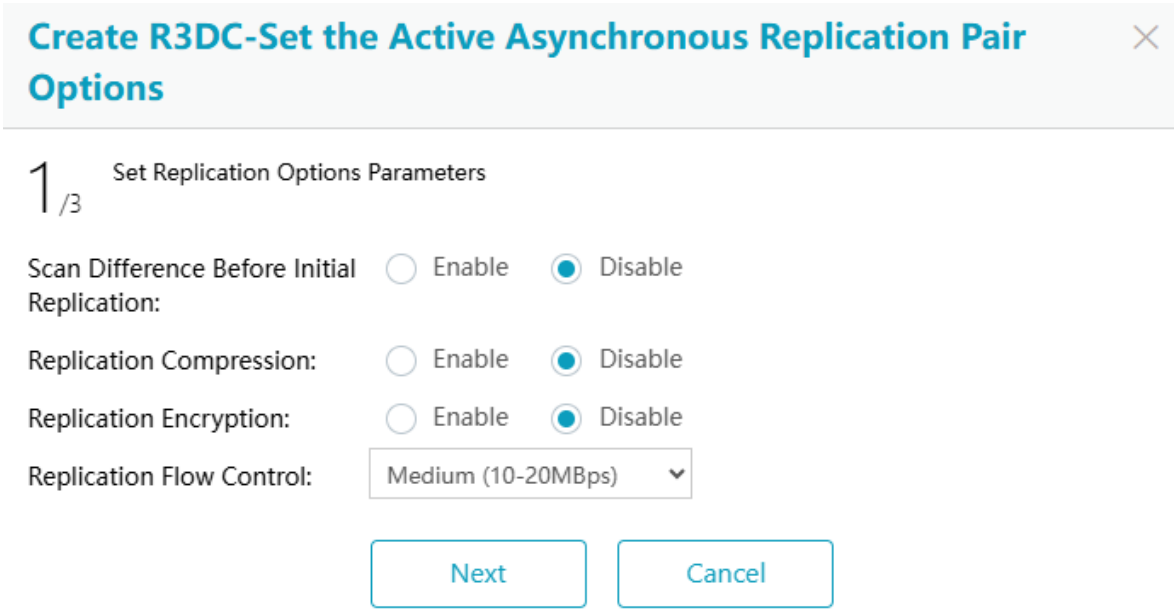

Figure 7-12 Set the active asynchronous replication pair options wizard interface (1)

Step 4.4.2: Set replication policy, as shown in Figure 7-13. Set relevant parameters (see Table 7-2 for details) and click the <Next> button to enter the next interface.

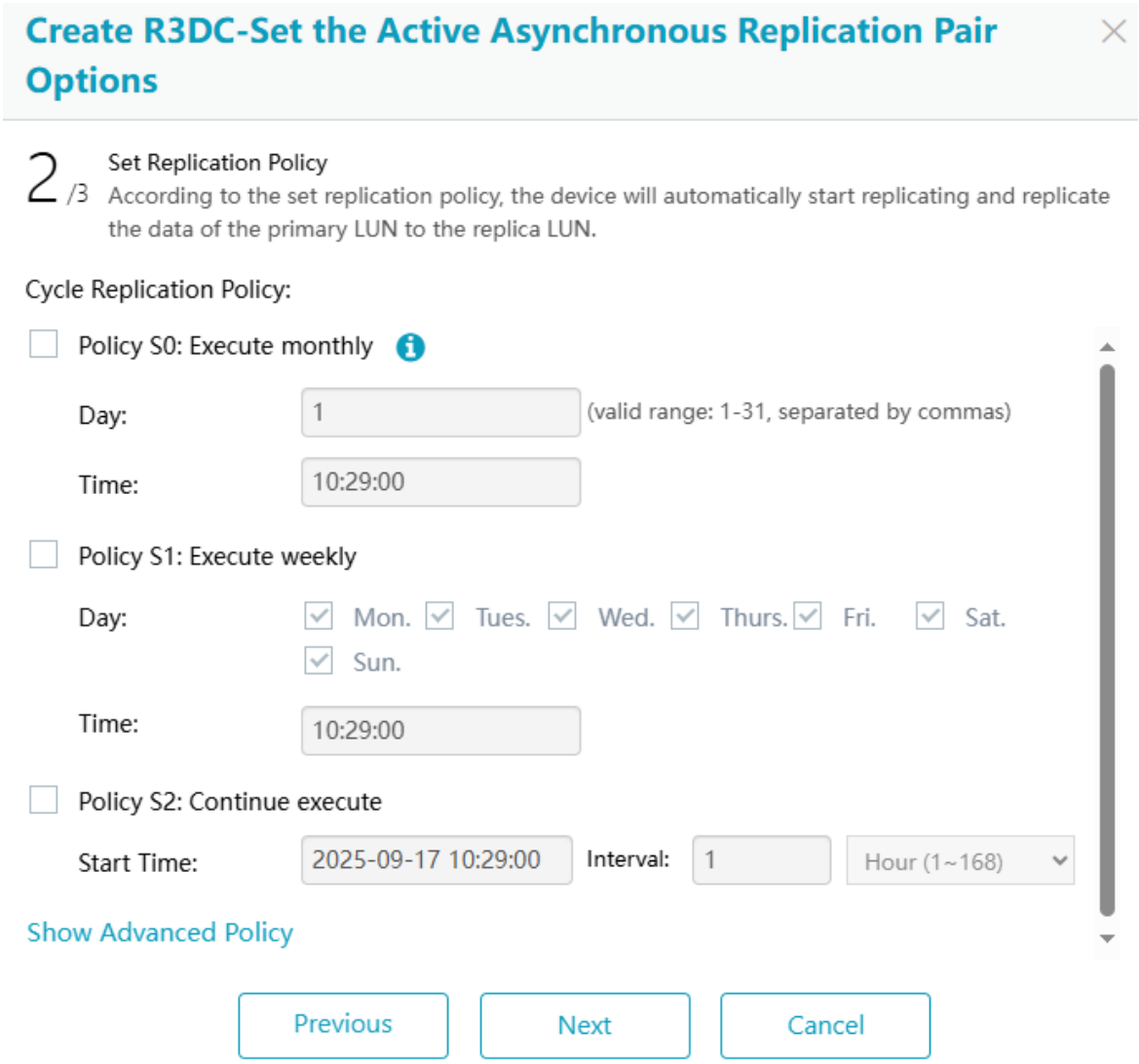

Figure 7-13 Set the active asynchronous replication pair options wizard interface (2)

Step 4.4.3: Check the configuration information and click the <Finish> button.

Step 4.5: Click the <Show Advanced Parameters> button to configure R3DC parameters (see Table 7-4 for details) and click the <Next> button to enter the next interface.

Table 7-4 Description of the parameters for creating R3DC

Parameter	Description
Name	It refers to the name of R3DC.
Switchover Policy	It refers to the active/standby switchover policy of R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".
Local LUN	It refers to the snapshot resource capacity of local LUN, which can be configured manually and automatically.
Sync Replication Remote LUN	It refers to the snapshot resource capacity of sync replication remote LUN, which can be configured manually and automatically.

Async Replication Remote LUN	It refers to the snapshot resource capacity of async replication remote LUN, which can be configured manually and automatically.

Step 5: In the third step of the **Create R3DC** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

7.1.2 Viewing LUN R3DC Properties

This section explains how to view LUN R3DC's basic properties.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** 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 R3DC.

7.1.3 Modifying LUN R3DC Properties

This section explains how to modify LUN R3DC's name, switchover policy and switchover silent time.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window, as shown in Figure 7-14. Modify the properties of R3DC (see Table 7-5 for details) and click the <Apply> button to complete the configuration.

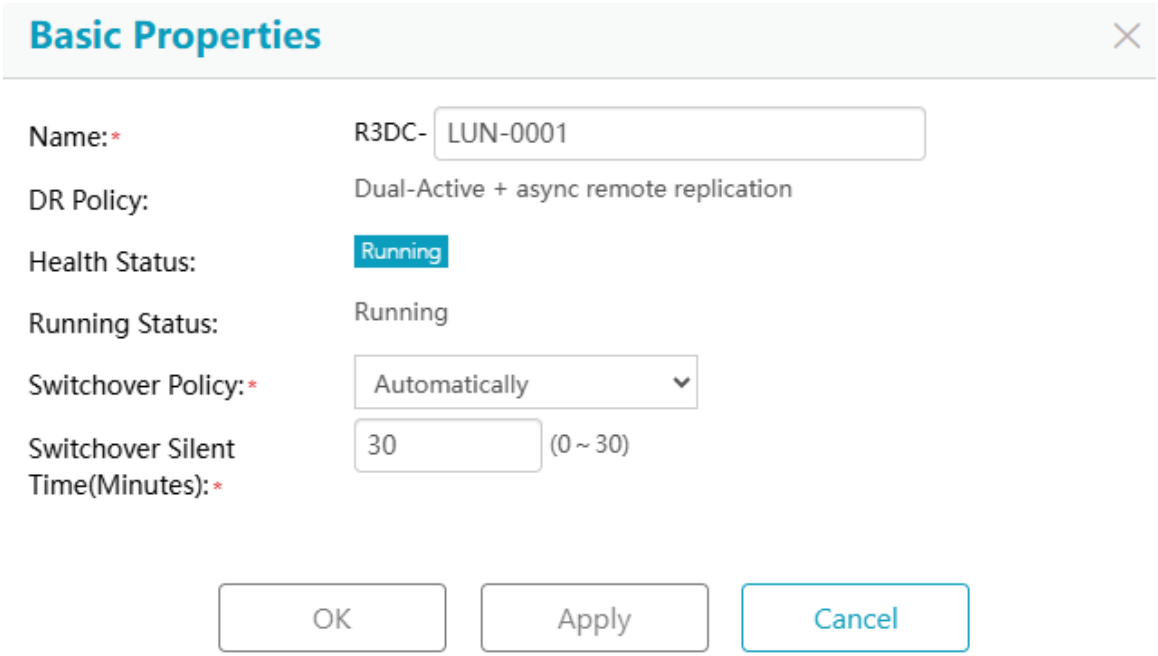

Figure 7-14 R3DC basic properties interface

Table 7-5 Description of the parameters for R3DC basic properties interface

Parameter	Description
Name	It refers to the name of R3DC.
Switchover Policy	It refers to the active/standby switchover policy of R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".

7.1.4 Switching over LUN R3DC Manually

This section explains how to manually switch over active/standby status of two asynchronous replication pairs in LUN R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** tab of the information display area, click the <Switchover> button, select active async replication pair in the pop-up confirmation box, and click the <OK> button to complete the configuration.

7.1.5 Starting LUN R3DC

This section explains how to start LUN R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** tab of the information display area, click the <Start> button, click the <Start> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

7.1.6 Stopping LUN R3DC

This section explains how to stop LUN R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** tab of the information display area, click the <Start> button, click the <Stop> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

7.1.7 Deleting LUN R3DC

This section explains how to delete LUN R3DC.

Prerequisites

- The running status of three devices must be normal and the XAN between any two devices is reachable.
- Please stop R3DC before deleting it and ensure the running status is "Closed".

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired R3DC in the **LUN R3DCs** tab of 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.

7.2 Managing Consistency Group R3DC

7.2.1 Creating Group R3DC

7.2.1.1 Creating Group R3DC Based on Dual-Active + Asynchronous Replication

This section explains how to create group R3DC based on dual-active + asynchronous replication.

Prerequiistes

- The XAN is well configured and reachable.
- The LUN R3DC in the consistency group must meet the following requirements:

- The health status of primary LUN, mirror LUN and replica LUN must be normal.
- The access types of primary LUN, mirror LUN and replica LUN must be the same.
- If snapshot resources have been created for primary LUN, mirror LUN and replica LUN, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN, mirror LUN and replica LUN, they will be created in the system automatically.
- The capacities of primary LUN and mirror LUN must be the same.
- Mirror LUN cannot be assigned to client servers.
- Replica LUN can only be assigned to client servers in read-only mode.
- If snapshots are enabled on replica LUN, all time points must be deleted. Otherwise, a large amount of data will be written to replica LUN in the initial replication process, causing great expansion on snapshot resource space of replica LUN.
- If dual-active has already been enabled on primary LUN and mirror LUN, its status cannot be negotiate.
- If replication has already been enabled on primary LUN and replica LUN, its status cannot be split; If replication has already been enabled on mirror LUN and replica LUN, its status cannot be split.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Click the <Create> button in the **Group R3DCs** tab of the information display area to open the **Create Group R3DC** wizard.

Step 3: The first step of the **Create Group R3DC** wizard is shown in Figure 7-15. Select dual-active + async remote replication and local group and click the <Next> button to enter the next interface.

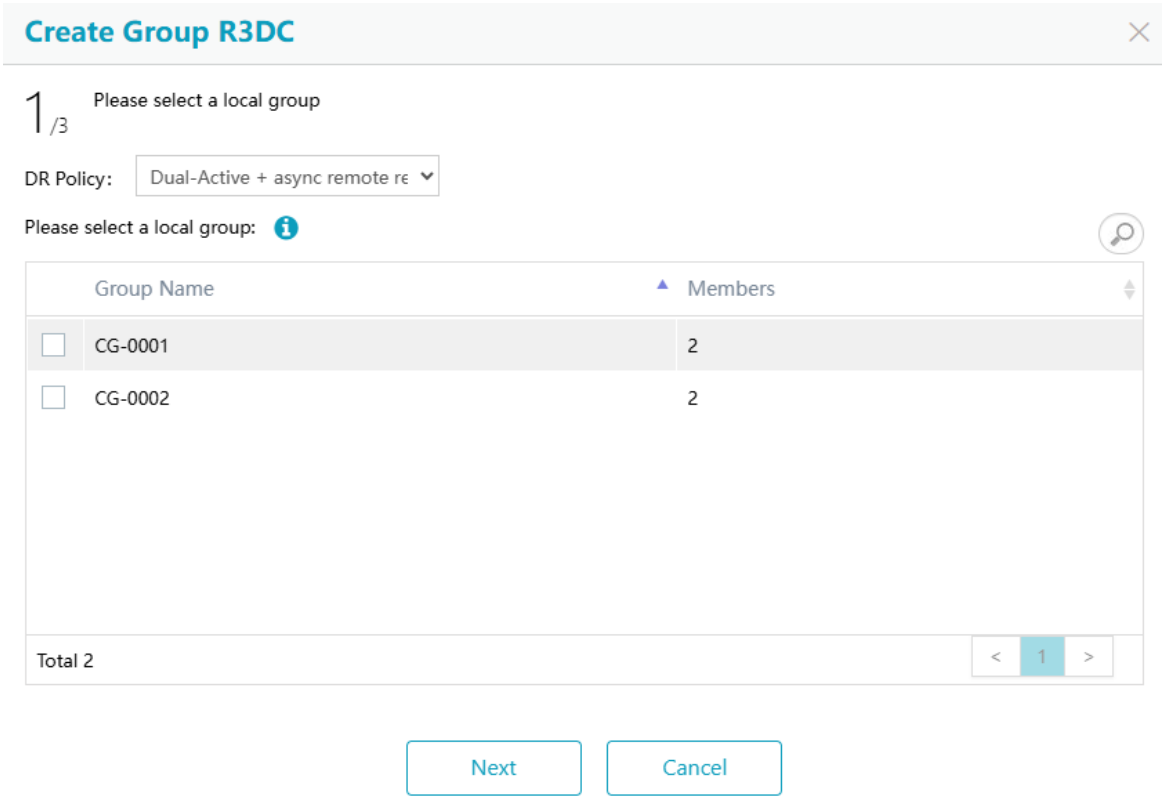

Figure 7-15 Create group R3DC (dual-active + async replication) wizard interface (1)

Step 4: The second step of the **Create Group R3DC** wizard is shown in Figure 7-16. Please follow Step 4.1 to Step 4.4 to configure.

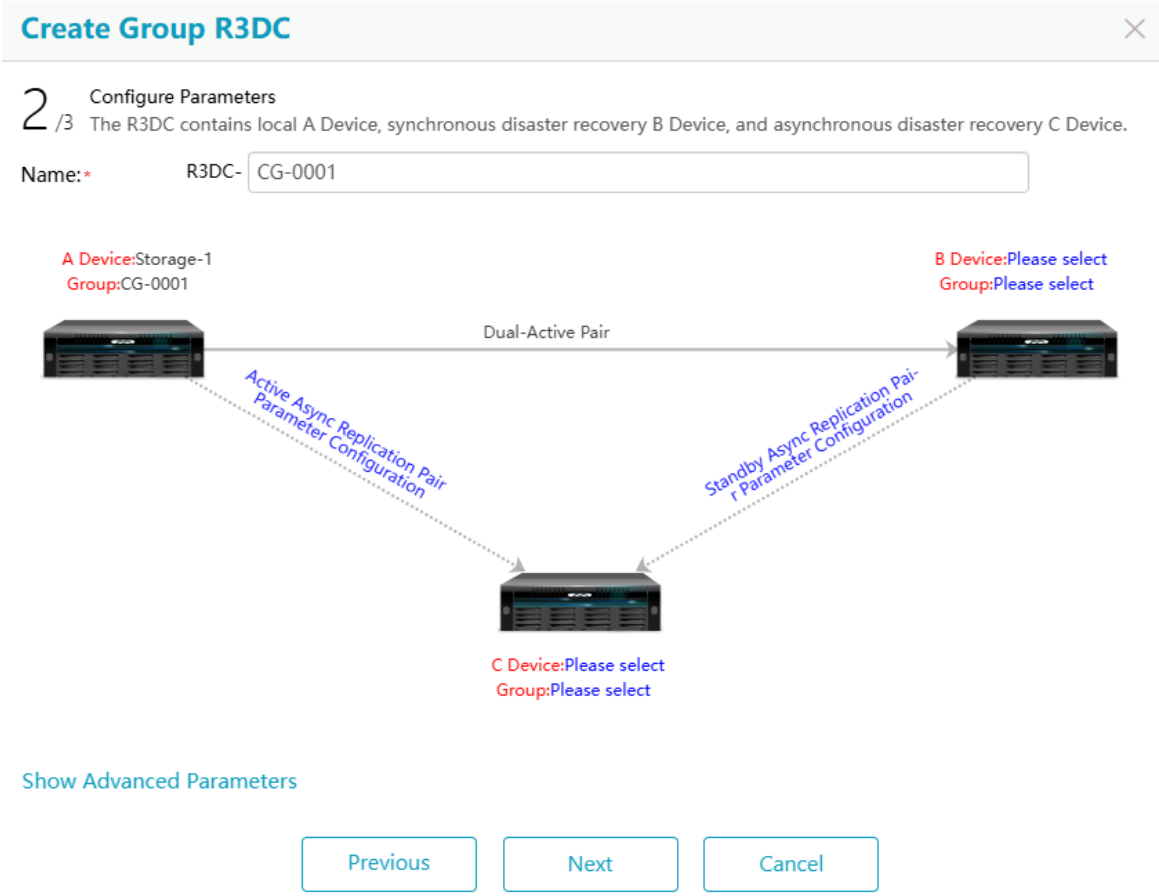

Figure 7-16 Create group R3DC (dual-active + async replication) wizard interface (2)

Step 4.1: Please follow Step 4.1.1 to Step 4.1.2 to specify dual-active pair mirror group and configure mirror pair for members.

Step 4.1.1: Click the <Please select> button of Device B or Group to open the **Specify Dual-Active Pair Mirror Group** window, as shown in Figure 7-17. Select Device B and mirror group and click the <Next> button to enter the next interface.

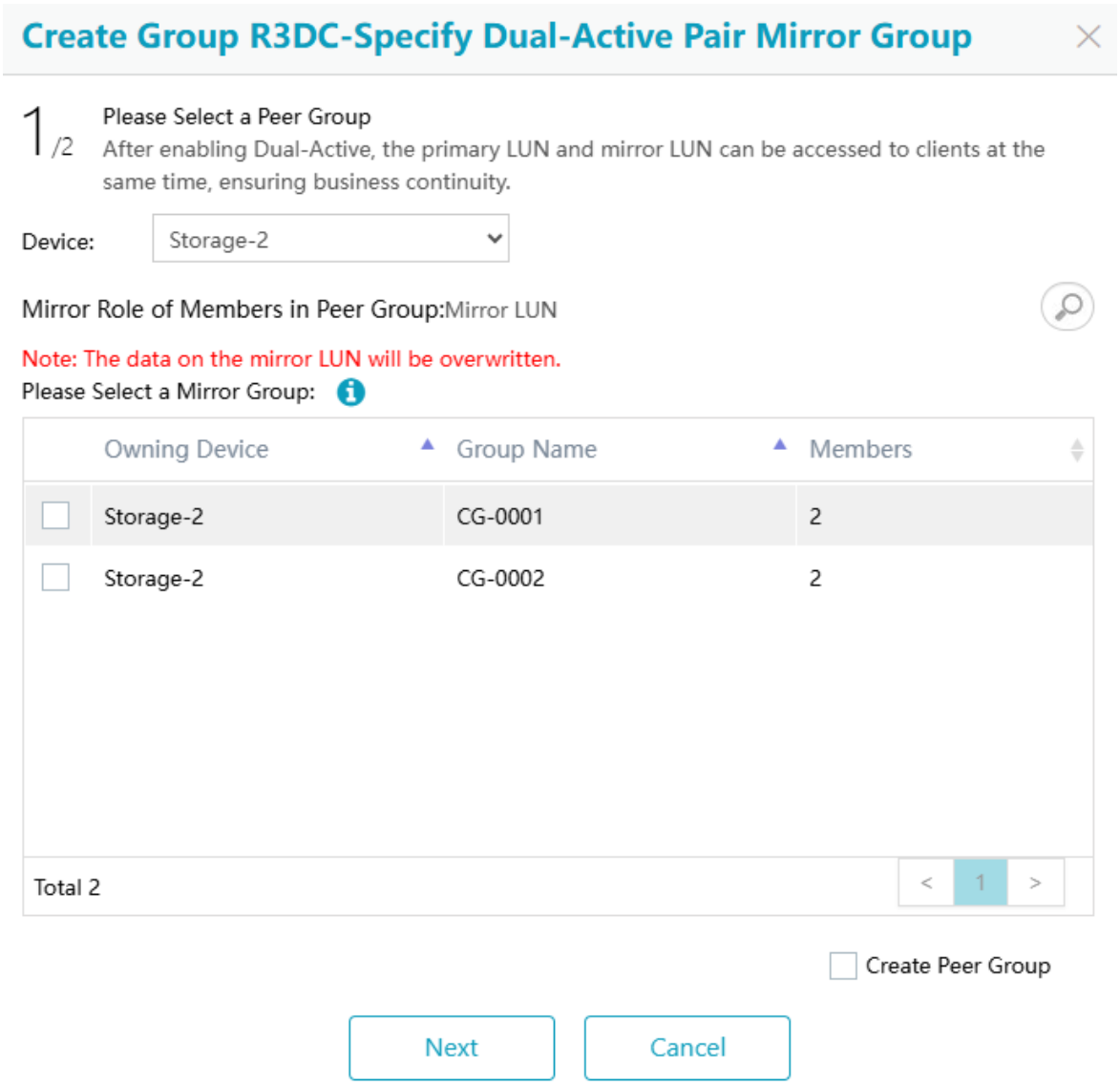

Figure 7-17 Specify dual-active pair mirror group wizard interface (1)

ⓘNOTE

If a mirror group has not been created in advance, you can also select the option of "Create Peer Group" in this step to create a new mirror group on Device B. In the next steps, you will create a new mirror group through extended steps, corresponding to steps 1a/2. For the steps and parameter descriptions of creating a group, please refer to 5.1 Creating Consistency Group.

Step 4.1.2: Configure mirror pairs for members, as shown in Figure 7-18 and click the <Finish> button.

ⓘNOTE

- If dual-active has already been enabled on the primary LUN, the corresponding mirror LUN will be displayed automatically, which cannot be modified.
- It the LUN in the mirror group is not matched with a primary LUN, it will be removed automatically.

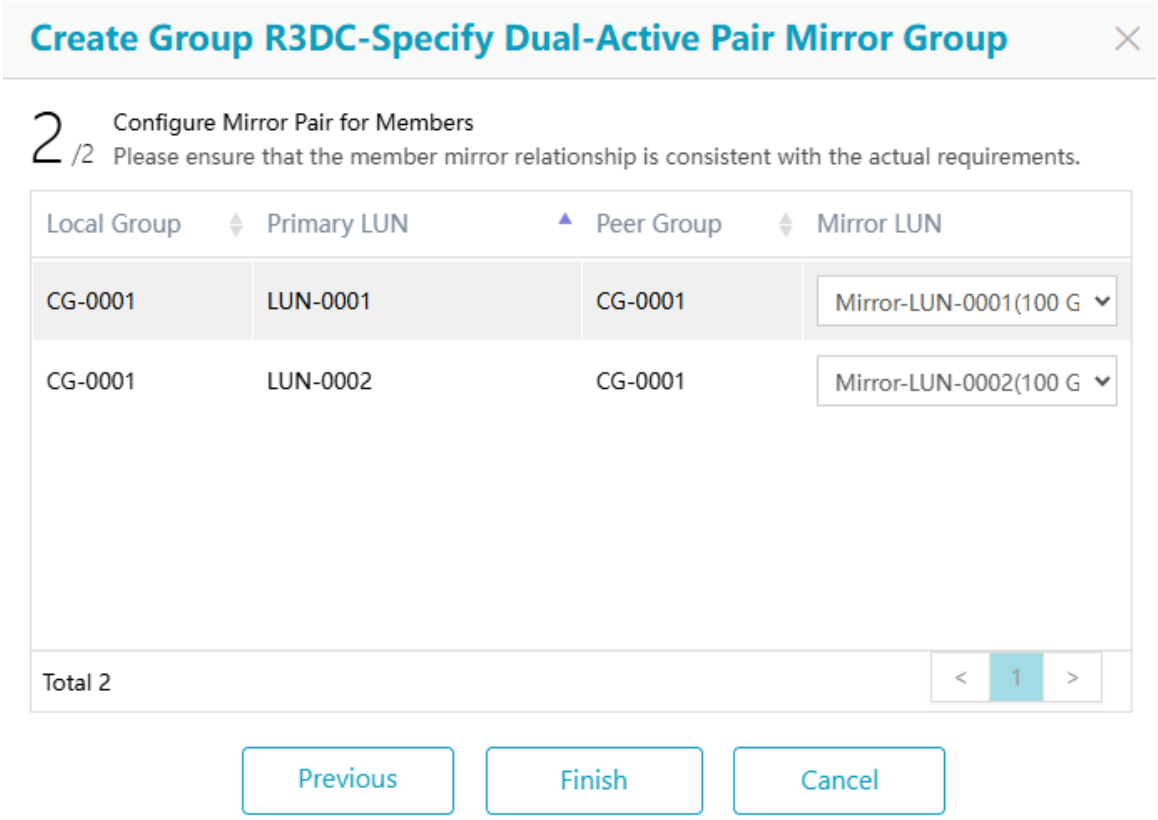

Figure 7-18 Specify dual-active pair mirror group wizard interface (2)

Step 4.2: Please follow Step 4.2.1 to Step 4.2.2 to specify asynchronous replication pair replica group and configure replication pair for members.

Step 4.2.1: Click the <Please select> button of Device C or Group to open the **Specify Asynchronous Replication Pair Replica Group** window, as shown in Figure 7-19. Select Device C and replica group and click the <Next> button to enter the next interface.

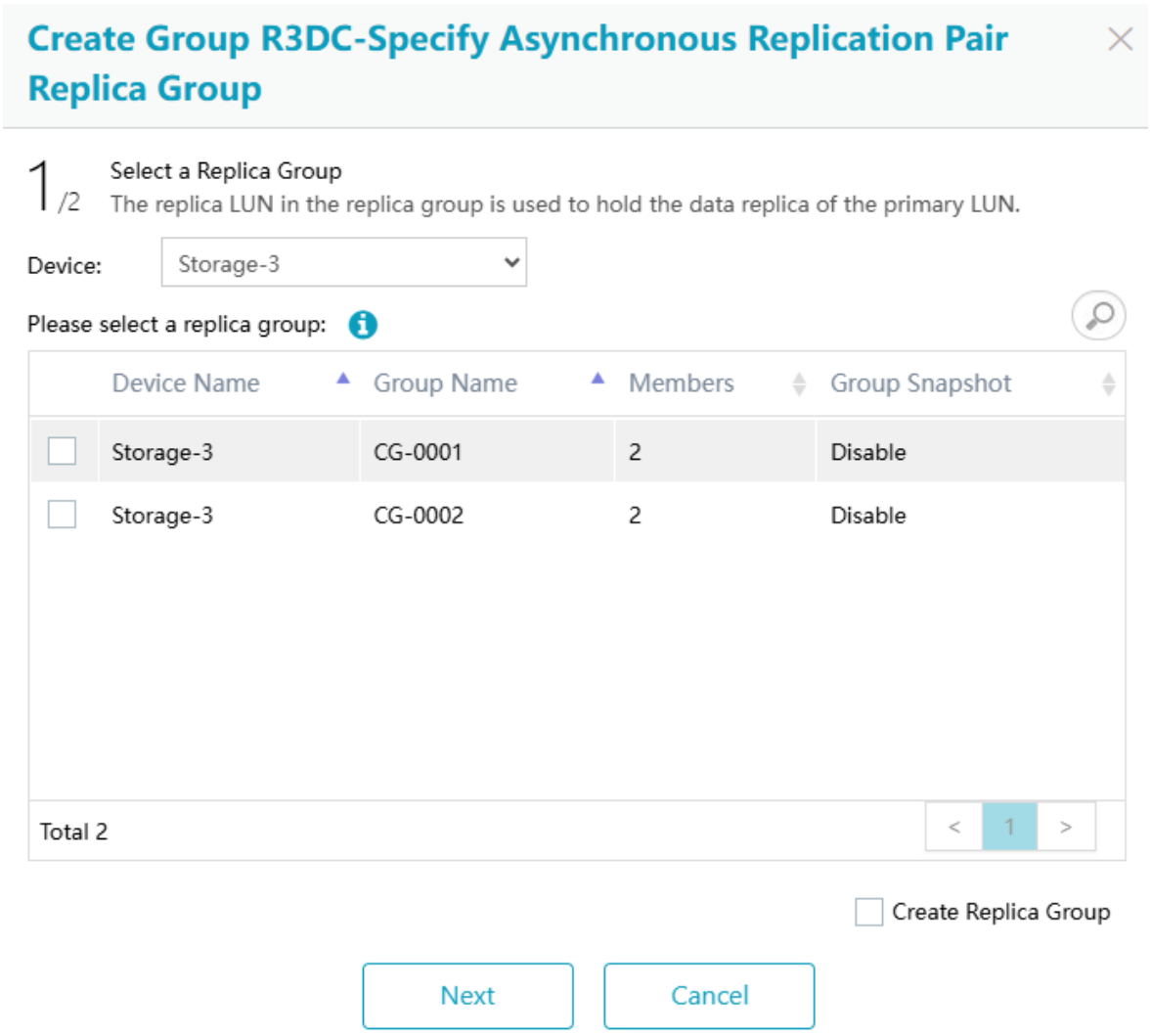

Figure 7-19 Specify asynchronous replication pair replica group wizard interface (1)

ⓘNOTE

If a replica group has not been created in advance, you can also select the option of "Create Replica Group" in this step to create a new replica group on the Device C. In the next steps, you will create a new replica group through extended steps, corresponding to steps 1a/2. For the steps and parameter descriptions of creating a group, please refer to 5.1 Creating Consistency Group.

Step 4.2.2: Configure replication pairs for members, as shown in Figure 7-20, and click the <Finish> button.

ⓘNOTE

It the LUN in the replica group is not matched with a primary LUN, it will be removed automatically.

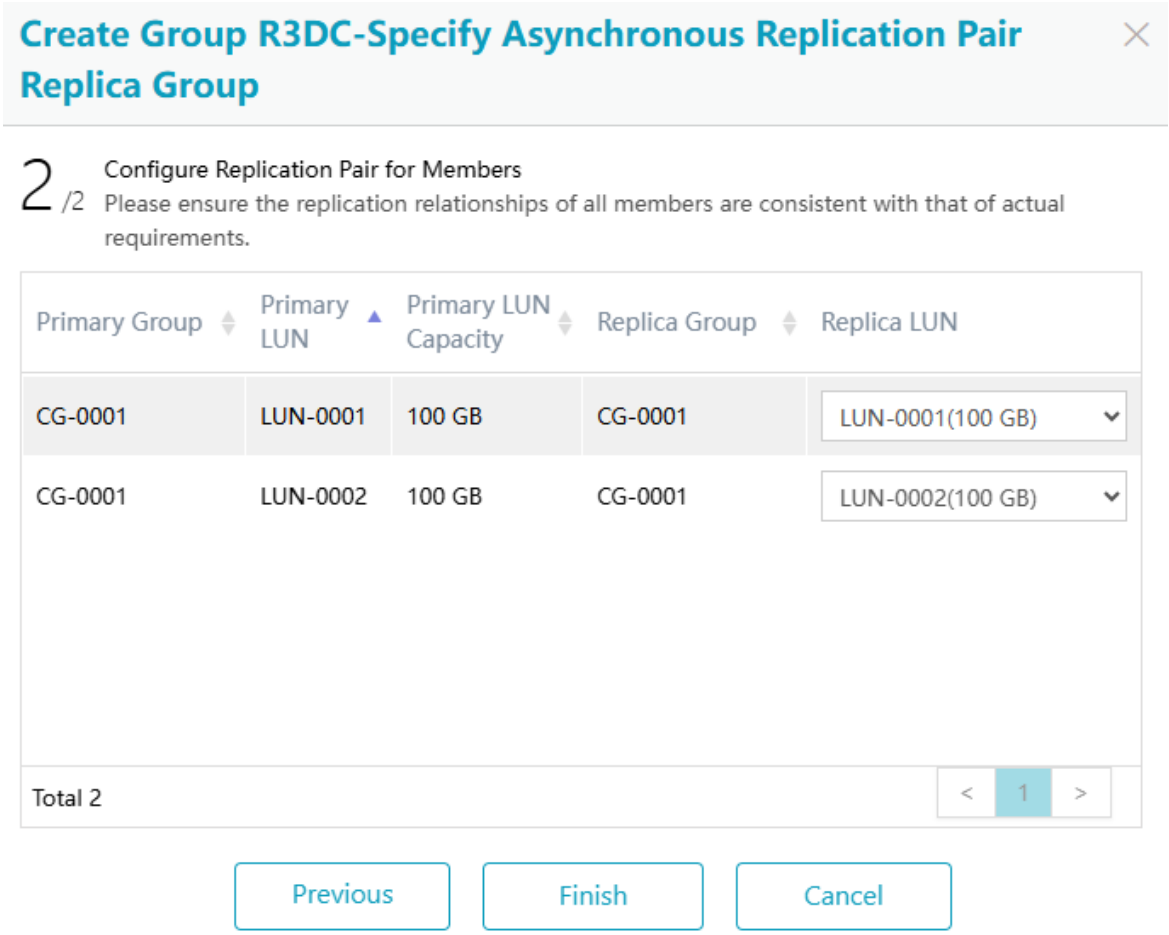

Figure 7-20 Specify asynchronous replication pair replica group wizard interface (2)

Step 4.3: Set the parameters for active asynchronous replication pair and standby asynchronous replication pair. The following is an example of setting active asynchronous replication pair and please follow Step 4.3.1 to Step 4.3.3 to configure.

Step 4.3.1: Click the <Active Async Replication Pair Parameter Configuration> button to open the **Set the Active Asynchronous Replication Pair Options** window, as shown in Figure 7-21. Set group replication parameters (see Table 7-6 for details) and click the <Next> button to enter the next interface.

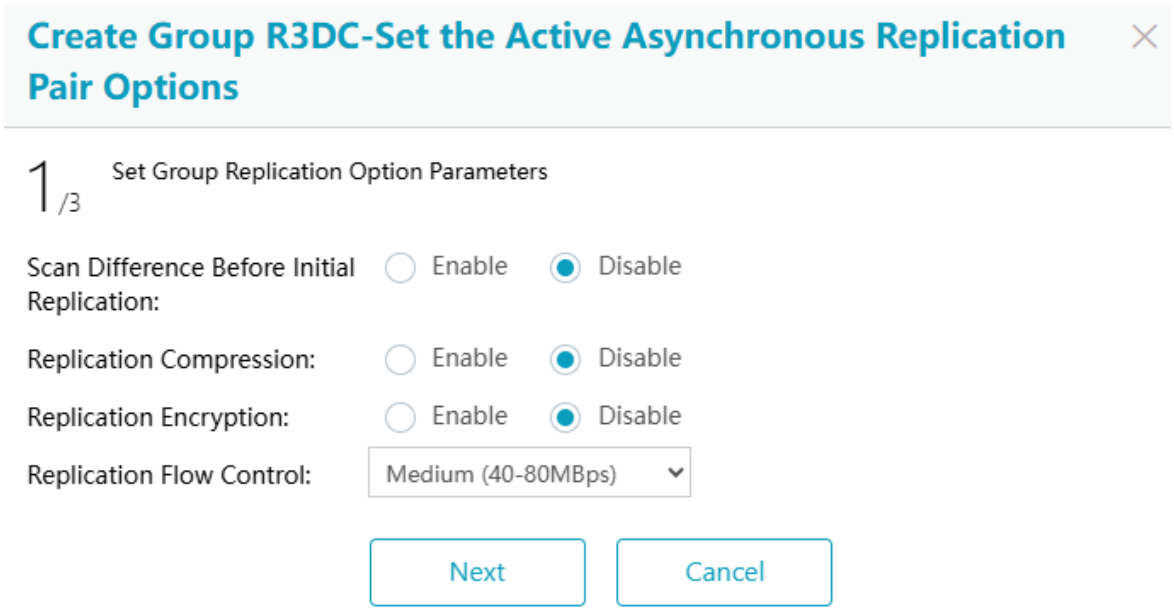

Figure 7-21 Set the active asynchronous replication pair options wizard interface (1)

Table 7-6 Description of the parameters for setting the active asynchronous replication pair options wizard interface (1)

Parameter	Description
Scan Difference Before Initial Replication	It refers to enabling or disabling scanning difference before initial replication. The default value is disabling. **NOTE** If there are small differences between primary LUN and replica LUN, for example, the replication has been done before, please enable the option. After enabling, the differential data between primary LUN and replica LUN will be scanned first when the initial replication is triggered. Only the differential data will be replicated during initial replication, greatly reducing the amount of replicated data.
Replication Compression	It refers to enabling or disabling replication compression. The default value is disabling.
Replication Encryption	It refers to enabling or disabling replication encryption. The default value is disabling.
Replication Flow Control	It is used to control the replication rate so that the synchronous bandwidth consumption of the back-end replication does not affect the front-end traffic on the primary LUN. • Low (0-20MBps) • Medium (40-80MBps) • High (100-200MBps) • Highest (greater than 200MBps) • Custom: It refers to manually setting the upper limit of the rate. Valid range: 1-1024MBps.

Step 4.3.2: Set group replication policy, as shown in Figure 7-22. Set relevant parameters (see Table 7-7 for details) and click the <Next> button to enter the next interface.

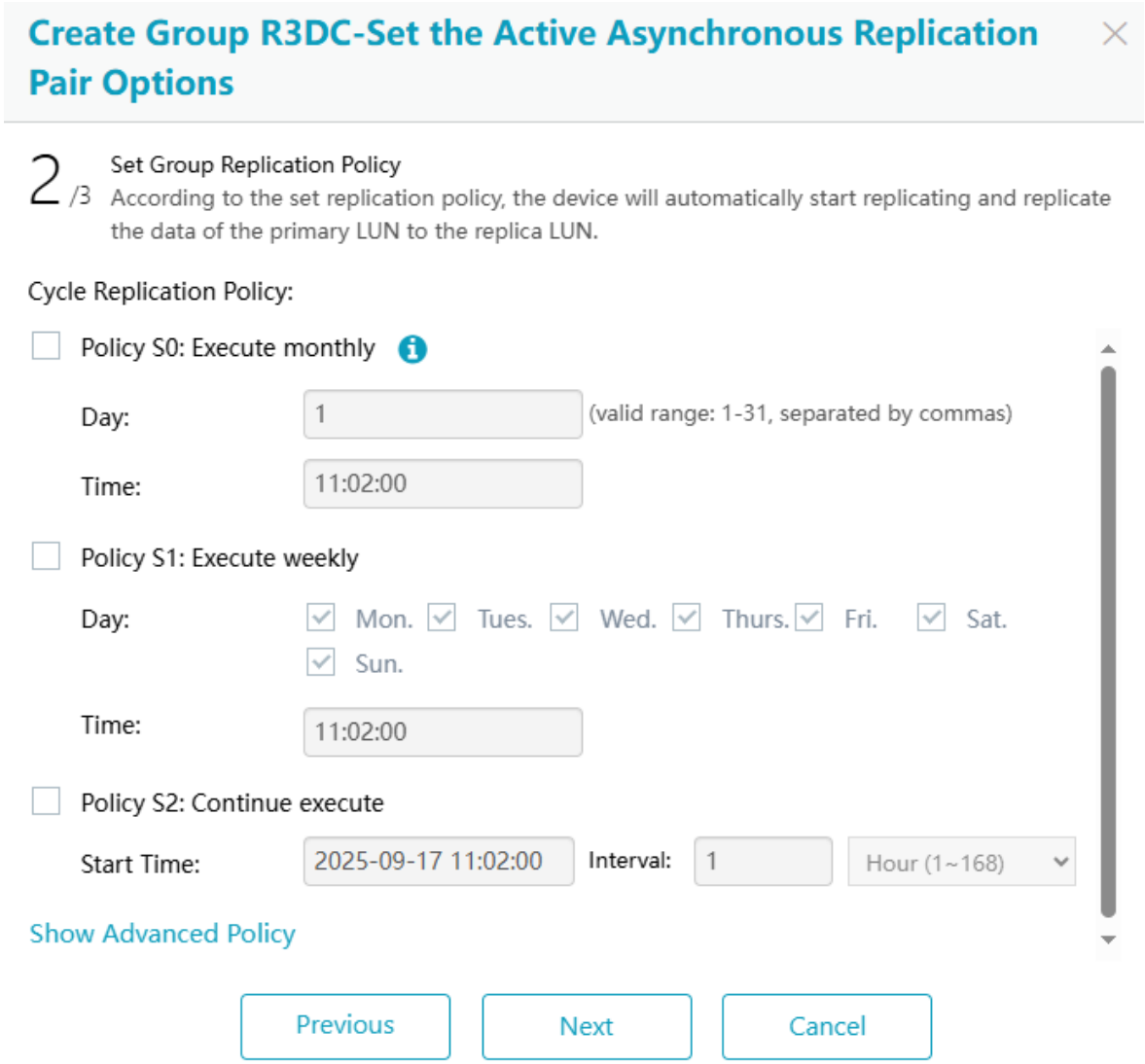

Figure 7-22 Set the active asynchronous replication pair options wizard interface (2)

Table 7-7 Description of the parameters for setting the active asynchronous replication pair options wizard interface (2)

Parameter	Description
Cycle Replication Policy	Replication is started automatically according to the set cycle replication policy. The following cycle replication policies are supported: • Policy S0: Replication is started automatically at a fixed time every month. • Policy S1: Replication is started automatically at some time of every day/week. • Policy S2: Replication is started automatically at a certain time with a specified interval. ⓘNOTE

	Click the <Show Advanced Policy> button and you can also set advanced policy A0~A3 according to actual needs, and automatically start replication at specific time intervals within a specified period of time per day/week.

Step 4.3.3: Check the configuration information and click the <Finish> button.

Step 4.4: Click the <Show Advanced Parameters> button to configure group R3DC parameters (see Table 7-8 for details) and click the <Next> button to enter the next interface.

Table 7-8 Description of the parameters for configuring group R3DC interface

Parameter	Description
Name	It refers to the name of group R3DC.
Switchover Policy	It refers to the active/standby switchover policy of group R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".
Local Group Member	It refers to the snapshot resource capacity of local group member, which can be configured manually and automatically.
Dual-Active Remote Group Member	It refers to the snapshot resource capacity of dual-active mirror remote group member, which can be configured manually and automatically.
Async Replication Remote Group Member	It refers to the snapshot resource capacity of async replication remote group member, which can be configured manually and automatically.

Step 5: In the third step of the **Create Group R3DC** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

7.2.1.2 Creating Group R3DC Based on Synchronous Replication + Asynchronous Replication

This section explains how to create group R3DC based on synchronous replication + asynchronous replication.

Prerequiistes

- The XAN is well configured and reachable.
- The LUN R3DC in the consistency group must meet the following requirements:
  - The health status of primary LUN and two replica LUNs must be normal.
  - The access types of primary LUN and two replica LUNs must be the same.
  - If snapshot resources have been created for primary LUN and two replica LUNs, they must have normal health status and valid data; if no snapshot resources have been created for primary LUN and two replica LUNs, they will be created in the system automatically.
  - Two replica LUNs can only be assigned to client servers in read-only mode.

- If snapshots are enabled on two replica LUNs, all time points must be deleted. Otherwise, a large amount of data will be written to replica LUNs in the initial replication process, causing great expansion on snapshot resource space of replica LUNs.
- If replication has already been enabled on primary LUN and two replica LUNs, its status cannot be split; If replication has already been enabled on two replica LUNs, its status cannot be split.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Click the <Create> button in the **Group R3DCs** tab of the information display area to open the **Create Group R3DC** wizard.

Step 3: The first step of the **Create Group R3DC** wizard is shown in Figure 7-23. Select sync + async remote replication and local group and click the <Next> button to enter the next interface.

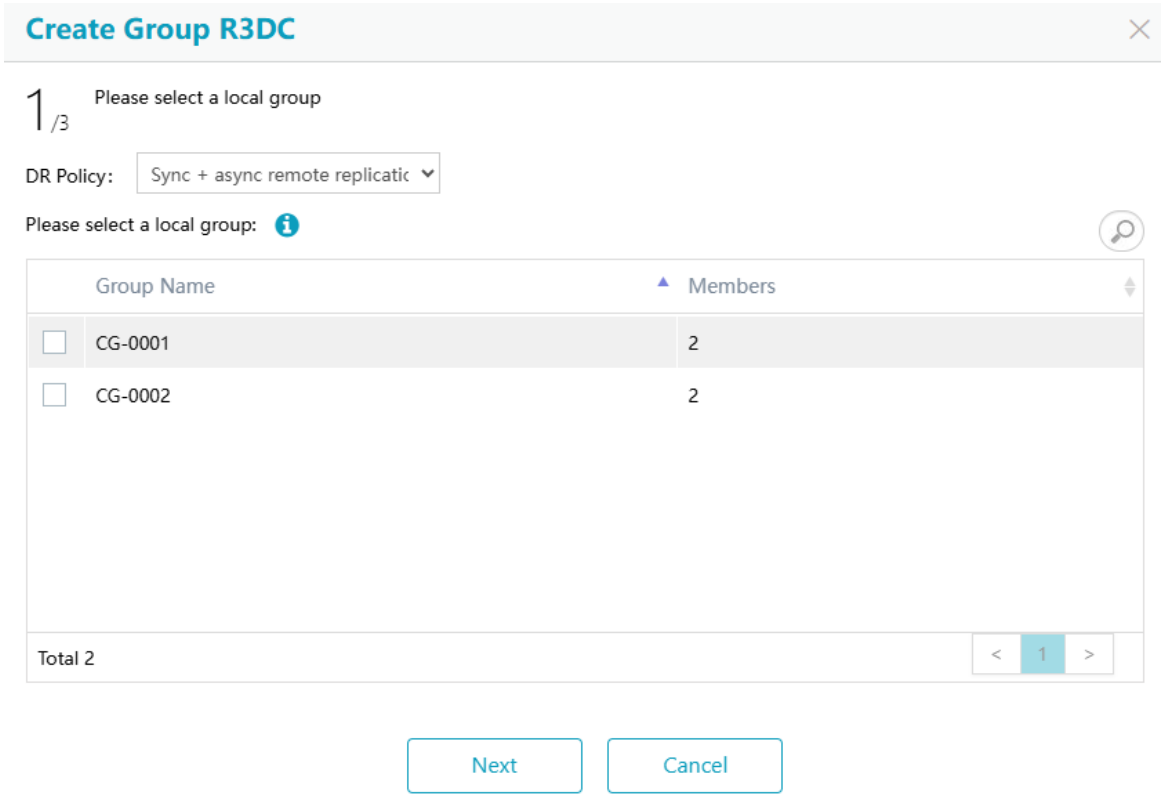

Figure 7-23 Create group R3DC (sync replication + async replication) wizard interface (1)

Step 4: The second step of the **Create Group R3DC** wizard is shown in Figure 7-24. Please follow Step 4.1 to Step 4.5 to configure.

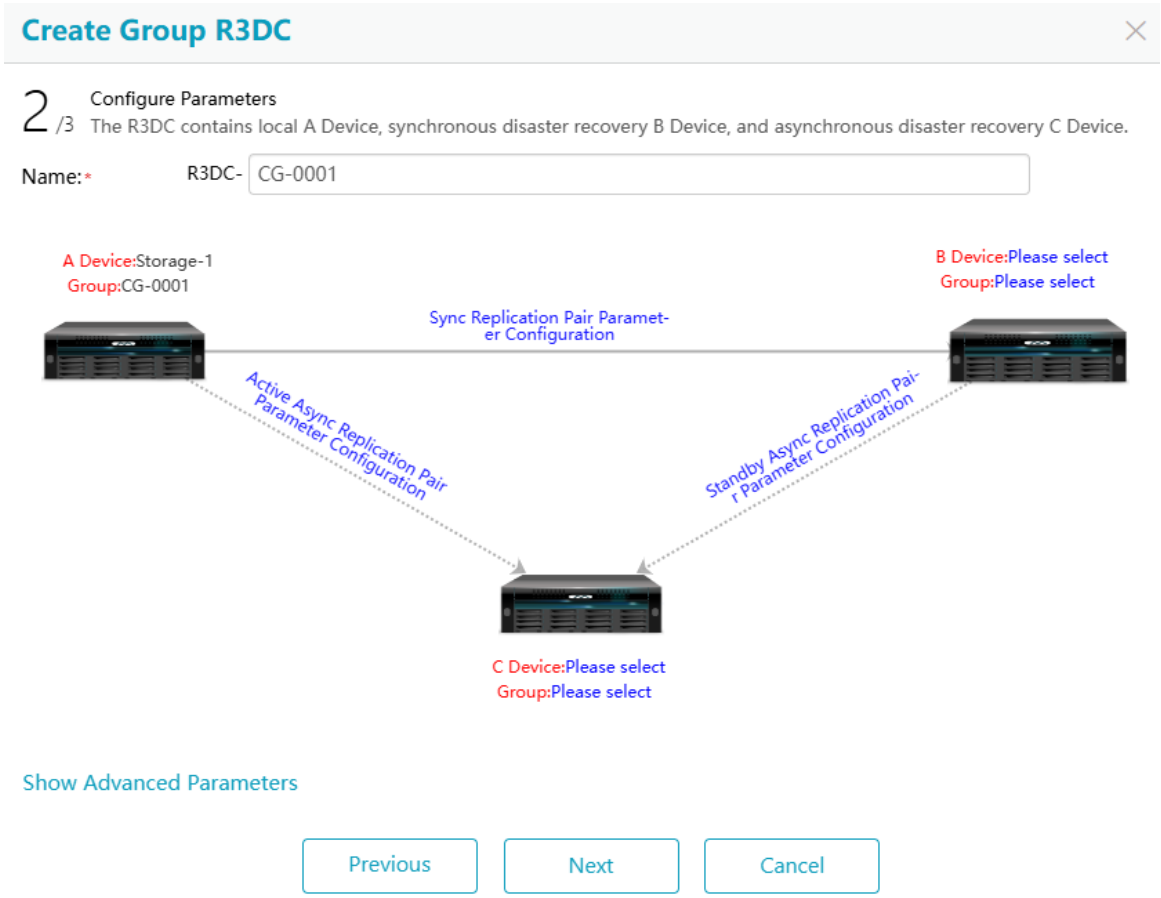

Figure 7-24 Create group R3DC (sync replication + async replication) wizard interface (2)

Step 4.1: Please follow Step 4.1.1 to Step 4.1.2 to specify synchronous replication pair replica group and configure replica pair for members.

Step 4.1.1: Click the <Please select> button of Device B or Group to open the **Specify Synchronous Replication Pair Replica Group** window, as shown in Figure 7-25. Select Device B and replica group and click the <Next> button to enter the next interface.

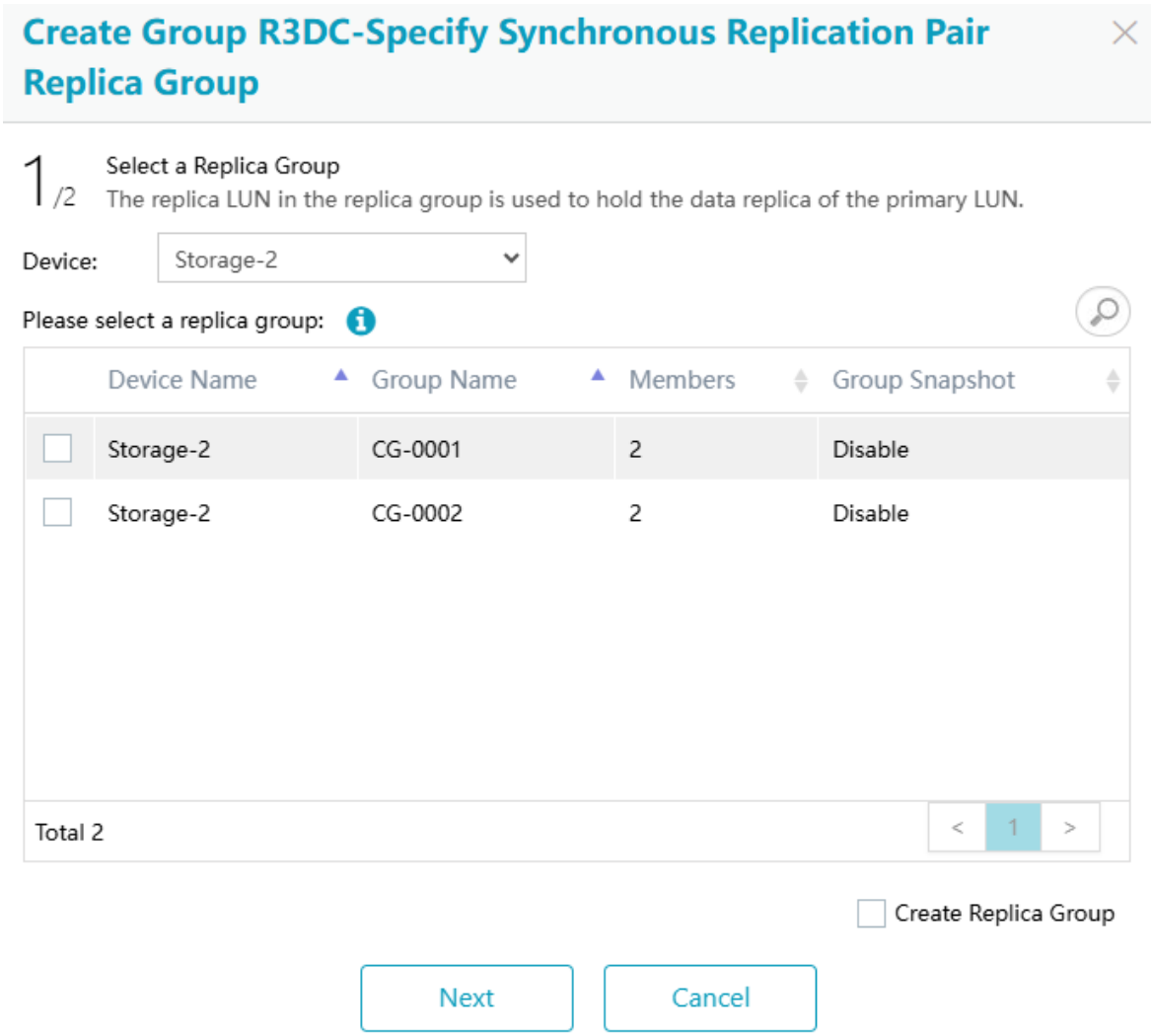

Figure 7-25 Specify synchronous replication pair replica group wizard interface (1)

ⓘNOTE

If a replica group has not been created in advance, you can also select the option of "Create Replica Group" in this step to create a new mirror group on Device B. In the next steps, you will create a new replica group through extended steps, corresponding to steps 1a/2. For the steps and parameter descriptions of creating a group, please refer to 5.1 Creating Consistency Group.

Step 4.1.2: Configure replication pairs for members, as shown in Figure 7-26, and click the <Finish> button.

ⓘNOTE

- If synchronous replication that in active status has already been enabled on the primary LUN, the corresponding replica LUN will be displayed automatically and cannot be modified.
- It the LUN in the replica group is not matched with a primary LUN, it will be removed automatically.

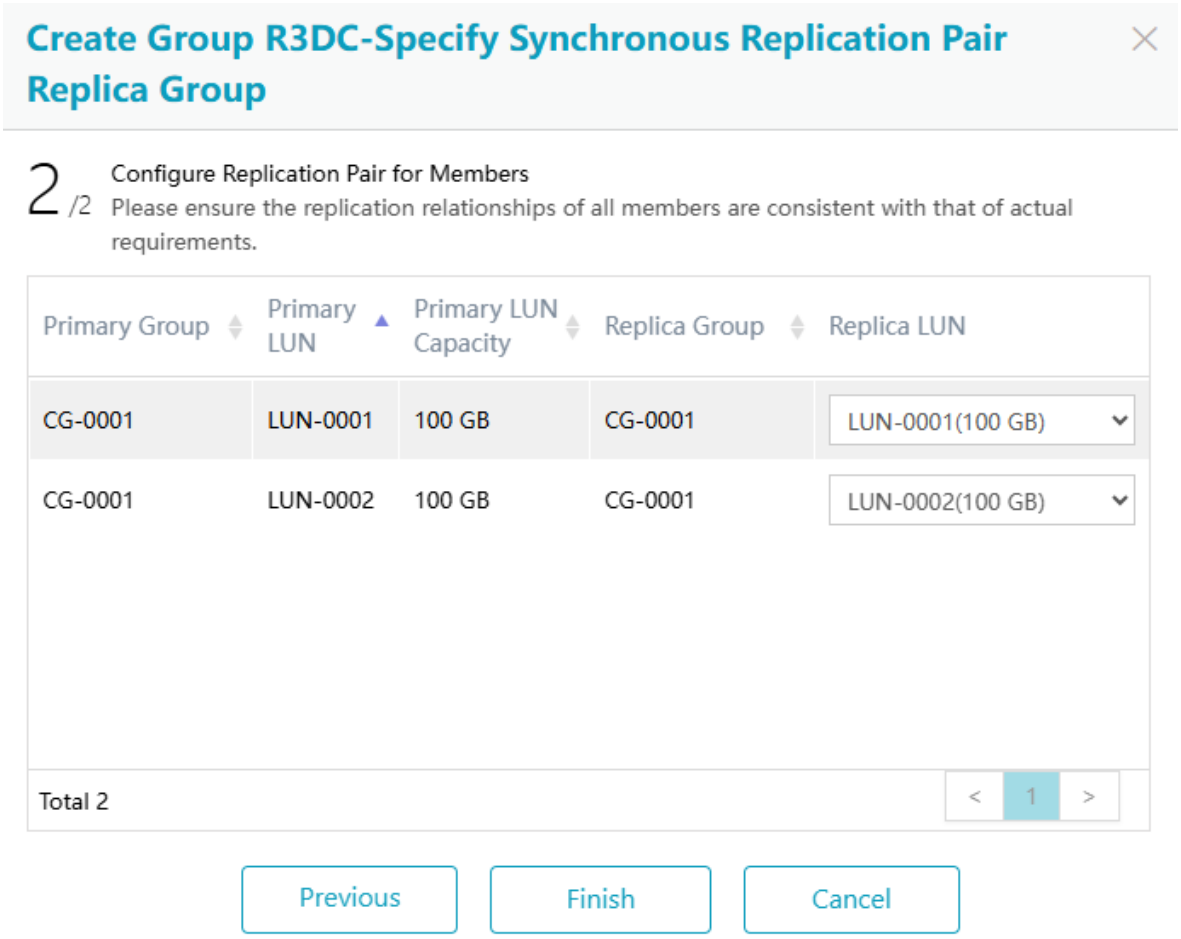

Figure 7-26 Specify synchronous replication pair replica group wizard interface (2)

Step 4.2: Please follow Step 4.2.1 to Step 4.2.2 to specify asynchronous replication pair replica group and configure replication pair for members.

Step 4.2.1: Click the <Please select> button of Device C or Group to open the **Specify Asynchronous Replication Pair Replica Group** window, as shown in Figure 7-27. Select Device C and replica group and click the <Next> button to enter the next interface.

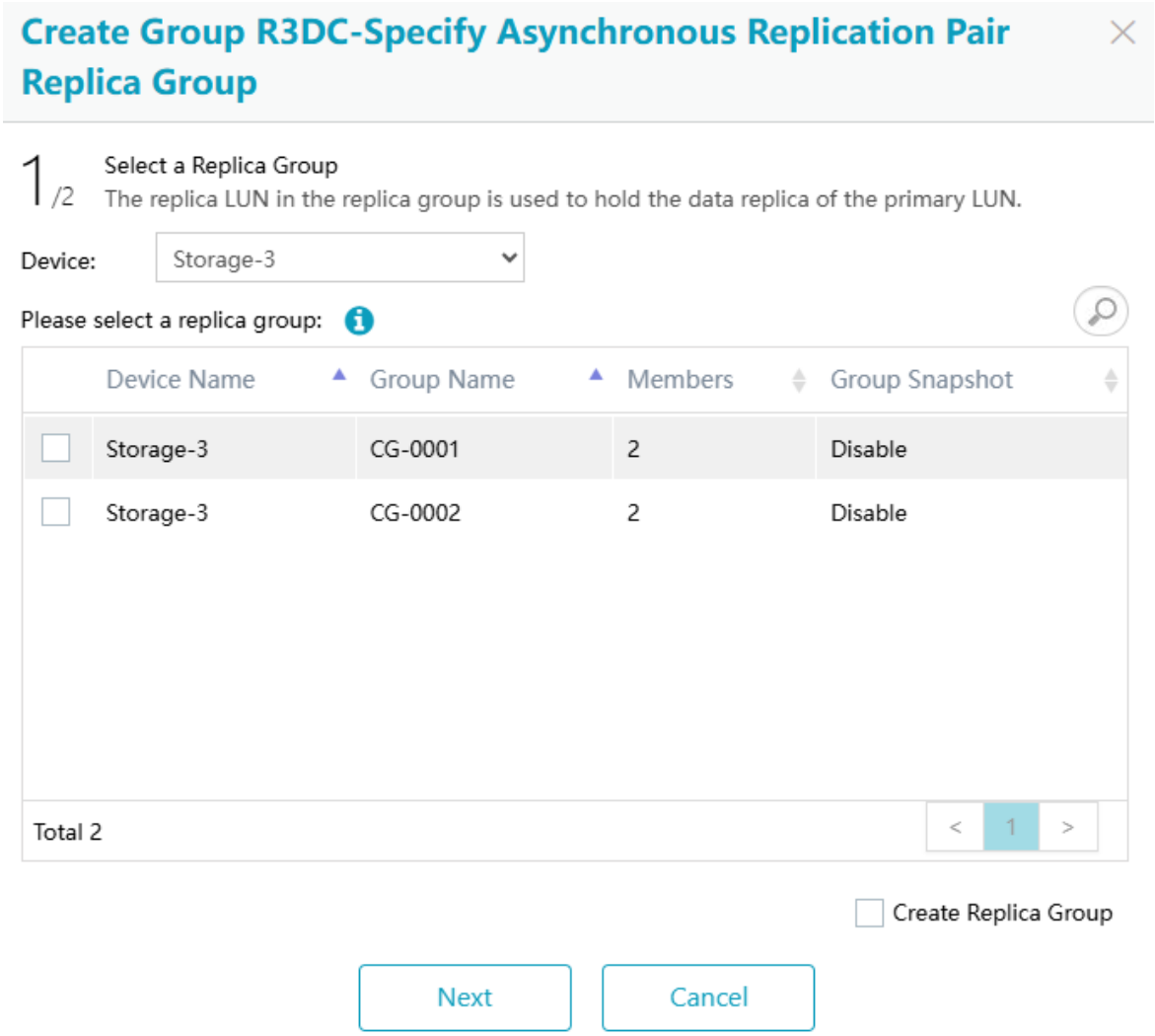

Figure 7-27 Specify asynchronous replication pair replica group wizard interface (1)

ⓘNOTE

If a replica group has not been created in advance, you can also select the option of "Create Replica Group" in this step to create a new replica group on the Device C. In the next steps, you will create a new replica group through extended steps, corresponding to steps 1a/2. For the steps and parameter descriptions of creating a group, please refer to 5.1 Creating Consistency Group.

Step 4.2.2: Configure replication pairs for members, as shown in Figure 7-28, and click the <Finish> button.

ⓘNOTE

It the LUN in the replica group is not matched with a primary LUN, it will be removed automatically.

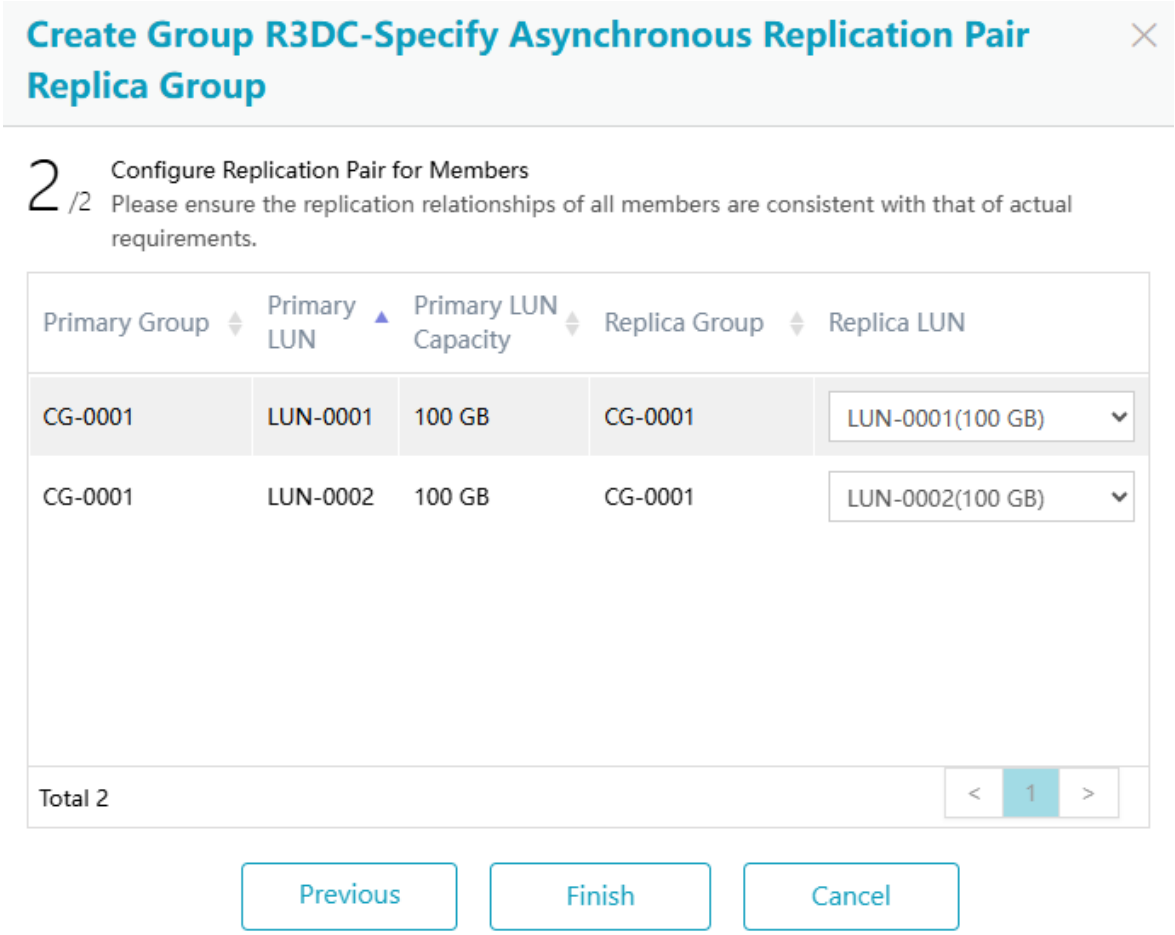

Figure 7-28 Specify asynchronous replication pair replica group wizard interface (2)

Step 4.3: Click the <Sync Replication Pair Parameter Configuration> button to open the **Set the synchronous replication pair options** window, as shown in Figure 7-29. Set synchronous replication pair paremeters (see Table 7-1 for details) and click the <Finish> button.

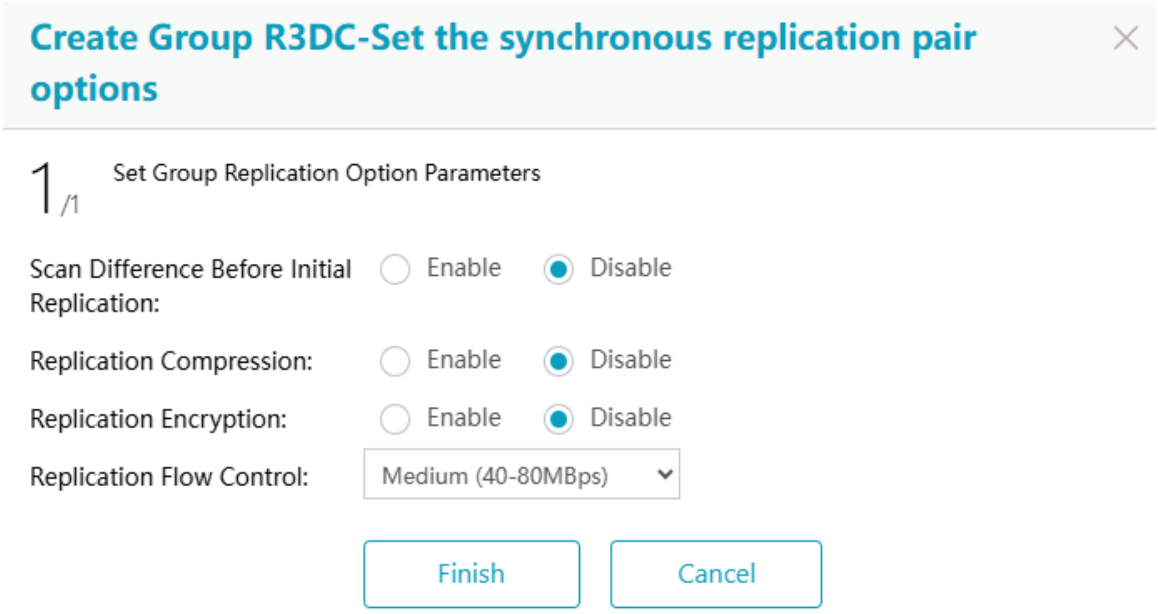

Figure 7-29 Set the synchronous replication pair options interface

Step 4.4: Set the parameters for active asynchronous replication pair and standby asynchronous replication pair. The following is an example of setting active asynchronous replication pair and please follow Step 4.4.1 to Step 4.4.3 to configure.

Step 4.4.1: Click the <Active Async Replication Pair Parameter Configuration> button to open the **Set the Active Asynchronous Replication Pair Options** window, as shown in Figure 7-30. Set group replication parameters (see Table 7-6 for details) and click the <Next> button to enter the next interface.

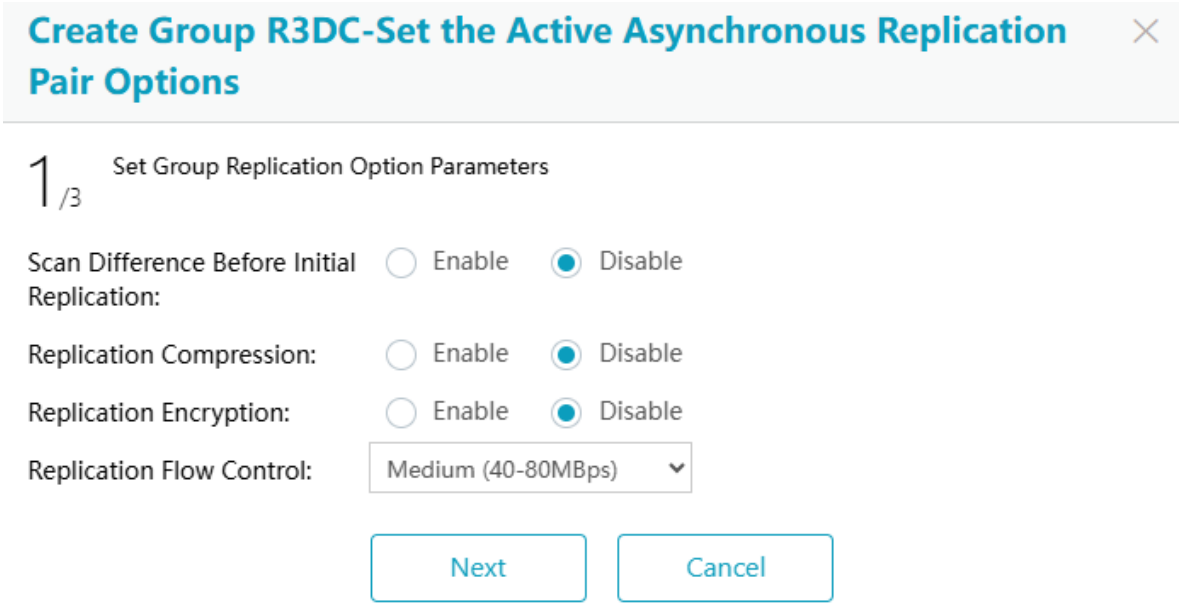

Figure 7-30 Set the active asynchronous replication pair options wizard interface (1)

Step 4.4.2: Set group replication policy, as shown in Figure 7-31. Set relevant parameters (see Table 7-7 for details) and click the <Next> button to enter the next interface.

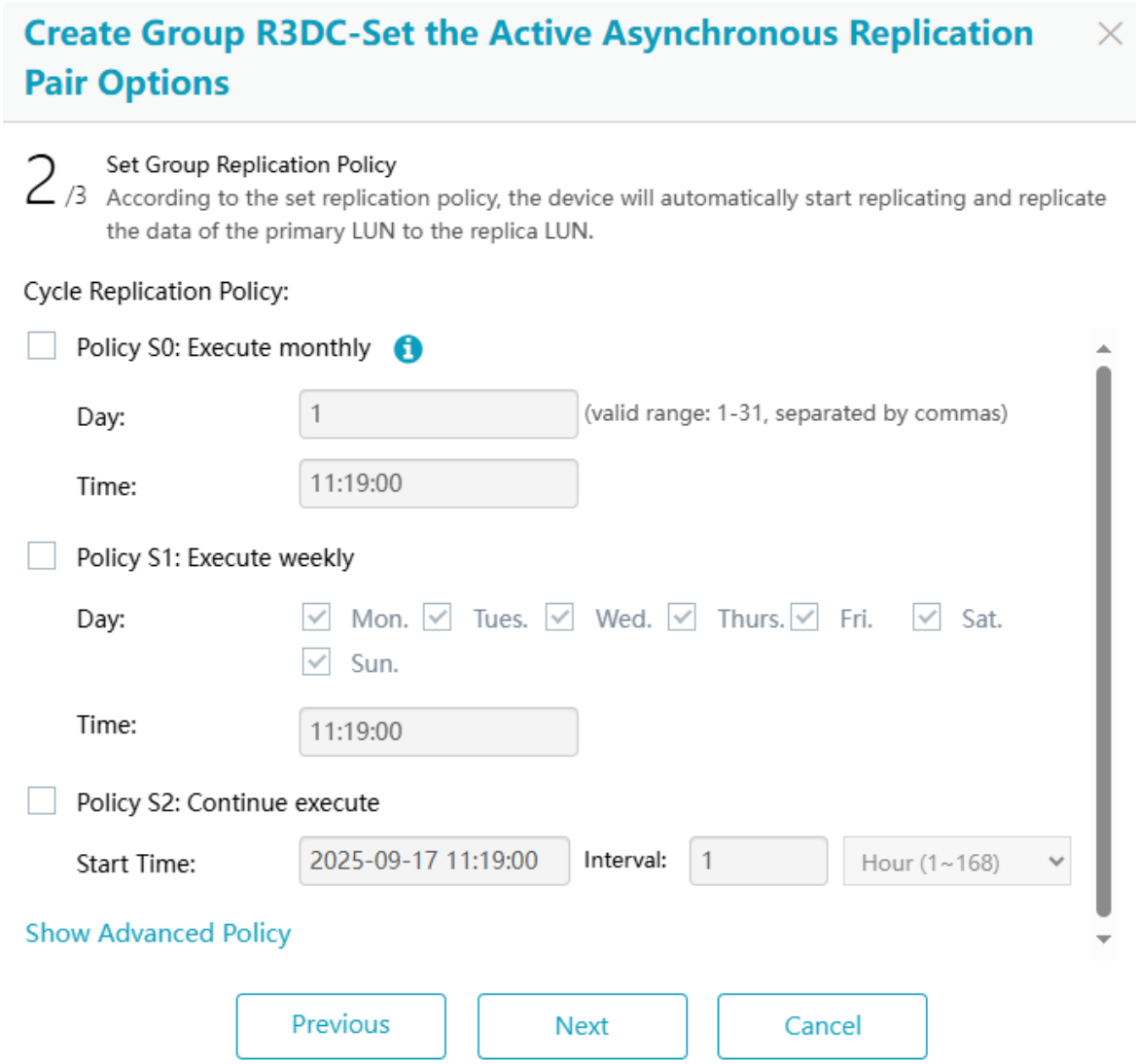

Figure 7-31 Set the active asynchronous replication pair options wizard interface (2)

Step 4.4.3: Check the configuration information and click the <Finish> button.

Step 4.5: Click the <Show Advanced Parameters> button to configure group R3DC parameters (see Table 7-9 for details) and click the <Next> button to enter the next interface.

Table 7-9 Description of the parameters for configuring group R3DC interface

Parameter	Description
Name	It refers to the name of group R3DC.
Switchover Policy	It refers to the active/standby switchover policy of group R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".
Local Group Member	It refers to the snapshot resource capacity of local group member, which can be configured manually and automatically.

Sync Replication Remote Group Member	It refers to the snapshot resource capacity of sync replication remote group member, which can be configured manually and automatically.
Async Replication Remote Group Member	It refers to the snapshot resource capacity of async replication remote group member, which can be configured manually and automatically.

Step 5: In the third step of the **Create Group R3DC** wizard, you can check the configuration information and click the <Finish> button to complete the configuration.

7.2.2 Viewing Group R3DC Properties

This section explains how to view group R3DC's basic properties.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** 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 R3DC.

7.2.3 Modifying Group R3DC Properties

This section explains how to modify group R3DC's name, switchover policy and switchover silent time.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** tab of the information display area and click the <Properties> button to open the **Basic Properties** window, as shown in Figure 7-32. Modify the properties of group R3DC (see Table 7-10 for details) and click the <Apply> button to complete the configuration.

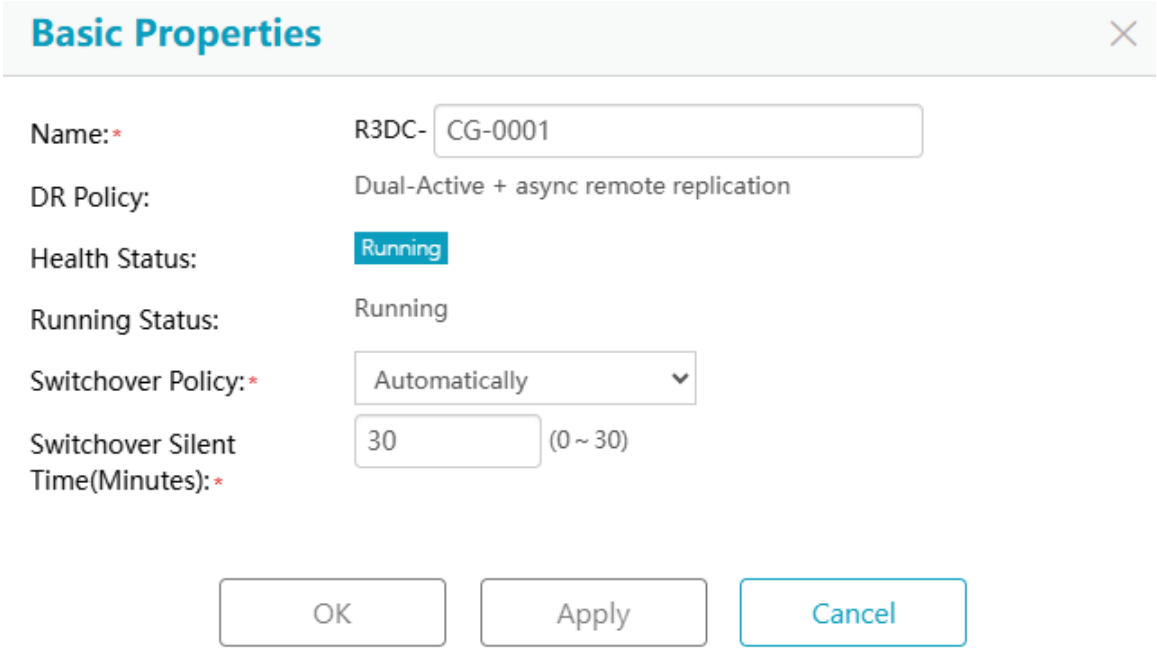

Figure 7-32 Group R3DC basic properties interface

Table 7-10 Description of the parameters for group R3DC basic properties interface

Parameter	Description
Name	It refers to the name of group R3DC.
Switchover Policy	It refers to the active/standby switchover policy of group R3DC, which can be configured manually and automatically.
Switchover Silent Time (Minutes)	It refers to the silent time of switchover policy. Valid range: 0-30. It can be set when the switchover policy is "Automatically".

7.2.4 Switching over Group R3DC Manually

This section explains how to manually switch over active/standby status of two asynchronous replication pairs in group R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** tab of the information display area, click the <Switchover> button, select active async replication pair in the pop-up confirmation box, and click the <OK> button to complete the configuration.

7.2.5 Starting Group R3DC

This section explains how to start group R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** tab of the information display area, click the <Start> button, click the <Start> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

7.2.6 Stopping Group R3DC

This section explains how to stop group R3DC.

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** tab of the information display area, click the <Start> button, click the <Stop> button in the drop-down menu, enter "yes" in the pop-up warning box, and click the <OK> button to complete the configuration.

7.2.7 Deleting Group R3DC

This section explains how to delete group R3DC.

Prerequisites

- The running status of three devices must be normal and the XAN between any two devices is reachable.
- Please stop group R3DC before deleting it and ensure the running status is "Closed".

Steps

Step 1: Select "Service" -> "R3DC" on the navigation tree to open the R3DC interface.

Step 2: Select the desired group R3DC in the **Group R3DCs** tab of 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.

Appendix A. Device Default Configurations

The default configurations of the device are shown in Table 7-11.

Table 7-11 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 7-12.

Table 7-12 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