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Hitachi Virtual Storage Platform 5000 Series

SVOS RF 9.4

ShadowImage for Mainframe User Guide

Hitachi ShadowImage® for Mainframe (SIz) uses local mirroring technology that your site can use to create and maintain full copies of data volumes within a storage system. Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

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Preface

Hitachi ShadowImage® for Mainframe (SIz) uses local mirroring technology that your site can use to create and maintain full copies of data volumes within a storage system. Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

Intended audience

This document is intended for system administrators, Hitachi Vantara representatives, and authorized service providers.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- The Device Manager - Storage Navigator software, and the *System Administrator Guide*.

Product version

This document revision applies to the following versions:

- VSP 5000 series: firmware 90-04-04-00/00 or later
- SVOS RF 9.4 or later

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on Hitachi Vantara Support Connect: https://knowledge.hitachivantara.com/Documents.

Changes in this revision

- Added information about the expansion of DP-VOL capacity to the sections of the manual that describe the Local Replication window and the View Pair Properties window.
- Added information about VVol replication to the sections of the manual that describe the View Pair Properties window, View Pair Synchronization Rate window, History window, Consistency Group Properties window, Split Pairs window, Split Pairs confirmation window, Resync Pairs window, Resync Pairs confirmation window, and Delete pairs window.

Document conventions

This document uses the following typographic conventions:

Convention	Description
Bold	▪ Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click **OK**. ▪ Indicates emphasized words in list items.
Italic	▪ Indicates a document title or emphasized words in text. ▪ Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: `pairdisplay -g group` (For exceptions to this convention for variables, see the entry for angle brackets.)
`Monospace`	Indicates text that is displayed on screen or entered by the user. Example: `pairdisplay -g oradb`
< > angle brackets	Indicates variables in the following scenarios: ▪ Variables are not clearly separated from the surrounding text or from other variables. Example: `Status-<report-name><file-version>.csv` ▪ Variables in headings.
[ ] square brackets	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.

Convention	Description
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a | b] indicates that you can choose a, b, or nothing. { a | b } indicates that you must choose either a or b.

This document uses the following icons to draw attention to information:

Icon	Label	Description
	Note	Calls attention to important or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (for example, disruptive operations, data loss, or a system crash).
	WARNING	Warns the user of a hazardous situation which, if not avoided, could result in death or serious injury.

Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1{,}000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1{,}000^3$ bytes
1 terabyte (TB)	1,000 GB or $1{,}000^4$ bytes
1 petabyte (PB)	1,000 TB or $1{,}000^5$ bytes
1 exabyte (EB)	1,000 PB or $1{,}000^6$ bytes

Logical capacity values (for example, logical device capacity, cache memory capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 cylinder	Mainframe: 870 KB Open-systems: ▪ OPEN-V: 960 KB ▪ Others: 720 KB
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1{,}024^2$ bytes
1 GB	1,024 MB or $1{,}024^3$ bytes
1 TB	1,024 GB or $1{,}024^4$ bytes
1 PB	1,024 TB or $1{,}024^5$ bytes
1 EB	1,024 PB or $1{,}024^6$ bytes

Accessing product documentation

Product user documentation is available on Hitachi Vantara Support Connect: https://knowledge.hitachivantara.com/Documents. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

Hitachi Vantara Support Connect is the destination for technical support of products and solutions sold by Hitachi Vantara. To contact technical support, log on to Hitachi Vantara Support Connect for contact information: https://support.hitachivantara.com/en_us/contact-us.html.

Hitachi Vantara Community is a global online community for Hitachi Vantara customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to community.hitachivantara.com, register, and complete your profile.

Comments

Please send us your comments on this document to doc.comments@hitachivantara.com. Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Vantara LLC.

Thank you!

Chapter 1: Overview of ShadowImage for Mainframe

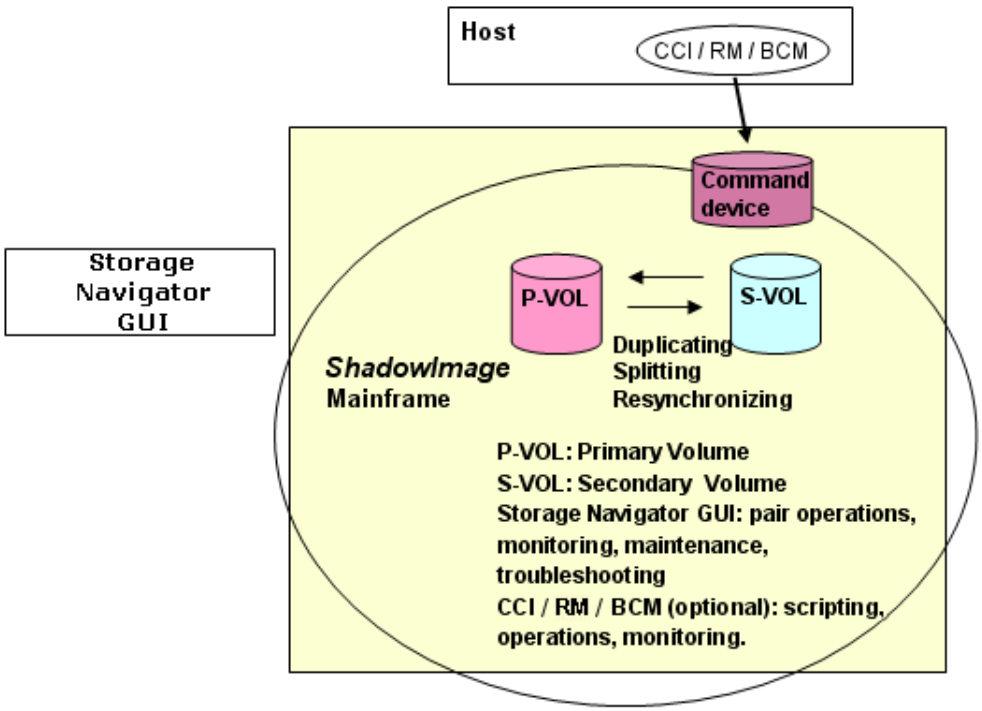
Hitachi ShadowImage® for Mainframe (SIz) uses local mirroring technology that your site can use to create and maintain full copies of data volumes within a storage system.

Using SIz volume copies (for example: backups, secondary host applications, data mining, testing) allows you to continue working without stopping host application input/output (I/O) in the production volume.

Hardware and software components

A typical configuration consists of a storage system, a host connected to the storage system, the SIz software, a primary or source volume (P-VOL), and secondary or target volumes (S-VOLs), and interface tools for operating SIz.

The following image shows a typical configuration.



Interface tools

Interface tools used to operate ShadowImage for Mainframe include the following:

- Business Continuity Manager (BCM)
- IBM Peer-to-Peer Remote Copy (PPRC) host software functions

  For more information about usage of PPRC software functions in general, see the IBM documentation.
- IBM DFSMSdss host software functions

  For more information, see the *Hitachi Business Continuity Manager User Guide*.
- HDvM - SN graphical user interface (GUI)
- Command Control Interface (CCI)

Business Continuity Manager

Business Continuity Manager (BCM) runs in the mainframe under z/OS providing operation, monitoring, and scripting for SIz. In addition, BCM provides the ability to perform an ATTIME Suspend.

Device Manager - Storage Navigator

Use HDvM - SN to perform the following tasks:

- Install the SIz license key, which enables it.
- Configure the storage system.
- Perform the initial and update copy operations.
- Monitor, maintain, and troubleshoot the storage system.

HDvM - SN communicates with the storage system over defined TCP/IP connections. HDvM - SN is LAN-attached to the storage system.

For more information about using HDvM - SN, see the *System Administrator Guide*.

Command Control Interface

CCI is a tool that uses the command line interface to perform operations that are necessary to use storage systems. You can either run pair commands directly from a separate open system host by using a configured open system command device, or you can script CCI commands on the open system host. CCI does not provide any control or monitoring capability directly from the mainframe operating environment.

For more information about using CCI, see the *Command Control Interface User and Reference Guide*.

Consistency groups

Use a consistency group (CTG) to perform tasks on the SIz pairs in the group at the same time, including CTG pair-split tasks. Using a CTG to perform tasks ensures the consistency of the pair status for all pairs in the group.

Volume pairs

A volume pair consists of a P-VOL and one to three S-VOLs.

Because S-VOLs are updated asynchronously, the P-VOL and S-VOLs might not be identical except immediately after a split. If a pair is split, any further updates to the P-VOL will not be reflected in the S-VOL.

Splitting or deleting a pair allows the host access to the S-VOL.

Initial and update copy operations

Creating a pair causes the storage system to start the initial copy. During the initial copy, the P-VOL remains available for read and write operations from the host. After the initial copy, the storage system periodically copies the differential data in the P-VOL to the S-VOL. Subsequent write operations to the P-VOL are regularly duplicated to the S-VOL. The data in the P-VOL is copied to the S-VOL.

Initial copy workflow

Initial copy is performed when you create a copy pair. Data on the P-VOL is copied to the S-VOL for the initial copy using the following workflow.

The storage system goes through the following workflow to create an initial copy:

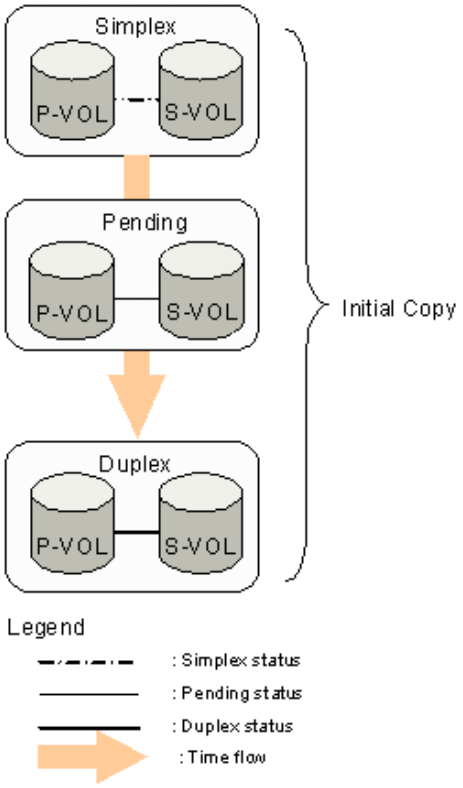
1. The S-VOLs are not paired. You create the copy pair.

   Note: The storage system accepts read/write for unpaired volumes.

2. The initial copy is in progress (PENDING status). The storage system copies the P-VOL data to the S-VOL.
3. The initial copy is complete and the volumes are paired (DUPLEX status).

   Note: Data consistency is not ensured for SI pairs in DUPLEX status.

A P-VOL continues receiving updates from the host during the initial copy.



Update copy workflow

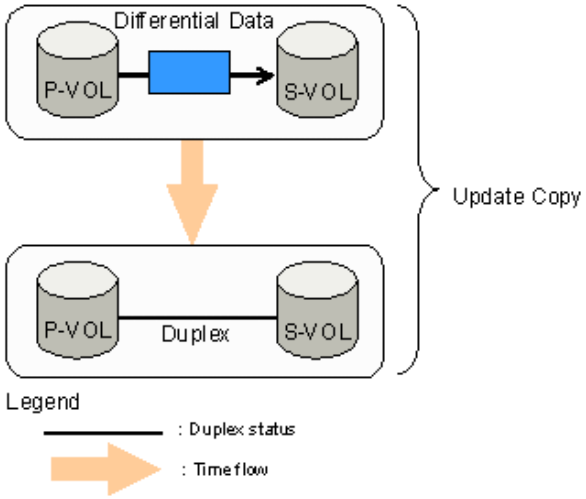
Update copy is performed to asynchronously copy new data (differential data) from the P-VOL of a copy volume to the S-VOL.

The storage system goes through the following process to create an update copy:

1. The storage system marks I/O to the P-VOL in DUPLEX status as differential data and stores the location of the data in bitmaps for transfer to the S-VOL.
2. After there are write I/O operations to a P-VOL, the storage system starts the update copy operation.

> **Note:** The timing of the update copy operation is based on the amount of differential data that accumulates and the elapsed time since the previous update.

The following image shows the update copy operation.



Updated data is copied asynchronously. Therefore, even when the initial copy completes and the pair status changes to PAIR, data in the P-VOL and in the S-VOL might not be the same. If you want data in the P-VOL and in the S-VOL to match at a certain date and time, you must split the pair.

Note: Data in the P-VOL and in the S-VOL might not be the same if the host did not write data to the P-VOL during copy operation. To ensure matching data in the P-VOL and the S-VOL, you must split the pair to change its status to PSUS.

Chapter 2: ShadowImage for Mainframe system requirements and planning

Before getting started with SIz storage systems, review the system requirements and planning tasks.

System requirements

The following table describes requirements for SIz.

Item	Requirement
SIz license capacity	The installed license capacity must be greater than or equal to the combined size of all P-VOLs and S-VOLs. For more information about license capacity requirements, see ShadowImage for Mainframe licensed capacity requirements (on page 22).
License key	Must be installed.
RAID level	RAID 1, RAID 5, RAID 6
HDvM - SN	Required
BCM/IBM PPRC	Use Business Continuity Manager (BCM) or IBM PPRC, but not both interface tools. If you use BCM, a command device is required for remote array operations. For more information about preparing BCM and IBM PPRC, see Using Business Continuity Manager and IBM PPRC (on page 29).
CCI	Required if you are running commands through an in-band Fibre Channel connection. Otherwise, CCI is not required. For more information about CCI and running commands through an in-band Fibre Channel connection, see the *Command Control Interface User and Reference Guide*.
Pair volumes	The pair volumes.

Item	Requirement
	Values: ▪ Number of P-VOLs per S-VOL: 1 ▪ Number of S-VOLs per P-VOL: : 1 to 3 ▪ Volume Capacity: The P-VOL and S-VOL must be the same size in cylinders. If the capacity is displayed in GB or TB, a small difference between P-VOL and S-VOL capacity might not be displayed. To view the capacity in cylinders, select Options > Capacity Unit > Cyl in the Logical Devices window. ▪ The maximum size of the P-VOLs is the maximum size of the volumes that can be created in a storage system. The maximum size of the S-VOLs is also the maximum size of the volumes that can be created in a storage system. However, the total size of the P-VOLs and the S-VOLs cannot exceed the maximum size of the volumes that can be created in a storage system. For details, see the *Provisioning Guide* for your system. ▪ Supported emulation types. For more information about the supported emulation types, see Pair volumes and emulation types (on page 22) . ▪ Supported volume types: • Internal volumes • External volumes configured as mainframe volumes **Note:** Universal Volume Manager license is required. • Custom-sized volumes **Note:** VLVI is required. Pair volumes must have the same capacity and emulation type.

Item	Requirement
	▪ Mirror Unit number (MU number): Values: • For HDvM - SN and CCI: 0, 1, or 2 • For BCM or IBM PPRC: Not specified ▪ You can share volumes with other software applications (see Sharing ShadowImage for Mainframe volumes (on page 30)). ▪ You cannot use the following volumes as pair volumes: • URz journal volumes • Pool volumes • Command devices for BCM • TSE volumes • Volumes for which Soft Fence is set
Maximum number of pairs	Pairs per storage system (if you pair one S-VOL per P-VOL): ▪ VSP 5000 series: 32,768 **Note:** The maximum is dependent on the amount of installed shared memory. For more information about installed shared memory, see Maximum number of tables based on installed shared memory (on page 23) . For more information about the number of pairs your VSP 5000 series configuration supports, see Workflow for determining the maximum number of ShadowImage for Mainframe pairs (on page 22) .
Consistency groups	Maximum per storage system: 2,048 (including SI, SIz, and Thin Image (HTI)) Maximum for SI and SIz: 128 **Note:** You cannot place SI, SIz, and HTI pairs in the same CTG. Maximum SIz pairs per CTG: ▪ VSP 5000 series: 1,024 For more information about the requirements for CTGs in BCM, see the *Hitachi Business Continuity Manager User Guide*. For more information about how to manage CTG IDs, including how to reserve CTGs, see Managing consistency group IDs for ShadowImage for Mainframe using Device Manager - Storage Navigator (on page 43) .

Pair volumes and emulation types

The pair's P-VOL and S-VOLs must share the same emulation type. A volume's emulation type affects the number of differential and pair tables you will need for SIz. To create a pair, the P-VOL and S-VOL must be the same size and emulation type (for example, both 3390-3).

ShadowImage for Mainframe licensed capacity requirements

The capacity of P-VOLs and S-VOLs must be less than or equal to the installed license capacity. Volume capacity is counted only once, even if you use the volume more than once. You do not need to multiply the capacity by the number of times a volume is used (For example, a P-VOL used as the source volume for three pairs is counted only once).

For a normal volume, the volume capacity is counted, but for a DP-VOL (a virtual volume used in Dynamic Provisioning for Mainframe, Dynamic Tiering for Mainframe, or active flash for mainframe), the pool capacity being used by the volume is counted.

After you start performing pair tasks, monitor your capacity requirements to keep the used capacity within the capacity of the installed license.

You can continue using ShadowImage for Mainframe volumes in pairs for 30 days after licensed capacity is exceeded. After 30 days, the only allowed operation is pair deletion. The problem of exceeding the licensed capacity can be resolved by reducing the capacity to less than or equal to the licensed capacity. However, the warning message will remain displayed. The warning message is updated once a day, therefore when the problem is resolved, the warning message will automatically disappear within 24 hours.

For more information about licenses, see the *System Administrator Guide*.

Workflow for determining the maximum number of ShadowImage for Mainframe pairs

Complete the following steps to determine the maximum number of SIz pairs that you can create in your storage system:

1. Determine the number of differential and pair tables your storage system needs to create SIz pairs:
   - Query the number of differential tables required to create SIz pairs.
   - Calculate the number of tables for SIz.
2. Determine the maximum number of SIz pairs that you can create on your storage system.

Differential tables and pair tables

Differential tables and pair tables are required to create SIz pairs. Differential tables are tables that manage the differential bitmaps, and pair tables are tables that contain the information needed to manage SIz pairs. Create enough tables to handle the SIz pairs you plan to create.

The storage system uses a single pair table for up to 36 differential tables.

Software applications that use tables

The following software applications use differential tables:

- ShadowImage for Mainframe
- Volume Migration

The following software applications use pair tables:

- ShadowImage for Mainframe
- Volume Migration (using migration plans)

Maximum number of tables based on installed shared memory

For , theThe maximum number of differential tables and pair tables in a storage system depends on the amount of installed shared memory. Ensure that you have sufficient shared memory to handle the number of SIz pairs you plan to create.

The following tables show the number of differential tables and pair tables.

Table and volume limits

Differential table limit	Pair table limit	System volume limit
419,200	32,768	65,536

The maximum number of SIz pairs you can create is half the number of system volumes in the table if the P-VOLs and S-VOLs are in a one-to-one relationship.

For example, if the maximum amount of system volumes you can create is 65,536, then you can only create 32,768 SIz pairs. If there are more S-VOLs than P-VOLs, then the number of allowed SIz pairs decreases.

The following tables show the number of differential tables and pair tables according to the amount of installed shared memory.

Calculating the number of tables for ShadowImage for Mainframe when sharing tables

You can calculate the number of differential tables and pair tables your storage system needs to create SIz pairs.

Procedure

1. Use the following formula:

```
Maximum number of pairs that can be created in a storage system =<
(the total number of differential and pair tables in the storage
system –
the number of tables used by other software applications
```

> **Note:** You can use CCI **inqraid** command to query the number of the differential tables required when you create SI pairs, though not for creating SIz pairs. For SI, you can also query the number of differential tables not used in the storage system with this command.
>
> For more information about the **inqraid** command, see the *Command Control Interface User and Reference Guide*.

Calculating the number of tables for emulation types that are not OPEN-V

You can calculate the number of differential tables and pair tables you will need for a volume that has an emulation type other than OPEN-V.

Procedure

1. Use the following formula:

```
Total number of differential tables per pair =
(volume capacity KB ÷ 48) +
(management area capacity as number of cylinders)* × 15) ÷ (20,448**)
```

   * See the table that describes the control cylinders per emulation type in the *Provisioning Guide for Open Systems*.

   ** 20,488 is the maximum number of slots that a differential table can manage.

2. Round up the total number to the nearest whole number.

   For example, if the capacity of the divided volume is 2,403,360 KB, the calculation is as follows:

```
(2,403,360 ÷ 48 + 8 × 15) ÷ 20,448 = 2.4545...
```

Calculating the number of tables for OPEN-V emulation type

You can calculate the number of differential tables and pair tables that you will need for a volume that has an OPEN-V emulation type.

Note: If a DP-VOL exceeds 4 TB, differential tables are placed in hierarchy memory instead of shared memory, and differential tables in shared memory are not used. Therefore, it is not necessary to calculate the number of differential tables for DP-VOLs over 4 TB.

Procedure

1. Use the following formula:

```
Total number of the differential tables per pair =
(volume capacity KB / 256) ÷ 20,448*
```

   * The number of slots that a differential table can manage.

2. Round up the total number to the nearest whole number.

Calculating the number of tables for ShadowImage for Mainframe only

You can calculate the number of differential and pair tables your storage system needs to create SIz pairs.

Note: This calculation assumes that you are only using SIz in the system.

Note: If a volume exceeds 223 GB (262,668 cyl), differential tables are placed in hierarchy memory instead of shared memory, and differential tables in shared memory are not used. Therefore, it is not necessary to calculate the number of differential tables for volumes over 223 GB.

Procedure

1. Use the following formula:

```
Total number of the differential tables per pair = ((the number of
cylinders in a volume) + (management area capacity as number of
cylinders)) × 15 ÷ (20,448)
```

   - For management area capacity as number of cylinders, see the table that describes control cylinders per emulation type in the *Provisioning Guide for Mainframe Systems*.
   - 20,448 here is the number of the slots that a differential table can manage.

2. Round up the total number to the nearest whole number.
3. Use the following formula for calculating total number of the pair tables for each pair:

```
Total number of the pair tables per pair = Total number of the
differential tables per pair ÷ 36*
```

   (rounded up)

* The number of differential tables used for each pair table

```
194 ÷ 36 = 5.3888...
```

Round up 5.3888 to the nearest whole number and it will become 6. Therefore, the total number of the pair tables for each pair is 6 in this example. One or more pair tables can be used for each pair. However, the pair tables assigned to a pair cannot be used by a different pair until the pair is deleted.

Example

If the emulation type is 3390-3 and if the number of the cylinders of the volume is 3,339, the calculation is as follows:

```
(3,339 + 6) x 15 ÷ 20,448 = 2.4537
```

Round up 2.4537 to the nearest whole number, 3. In this example, you will need three differential tables and one pair table. However, the pair tables assigned to a pair cannot be used by a different pair until the pair is deleted.

Example

If the emulation type is 3390-A and if the number of the cylinders of the volume is 262,668, the calculation is as follows:

```
(262,668 + 1,652) x 15 ÷ 20,448 = 193.8967...
```

Round up 193.8967 to the nearest whole number and it will become 194. In this example, you will need 194 differential tables for each pair.

Calculating the maximum number of ShadowImage for Mainframe pairs

You can calculate the maximum number of pairs your storage system can support. In the calculation, you use the results of calculating the number of differential and pair tables.

Procedure

1. Use the following formula:

```
Σ {(α) x (the number of SIz pairs)} ≤ (β) and Σ {(γ) x (the number of
SIz pairs)} ≤ (δ)
```

where:

- (α): The required number of differential tables per pair (per previous calculation).
- (β): The number of differential tables available in the system.

  For more information about differential tables, see Maximum number of tables based on installed shared memory (on page 23).
- (γ): The required number of pair tables per pair.

  For more information about determining the number of differential and pair tables your storage system needs to create SIz pairs, see Workflow for determining the maximum number of ShadowImage for Mainframe pairs (on page 22).

Example

For example, if you plan to create 10 SIz pairs of 3390-3 volumes and 20 SIz pairs of 3390-L volumes in a storage system that has 26,176 differential tables, use the following formula:

`(3 x 10) + (24 x 20) = 510`, which is ≤ 26,176

If the emulation type is 3390-3, you will need three differential tables and one pair table.

If the emulation type is 3390-L, you will need 24 differential tables and one pair table.

Apply these numbers to the following formula:

```
(3 x 10) + (24 x 20) = 510 ≤ 26,176
```

and

```
(1 x 10) + (1 x 20) = 30 ≤ 8,192
```

Thus, you can create 10 SIz pairs of 3390-3 volumes and 20 SIz pairs of 3390-L volumes.

Performance planning for ShadowImage for Mainframe

Performing pair tasks, such as creating, splitting, and resynchronizing SIz pairs, can affect host I/O performance on the storage system.

Consider the following items for performance planning:

- Host I/O performance and number of SIz pairs.
  - Compare the importance of host I/O performance with the number of SIz pairs and the copy pace.
  - Assigning multiple S-VOLs to a P-VOL uses more system resources and lowers the potential performance.
- Load sharing on parity groups.
  - S-VOLs and P-VOLs should be assigned to different parity groups in case of failure. Make sure that enough parity groups are used to provision the P-VOLs and S-VOLs and provide the performance capability desired.
  - P-VOLs and S-VOLs should be distributed across the appropriate parity groups. If you plan to have multiple copies of the same P-VOLs, consider placing the S-VOLs in different combinations of parity groups.
  - SIz can create high levels of internal activity in your storage system. Ensure the configuration is appropriate for the internal and host workload. Items that can help are additional parity groups, cache adapters, cache, BEDs, and MPUs.
  - Limit the number of volumes performing initial copy operations provisioned in the same parity group.
  - If you need to perform copy operations for multiple pairs in the same parity group, perform the operation for a pair at a time.
  - When the system load is high, add a parity group, cache, channel board (CHB), and disk board (DKB). Allocate an S-VOL to the newly installed parity group.
- Quick Restore. You can maximize performance when you restore pairs using Quick Restore (see Workflow for maximizing Quick Restore performance (on page 29)).

For more information about the guidelines for maximizing host I/O performance while performing pair operations, see How to maximize host I/O performance (on page 28) .

How to maximize host I/O performance

Creating, splitting, and resynchronizing pairs can affect host I/O performance.

Use the following suggestions to minimize the impact of pair operations on host I/O performance:

- If you are creating SIz pairs, try one or both of the following:
  - Create the pair when the I/O load is light.

    For more information about checking I/O performance-related information, see the *System Administrator Guide*.
  - Limit the number of pairs that you simultaneously create.
- If you are creating, splitting, or resynchronizing SIz pairs, select a slower copy pace. You can enable the system option for copy pace or you can select a specific copy pace while performing the task. In HDvM - SN, select Slower. In CCI, use the **`paircreate -c`** command, and set 1 or 2 as the copy pace.

Workflow for maximizing Quick Restore performance

Complete the following steps to maximize performance when restoring pairs with Quick Restore:

1. Use the same RAID level and hard disk drive (HDD) device type for the P-VOL and S-VOL.

   For more information about HDD and HDD device types, see the *System Administrator Guide*.
2. If the P-VOL and S-VOLs are in different partitions, place them into the same cache partition.
3. Restore the pairs using Quick Restore.
4. Resume the original RAID levels if they were changed by a reverse resynchronization action.

Using Business Continuity Manager and IBM PPRC

You can use Business Continuity Manager (BCM) or IBM PPRC to perform the SIz pair tasks. IBM PPRC and BCM are independent functions; you must use one or the other. There is no guard logic to prevent using both at the same time. Simultaneous use can cause unexpected results and errors, because commands might be issued when states are not as expected.

Workflow for preparing Business Continuity Manager command devices

Business Continuity Manager (BCM) command devices are required when performing operations on systems that are not locally connected to the host.

BCM command devices cannot be used as CCI command devices, nor CCI command devices as BCM command devices. BCM command devices must be 3390 emulation devices and offline to the host. BCM command devices cannot be replicated.

For more information about BCM command devices, assigning volumes as BCM command devices, and MIH values for volumes used as BCM command devices, see the *Hitachi Business Continuity Manager User Guide*.

Chapter 3: Sharing ShadowImage for Mainframe volumes

Before sharing SIz volumes with other Hitachi software application volumes, review the associated requirements, restrictions, and guidelines.

Types of volumes you can share with ShadowImage for Mainframe

You can share SIz volumes with the following VSP 5000 series software applications:

- Compatible FlashCopy®.
- Hitachi Compatible Software for IBM® FlashCopy® SE.

  For more information about sharing volumes with Hitachi Compatible Software for IBM® FlashCopy® SE, see the *Hitachi Compatible FlashCopy/FlashCopy SE User Guide*.
- Compatible XRC.
- Concurrent Copy.
- Dynamic Provisioning for Mainframe and Dynamic Tiering for Mainframe.
- Resource Partition Manager.
- TrueCopy for Mainframe.
- Universal Replicator for Mainframe.
- Universal Volume Manager
- Virtual LVI.

  You can assign Virtual LVI volumes to SIz pairs. The S-VOL must have the same capacity as the P-VOL.

  For more information about Virtual LVI, see the *Provisioning Guide for Mainframe Systems*.
- Volume Migration.
- Volume Retention Manager.

Sharing volumes with Compatible FlashCopy®

You can share an SIz P-VOL with a Compatible FlashCopy® source volume only.

If you share an SIz P-VOL with a Compatible FlashCopy® source volume, you are limited to the following SIz tasks:

- Add pairs
- Split pair
- Suspend Pair
- Resync pair
- Delete pair

You can establish and delete Compatible FlashCopy® relationships only on source volumes that you share with SIz. To establish or delete relationships, the SIz pair cannot be in the process of being reverse resynchronized (Resync-R/REVRSY status).

If you share an SIz P-VOL with a Compatible FlashCopy® source volume, you can only create the following maximum number of pairs for each software application:

- SIz: 3
- Compatible FlashCopy®: 16

For more information about Compatible FlashCopy®, see the *Hitachi Compatible FlashCopy/FlashCopy SE User Guide*.

Sharing volumes with Compatible XRC

You can share an SIz P-VOL with a Compatible XRC primary volume (P-VOL). If you share a volume with Compatible XRC, you cannot perform a Reverse Copy or Quick Restore operation.

Note: Do not use Compatible XRC secondary volumes (S-VOLs) for SIz volumes.

Sharing volumes with Concurrent Copy

You can share SIz S-VOLs with a Concurrent Copy primary volume (P-VOL). If you share a volume with Concurrent Copy, you cannot perform a Reverse Copy or Quick Restore operation.

Note: Do not use Concurrent Copy secondary volumes (S-VOLs) for SIz volumes.

Sharing volumes with Dynamic Provisioning for Mainframe

Volumes created using Dynamic Provisioning for Mainframe can be used as SIz P-VOLs or S-VOLs.

If you are using an HDP volume as an SIz P-VOL or S-VOL, the capacity of the HDP pool allocated to the volume is added to the SIz licensed capacity.

The term Dynamic Provisioning for Mainframe in this manual includes Dynamic Provisioning for Mainframe, Dynamic Tiering for Mainframe, or active flash for mainframe.

Restrictions

The following restrictions apply:

- Because the S-VOL uses the same pool capacity as the P-VOL, best practice is to avoid the following volume combinations:
  - Using only the S-VOL as a Dynamic Provisioning volume (DP-VOL).
  - Using the P-VOL as a DP-VOL with the Data Direct Mapping attribute, and using the S-VOL as a normal DP-VOL.
- You cannot perform a Quick Restore if only the P-VOL or only the S-VOL is a DP-VOL. For Quick Restore, you must use DP-VOLs for both the P-VOL and S-VOL.
- When you create an SIz pair using a DP-VOL greater than 262,668 cylinders, the differential data is managed by control cylinder information written in pages which are assigned in the SIz pair volume. In this case, the required pool capacity for managing the differential data is one page for every 4,096 cylinders. When pages are not assigned to the SIz pair volume, pages for recording control cylinder information might be created during the creation of SIz pairs. However, if the pages have been assigned for all of the area in the volume, it is not required to add pool capacity for managing differential data since the page format for control cylinder information and for user data is same. The control cylinder information for ShadowImage for Mainframe, TrueCopy for Mainframe, and Compatible FlashCopy® V2 are recorded in the same pages.
- () If the copy origination page of an SI pair is not allocated, but the copy destination page is already allocated, zero data is copied to the copy destination. In this case, zero data pages are not reclaimed. If you want to reclaim zero data pages, split the SI pair to change its status to PSUS, and then reclaim zero data pages of the applicable volume.

Sharing volumes with Resource Partition Manager

You can share SIz P-VOLs and S-VOLs with Resource Partition Manager by specifying them in a Resource Partition Manager resource group.

For more information about Resource Partition Manager, see the *Provisioning Guide for Mainframe Systems*.

Before you begin

The resource group must be assigned to a user group for which you have privileges.

Note: You can only access one resource group from a host. Therefore, make sure that the resource group volumes you use as P-VOLs and S-VOLs are in the group that the host can access.

Sharing volumes with TrueCopy for Mainframe

You can share SIz P-VOLs and S-VOLs with TCz P-VOLs and S-VOLs. However, you cannot share SIz S-VOLs with TCz S-VOLs.

The write operation on the TCz P-VOL takes more time when you share an SIz P-VOL with a TCz S-VOL.

Note: If you are using IBM PPRC, the storage system cannot distinguish pairs that you have split (Split/SUSPOP status) from pairs that are in the process of being Quick Split (V-Split/SUSPVS status).

Check the pair status using one of the following methods:

- From a command prompt, run the following command:

  CSUSPEND

  To Steady Split, specify `MFS00` for the PRIM parameter. In this case, the pair is not in the process of being Quick Split (V-Split/SUSPVS status).
- Use HDvM - SN to check the statuses (Split/SUSPOP or V-Split/SUSPVS) of the pair.

For more information about splitting pairs, see Pair splitting methods (on page 62) .

Restrictions

The following restrictions apply:

- When you share an SIz P-VOL with a TCz S-VOL, if you split the SIz pair during write I/Os to the TCz P-VOL, only part of write I/Os might be written to the SIz S-VOL. To keep data consistency in the SIz S-VOL, stop I/Os to the TCz P-VOL first, and then split the SIz pair. If you want to use the YKFREEZE command to stop I/Os, run the command, wait for the I/Os processed before the command was received to complete, and then split the SIz pair. For the wait time to specify using the command, use a value shorter than the MIH value of the host.
- If you plan to Quick Restore the SIz pair, you must first suspend the TCz pair.
- If the SIz S-VOL and TCz P-VOL are shared, you cannot create another SIz pair using the SIz P-VOL.
- You can perform a CTG pair-split on SIz pairs that share volumes with TCz S-VOLs.

  For more information about CTG pair-split for shared volumes, see Using consistency group pair-split with shared volumes (on page 67)

For more information about sharing SIz and TCz volumes, see the *Hitachi TrueCopy® for Mainframe User Guide*.

The following table describes ShadowImage for Mainframe operations when ShadowImage for Mainframe P-VOLs are shared with TrueCopy for Mainframe P-VOLs or S-VOLs.

TrueCopy for Mainframe pair status	ShadowImage for Mainframe operation							
	Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
					Normal copy	Quick resync	Reverse copy	Quick restore
Pending	YES	YES	YES	YES	YES	YES	NO	NO
DUPLEX	YES	YES	YES	YES	YES	YES	NO	NO
Split/ SUSPOP	YES	YES	YES	YES	YES	YES	YES	YES
Suspend/ SUSPER	YES	YES	YES	YES	YES	YES	YES	YES

The following table describes ShadowImage for Mainframe operations when ShadowImage for Mainframe S-VOLs are shared with TrueCopy for Mainframe P-VOLs.

TrueCopy for Mainframe pair status	ShadowImage for Mainframe operation							
	Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
					Normal copy	Quick resync	Reverse copy	Quick restore
Pending	NO	NO	YES	YES	NO	NO	NO	NO
DUPLEX	NO	NO	YES	YES	NO	NO	NO	NO
Split/ SUSPOP	NO	YES	YES	YES	YES	YES	YES	YES
Suspend/ SUSPER	NO	YES	YES	YES	YES	YES	YES	YES

Sharing volumes with Universal Replicator for Mainframe

You can share SIz P-VOLs with URz P-VOLs and S-VOLs.

- When you share the SIz P-VOL with a URz S-VOL, if you split the SIz pair during write I/Os to the URz P-VOL, only part of write I/Os might be written to the SIz S-VOL. To keep data consistency in the SIz S-VOL, use consistency group pair-split to split the SIz pair.
- If you plan to Quick Restore the SIz pair, you must first suspend the URz pair.

  For more information about Quick Restore, see Reverse resynchronization (on page 75).
- The system reports SIz status when you query pair status for SIz and URz shared volumes using IBM PPRC. Use Business Continuity Manager (BCM) to query URz's pair status.

  For more information about using BCM, see the *Hitachi Business Continuity Manager User Guide*.
- You can perform a CTG pair-split on SIz pairs that share volumes with URz S-VOLs.

  For more information about using CTG pair-split on pairs with shared volumes, see Using consistency group pair-split with shared volumes (on page 67).

For more information about sharing SIz and URz volumes, see the related appendix in the *Hitachi Universal Replicator for Mainframe User Guide*.

The following table describes ShadowImage for Mainframe operations when ShadowImage for Mainframe P-VOLs are shared with Universal Replicator for Mainframe P-VOLs or S-VOLs.

Universal Replicator for Mainframe pair status	ShadowImage for Mainframe operation							
	Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
					Normal copy	Quick resync	Reverse copy	Quick restore
Pending	YES	YES	YES	YES	YES	YES	NO	NO
DUPLEX	YES	YES	YES	YES	YES	YES	NO	NO
Split/ SUSPOP	YES	YES	YES	YES	YES	YES	YES	YES
Suspend/ SUSPER	YES	YES	YES	YES	YES	YES	YES	YES
Suspending	YES	YES	YES	YES	YES	YES	NO	NO
Deleting	YES	YES	YES	YES	YES	YES	NO	NO

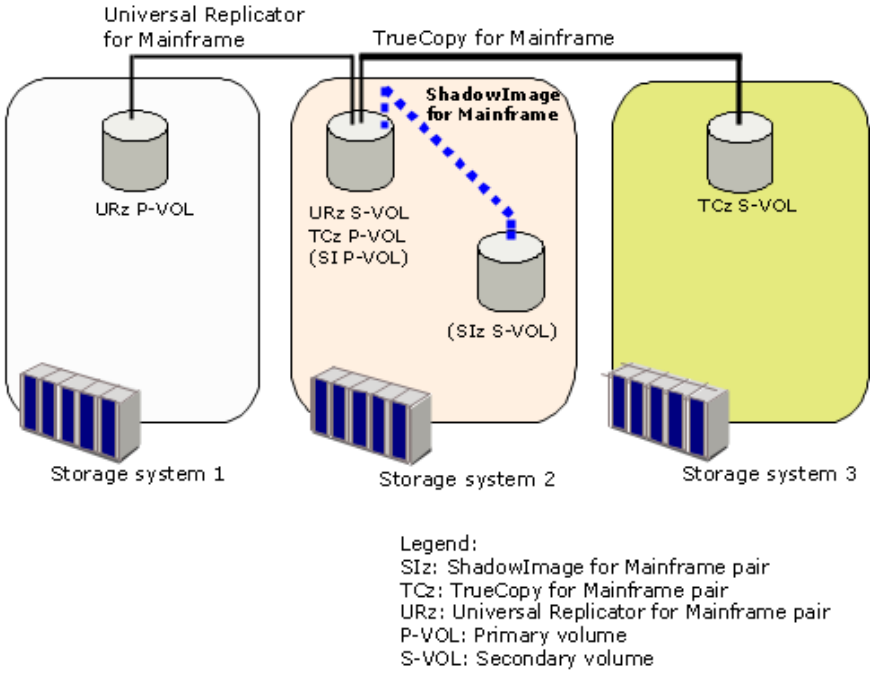
The following table describes ShadowImage for Mainframe operations when ShadowImage for Mainframe S-VOLs are shared with Universal Replicator for Mainframe P-VOLs.

Universal Replicator for Mainframe pair status	ShadowImage for Mainframe operation							
	Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
					Normal copy	Quick resync	Reverse copy	Quick restore
Pending	NO	NO	YES	YES	NO	NO	NO	NO
DUPLEX	NO	NO	YES	YES	NO	NO	NO	NO
Split/ SUSPOP	NO	YES	YES	YES	YES	YES	YES	YES
Suspend/ SUSPER	NO	YES	YES	YES	YES	YES	YES	YES
Suspending	NO	NO	YES	YES	NO	NO	NO	NO
Deleting	NO	NO	YES	YES	NO	NO	NO	NO

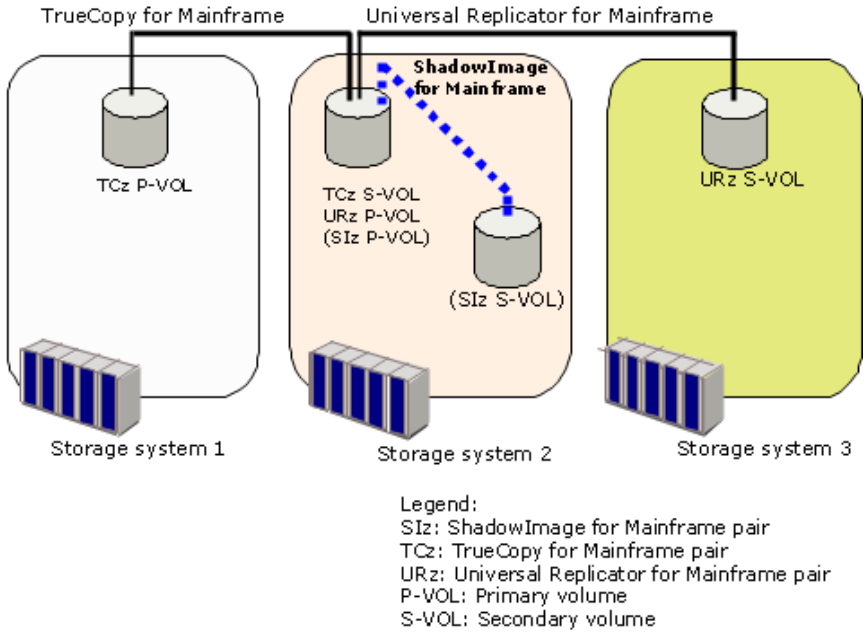
Sharing volumes with TrueCopy for Mainframe and Universal Replicator for Mainframe

The following figures provide configuration examples when ShadowImage for Mainframe, TrueCopy for Mainframe, and Universal Replicator for Mainframe are used.

Example of a pair shared by URz S-VOL and TCz P-VOL



Example of a pair shared by TCz S-VOL and URz P-VOL



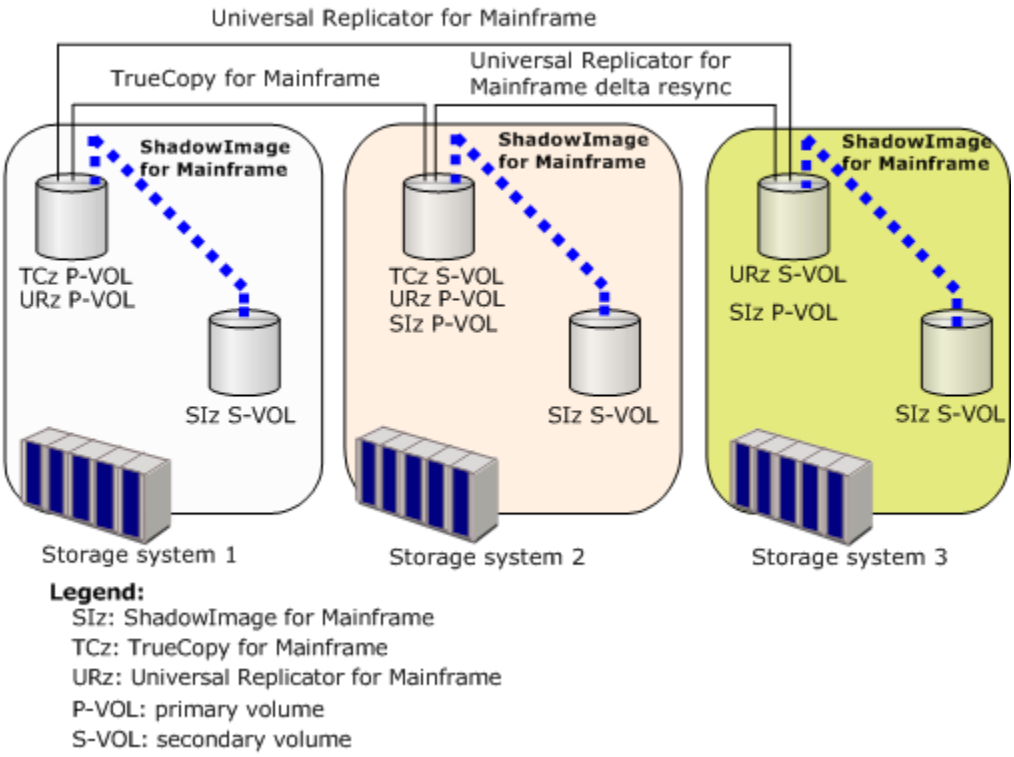
For the above configurations, you cannot perform Quick Restore for SIz pairs.

The following image illustrates a 3DC multi-target configuration with the following pairs:

- Universal Replicator for Mainframe pair
- Universal Replicator for Mainframe delta resync pair
- ShadowImage for Mainframe pair
- TrueCopy for Mainframe pair

For details about 3DC multi-target configurations, see the *Hitachi Universal Replicator for Mainframe User Guide*.

Example of combining an SIz pair, TCz pair, and URz pair in the 3DC multi-target configuration



The following tables describe ShadowImage for Mainframe operations according to the status of TCz pairs and URz delta resync pairs in the storage system of the TCz secondary site.

Table 1 ShadowImage for Mainframe operations in the TCz secondary storage system

TCz Pair Status	URz delta resync pair status	ShadowImage for Mainframe operation							
		Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
						Normal copy	Quick resync	Reverse copy	Quick restore
PAIR	HOLD	YES	YES	YES	YES	YES	YES	NO	NO
COPY		YES	YES	YES	YES	YES	YES	NO	NO
PSUS/ PSUE		YES	YES	YES	YES	YES	YES	YES	NO
PAIR	HLDE	YES	YES	YES	YES	YES	YES	NO	NO
COPY		YES	YES	YES	YES	YES	YES	NO	NO
PSUS/ PSUE		YES	YES	YES	YES	YES	YES	YES	NO

Table 2 ShadowImage for Mainframe operations in the URz secondary storage system

URz Pair Status	URz delta resync pair status	ShadowImage for Mainframe operation							
		Create pairs	Split pairs	Suspend copy operation	Release pairs	Resync pairs			
						Normal copy	Quick resync	Reverse copy	Quick restore
PAIR	HOLD	YES	YES	YES	YES	YES	YES	NO	NO
COPY		YES	YES	YES	YES	YES	YES	NO	NO
PSUS/ PSUE		YES	YES	YES	YES	YES	YES	YES	NO

The following table describes ShadowImage for Mainframe operations according to the status of TCz and URz pairs in the storage system of the TCz or URz local site.

The following table applies when there is no URz delta resync pair.

Table 3 ShadowImage for Mainframe operations in the TCz or URz primary storage system

TCz pair status	URz pair status	ShadowImage for Mainframe operation							
		Create pairs	Split pairs	Suspend copy	Release pairs	Resync pairs			
						Normal copy	Quick resync	Reverse copy	Quick restore
Duplex	Duplex	YES	YES	YES	YES	YES	YES	NO	NO
	Pending	YES	YES	YES	YES	YES	YES	NO	NO
	Suspend	YES	YES	YES	YES	YES	YES	NO	NO
Pending	Duplex	YES	YES	YES	YES	YES	YES	NO	NO
	Pending	YES	YES	YES	YES	YES	YES	NO	NO
	Suspend	YES	YES	YES	YES	YES	YES	NO	NO
Suspend	Duplex	YES	YES	YES	YES	YES	YES	NO	NO
	Pending	YES	YES	YES	YES	YES	YES	NO	NO
	Suspend	YES	YES	YES	YES	YES	YES	YES	NO

Sharing volumes with Universal Volume Manager

You can create SIz pairs using Universal Volume Manager external volumes.

For more information about Universal Volume Manager external volumes, see the *Hitachi Universal Volume Manager User Guide*.

Access to the external volumes used for SI-MF pairs, only from or through the local storage system. Do not access, for example, from a host connected with the external storage system, or by using a copy functionality on the external storage system.

Sharing volumes with Hitachi Volume Migration

You can migrate the following types of SIz pair volumes as Volume Migration source volumes:

- L1 P-VOL with up to two S-VOLs.
- L2 P-VOL with at least one S-VOL.

To assign another type of SIz pair volume as a Volume Migration source volume, you must delete the SIz pair first.

SIz pair volumes cannot be migrated as Volume Migration target volumes.

Volume Migration volumes cannot be used in SIz pair tasks; you must release a volume in Volume Migration before you can use it as an SIz volume.

Sharing volumes and Volume Retention Manager access attributes

You can create SIz pairs using volumes for which you set access attributes using Volume Retention Manager (VRM).

Setting up to use volumes in ShadowImage for Mainframe pairs

Complete the following steps to use volumes in SIz pairs where you set access attributes using VRM:

1. Use VRM to set the volume access attributes.
2. Perform SIz pair tasks and reserve attribute change tasks for the volumes.

Setting ShadowImage for Mainframe volume access attributes using Volume Retention Manager

You can use VRM to set the following P-VOL and S-VOL access attributes:

- Read/Write
- Read Only
- Protect

For use with SIz, Read/Write access is required for the S-VOLs and for the P-VOLs for a reverse resync.

Note: Do not set the Read Only or Protect attribute.

ShadowImage for Mainframe pair tasks determined by access attribute settings

The access attribute setting determines which SIz pair and change tasks you can perform.

Note: If you use volumes for which you set access attributes using VRM, the SIz tasks you perform do not change the volume VRM access attributes.

The following table lists actions for SIz volumes when VRM attributes are set.

Volume access attributes specified for the SIz pair		SIz pair tasks	
P-VOL	**S-VOL**	**Create, Split, Suspend, Resync (Normal Copy, Reverse Copy)**	**Delete**
Read/ Write	Read/Write or Read Only	YES	YES
	Protect	NO	YES
Read Only	Read/Write or Read Only	YES	YES
	Protect	NO	YES
Protect	Read/Write, Read Only, or Protect	NO	YES

Chapter 4: Configuring ShadowImage for Mainframe

When you configure SIz, you will complete tasks such as enabling system options, setting up Host I/O options, and setting up volumes.

Workflow for setting up ShadowImage for Mainframe

Set up SIz before you create the copy pair. You must have Storage Administrator (Local Copy) role to perform SIz operations.

Complete the following steps to set up SIz:

1. (Optional) If you have created CTGs, manage the CTG IDs (see Managing consistency group IDs for ShadowImage for Mainframe using Device Manager - Storage Navigator (on page 43)).
2. Release the reserved mainframe consistency groups (see Releasing reserved mainframe consistency groups (on page 45)).
3. (Optional) Change local replica options (see Changing local replica options (on page 46)).

Managing consistency group IDs for ShadowImage for Mainframe using Device Manager - Storage Navigator

1. If you plan to use ShadowImage for Mainframe CTGs in Business Continuity Manager (BCM) or IBM PPRC, reserve the CTGs for SIz so that you can perform tasks on the pairs in the group. Otherwise, skip this step.
2. Perform one of the following tasks:
   - If you are using BCM or IBM PPRC to create CTGs, assign the same CTG ID to all of the SIz pairs in the group. Use a CTG value that was reserved in step 1.

     You can use CTG ID 00 to 7F (or 0 to 127) for SI, SIz, and HTI.
   - If you are using BCM or IBM PPRC to run commands, create the SIz pair and assign it to a CTG.

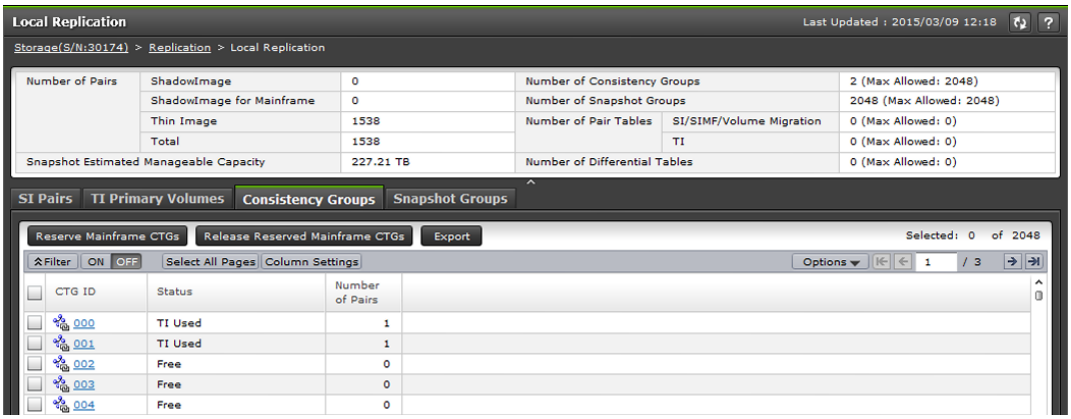
Reserving consistency groups using Device Manager - Storage Navigator

If you plan to use CTGs in BCM or IBM PPRC, use HDvM - SN to reserve the CTGs, which includes specifying the CTG ID.

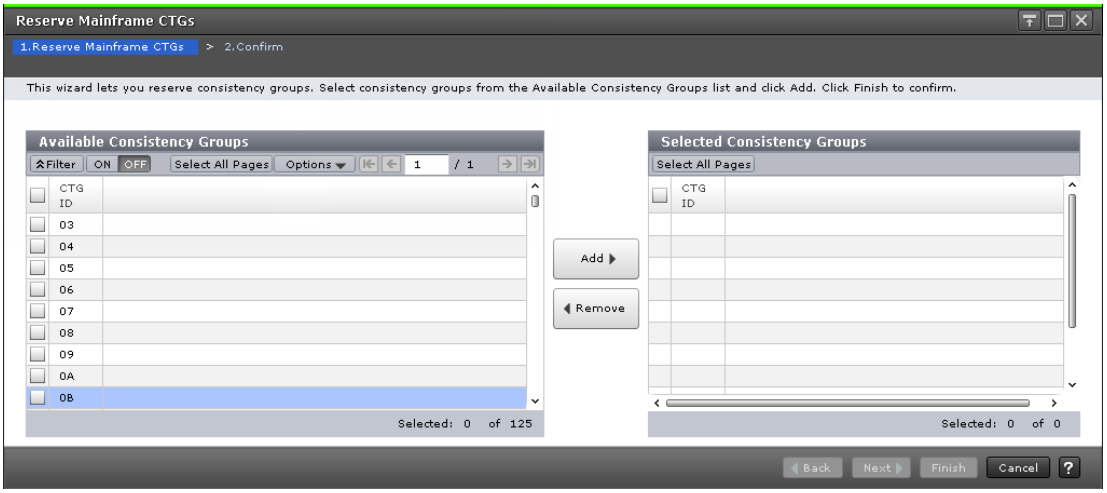
This task cannot be performed using BCM.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **Consistency Groups** tab.

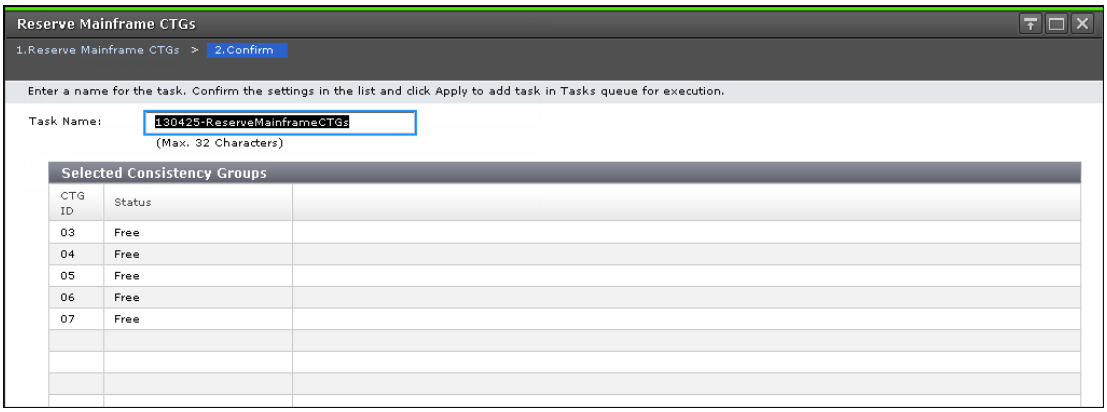


3. On the **Consistency Groups** tab, click **Reserve Mainframe CTGs**.



4. In the **Reserve Mainframe CTGs** window of the **Reserve Mainframe CTGs** wizard, from the **Available Consistency Groups** table, select the CTG you want to reserve, and then click **Add**.

   The CTG is moved to the **Selected Consistency Groups** table.
5. Click **Finish**, and then confirm the settings.



6. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |

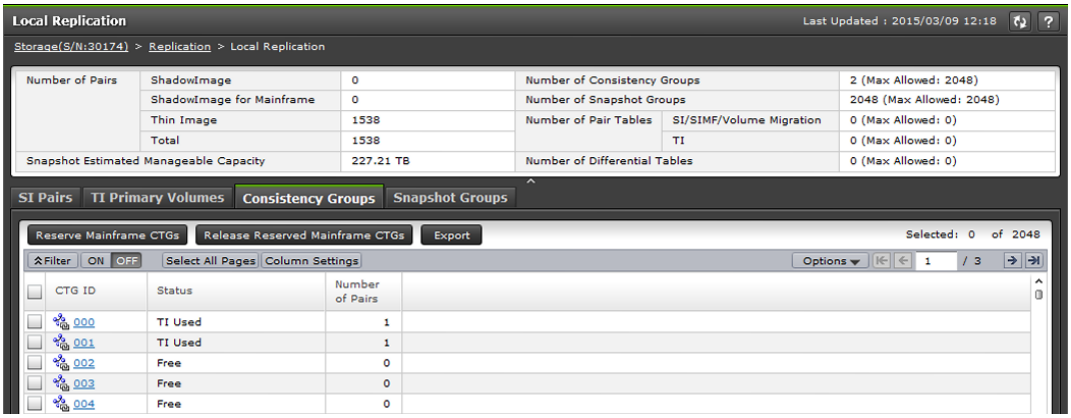
7. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
8. Click **Apply** to submit the task.

Releasing reserved mainframe consistency groups

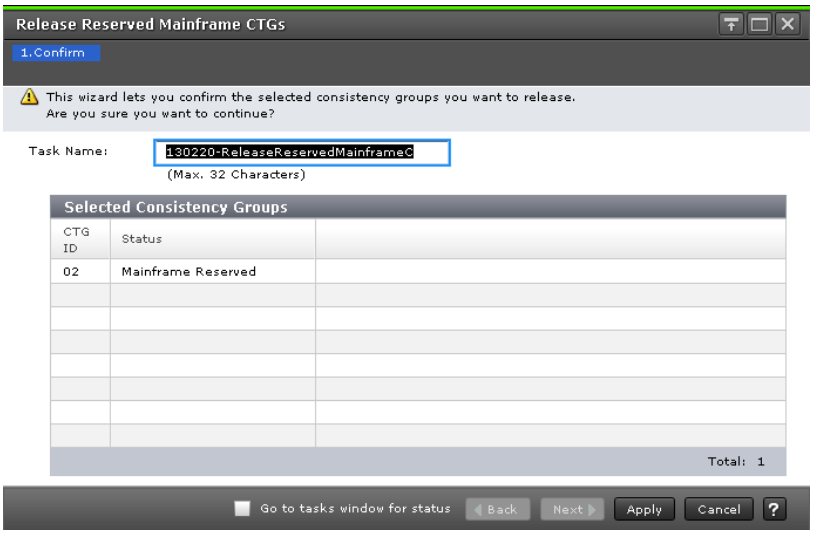
This task cannot be performed using BCM.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **Consistency Groups** tab.



3. On the **Consistency Groups** tab, select the reserved mainframe CTG you want to release and click **Release Reserved Mainframe CTGs**.



4. Confirm the settings.
5. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |
6. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
7. Click **Apply** to submit the task.

Changing local replica options

You can enable and disable the local replica options that affect performance. For details about how to change local replica options using Command Control Interface, see the *Command Control Interface User and Reference Guide* or the *Command Control Interface Command Reference*.

This task cannot be performed using BCM.

Before you begin

- You must have the Storage Administrator (Local Copy) role.
- In CCI, use the **`raidcom modify local_replica_opt`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication**.
2. In the **Replication** window, click **Edit Options** > **Local Replication**.
3. In the **Edit Local Replica Options** window, complete the following steps:
   a. For **System Type**, verify that **Mainframe** is selected.

      The default setting is **Open**.

b. From the **SIMF/FCv2/FCSE System Options** table, select the system option you want to enable, and then click **Enable**.

4. Click **Finish**, and then confirm the settings.
5. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |
6. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
7. Click **Apply** to submit the task.

System options

Some ShadowImage options can be set by using Device Manager - Storage Navigator or Command Control Interface (local replica options), and some ShadowImage options can only be set by your service representative.

Options set by service representatives

The copy threshold option can only be set by your service representative. When you want to change the copy threshold option, please contact your service representative.

Option	Description
Copy Threshold	Temporarily stops copy operations when the workload of the storage system is heavy, and minimizes degradation of host I/O performance. This option is enabled only when the workload is heavy. When this option is set, the function is enabled for the following products: ▪ ShadowImage ▪ ShadowImage for Mainframe ▪ Compatible FlashCopy® V2 ▪ Thin Image ▪ Volume Migration

Options set by using Device Manager - Storage Navigator or Command Control Interface

You can set the following ShadowImage options by using Device Manager - Storage Navigator or Command Control Interface (CCI). For details about how to change system options using CCI, see the *Command Control Interface User and Reference Guide*.

No.	Default	Option	Description
1	OFF	Swap & Freeze	Saves ShadowImage data as is immediately after Quick Restore. Used with the Quick Restore, inhibits the update copy operation after Quick Restore, and the paired S-VOL in DUPLEX status is not updated and remains unchanged.
2	OFF	Host I/O Performance	Gives weight to host I/O responses rather than the copy time of a volume. This option controls SIz copy operations and improves host I/O responses. This option suppresses copy operations at any time regardless of workload.
20 21 22	OFF	Copy Pace Ext. Slower1 Copy Pace Ext. Slower2 Copy Pace Ext. None	Reducing the copy volume in the DUPLEX status curbs the influence to the I/O performance of the host server. This option is available to all SIz pairs in the DUPLEX status. The I/O performance of the host server is improved most effectively with Copy Pace Ext. None, followed by Copy Pace Ext. Slower2, and Copy Pace Ext. Slower1. Copy Pace Ext. None takes precedence over Copy Pace Ext. Slower2, and Copy Pace Ext. Slower2 takes precedence over Copy Pace Ext. Slower1. This function is enabled only when the pair status is DUPLEX. If the pair status is PENDING, SP-Pend/TRANS, V-Split/SUSPVS, Resync/PENDING and Resync-R/REVRSY, this function cannot reduce the impact on the host server's I/O performance.
24	ON	Quick/Steady Split Multiplexing (ShadowImage/ ShadowImage for Mainframe)	Accelerates SIz pair split. The number of jobs used for concurrent copy processing for each pair is changed from 1 to 24.
25	ON	Reverse Copy Multiplexing (ShadowImage/ ShadowImage for Mainframe)	Accelerates resynchronization (secondary to primary) of SIz pairs. The number of jobs used for concurrent copy processing for each pair is changed from 1 to 24.
26	ON	Normal Resync Multiplexing (ShadowImage/ ShadowImage for Mainframe)	Accelerates resynchronization (primary to secondary) of SIz pairs. The number of jobs used for concurrent copy processing for each pair is changed from 1 to 24.

Caution: The Host I/O Performance option suppresses copy processing, and prolongs the copy time. Also, if there is an SI pair, host I/O responses might not be improved. In this case, enable this option for both SI and SIz.

For details about how to set I/O Performance options using Command Control Interface, see the *Command Control Interface User and Reference Guide.*

Caution: Note the following when you use the Quick/Steady Split Multiplexing (ShadowImage/ShadowImage for Mainframe), Reverse Copy Multiplexing (ShadowImage/ShadowImage for Mainframe), and Normal Resync Multiplexing (ShadowImage/ShadowImage for Mainframe) options:

- The increase in copy volume, increases the amount of data to be written to the target volume.
- If the parity group (for example, physical disk) performance is less than the pair split or resync performance, the amount of data waiting to be written to cache memory (write pending ratio) may increase until it exceeds 60%, and the copy processing might be placed in the wait state. In such a case, consider the copy order to reduce the number of pairs for which copy processing is executed concurrently for volumes provisioned by the same parity group.
- If the number of volumes to be resynchronized or split increases, the maximum number of jobs for pair split or resynchronization that can execute concurrently for a pair decreases. In this case, when you split or resynchronize many pairs concurrently with this option set, the pair split or resynchronization performance might not be changed.
- The maximum number of copy operations that can be run concurrently is 128 (including the number for ShadowImage/ShadowImage for Mainframe). This number includes initial copying, resynchronization, update copying, and differential data copying. When copy operations other than pair split and resynchronization are running concurrently, if you set this option, the pair split or resynchronization performance might not be changed.
- The maximum number of pairs that can be copied concurrently in the background is 504. If the number of pairs being copied reaches 504, the next pair to be copied waits until one of the copy processing finishes.
- The Quick/Steady Split Multiplexing (ShadowImage/ShadowImage for Mainframe) option is enabled for Steady Split and Quick Split.
- Reverse Copy Multiplexing (ShadowImage/ShadowImage for Mainframe) is enabled for Reverse Copy.
- Normal Resync Multiplexing (ShadowImage/ShadowImage for Mainframe) is enabled for Normal Resync.

Note: When the Copy Pace Ext. None option is set, copy operation is not performed for the pair in the DUPLEX status and the synchronization rate during split operation might become lower. In this case, the V-Split/SUSPVS and SP-Pend/TRANS status during split operation might last longer. If this is a problem, perform either of or both the following actions:

- Minimize the time that the pair status is DUPLEX to avoid lowering the sychronization ratio in the DUPLEX status.
- Use this option to change the status to Copy Pace Ext. Slower1 or Copy Pace Ext. Slower2. If you select either of them, the write response might be larger than the one for Copy Pace Ext. None.

Tip:

Difference between the Host I/O Performance option and the Copy Pace Ext. options:

The Host I/O Performance option reduces the impact on host I/O by lowering the copy activity when a pair is in PENDING, DUPLEX, SP-Pend/TRANS, V-Split/SUSPVS, Resync/PENDING or Resync-R/REVRSY status.

The Copy Pace Ext. option reduces the impact on host I/O by lowering the copy activity when the pair is the DUPLEX status. These options can be set concurrently. If you set both options, you can benefit from both.

Chapter 5: Managing ShadowImage for Mainframe pairs

You can review information on ATTIME Suspend using Business Continuity Manager, information related to using HDvM - SN to complete SIz pair tasks, and for using CCI to split pairs by consistency group.

Workflow for managing ShadowImage for Mainframe pairs

During most pair tasks, the P-VOL remains available to the host for I/O operations. You must have the Storage Administrator (Local Copy) role to perform SIz pair tasks.

Complete the following steps to complete pair tasks:

1. Check the SIz pair status to determine if you can perform a task.
2. Create the SIz pairs.
3. (Optional) Suspend SIz pair creation.
4. (Optional) Suppress update copy operations during pair restoration.
5. Split the pairs. You can do the following:
   - Split SIz pairs.
   - Split SIz pairs in a CTG.
6. Resynchronize or restore the SIz pairs.
7. (Optional) If you have performed a Quick Resync on the pair (DUPLEX status), suppress copy processing.
8. Delete the unnecessary SIz pairs, which ends the pair relationship between the pair volumes.

It may be a long time before a ShadowImage for Mainframe copy operation starts, because differential tables are initialized for the relevant pairs, one pair at a time, before the copy operation starts. Especially when the pairs use a large volume of data, initialization can be a very long process.

Creating ShadowImage for Mainframe pairs

When you create a pair, the storage system performs an initial copy to copy data in the P-VOL to the S-VOL. You can create the SIz pair and immediately split the pair so that you can access the S-VOL. You can also create a cascaded pairs.

Creating an SIz pair causes the MP unit that is responsible for processing the P-VOL LDEV's I/O to assume processing responsibility for the S-VOL LDEV's I/O operations.

Workflow for creating ShadowImage for Mainframe pairs

Complete the following steps to create an SIz pair:

1. Select the volume that you want to duplicate. This becomes the primary volume (P-VOL).

   Note: In Device Manager - Storage Navigator (HDvM - SN), the source volume is called "P-VOL" and the destination volume is called "S-VOL."

   You cannot use volumes in use by SIz as destination volumes.

2. Identify the volume that will contain the copy. This becomes the secondary volume (S-VOL).

   If you are setting up pair configurations for SIz, specify the pair configuration settings (see Setting up pair configurations for ShadowImage for Mainframe (on page 58)).

3. Create the pair by associating the P-VOL and the S-VOLs (see Creating ShadowImage for Mainframe pairs in HDvM - SN (on page 53)).

   The storage system starts the initial copy (see Initial copy workflow (on page 16)).

4. (Optional) Suppress copy processing (see Suppressing update copy operations (on page 57)).

Considerations for creating ShadowImage for Mainframe pairs

Keep the following considerations in mind when creating SIz pairs:

- The P-VOL and S-VOL must be the same size in cylinders. If the capacity is displayed in GB or TB, a small difference between P-VOL and S-VOL capacity might not be displayed. To view the capacity in cylinders, click Options > Capacity Unit > Cyl in the Logical Devices window.
- If your storage system has encryption BEDs, you can copy an encrypted volume to an unencrypted volume. There is no guard logic to enforce copying encrypted P-VOLs to only encrypted S-VOLs. Unless there is a specific reason for the data to become unencrypted, make sure you maintain the encryption by using only encrypted S-VOLs.
- When you simultaneously create an L1 pair and an L2 pair, if you select Quick Split or Steady Split for Split Type in HDvM - SN or specify the **`-split`** command in CCI, the L2 pair split begins before the L1 pair status changes to PSUS. Because of this, the operation might fail.

- After creating a SI pair, if the number of pairs displayed in the summary section and the number of listed pairs in the HDvM - SN window are different, the configuration might be changed. Wait a while, and then select File > Refresh All to update the configuration information.
- Initial copy is performed with a maximum of 24 multiplicities (number of jobs for which concurrent copy can be performed) for each pair. However, if Steady Split or Quick Split is set as the split type, the multiplicity is set to 1. Because of this, the processing time becomes longer than when Non Split is set as the split type. In the Edit Local Replica Options window, if Quick/Steady Split Multiplexing (ShadowImage/ShadowImage for Mainframe) option is enabled, the maximum number of multiplexing becomes 24 even when Steady Split or Quick Split is set as the split type.

Creating ShadowImage for Mainframe pairs in HDvM - SN

Creating an SIz pair copies the P-VOL to the S-VOL.

You can perform this task using the **YKMAKE** command. For details, see the BCM documentation.

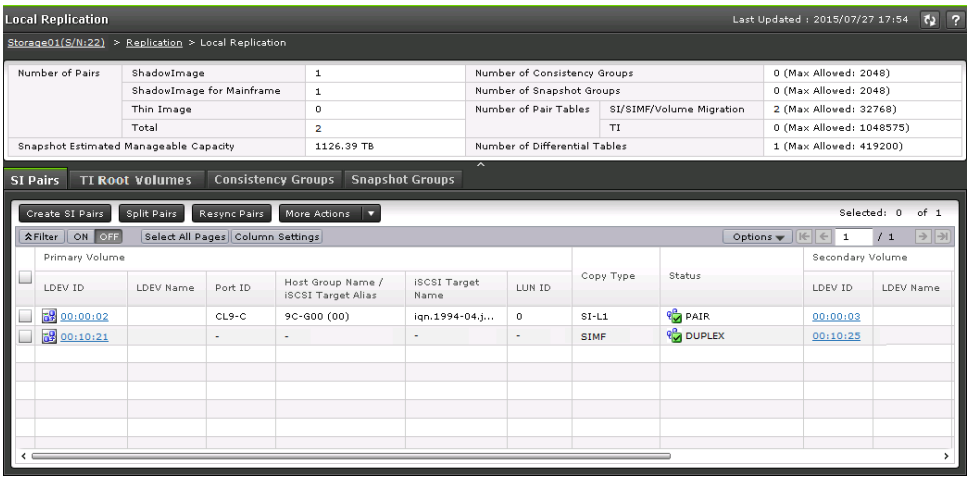
Before you begin

- You must have Storage Administrator (Local Copy) role.
- In CCI, use the paircreate command.
- The P-VOL and S-VOL must be unpaired.
- If the P-VOL is already paired with other S-VOLs (DUPLEX status), you have determined that the status of existing S-VOLs is the status that is required to create the new pair.

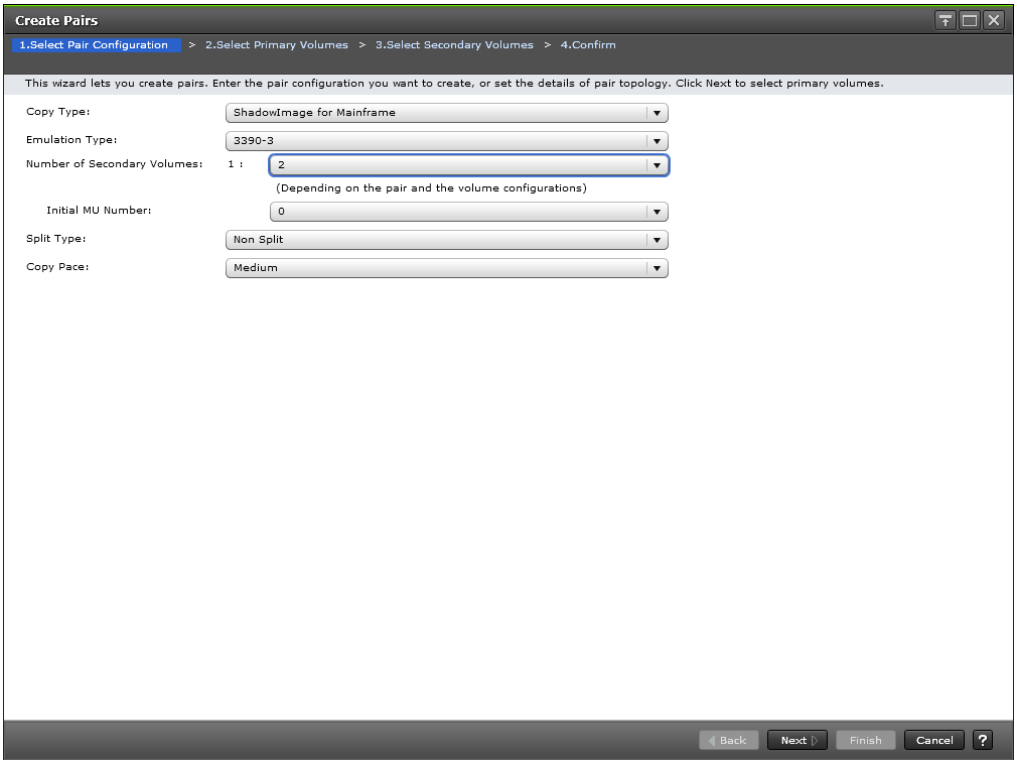
  For more information about S-VOL status, see Unaffected S-VOL status and pair tasks (on page 93) .
- If you are concerned with host I/O performance, make sure that the I/O load is light.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, click **Create SI Pairs**.



4. In the **Select Pair Configuration** window, complete the following steps, and then click **Next**:
   - For **Copy Type**, select **ShadowImage for Mainframe**.
   - For **Emulation Type**, select the emulation type.

     For more information about the emulation types that are supported, see Pair volumes and emulation types (on page 22).
   - For **Number of Secondary Volumes**, type the number of S-VOLs according to the P-VOL with the highest number of S-VOLs that you want to set up.

     For more information about how to configure pairs for SIz, see Setting up pair configurations for ShadowImage for Mainframe (on page 58).

- For **Initial MU Number**, select an initial MU number.
- For **Split Type**, select how you want to split the pair.

  Values:

  - **Non Split**: The pair is not split.

  - **Quick Split** (default): Splits the new pair, and then copies the data so that the S-VOL is immediately available for read and write I/O. The storage system copies the remaining differential data to the S-VOL in the background.

  - **Steady Split**: Copies the differential data to the S-VOL, and then splits the new pair.
- For **Copy Pace**, select the rate at which you want the storage system to copy data.

  Values:

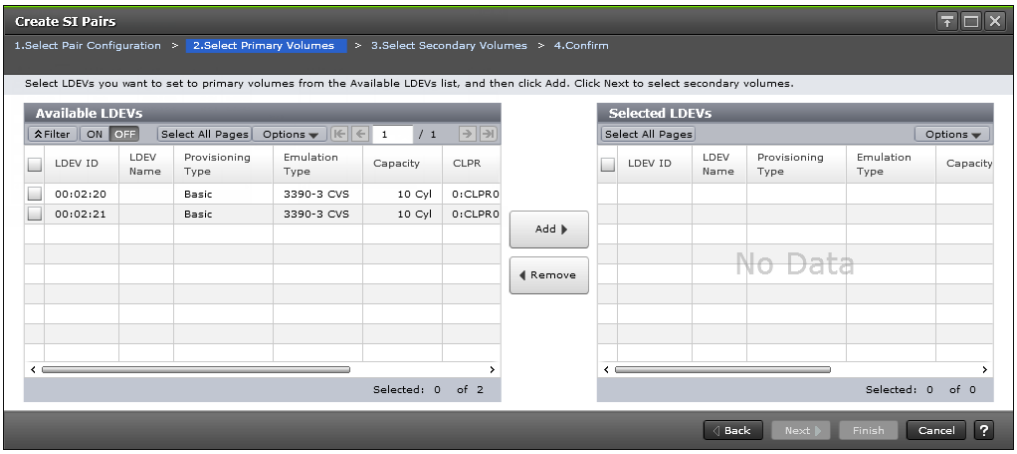
  - **Slower**: Improved host I/O performance but slower processing speed.

  - **Medium** (default): Average processing speed and host I/O performance.

  - **Faster**: Faster processing speed but slower host I/O performance.

  Note: The pace you select affects processing speed and host I/O performance.

  For more information about performance, see Performance planning for ShadowImage for Mainframe (on page 27).

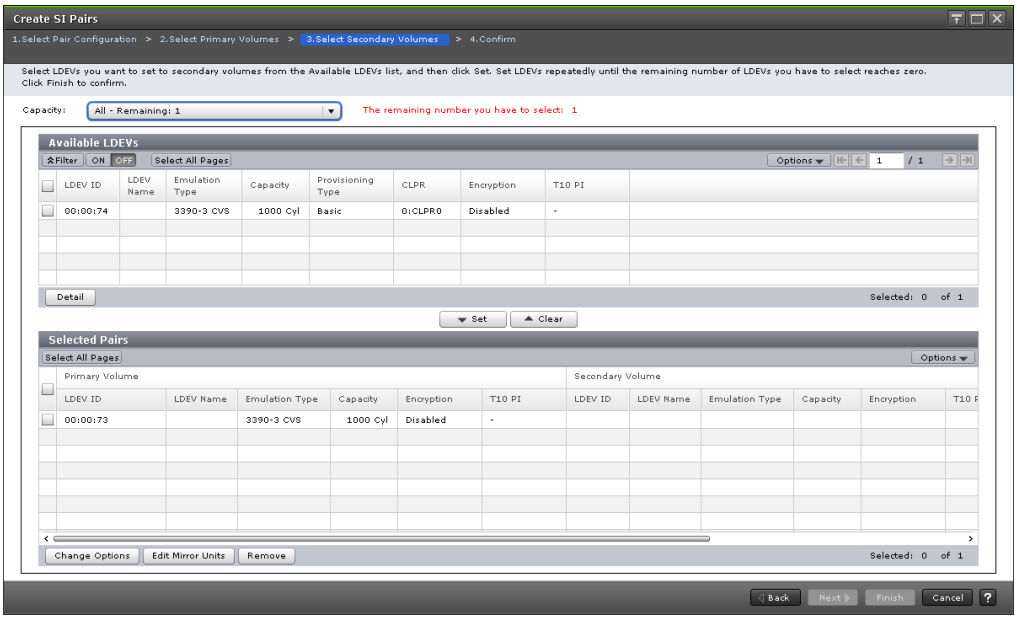


5. In the **Select Primary Volumes** window of the **Create SI Pairs** wizard, complete the following steps:
   a. In the **Available LDEVs** table, select one or more LDEVs you want to be P-VOLs, and then click **Add**.

      Note: nondisruptive migration volumes do not appear in the **Available LDEVs** table.

      Selected LDEVs are moved to the **Selected LDEVs** table.

   b. Click **Next**.



6. In the **Select Secondary Volumes** window of the **Create SI Pairs** wizard, assign LDEVs as S-VOLs to the specified P-VOL LDEVs.

   - If you specified one P-VOL, select a secondary LDEV from the **Available LDEVs** table, and click **Set**. Repeat this step to assign additional S-VOLs.
   - If you specified multiple P-VOLs, select an LDEV from the **Available LDEVs** table, select a P-VOL LDEV from the **Selected Pairs** table, and then click **Set**. Repeat this step as many times as needed to make all your pairings.
   - If you do not select a P-VOL from the **Selected Pairs** table, the S-VOL you select and set is assigned to P-VOLs in the order they are listed in the table.

   After an S-VOL is selected, you can also perform the following optional steps:

   - To sort the **Available LDEVs** and **Selected Pairs** tables according to the capacity, choose a capacity item for **Capacity**.

     The remaining number you have to select refers to the P-VOLs that do not have an assigned S-VOL, as seen in the **Selected Pairs** table.
   - To change the split type and the rate at which data is copied, which applies to all new pairs, change the pair options (see Changing ShadowImage for Mainframe pair options (on page 60)).
   - To change MU numbers, complete the following steps:

     a. Select the line for the LDEV in the **Selected Pairs** table.

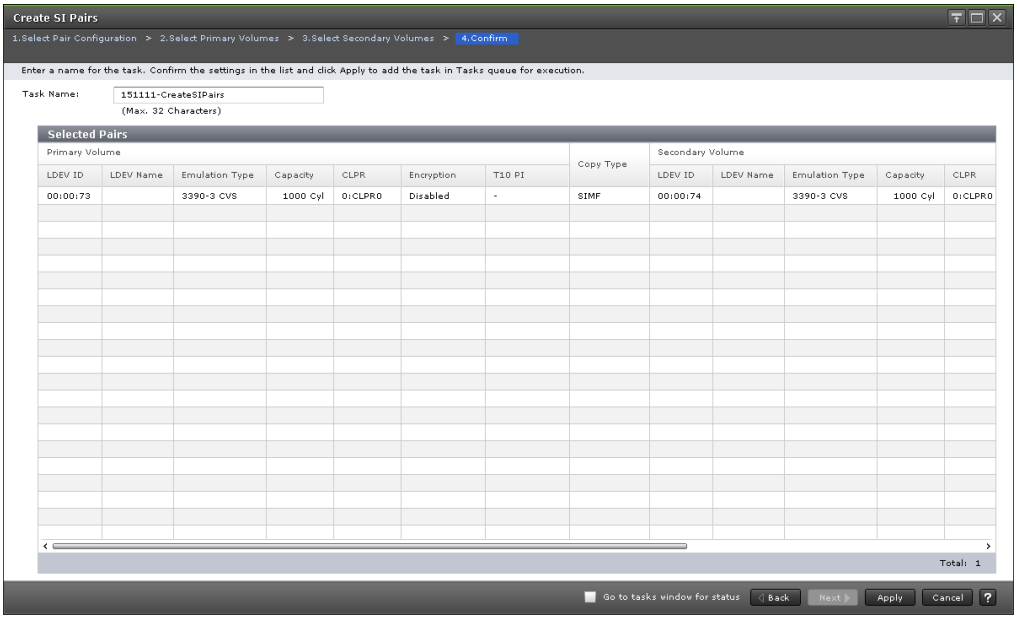
     b. Click **Edit Mirror Units**.

     c. In the **Edit Mirror Units** dialog box, specify the S-VOL's L1mirror unit number, and click **OK**.

- Change the pair options (see Changing ShadowImage for Mainframe pair options (on page 60)).
- To remove an unwanted LDEV or pair from the **Selected Pairs** table, select the line for the LDEV or pair you want to remove and click **Remove**.

  For more information about removing rows to alter pair configuration, see Setting up pair configurations for ShadowImage for Mainframe (on page 58) .

7. Click **Finish**, and then confirm the settings.



8. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |

9. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
10. Click **Apply** to submit the task.

    The SIz pair is created and the status is PAIR.

Suppressing update copy operations

You can suppress update copy operations after you create pairs. Suppressing update copy operations keeps the P-VOL and S-VOL unsynchronized and reduces the effect on host I/O performance.

This task cannot be performed using BCM.

Before you begin

The pair status is DUPLEX.

Procedure

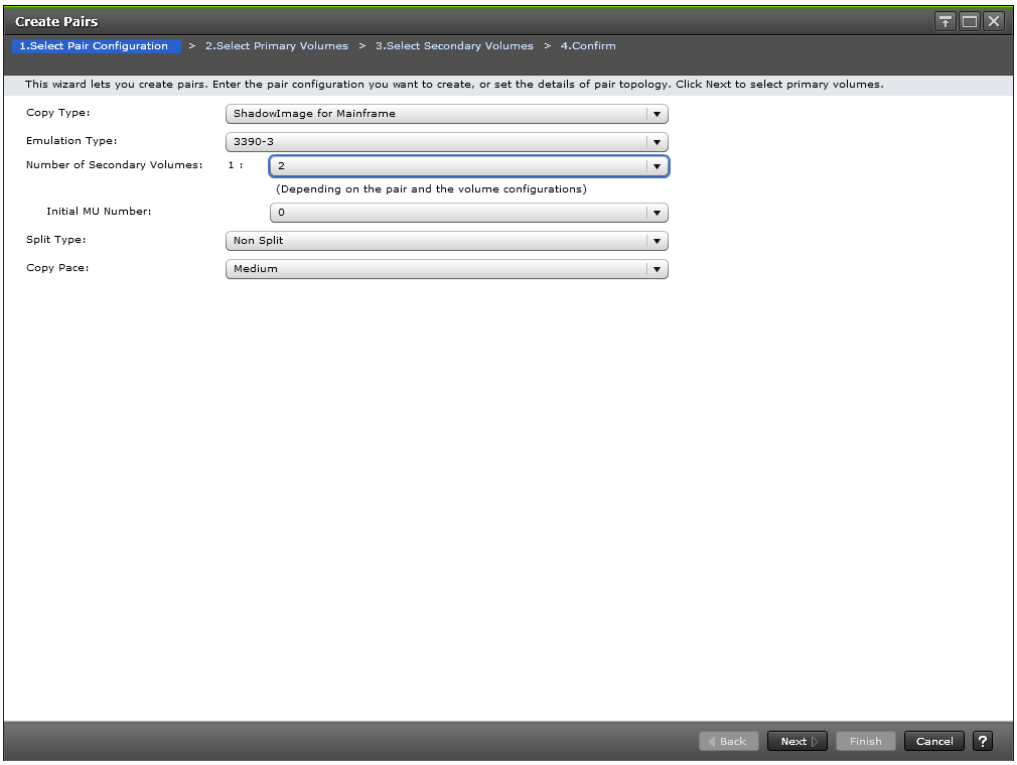
1. Enable the **Swap & Freeze** system option.

Setting up pair configurations for ShadowImage for Mainframe

Procedure

1. Create pairs with different numbers of S-VOLs.

   Open the **Select Pair Configuration** window of the **Create Pairs** wizard.



   For **Number of Secondary Volumes**, select the number according to the pair with the highest number of S-VOLs, even when some pairs do not have many S-VOLs.

2. Remove the unwanted volumes.

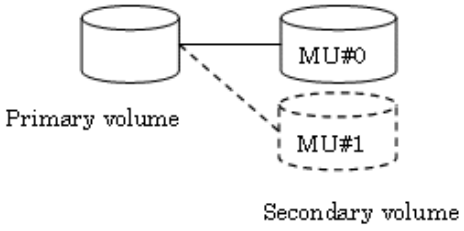
Example 1

If you want to create a pair using one P-VOL and one S-VOL, set the Number of Secondary Volumes to 1.

If you want to use one P-VOL and three S-VOLs (the maximum), set the Number of Secondary Volumes to 3.

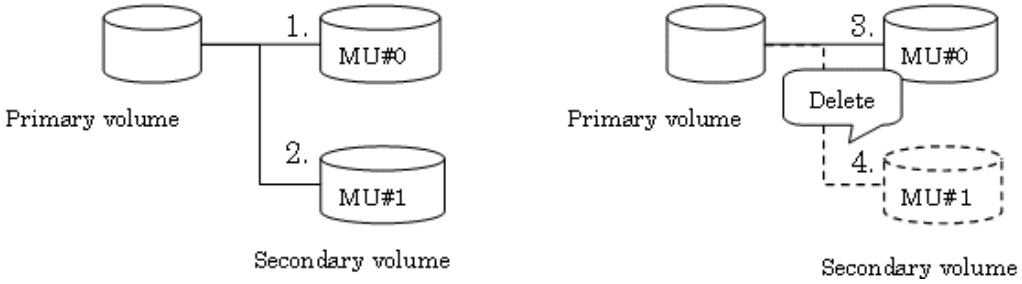
Example 2

If you want to add a new S-VOL to an existing pair, as illustrated in the following image, select 2 for Number of Secondary Volumes.



Example 3

If you want to create one pair with two S-VOLs, and another pair with one S-VOL at the same time, set the Number of Secondary Volumes at 2. In this case, the system operates as if you are creating two pairs, each having two S-VOLs.

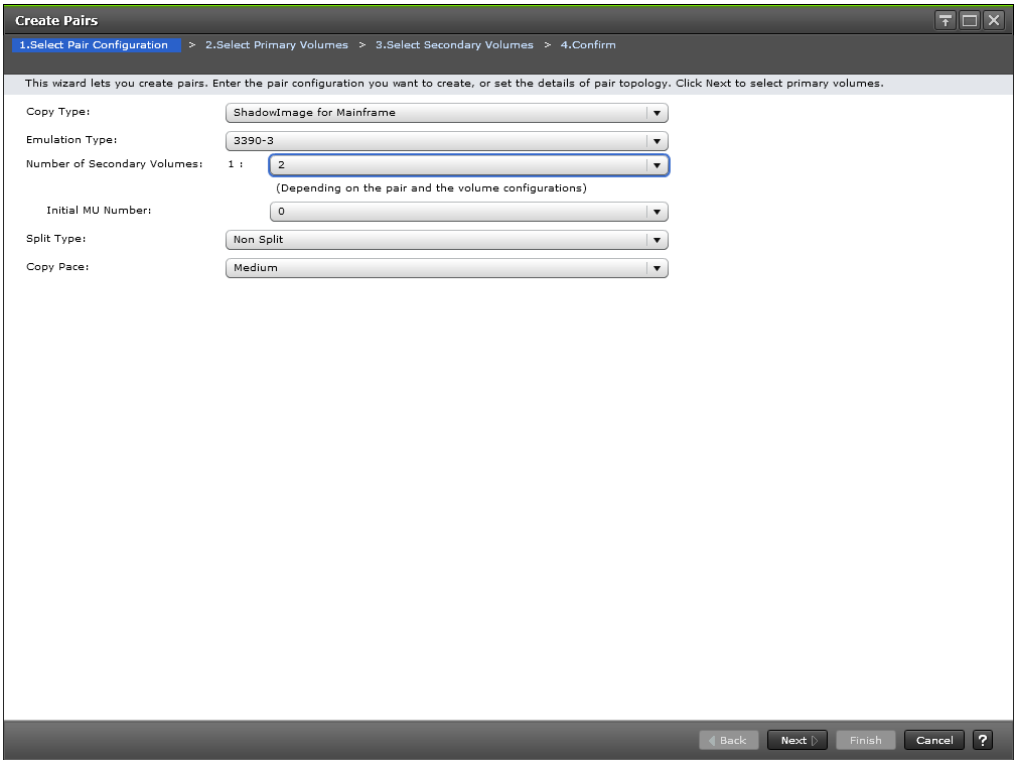


Creating pairs with different numbers of S-VOLs

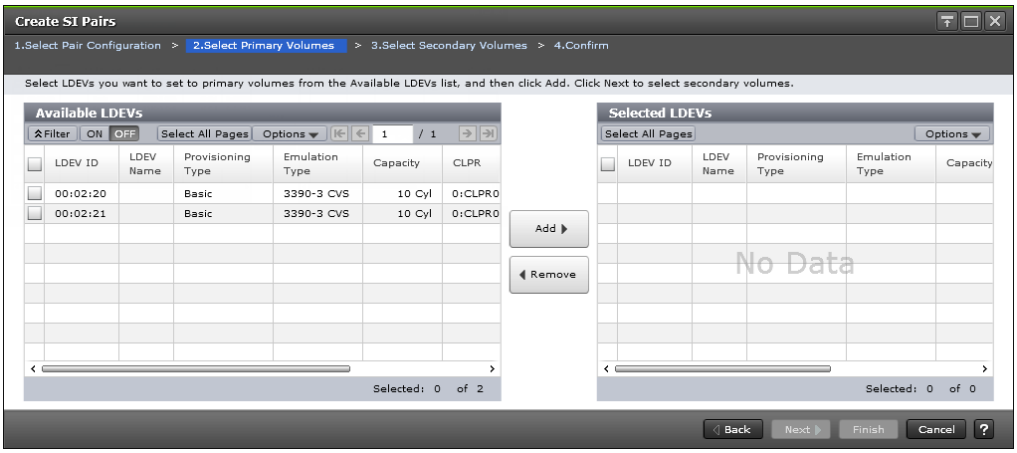
Use this procedure to simultaneously create one pair with two S-VOLs, and another pair with one S-VOL.

Procedure

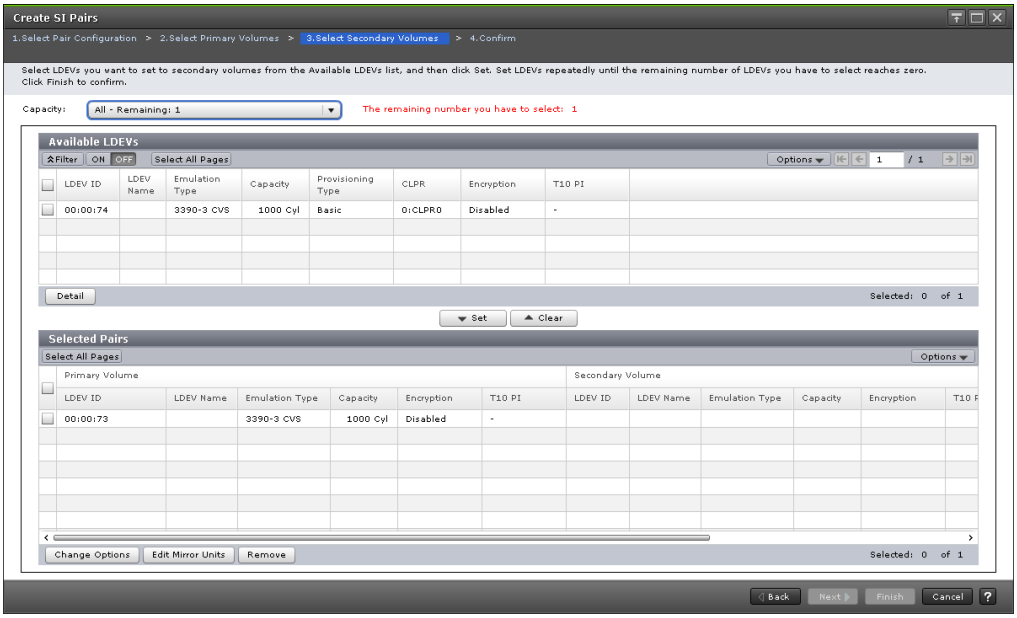
1. Open the **Select Pair Configuration** window of the **Create Pairs** wizard.



2. For **Number of Secondary Volumes**, select 2, and then click **Next**. It is assumed that you are creating two pairs, each having two S-VOLs.



3. In the **Select Primary Volumes** window of the **Create SI Pairs** wizard, select the two LDEVs you want to use as the P-VOLs, and then click **Next**.



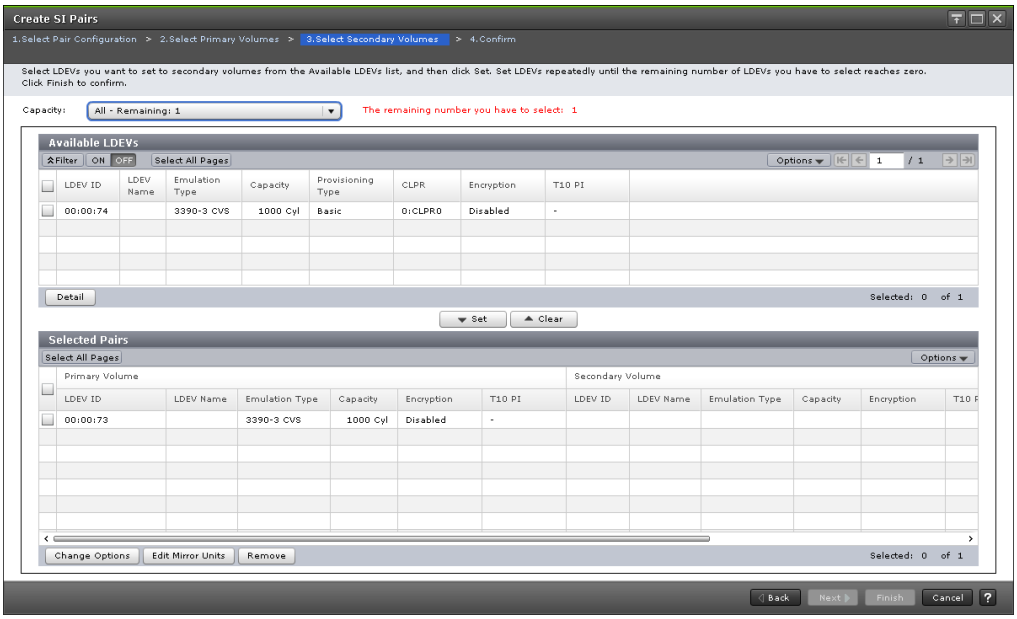
4. In the **Select Secondary Volumes** window of the **Create SI Pairs** wizard, complete the following steps, and then click **Next**:
   a. In the **Available LDEVs** table, select the three LDEVs you want to use as the S-VOLs for the pairs and click **Set**.
   b. In the **Selected Pairs** table, remove the unwanted LDEV.

Changing ShadowImage for Mainframe pair options

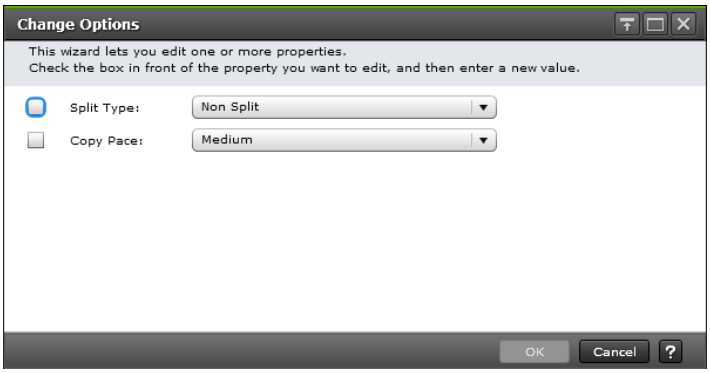
You can change the default setting for the Split Type and Copy Pace system options for all new pairs that you create.

Procedure

1. Open the **Select Secondary Volumes** window of the **Create SI Pairs** wizard.



2. In the **Select Secondary Volumes** window of the **Create SI Pairs** wizard, click **Change Options**.



3. In the **Change Options** dialog box, complete the following steps, and then click **OK**:
   - For **Split Type**, select a split type.

     Values:

     - **Non Split** (default): The pair is not split.
     - **Quick Split**: The pair is split, and then the differential data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background.
     - **Steady Split**: Differential data is copied, and then the pair is split.
   - For **Copy Pace**, select the rate at which you want the storage system to copy data.

     Values:

     - **Slower**: Improved host I/O performance but slower processing speed.
     - **Medium** (default): Average processing speed and host I/O performance.
     - **Faster**: Faster processing speed but slower host I/O performance.

Splitting ShadowImage for Mainframe pairs

Splitting an SIz pair suspends the pairing of the P-VOL and S-VOLs until a resync or delete operation is performed. Host updates to the P-VOL continue and are tracked as delta tracks in the bitmap. The S-VOL data is available and can be accessed.

Splitting an SIz pair ensures data consistency and that the data in the S-VOL at the time of the split is usable. The S-VOL contains a mirror image of the original volume at that point in time, and it is available for read/write access by secondary host applications.

The P-VOL for a split pair continues to be updated, but the S-VOL remains unchanged. The differential data that accrues while the pair is split is stored in the differential bitmaps. Changes to the P-VOL and S-VOLs are managed in these differential bitmaps. The differential data accrues until you resynchronize the pair, which copies the differential data to the S-VOL.

If you have assigned an SIz P-VOL or S-VOL to a volume reserved for Volume Migration, splitting the volume cancels migration.

If you are splitting SIz pairs with shared TCz or URz volumes, see the restrictions (see Requirements_ restrictions_ and guidelines for using consistency group pair-split with shared volumes (on page 69)).

If you are sharing SIz S-VOLs with URz P-VOLs and the R-JNL has a timeout period that ends after the split time, the storage system might not detect the journal data. In this case, the SIz split operation runs after the timeout period.

You set the timeout value according to your requirements.

Default: 6 hours

For more information about the timeout period, see the *Hitachi Business Continuity Manager User Guide*.

Pair splitting methods

By default, for pair split (Non Split, Steady Split, or Quick Split), the maximum multiple copy processing for each pair is set to 24. However, if you set the Quick/Steady Split Multiplexing option of the local replica option to OFF, the multiplicity can be changed to 1. Make sure to set the Quick/Steady Split Multiplexing option to OFF if the host I/O performance is prioritized. The local replica options can be set using HDvM - SN or CCI.

You can use one of the following methods to split pairs:

HDvM - SN	CCI	Description
Non Split	**paircreate**	Pairs are not split after they are created.
Steady Split	**paircreate –split -fq normal**	When copy of all differential data completes, the pairs are split.
Quick Split	**paircreate –split -fq quick**	Split all pairs in a consistency group in a batch. PPRC, Business Continuity Manager, or CCI is required to split pairs. PPRC: The splitting operation is the same as the one for Quick Split. Steady Split cannot be specified. Business Continuity Manager: The time for splitting pairs cannot be specified. CCI: Both Steady Split and Quick Split can be specified. For details, see the *Command Control Interface User and Reference Guide*.
-	**paircreate –g <group> -m grp [CTG ID]**	Split all pairs in a consistency group at one time. CCI is required for this operation. For details, see the *Command Control Interface User and Reference Guide*.

Splitting ShadowImage for Mainframe pairs

You can perform this task using the **YKSUSPND** command. For details, see the BCM documentation.

Before you begin

- You must have Storage Administrator (Local Copy) role.
- In CCI, use the **pairsplit** command.

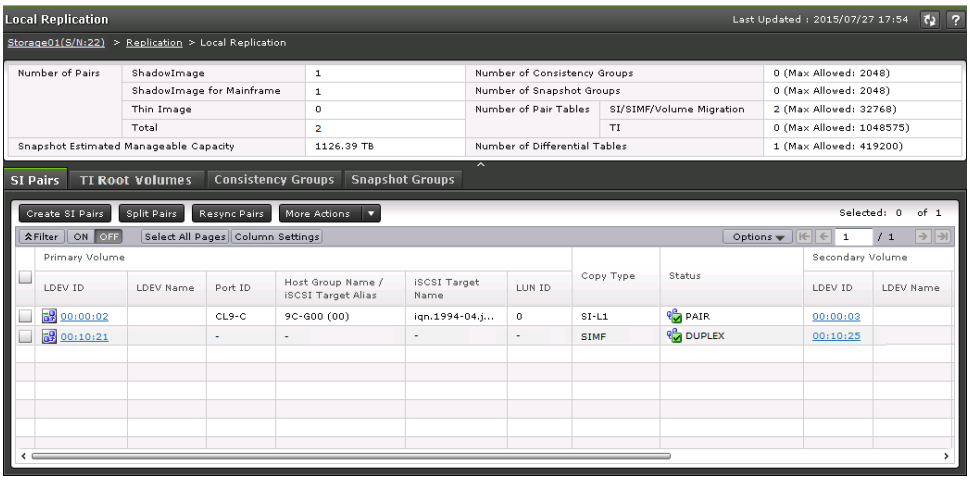
- If you split a pair when there are write I/Os to multiple tracks on the P-VOL, only some of the write I/Os may be written to the S-VOL. To ensure that all write I/Os are written to the S-VOL, stop I/Os to the P-VOL before splitting the pair. You can maintain data consistency of the S-VOL (maintain the order in which data is written to the S-VOL) by using a consistency group pair-split to split a pair, or by stopping all I/Os to the P-VOL before splitting the pair. If you want to use the YKFREEZE command to stop I/Os, run the command, wait for the I/Os processed before the command was received to complete, and then split the SIz pair. For the wait time to specify using the command, use a value shorter than the MIH value of the host.
- P-VOL data and S-VOL data are synchronized when the pair status changes from SP-Pend/TRANS or V-Split/SUSPVS to Split/SUSPOP. Because SIz update copy is performed asynchronously, it takes some time before the pair status changes.

  To ensure data consistency in the P-VOL and the S-VOL after a split, stop write I/Os from the host to the P-VOL in advance. By this method, you can keep the P-VOL from being updated during a split, and ensure data consistency between the P-VOL and the S-VOL.
- The pair status must be one of the following:
  - If you are splitting an existing pair, the pair status must be DUPLEX or PENDING.
  - If you are creating and then immediately splitting a pair, the volumes are unpaired (SIMPLEX).
  - The status of all pairs in a CTG that you want to Quick Split must be DUPLEX.
- To split pairs quickly, stop host access to the P-VOL before splitting the pairs.
- Check the I/O load to verify that it will not affect host performance.

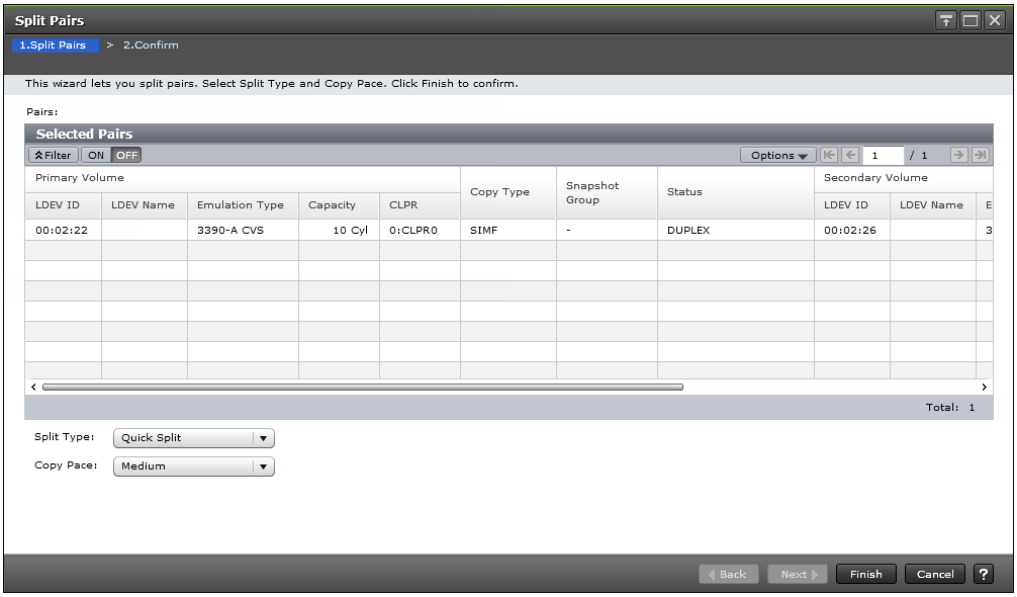
  For more information about checking I/O performance, see the *System Administrator Guide*.
- If you split a pair during initial copy, the initial copy operation is canceled, and it is performed again after the split. For initial copy, the maximum copying multiplicity (the number of jobs used for concurrent copy processing) for each pair is 24, but the number might change to 1 after the split. As a result, if you split a pair during initial copy, copy processing might take longer than splitting a pair after initial copy completes.
- The copy processing to split a pair requires some time to check if the differential data exists even if there is no differential data. The amount of time to check the differential data takes longer as the volume capacity increases, and it might take 10 minutes or more for 256 TB.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, select the pair you want to split, and then click **Split Pairs**.



4. In the **Split Pairs** window of the **Split Pairs** wizard, complete the following steps:
   - For **Split Type**, select the split type.

     Values:

     - **Quick Split** (default): Splits the new pair, and then copies the data so that the S-VOL is immediately available for read and write I/O. The storage system copies the remaining differential data to the S-VOL in the background.

     - **Steady Split**: Copies the differential data to the S-VOL, and then splits the new pair.

     For more information about the methods you can use to split pairs, see Pair splitting methods (on page 62).
   - For **Copy Pace**, select the rate at which you want the storage system to copy data.

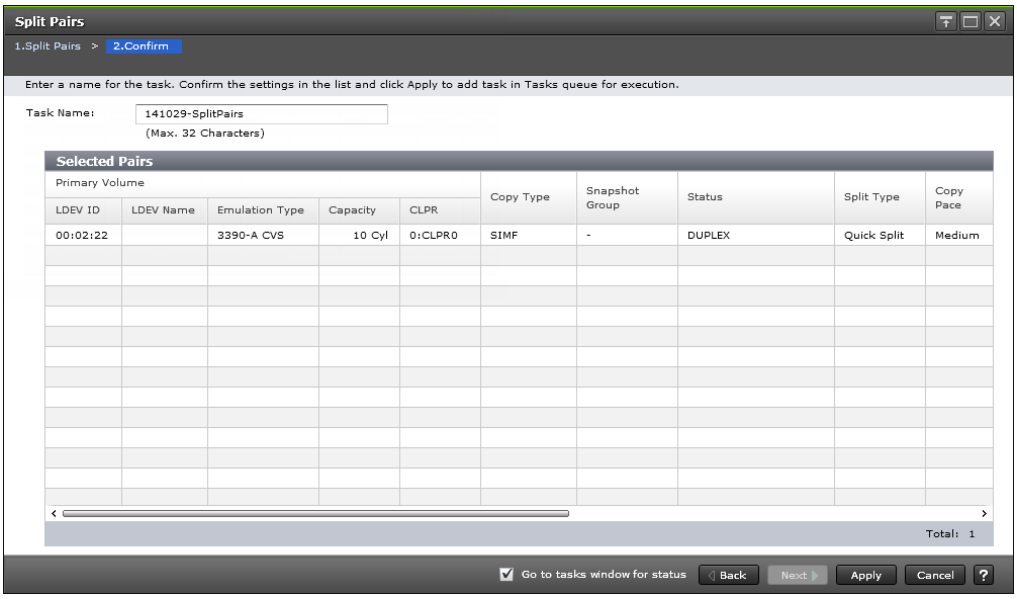
     Values:

     - **Slower**: Improved host I/O performance but slower processing speed.

     - **Medium** (default): Average processing speed and host I/O performance.

     - **Faster**: Faster processing speed but slower host I/O performance.

     > **Note:** The pace you select affects processing speed and host I/O performance.
     >
     > For more information about performance, see Performance planning for ShadowImage for Mainframe (on page 27).
5. Click **Finish**, and then confirm the settings.



6. Accept the default task name or enter a unique name.
   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |

7. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
8. Click **Apply** to submit the task.

   The SIz pair is split and the pair status changes from V-Split/SUSPVS or SP-Pend/TRANS to Split/SUSPOP. The snapshot data is consistent with the P-VOL data and is ready to use in SIz pair tasks.

Using consistency groups to split pairs

A consistency group (CTG) lets you perform tasks and change pair status on a group of SIz pairs. With CTG pair-split, you can simultaneously split all of the pairs in a CTG.

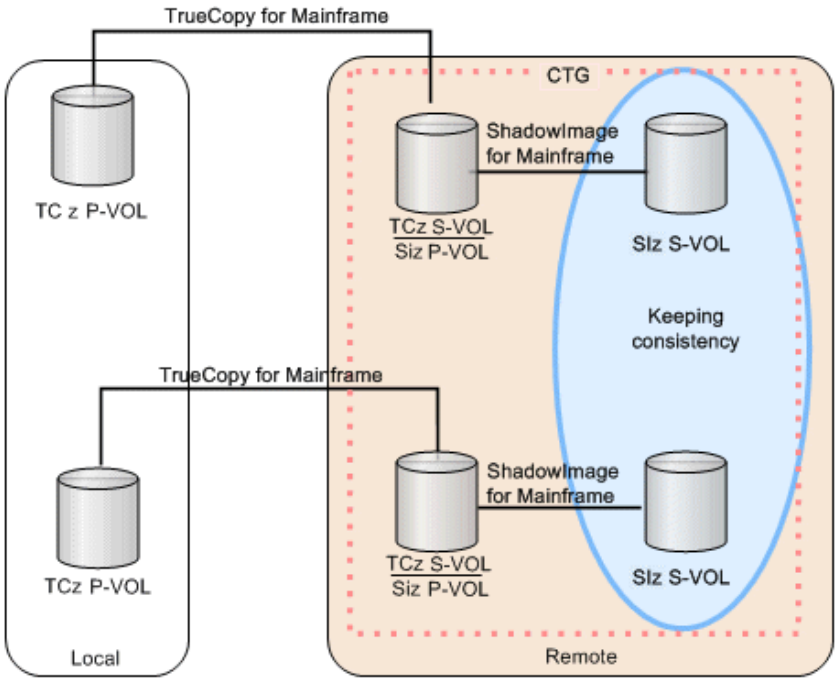
Using consistency group pair-split with shared volumes

If you share SIz P-VOLs in a storage system with TCz or URz S-VOLs, you can use consistency group (CTG) pair-split to keep SIz S-VOLs consistent.

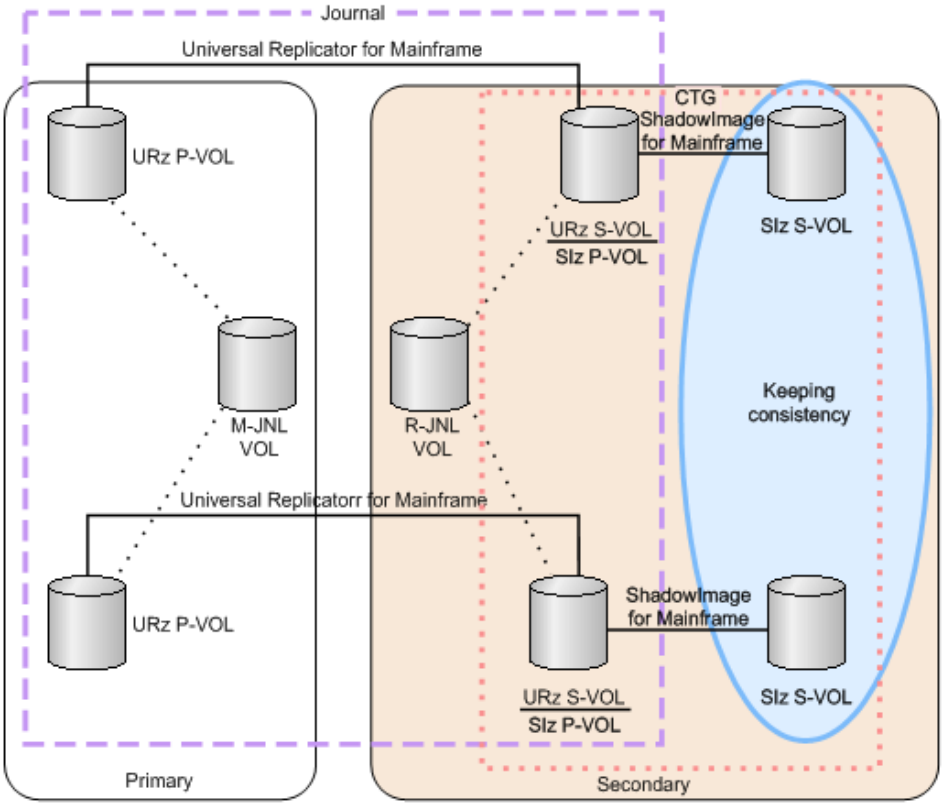
When an SIz P-VOL shares a URz or TCz S-VOL to create pairs, you can assign the same CTG ID to the SIz pairs in order to use the CTG pair-split function to maintain consistency among the SIz S-VOLs.

Note: Consistency among the SIz P-VOL, URz S-VOLs, and TCz S-VOLs can be maintained only if the volumes have the same status, and consistency with URz S-VOLs can be maintained only if the volumes are registered in the same journal.

The following image illustrates CTG pair-split with TCz.



The following image illustrates CTG pair-split with URz.



When you perform a CTG pair-split on shared URz P-VOLs, the following operations occur:

1. URz restores the journal data that was created before you restored the split time to URz S-VOLs (SIz P-VOLs).

   Note: If an SIz pair is suspended due to a failure, the split time and the actual task start time must be the same in order to restore URz journal data that you created before the split time to the URz/SIz volume after the split. The task start time is determined by the amount of journal data in the journal volume at the time of the split.

   For example, if the journal volume contains data that needs one hour to be restored, the starting time of the split operation delays for an hour.

2. URz detects restore journal (R-JNL) data with a time stamp later than the registered split time and suspends R-JNL operations.
3. The SIz pair is split.
4. URz resumes the suspended R-JNL operations.

Workflow for splitting pairs in a consistency group

You can use consistency group (CTG) pair-split to simultaneously split all the SIz pairs in a CTG. If you use Business Continuity Manager (BCM), you can also use ATTIME Suspend to split the pairs at a specified time. If you use CCI or IBM PPRC commands, you can simultaneously split the pairs in a CTG, but without time specification.

Procedure

1. Define a CTG to which you want to assign the SIz pairs using BCM, IBM PPRC, or CCI.
2. Verify that all the SIz pairs you want to be consistent are assigned to the same SIz CTG.
3. Use the ATTIME Suspend feature and use BCM to register the split time for the SIz CTG to indicate the time when you want to mirror the P-VOL data in the S-VOL.

   For more information about registering split times, see the *Hitachi Business Continuity Manager User Guide*.

   The split type changes to **Quick Split** and the SIz pairs are simultaneously split at the scheduled time. The registered split time remains in the storage system after the SIz pairs have been split. You can register a new split time.

   Note: When the scheduled operation is in a secondary storage system, discontinuing use of the secondary storage system or turning off its power cancels the pair-split operation.
4. If the pair-split operation fails, troubleshoot CTG pair-split failures (see Consistency group pair-split failures (on page 104)).
5. If you have specified a split time and you are splitting pairs with shared volumes, complete the following steps:
   a. Delete the split time for the SIz pair that has an S-VOL related to the R-JNL.
   b. Restore the pair.

      - If you are using HDvM - SN, see Workflow for restoring ShadowImage for Mainframe pairs (on page 77) .

      - If you are using CCI, use the **`pairresync -restore`** command on the URz pair. For more information about this command, see the *Command Control Interface User and Reference Guide*.
6. Create the pairs.

Requirements, restrictions, and guidelines for using consistency group pair-split with shared volumes

You can share SIz P-VOLs with TCz or URz S-VOLs but there are requirements, restrictions, and guidelines for using consistency group (CTG) pair-split in these cases.

Requirements

If you are sharing SIz P-VOLs with TCz or URz S-VOLs, CTG pair-split has the following requirements:

- All pair operations must be performed using CCI, Business Continuity Manager (BCM), or IBM PPRC commands. The examples in this manual assume you are using BCM.
- You must share SIz P-VOLs with the TCz or URz S-VOLs.
- The TCz or URz S-VOLs that you are sharing with the SIz CTG pairs must have the same status.

- If you are sharing SIz volumes with URz volumes, the pair status must be the following:
  - (For URz) DUPLEX.
  - (For SIz) DUPLEX or PENDING.
- If you are sharing SIz volumes with TCz volumes, the pair status must be the following:
  - (For TCz) DUPLEX, "Suspended S-VOL by operator", or Suspend/SUSPER.
  - (For SIz) DUPLEX or PENDING.

Restrictions

If you are sharing SIz P-VOLs with TCz or URz S-VOLs, CTG pair-split has the following restrictions:

- You can perform one split operation for each SIz CTG.
- You can:
  - Split each URz journal up to three times (equivalent to three SIz CTGs).
  - Quick Split or Steady Split the pairs.

    For more information about the methods you can use to split pairs, see Pair splitting methods (on page 62).

Guidelines

If you are sharing SIz P-VOLs with TCz or URz S-VOLs, use the following guidelines when performing a CTG pair-split:

- Make sure that the SIz S-VOLs are in a consistent state.

  For more information about maintaining consistent backups of volumes, see Maintaining consistent ShadowImage for Mainframe secondary volume backups (on page 73).
- Ensure that all SIz pairs in the CTG are in DUPLEX or PENDING status.

  Note: If you share SIz pair P-VOLs with URz S-VOLs and you include SIz pairs in a status other than DUPLEX or PENDING in the CTG, you cannot maintain SIz S-VOL consistency.

Restrictions for consistency group pair-split

Consistency group (CTG) pair-split has the following restrictions:

- To perform a CTG pair-split on SIz pairs, the pairs must have been created using BCM, IBM PPRC, or CCI. You cannot use CTG pair-split if the pairs were created using the HDvM - SN.
- To perform a CTG pair-split more than once, the status of all pairs in the CTG must have changed to the status specified by the BCM **`YKEWAIT`** command.

  For more information about this command, see the *Hitachi Business Continuity Manager User Guide*.

Supported pair statuses for consistency group pair-split

The pair status for all of the SIz pairs in the CTG determines if you can perform a consistency group (CTG) pair-split. If all of the SIz pairs in the CTG are paired (DUPLEX status), you can perform a CTG pair-split.

The following table describes when you can perform a CTG pair-split, based on the SIz pairs in the CTG that are not paired (a status other than DUPLEX), and the resulting pair status after you perform the pair-split.

The status of the pairs in the CTG that have a status other than DUPLEX	Can you perform a CTG pair-split?	Status after you perform a CTG pair-split
PENDING	YES	Split/SUSPOP
SP-Pend/TRANS	YES[2]	Split/SUSPOP
V-Split/SUSPVS	YES[2]	Split/SUSPOP
Split/SUSPOP	YES[2]	Split/SUSPOP
Resync/PENDING	NO The command ends abnormally and shows the following information: `[EX_CMDRJE] An order to the control/command device was rejected`[1]	The pair statuses remain the same.
Resync-R/REVRSY	NO The command ends abnormally and shows the following information: `[EX_CMDRJE] An order to the control/command device was rejected`[1]	The pair statuses remain the same.
Suspend/SUSPER	NO The command ends abnormally and shows the following information: `[EX_CMDRJE] An order to the control/command device was rejected`	The pair statuses remain the same.
Notes:		

The status of the pairs in the CTG that have a status other than DUPLEX	Can you perform a CTG pair-split?	Status after you perform a CTG pair-split
1. If you share a URz S-VOL and an SIz P-VOL, the command might end normally after you perform a CTG pair-split. Ensure the status of the pairs within the CTG have changed to Split/SUSPOP (use the **`pairdisplay`** command). **2.** Consistency is guaranteed only for SIz pairs in DUPLEX or PENDING status.		

The following are examples of when you can perform a CTG pair-split based on status of the SIz pairs in the CTG:

- Example 1

  The are six SIz pairs in a CTG. Two of the pairs are paired (DUPLEX status), two are in PENDING status, and two are in Split/SUSPOP status. In this case, you can perform a CTG pair-split, and doing so changes the status of all of the pairs in the CTG to Split/SUSPOP. However, the S-VOLs that were in Split/SUSPOP might not be consistent with the other volumes in the CTG.

- Example 2

  There are two SIz pairs in a CTG and one is paired (DUPLEX status) and the other is in the process of being resynchronized (Resync/PENDING status). In this case, you cannot perform a CTG pair-split.

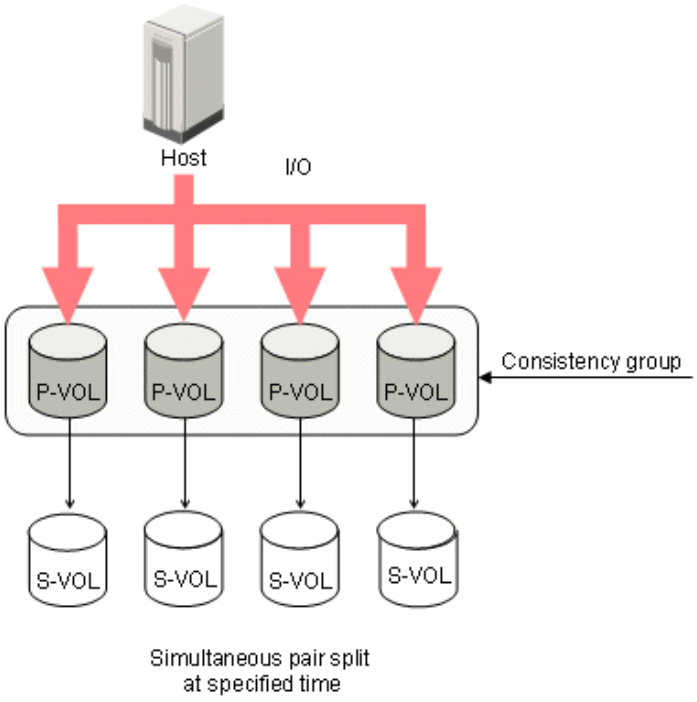
- Example 3

  The are six SIz pairs in a CTG. Two of the pairs are paired (DUPLEX status), two are in the process of Quick Split (V-Split/SUSPVS status), and two are in Suspend/SUSPER status. In this case, the CTG pair-split ends abnormally and the status of all of the pairs in the CTG remains the same.

Using ATTIME Suspend to split consistency group pairs

With ATTIME Suspend (sometimes referred to as ATTIME Split), you can define a specific time to simultaneously split all the pairs in a consistency group (CTG) and copy data from the P-VOLs to the S-VOLs.

The following image illustrates the use of ATTIME Suspend.



Maintaining consistent ShadowImage for Mainframe secondary volume backups

If you are sharing SIz P-VOLs with TCz or URz S-VOLs, use the following procedure to maintain a consistent backup of SIz S-VOLs:

Procedure

1. Assign URz pairs to the same journal group.

   For more information about assigning SIz pairs to journals, see the *Hitachi Universal Replicator for Mainframe User Guide*.
2. Register the journal group data volumes in an SIz CTG that is not already being used.

Registering new split times for ShadowImage for Mainframe consistency groups

If you have registered a split time for the SIz CTG, you must delete the split time before you can add, resume, or suspend pairs from BCM. To prevent the TCz command to resume split pairs from being rejected, pair the SIz volumes (DUPLEX status) before resuming the pairs that you have split (Split/SUSPOP status).

Complete the following steps to register a new split time for the SIz CTG:

Procedure

1. Delete the current registered split time.
2. Register the new split time.

Result

For more information about registering split times, see the *Hitachi Business Continuity Manager User Guide*.

Resynchronizing ShadowImage for Mainframe pairs

You can resynchronize split (Split/SUSPOP status) or suspend (Suspend/SUSPER status) pairs. Resynchronization changes the status of the split volume pairs to DUPLEX. Resynchronizing a split pair copies the P-VOL's differential data to the S-VOL and again pairs the S-VOL with the P-VOL. Resynchronizing a suspended pair copies the entire P-VOL to the S-VOL and takes the same amount of time as the initial copy operation.

Note: Resynchronizing a pair does not ensure data consistency. Data in the two volumes is consistent only if the following conditions exist:

- The P-VOL is offline.
- The pair is split (the S-VOL status is Split/SUSPOP).

  For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).

Note: If you perform a Quick Restore for a pair consisting of an encrypted volume and an unencrypted volume, the encryption statuses of the volumes are reversed.

Types of pair resynchronization

You can forward or reverse resynchronize pairs. A forward resynchronization resynchronizes from the P-VOL to the S-VOL. A reverse resynchronization restores pairs by resynchronizing from the S-VOL to the P-VOL.

Forward resynchronization

You can use one of the following methods to forward resynchronize pairs:

- Normal Copy (Primary > Secondary): A full forward resynchronization from the P-VOL to the S-VOL. During a Normal Copy, only the P-VOL is accessible to hosts for read/write operations.
- Quick Resync (Primary > Secondary): A forward resynchronization from the P-VOL to the S-VOL where data is not copied or resynchronized. The volumes are paired (DUPLEX status*). The update copy operation copies the differential data to the S-VOL.

  *The pair status changes to Resync/PENDING first, and then it changes to DUPLEX.

  During a Quick Resync, the P-VOL is accessible to hosts for read/write operations. The S-VOL is inaccessible to all hosts. Quick Resync does not ensure data consistency, even if there is no host I/O during the resynchronization.

Reverse resynchronization

You can use one of the following methods to restore pairs:

- Reverse Copy (Secondary > Primary): A full restoration from the S-VOL to the P-VOL. The differential data is updated to the P-VOL.

  During a Reverse Copy you can delete or suspend the pairs, but you cannot create, split, or resynchronize pairs that share the same P-VOL. The P-VOL is inaccessible to hosts.

  If you are sharing a TCz or URz volume with an SIz volume, you cannot create a TCz or URz pair with the shared volume.

  You cannot use Reverse Copy with the following pairs:

  - A P-VOL shared with an FCv2/FCSE volume.
  - A Concurrent Copy source volume.
  - An SIz S-VOL shared with a Compatible XRC or Concurrent Copy source volume.

    For more information about sharing volumes with Compatible XRC or Concurrent Copy, see Sharing volumes with Compatible XRC (on page 31) or Sharing volumes with concurrent copy (on page 31), respectively.

- Quick Restore (Secondary > Primary): A partial restoration that does not copy the data but does the following:
  - Swaps the P-VOL and S-VOLs including their RAID levels and HDD.
  - Pairs the volumes (DUPLEX status*).

    *The pair status changes to Resync/PENDING first, and then it changes to DUPLEX.
  - Exchanges the P-VOL and S-VOL encryption statuses if an SIz pair consists of encrypted volumes and a nonencrypted volume.

  Caution: To prevent the two volumes from being swapped, the P-VOL and S-VOLs must be assigned to the same cache logical partition (CLPR).

  During a Quick Restore, the P-VOL and S-VOL are inaccessible. After a Quick Restore, the P-VOL is accessible.

  Best Practice: If you have a small amount of differential data, use Reverse Copy instead of Quick Restore, since Reverse Copy completes faster.

  If you use volumes for which you set VRM access attributes, Quick Restore does not exchange the P-VOL and S-VOL access attributes.

  For more information about using volumes for which you set VRM access attributes, see Sharing volumes and Volume Retention Manager access attributes (on page 41).

  Note: HDvM - SN can show outdated information after a Quick Restore. To show the latest information, click Refresh View.

  Note: To minimize the time it takes to Quick Restore an SIz pair, do not perform LDEV maintenance while the Quick Restore is processing.

  You can delete or suspend the pair while you are restoring the pair using Quick Restore but you cannot do the following:

  - Create, split, or resynchronize pairs that share the same P-VOL.
  - Create a TCz or URz pair with a volume shared by SIz.

  You cannot Quick Restore the following pairs:

  - A pair volume for which you are formatting either internal volume using Quick Format.

    For more information about formatting volumes using Quick Format, see the *Provisioning Guide for Mainframe Systems*.
  - A pair in which one volume is a DP-VOL, though not both.
  - A Cross-OS File Exchange pair.
  - An SIz pair that has a shared P-VOL with an FCv2/HCFCSE volume.

  By default, for pair resynchronization (Normal Resync or Reverse Copy), the maximum multiplicity of copy processing for each pair is set to 24. However, if you set the Normal Resync Multiplexing option or Reverse Copy Multiplexing option of local replica options to OFF, the multiplicity can be changed to 1. Make sure to set the Normal Resync Multiplexing option or Reverse Copy Multiplexing option to OFF if the

host I/O performance is prioritized. These local replica options can be set by using HDvM - SN or CCI.

Workflow for resynchronizing ShadowImage for Mainframe pairs

Complete the following steps to resynchronize SIz pairs:

1. Place the S-VOL offline.
2. Split or suspend the pair.

   Note: The pair can also be in the process of being Quick Split (V-Split/SUSPVS status).

3. (Optional) If you are concerned about host I/O performance, check to make sure the I/O load is light.

   For more information about checking I/O performance, see the *System Administrator Guide*.

4. Resynchronize the pair (see Resynchronizing or restoring ShadowImage for Mainframe pairs (on page 77)).

Workflow for restoring ShadowImage for Mainframe pairs

Complete the following steps to restore SIz pairs:

1. Place the P-VOL offline.
2. Split or suspend the pair.

   If you plan to restore pairs using Reverse Copy, split or suspend the pairs sharing the same P-VOL.

   If the SIz pair you plan to restore shares a volume with TCz or URz, suspend the TCz or URz pair.

   For more information about splitting or suspending pairs, see Splitting ShadowImage for Mainframe pairs (on page 63) or Suspending ShadowImage for Mainframe pairs (on page 80), respectively.

3. Restore the pair (see Resynchronizing or restoring ShadowImage for Mainframe pairs (on page 77)).

Resynchronizing or restoring ShadowImage for Mainframe pairs

Use this task to resynchronize or restore split or suspended pairs.

Resynchronizing split pairs typically takes less time than resynchronizing suspended pairs (Suspend/SUSPER status). Split pairs typically contain much less accumulated differential data than the total amount of data in the P-VOL.

You can perform this task using the **`YKRESYNC`** command. For details, see the BCM documentation.

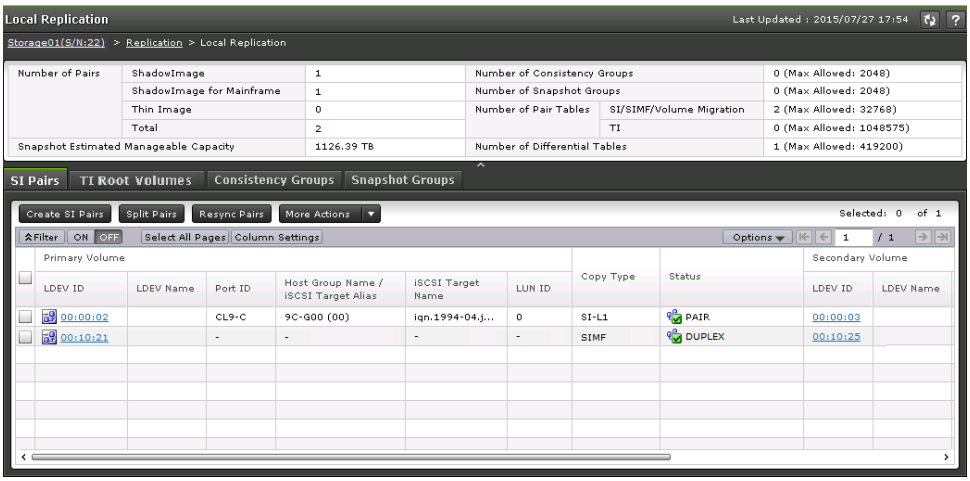
Before you begin

- After performing a Quick Split, wait 20 seconds before a Normal Copy or Quick Resync resynchronization, otherwise the operation might end abnormally.
- The pair resynchronization (Normal Resync or Reverse Copy) requires some time to check if the differential data exists even if there is no differential data. The amount of time to check the differential data takes longer as the volume capacity increases, and it might take 10 minutes or more for 256 TB.

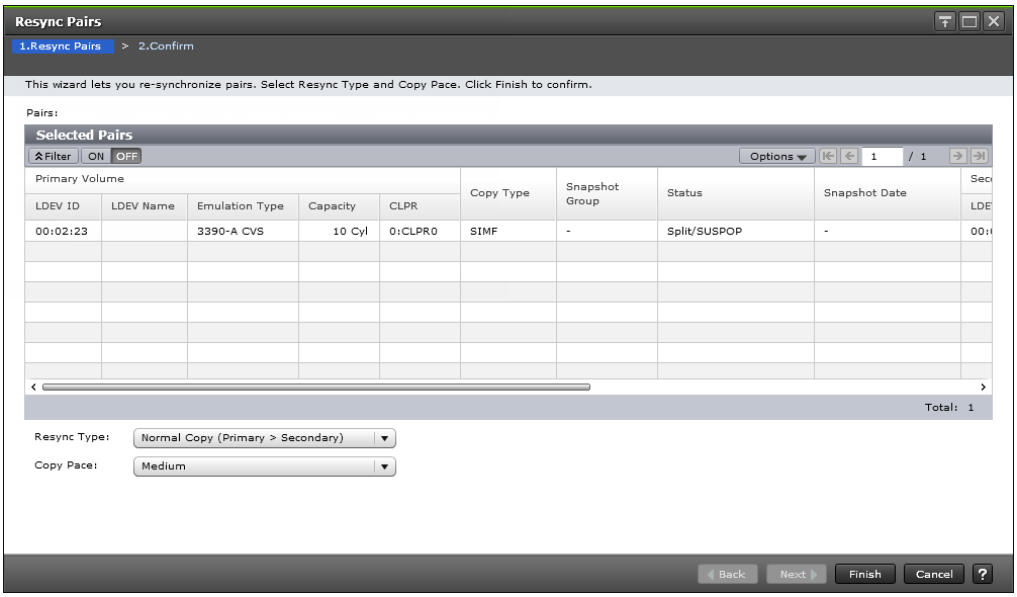
If you are using CCI to run commands, run the following command to resynchronize split pairs (Suspend/SUSPER status): **`pairresync`**

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, select the pair you want to resynchronize, and then click **Resync Pairs**.



4. In the **Resync Pairs** window of the **Resync Pairs** wizard, complete the following steps:
   - For **Resync Type**, select the type of resynchronization you want to perform.

     Values:

     - **Normal Copy (Primary** > **Secondary)** (default): A full forward resynchronization.

     - **Quick Resync (Primary** > **Secondary)**: A partial forward resynchronization.

     - **Reverse Copy (Secondary** > **Primary)**: A full restoration of the P-VOL from the S-VOL.

     - **Quick Restore (Secondary** > **Primary)**: A partial restoration of the P-VOL from the S-VOL.

     For more information about the types of SIz pair resynchronization you can use, including complete descriptions of the types, see Types of pair resynchronization (on page 74) .
   - For **Copy Pace**, select the rate at which you want the storage system to copy data.

     Values:

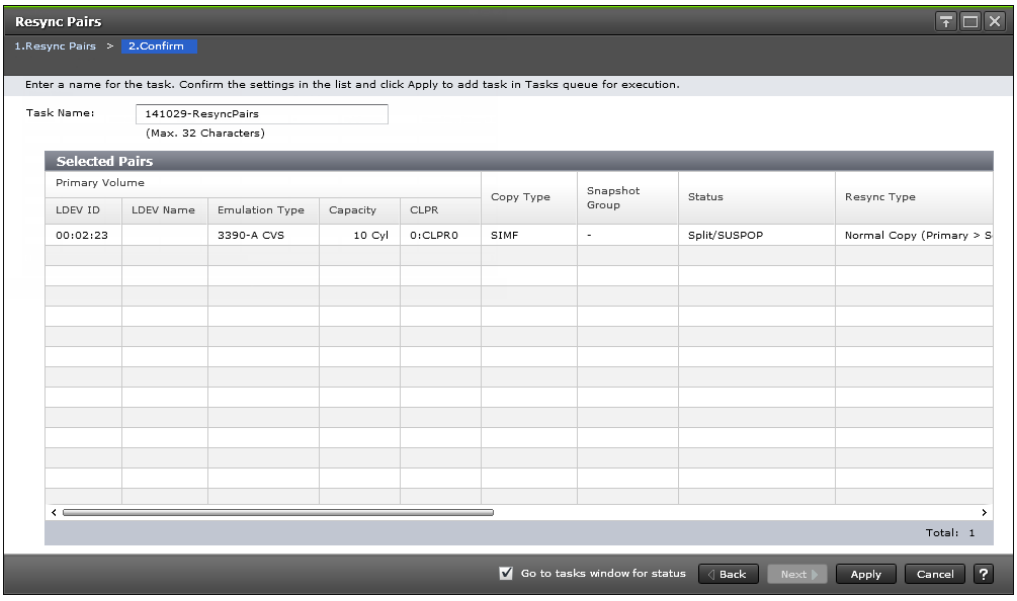
     - **Slower**: Improved host I/O performance but slower processing speed.

     - **Medium** (default): Average processing speed and host I/O performance.

     - **Faster**: Faster processing speed but slower host I/O performance.

     Note: The pace you select affects processing speed and host I/O performance

     For more information about performance, see Performance planning for ShadowImage for Mainframe (on page 27) .
5. Click **Finish**, and then confirm the settings.



6. Accept the default task name or enter a unique name.
   You can enter up to 32 letters, numbers, and symbols, except the following:
   \ / : , ; * ? " < > |
7. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
8. Click **Apply** to submit the task.
   The pairs are resynchronized and the volumes are paired (DUPLEX status).

   Note: If you are reverse resynchronizing and the task ends abnormally, the pair is suspended (Suspend/SUSPER status).

   For more information about the Suspend/SUSPER status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).

Suppressing update copy operations during pair restoration

You can suppress update copy operations when you restore pairs using Quick Restore. Suppressing update copy operations keeps the P-VOL and S-VOL unsynchronized and reduces the effect on host I/O performance.

The pair status is DUPLEX.

Procedure

1. Enable the **Swap & Freeze** system option.

Setting the RAID level

Complete the following steps to return to the original RAID level for the S-VOL and P-VOL after a Quick Restore when the RAID levels of the volumes are different.

Procedure

1. Split the pair.
2. Restore the pair using Quick Restore.

Suspending ShadowImage for Mainframe pairs

When the following conditions apply, a ShadowImage for Mainframe pair is suspended, and the status of the pair is changed to Suspend/SUSPER:

- the storage system detects an error condition related to an update copy operation
- the storage system cannot keep the pair mirrored

At this time, write I/Os to the P-VOL continue and all tracks of the P-VOL are saved as differential data. When the pair is resynchronized, the pair status changes to Resync/PENDING, and the entire P-VOL is copied to the S-VOL. For a split pair, resynchronization is completed in a short time. But it takes the same period of time for a suspended pair to be resynchronized as the initial copy operation.

In CCI, use the **`pairsplit -S`** command.

This task cannot be performed using BCM.

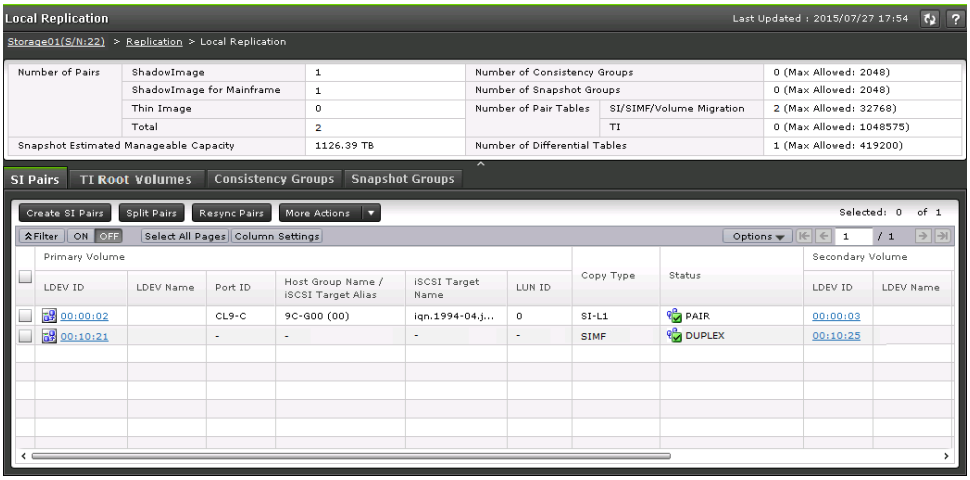
You can change the status of the pair to Suspend/SUSPER by using the following procedure.

Before you begin

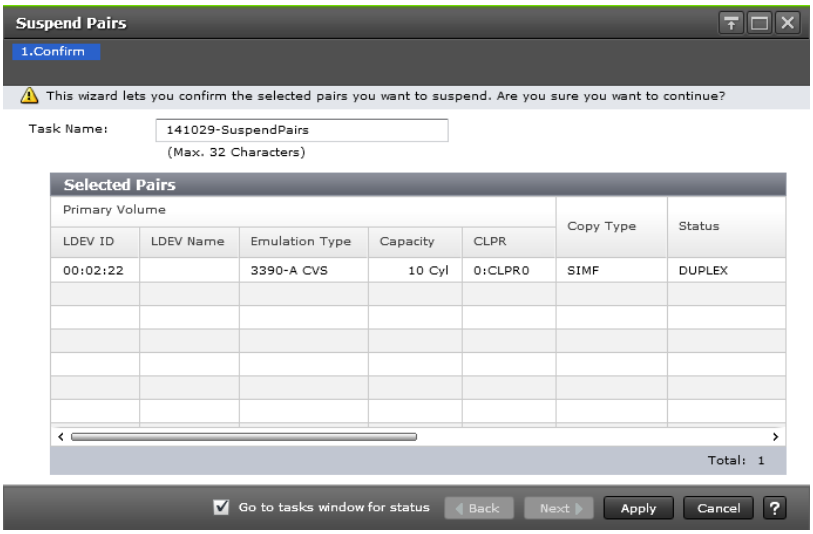
- You must have Storage Administrator (Local Copy) role.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, select the pair that you do not want to create, click **More Actions** > **Suspend Pairs**, and confirm the settings.



4. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |

5. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
6. Click **Apply** to submit the task.

   The pair is suspended (Suspend/SUSPER status).

Deleting ShadowImage for Mainframe pairs

Delete the SIz pairs that you no longer need. Deleting a pair unpairs the P-VOL and S-VOL but does not delete their data. You can use the volumes of deleted pairs in another pair.

If you are sharing SIz S-VOLs with URz P-VOLs and you plan to perform a CTG pair-split, register the split time for an SIz CTG before you delete the pair. The registered split time is deleted when you delete the following pairs:

- The SIz pairs that are assigned to the SIz CTG.
- The URz pairs that are assigned to the URz R-JNL, which is the journal volume on the secondary storage system associated to the S-VOL.

Prerequisites for deleting ShadowImage for Mainframe pairs

The pair must be unpaired and not in the process of being deleted and the volumes are not in the process of being unpaired (Deleting/TRANS status).

Items to consider before deleting ShadowImage for Mainframe pairs

Review the following list to understand what happens after an SIz pair is deleted.

- If an SIz pair is deleted, the volume status changes from Deleting/TRANS to SMPL. When the status changes to SMPL, the pair is no longer displayed in the window. You can use the **`pairdisplay`** command of CCI to check the volume status, but this command cannot differentiate SMPL from Deleting/TRANS. To differentiate them in CCI, use the **`inqraid`** command to check if the volume is used by SI. If it is used by SIz, the status is Deleting/TRANS. If it is not used by SIz, the status is SMPL.
- After deleting an SIz pair, if the number of pairs displayed in the summary section and the number of listed pairs in the HDvM - SN window are different, configuration might being changed. Wait a while, and then select File > Refresh All to update the configuration information.

Workflow for deleting ShadowImage for Mainframe pairs

Complete the following steps to delete an SIz pair:

1. Ensure that all of the write I/O operations to the P-VOL have completed and that all secondary host applications that access the P-VOL have stopped.
2. Set the P-VOL offline.
3. Verify that the SIz pair is unpaired and not in the process of being unpaired.
4. Split the SIz pair.
5. Delete the SIz pair.

Deleting ShadowImage for Mainframe pairs

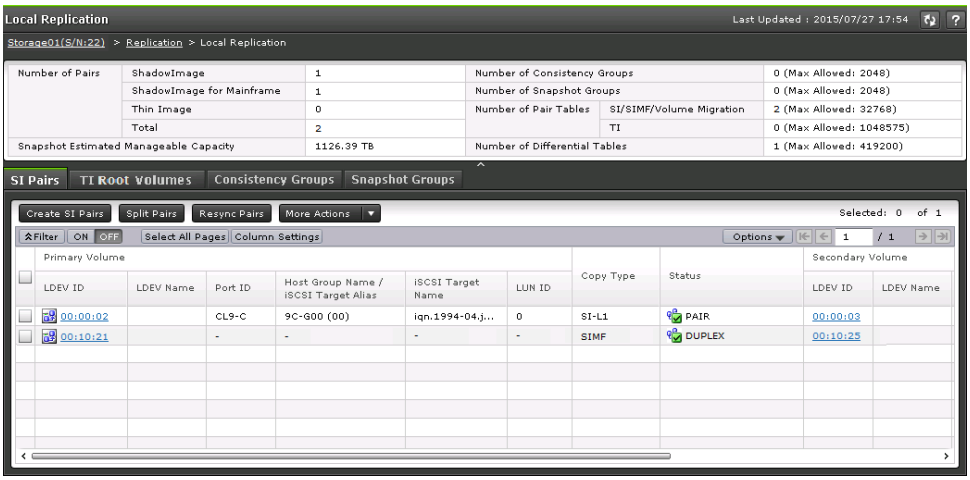
You can perform this task using the **`YKDELETE`** command. For details, see the BCM documentation.

Before you begin

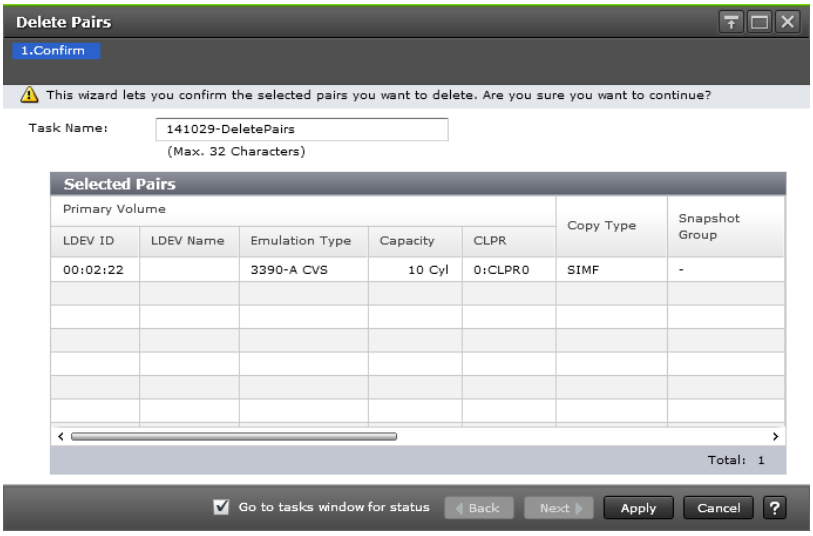
- You must have Storage Administrator (Local Copy) role.
- The P-VOL and the S-VOL must be synchronized.
- In CCI, use the **`pairsplit -S`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, select the pair you want to delete, click **More Actions** > **Delete Pairs**, and then confirm the settings.



4. Accept the default task name or enter a unique name.

   You can enter up to 32 letters, numbers, and symbols, except the following:

   \ / : , ; * ? " < > |

5. If you want to monitor the task after submitting it, select **Go to tasks window for status**.
6. Click **Apply** to submit the task.

> **Note:** To prevent the task from ending abnormally, wait until the P-VOL and S-VOL are unpaired (about 10 seconds) before completing another pair task, such as creating pairs, or event waiting.

The pair is deleted and the P-VOL and S-VOL are unpaired.

MP unit and pair deletion

The MP unit assigned to an S-VOL cannot be used if a pair is created because the MP unit assigned to the P-VOL is also assigned to the S-VOL. Deleting the pairs returns the allocation of processor responsibility to the state it was before the pairs were created. However, the allocation cannot be returned in either of the following cases:

- A user changed the allocation of the MP unit assigned to an S-VOL cannot be used if a pair is created because the MP unit for the P-VOL or S-VOL of the SI pair.
- When the pair is deleted, the write pending rate of the MP unit assigned to an S-VOL cannot be used if a pair is created because the MP unit to which the S-VOL belongs is 50% or more, or the write pending rate of the original MP unit assigned to an S-VOL cannot be used if a pair is created because the MP unit is 50% or more.

If the original MP unit assigned to an S-VOL cannot be used if a pair is created because the MP unit is already removed, assign another MP unit assigned to an S-VOL.

Chapter 6: Monitoring and maintaining ShadowImage for Mainframe

You can monitor and maintain the SIz system by completing tasks such as viewing consistency group properties, checking pair activities, and maintaining physical disk drives.

Monitoring the ShadowImage for Mainframe system

Monitor the SIz system on an ongoing basis to keep track of pairs and volumes and their current and past conditions.

You can monitor the system in the following ways:

- Viewing pair information for local replication (on page 86) .
- Monitoring ShadowImage for Mainframe pair activity and status (on page 87) . This includes the status definitions and the pair tasks that you can complete based on the status.
- Monitoring ShadowImage for Mainframe pair and volume details (on page 93) .
- Monitoring ShadowImage for Mainframe pair synchronization rates (on page 95) .
- Monitoring consistency groups (on page 96) .
- Monitoring pair task history (on page 98) .

Viewing pair information for local replication

You can view pair information for local replication in the Replication window and in the summary section of the Local Replication window in HDvM - SN. These windows show information such as the number of pairs in the storage system.

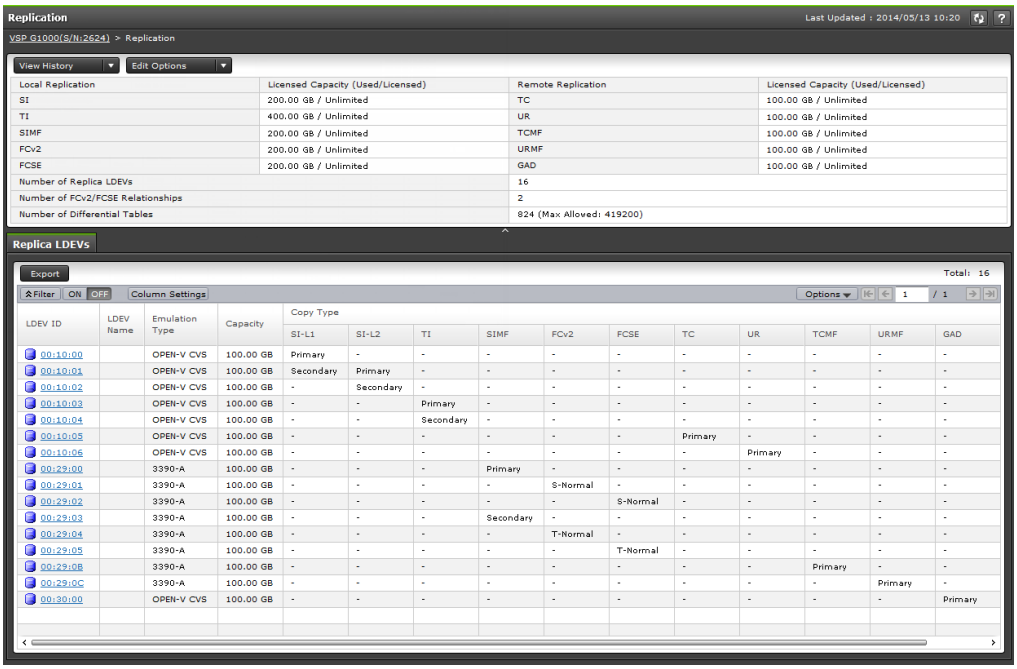
Note: If the information in the summary section is not up to date, the system has not completed processing the information. Click the refresh icon to refresh the information in the window.

You can perform this task using the YKQUERY or YKEWAIT command. For details, see the BCM documentation.

In CCI, use the **`pairdisplay`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication**.



2. The **Replica LDEVs** tab in the **Replication** window shows a list of LDEVs. From this window, you can perform the following tasks:
   - Click the LDEV ID for a specific replica LDEV and open the **LDEV Properties** window.
   - View information for a list of replica LDEVs for the selected LDEV.

Monitoring ShadowImage for Mainframe pair activity and status

You can monitor the status of SIz pairs using Business Continuity Manager (BCM) using the YKQRYDEV command, in IBM PPRC, z/OS console messages, and in HDvM - SN.

The status of pairs displayed by HDvM - SN changes as the pair status changes in the storage system. The displayed state is refreshed by HDvM - SN automatically. To manually refresh the HDvM - SN information, click the refresh icon.

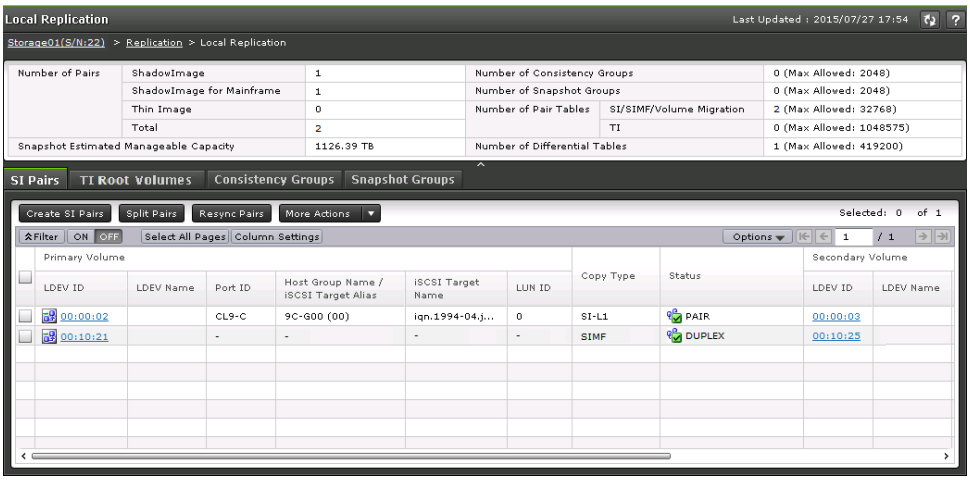
Note: Unpaired P-VOLs and S-VOLs are not shown in HDvM - SN.

Before you begin

- You must have Storage Administrator (Local Copy) role.
- In CCI, use the **`pairdisplay`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. In the summary section of the **Local Replication** page, view license information.

   If the information in the window is not up to date, click the refresh icon to refresh the information in the window.
4. On the **SI Pairs** tab, locate the pair whose status you want to review, and then check the **Status** column.

   HDvM - SN and the BCM pair status names are shown in the **Status** column in the format of HDvM - SN status/Business Continuity Manager status, unless the names are the same. If they are the same, only the HDvM - SN status is displayed. For more information about the items on this tab, see Monitoring ShadowImage for Mainframe pair and volume details (on page 93).
5. (Optional) Click **More Actions** > **View Pair Properties** to view more details for a selected pair.

Device Manager - Storage Navigator pair status names and descriptions

Note: Running the **DEVSERVE** command on a read/write disabled volume returns the INTERVENTION REQUIRED message. To return a normal value, create the pairs with online volumes, and then issue the command.

The following table lists HDvM - SN pair status names and their descriptions, including the level of host, P-VOL, and S-VOL access.

Pair status	Description	Host status	P-VOL access	S-VOL access
SIMPLEX	The volume is not part of a pair.	P-VOL = SIMPLEX S-VOL = SIMPLEX	Read/write enabled	Read/write enabled
Deleting/ TRANS	The pair is being deleted and the volumes are being unpaired.	P-VOL = SIMPLEX S-VOL = SIMPLEX	Read/write disabled[3]	Read/write disabled

Pair status	Description	Host status	P-VOL access	S-VOL access
PENDING[2]	The pair is being created and the initial copy is in progress.[1] The storage system continues to accept read/write to the P-VOL but stops write operations to the S-VOL. The storage system does not perform update copy operations.	P-VOL = "PPRI-PNDG" S-VOL = "PSEC-PNDG"	Read/write enabled	Read/write disabled
DUPLEX	The initial copy operation has completed and the volumes are paired. The storage system starts the update copy as needed. Data consistency is not ensured in this status.	P-VOL = "PPRIMARY" S-VOL = "PSECONDRY"	Read/write enabled	Read/write disabled
SP-Pend/ TRANS[2]	The pair is in the process of being Steady Split. Differential data is copied to the S-VOL, and then the pair is split.[1] For more information about the Steady Split method of splitting pairs, see Pair splitting methods (on page 62).	P-VOL = "PPRI-PNDG" S-VOL = "PSEC-PNDG"	Read/write enabled	Read/write disabled
V-Split/ SUSPVS[2]	The pair is in the process of being Quick Split.[1] The differential data is copied to the S-VOL only in the background. For more information about the Quick Split method of splitting pairs, see Pair splitting methods (on page 62).	P-VOL = "PPRI-PNDG" S-VOL = Unpaired	Read/write-enabled	Read/ write-enabled

Pair status	Description	Host status	P-VOL access	S-VOL access
Split/SUSPOP	The pair has been split. The storage system stops performing update copy operations from the P-VOL to the S-VOL. Write I/Os are accepted for S-VOL. The storage system keeps track of updates to split P-VOL and S-VOL when the pair status is Split/SUSPOP so that you can Quick Resync.	P-VOL = "PPRI-PNDG" S-VOL = Unpaired	Read/write enabled	Read/write-enabled
Resync/ PENDING[2]	The **`pairresync`** CCI command is in progress.[1] The storage system does not accept write I/Os for S-VOL and does not perform update copy operations. For more information about resynchronizing pairs, see Resynchronizing ShadowImage for Mainframe pairs (on page 74).	P-VOL = "PPRI-PNDG" S-VOL = "PSEC-PNDG"	Read/write enabled	Read/write disabled
Resync-R/ REVRSY[2]	The **`reverse pairresync`** CCI command is in progress.[1] The storage system copies only S-VOL differential data to the P-VOL. The storage system does not perform update copy operations during the Reverse Copy or Quick Restore. Write I/O operations to the S-VOL are rejected.	P-VOL = "PPRI-PNDG" S-VOL = "PSEC-PNDG"	Read/write disabled	Read/write disabled
Suspend/ SUSPER	The storage system does the following: ▪ Suspends the pair. ▪ Continues accepting read and write I/Os to the P-VOL.	P-VOL = "PPRI-PNDG" S-VOL = "PSEC-PNDG"	Read/write enabled	Read/write disabled

Pair status	Description	Host status	P-VOL access	S-VOL access
	▪ Stops update copy operations to the S-VOL. ▪ Marks the P-VOL as differential data. Resynchronizing a pair copies the P-VOL to the S-VOL. The status of other pairs sharing the same P-VOL does not change. Data consistency is not ensured in this status.			

Notes:

1. The starting time of the copy depends on the numbers of pairs and the storage system environment.
2. The pair status is displayed in the format of *screen pair status*/*Business Continuity Manager pair status*.
3. If the status was Read/write enabled before the transition to Deleting/TRANS, it is Read/write enabled.

Command Control Interface pair status names

The BCM pair status names can match HDvM - SN pair status names.

The following table lists the HDvM - SN pair status names and the corresponding pair status name in BCM. SIMPLEX status will not be displayed on the Local Replication window SI Pairs tab because volumes in SIMPLEX state are not listed.

HDvM - SN pair status name	BCM pair status name
SIMPLEX	SIMPLEX
PENDING	COPY
DUPLEX	DUPLEX
SP-Pend/TRANS	COPY
V-Split/SUSPVS	Split/SUSPOP
Split/SUSPOP	(P-VOL) Split/SUSPOP (S-VOL) SSUS

HDvM - SN pair status name	BCM pair status name
Resync/PENDING	COPY
Resync-R/REVRSY	RCPY
Suspend/SUSPER	Suspend/SUSPER

Pair status and available pair tasks

The status of a pair determines the actions you can perform.

The following table lists the required pair status for each task.

Pair task	Pair status								
	SIMPLEX	PENDING	DUPLEX	SP-Pend/ TRANS	V-Split/ SUSPVS	Split/ SUSPOP	Resync/ PENDING	Resync-R/ REVRSY	Suspend/ SUSPER
Create pairs	YES	NO	NO	NO	NO	NO	NO	NO	NO
Split pairs	NO	YES	YES	NO	NO	NO	NO	NO	NO
Suspend pairs	NO	YES	YES	YES	YES	YES	YES	YES	NO
Resync pairs (Normal Copy)	NO	NO	NO[1,2]	NO	YES	YES	NO[1,2,3]	NO	YES
Resync pairs (Reverse Copy)	NO	NO	NO[2]	NO	NO	YES	NO	NO[2]	NO
Delete pairs	NO	YES	YES	YES	NO	YES	YES	YES	YES

1. You can run the BCM command, but the pair is not resynchronized and the pair status does not change.
2. You can run the PPRC TSO command but the pair is not resynchronized and the pair status does not change.

   Note: To prevent the command from ending abnormally with CC = 8, do not specify YES in the MSGREQ parameter.

   To prevent the command from ending abnormally with CC =12, do not run the ICKDSF PPRCOPY command.

Pair task	Pair status								
	SIMPLEX	PENDING	DUPLEX	SP-Pend/ TRANS	V-Split/ SUSPVS	Split/ SUSPOP	Resync / PENDING	Resync -R/ REVRSY	Suspend/ SUSPER
3. To prevent the PPRC TSO command from ending abnormally with CC = 8, do not Steady Split a suspended pair (Suspend/SUSPER status).									

Unaffected S-VOL status and pair tasks

The SIz pair tasks you can perform depend on the pair's status and the status of unaffected S-VOLs.

The following table lists the pair tasks you can perform based on the status of S-VOLs related to the P-VOL in other pairs.

Status of unaffected S-VOLs	Pair task					
	Create pairs	Split pairs	Resync pairs (Normal Copy)	Resync pairs (Reverse Copy)	Suspend pairs	Delete pairs
Deleting/TRANS	NO	NO	NO	NO	NO	NO
PENDING	YES	YES	YES	NO	YES	YES
DUPLEX	YES	YES	YES	NO	YES	YES
SP-Pend/TRANS	YES	YES	YES	NO	YES	YES
V-Split/SUSPVS	YES	YES	YES	NO	YES	YES
Split/SUSPOP	YES	YES	YES	YES	YES	YES
Resync/PENDING	YES	YES	YES	NO	YES	YES
Resync-R/REVRSY	NO	NO	NO	NO	YES	YES
Suspend/SUSPER	YES	YES	YES	YES	YES	YES

Monitoring ShadowImage for Mainframe pair and volume details

You can review the data related to pairs and their volumes, including volume capacity, pair status, P-VOL and S-VOL, and identifiers.

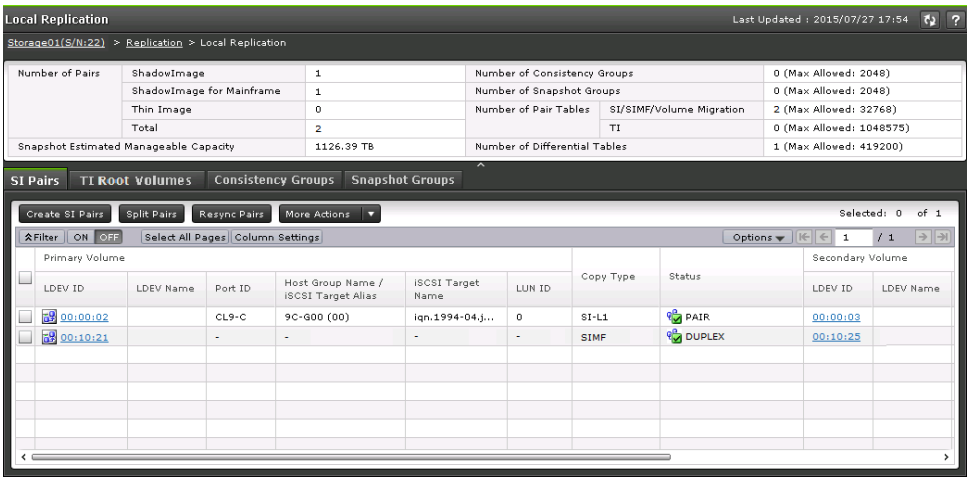
You can perform this task using the YKQRYDEV and YKQUERY command. For details, see the BCM documentation.

Before you begin

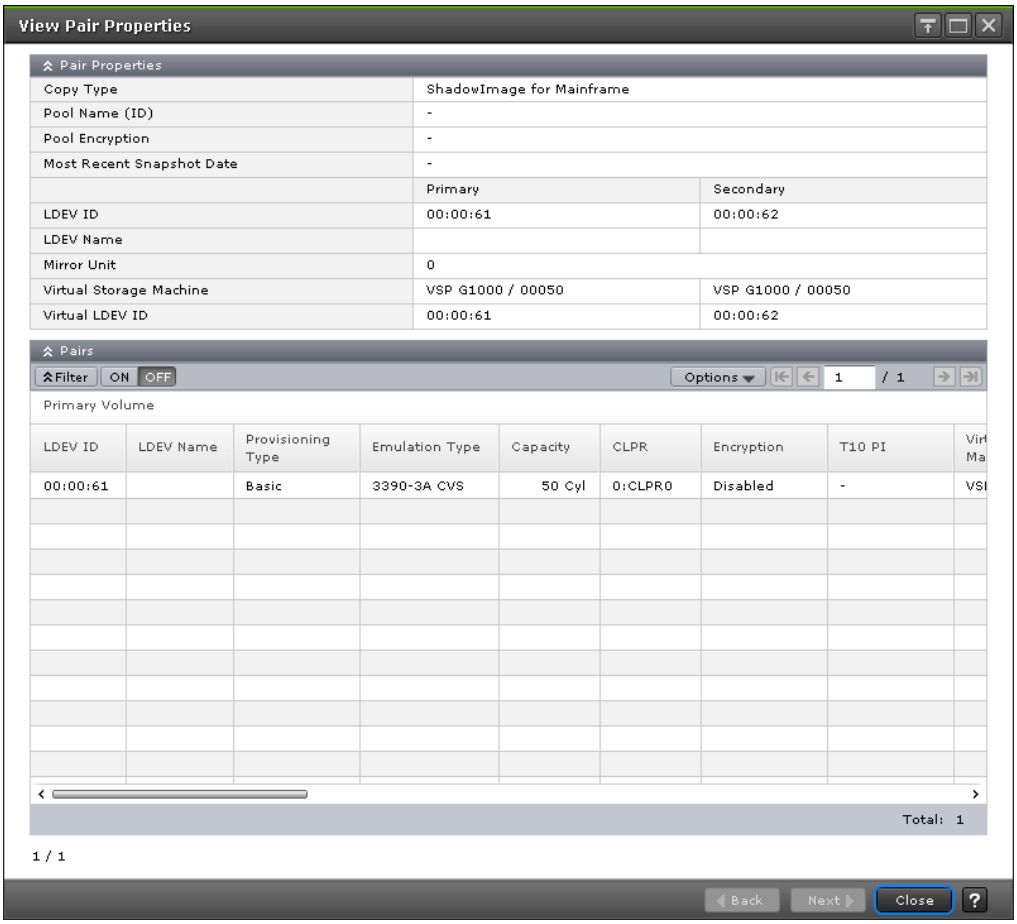
- You must have Storage Administrator (Local Copy) role.
- In CCI, use the **`pairdisplay`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. In the **SI Pairs** tab, select the pair, and then click **More Actions** > **View Pair Properties**.
4. In the **View Pair Properties** window, view the pair properties.



Monitoring ShadowImage for Mainframe pair synchronization rates

You can view the percentage of synchronized data between the P-VOL and S-VOL from the View Pair Synchronization Rate window.

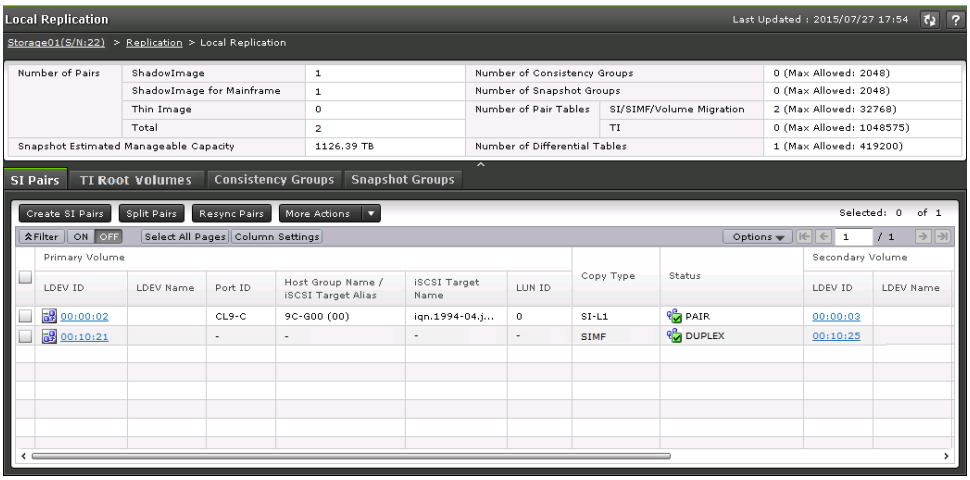
You can perform this task using the YKQUERY command. For details, see the BCM documentation.

Before you begin

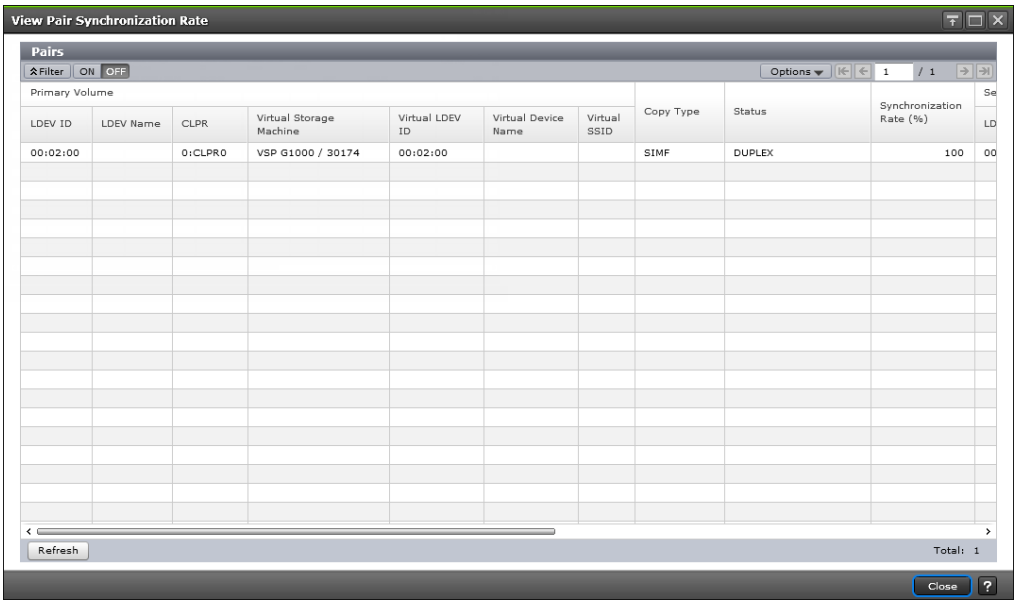
- You must have Storage Administrator (Local Copy) role.
- In CCI, use the **`pairdisplay`** command.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **SI Pairs** tab.



3. On the **SI Pairs** tab, select the pair, and then click **More Actions** > **View Pair Synchronization Rate**.



4. On the **View Pair Synchronization Rate** window, click **Refresh** to show the latest synchronization rate.

Note: If you close the window, information in the **Local Replication** window might not be up to date. Click the refresh icon to refresh the information in the window.

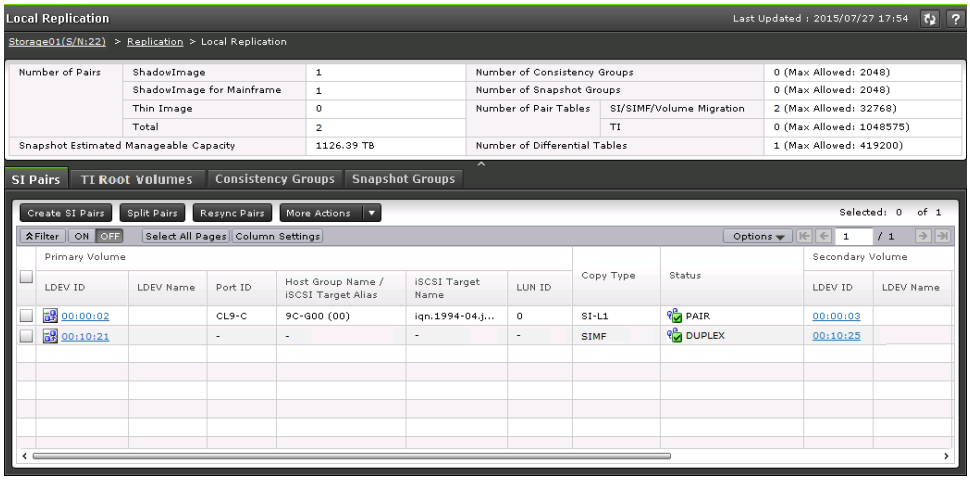
Monitoring consistency groups

You can view the number of consistency groups (CTGs) and the details and individual properties for CTGs from the following section and tabs in the Local Replication window in HDvM - SN:

Note: CCI does not have a command to view the number of consistency groups.

- The summary section. Use this section to view the number of CTGs and the number of pairs.
- The SI Pairs tab. Use this tab to:
  - View a list of SIz pairs.
  - Monitor pair activity and status (see Monitoring ShadowImage for Mainframe pair activity and status (on page 87)).
  - Monitor pair synchronization rates (see Monitoring ShadowImage for Mainframe pair synchronization rates (on page 95)).
- The Consistency Groups tab. Use this tab to:
  - View a list of CTGs.
  - View CTG properties (see Viewing consistency group properties (on page 97)).

The following figure shows the Local Replication window displaying the summary section and the SI Pairs tab.



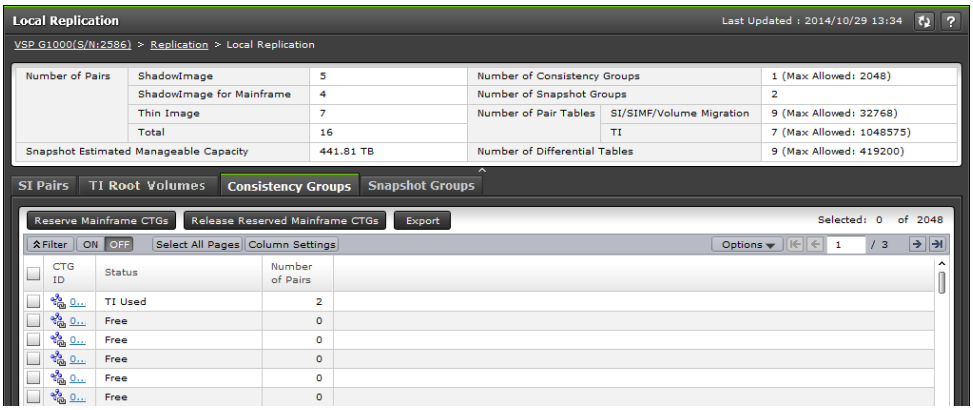
Viewing consistency group properties

You can perform this task using the YKQUERY command. For details, see the BCM documentation.

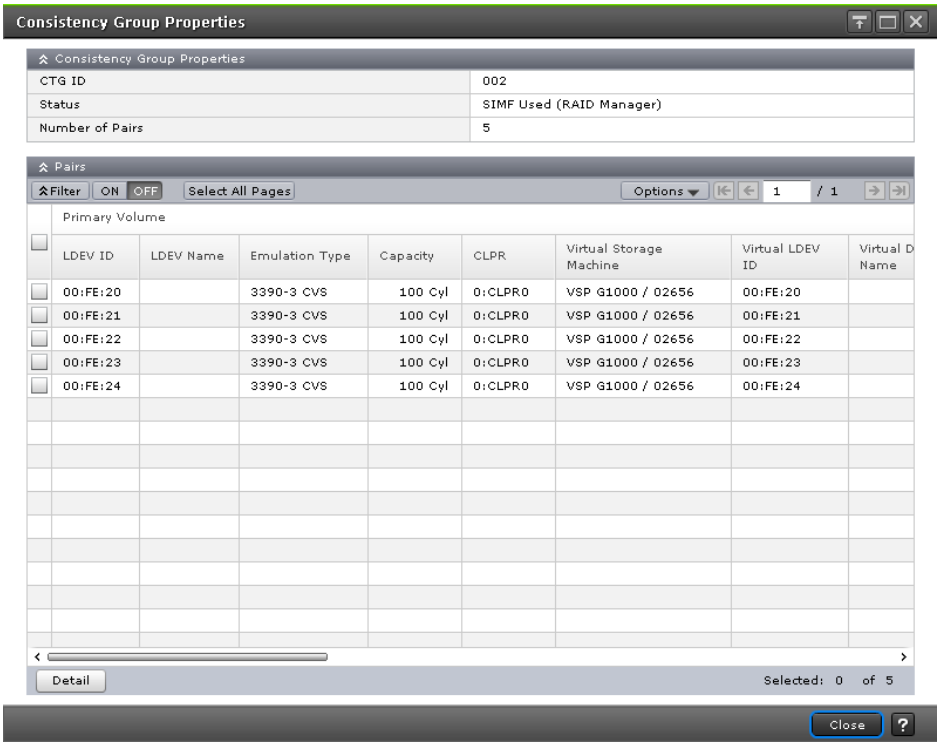
Note: CCI does not have a command to view consistency group properties.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication** > **Local Replication**.
2. In the **Local Replication** window, select the **Consistency Groups** tab.



3. On the **Consistency Groups** tab, click the **CTG ID** for the CTG you want to view properties.



4. In the **Consistency Group Properties** window, view the CTG's properties, such as group information for local replication.

Monitoring pair task history

You can review a history of the tasks you have completed on a pair from the History window in HDvM - SN. The storage system stores a history of up to 1,024,000 of the last tasks.

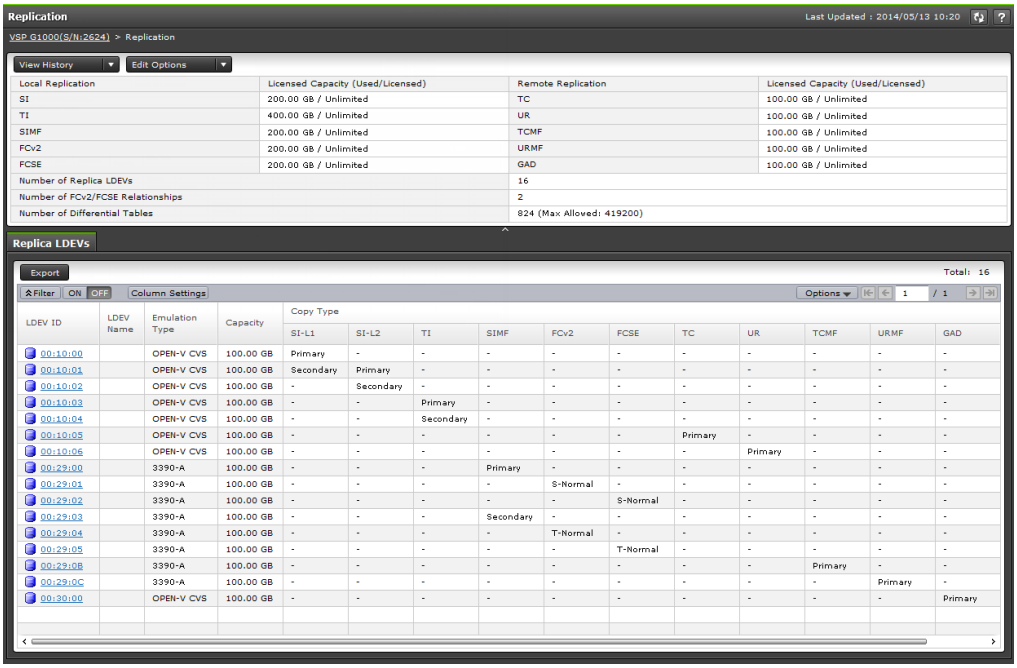
Note: You can also check the task history of SI pairs by using audit logs. For details, see the *Hitachi Audit Log User Guide*.

Before you begin

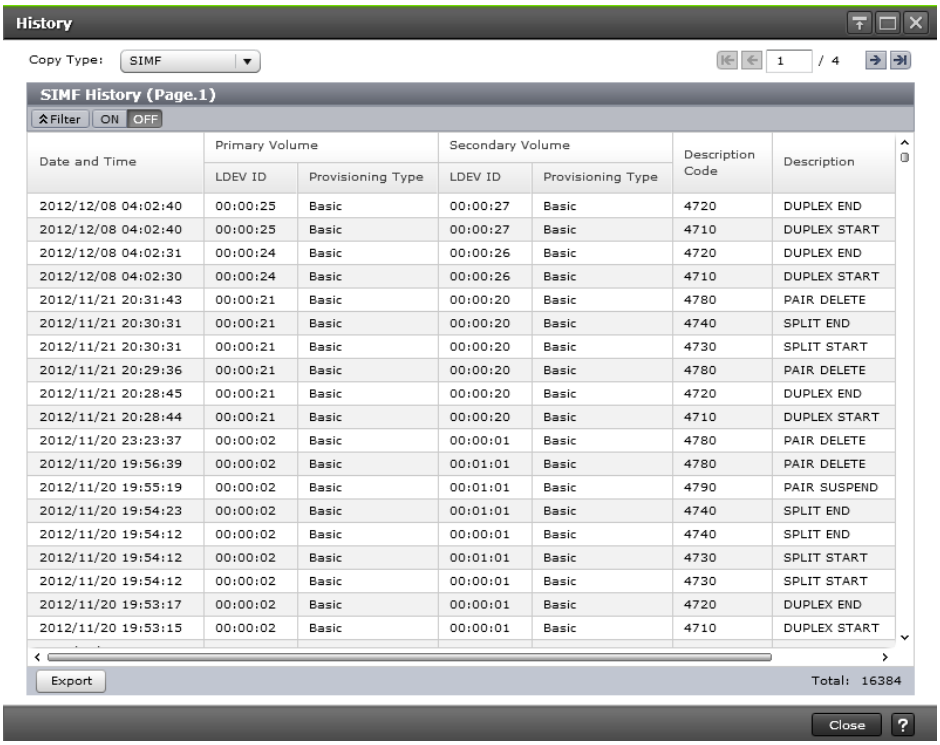
- You must have Storage Administrator (Local Copy) role.
- If you use 1,000 or more pairs concurrently, some operation history might not be recorded.

Procedure

1. In the **Explorer** pane, click **Storage Systems**, expand the storage system tree, and then click **Replication**.



2. In the **Replication** window, click **View History**, then click **Local Replication**.



Date and Time	Primary Volume		Secondary Volume		Description Code	Description
	LDEV ID	Provisioning Type	LDEV ID	Provisioning Type		
2012/12/08 04:02:40	00:00:25	Basic	00:00:27	Basic	4720	DUPLEX END
2012/12/08 04:02:40	00:00:25	Basic	00:00:27	Basic	4710	DUPLEX START
2012/12/08 04:02:31	00:00:24	Basic	00:00:26	Basic	4720	DUPLEX END
2012/12/08 04:02:30	00:00:24	Basic	00:00:26	Basic	4710	DUPLEX START
2012/11/21 20:31:43	00:00:21	Basic	00:00:20	Basic	4780	PAIR DELETE
2012/11/21 20:30:31	00:00:21	Basic	00:00:20	Basic	4740	SPLIT END
2012/11/21 20:30:31	00:00:21	Basic	00:00:20	Basic	4730	SPLIT START
2012/11/21 20:29:36	00:00:21	Basic	00:00:20	Basic	4780	PAIR DELETE
2012/11/21 20:28:45	00:00:21	Basic	00:00:20	Basic	4720	DUPLEX END
2012/11/21 20:28:44	00:00:21	Basic	00:00:20	Basic	4710	DUPLEX START
2012/11/20 23:23:37	00:00:02	Basic	00:00:01	Basic	4780	PAIR DELETE
2012/11/20 19:56:39	00:00:02	Basic	00:01:01	Basic	4780	PAIR DELETE
2012/11/20 19:55:19	00:00:02	Basic	00:01:01	Basic	4790	PAIR SUSPEND
2012/11/20 19:54:23	00:00:02	Basic	00:01:01	Basic	4740	SPLIT END
2012/11/20 19:54:12	00:00:02	Basic	00:00:01	Basic	4740	SPLIT END
2012/11/20 19:54:12	00:00:02	Basic	00:01:01	Basic	4730	SPLIT START
2012/11/20 19:54:12	00:00:02	Basic	00:00:01	Basic	4730	SPLIT START
2012/11/20 19:53:17	00:00:02	Basic	00:00:01	Basic	4720	DUPLEX END
2012/11/20 19:53:15	00:00:02	Basic	00:00:01	Basic	4710	DUPLEX START

3. In the **History** window, for **Copy Type**, select SIz.

Result

The Description column in the History table displays the pair tasks that you have completed.

The following table describes the codes.

Code	Description	Explanation
4710	DUPLEX START	The initial copy has started.
4720	DUPLEX END	The initial copy has completed and the pair status is DUPLEX.
4730	Split/SUSPOP START	The pair is being split.
4740	Split/SUSPOP END	The pair has been split and the pair status is Split/SUSPOP.
4750	Resync/PENDING START Resync-R/REVRSY START	The **`pair resync`** CCI command has started.
4760	Resync/PENDING END Resync-R/REVRSY END	The **`pair resync`** CCI command has completed and the volumes are paired (DUPLEX status).

Code	Description	Explanation
4780	Unpaired	The pair is deleted and the volumes are unpaired.
4790	Suspend/SUSPER	The pair is suspended.
47D0	COPY ABNORMAL END	Copy processing has ended abnormally for reasons other than the ones stated previously in this table.
47E9	INITIALIZE START	The initialization processing has started.
47EA	INITIALIZE END	The initialization processing completed.
47EB	INITIALIZE ENDED ABNORMAL	The initialization processing has ended abnormally.

Maintaining the ShadowImage for Mainframe system

Some maintenance tasks are a response to behavior discovered while monitoring the system. Other tasks are completed to keep the system in tune with your changing requirements.

Perform the following steps to maintain the system:

1. Keep the system in tune with your changing requirements.
2. If you discover behavior while monitoring the system, maintain the system.

System and device maintenance

The following maintenance activities do not affect SIz replication pairs:

- Cache maintenance can reduce overall performance and should be scheduled during times of low system activity.
- Maintenance of physical disk drives that provision LDEVs used by SIz can be performed without impacting SIz.
- If a physical device failure occurs, the pair status is not affected because of the RAID architecture.
- If a physical device failure requires the storage system to use dynamic sparing or automatic correction copy, the pair status is not be affected.
- If an LDEV failure occurs, the storage system suspends the pair.
- If an SIz pair is using an LDEV, certain activities are not allowed. You can only block (for maintenance), format, or restore an LDEV that is in use by only a pair in Suspend/SUSPER status.

Chapter 7: Troubleshooting ShadowImage for Mainframe

There are different aspects of SIz that you can troubleshoot; for example, SIMs that are reported by storage systems requiring maintenance and issues with volume pairs that are not displaying correctly.

Overview

Types of general troubleshooting are categorized as follows:

- Troubleshooting SIMs when using ShadowImage
- Troubleshooting when using and displaying ShadowImage pairs in HDvM - SN
- Troubleshooting when a ShadowImage volume contains pinned tracks
- Troubleshooting when copy operations take time

Troubleshooting SIMs for ShadowImage operations

Storage systems report SIMs when they require maintenance. SVP reports all SIMS regarding ShadowImage operations. All SIMS are recorded in the SVP of a storage system, and are reported to the management client. For details, see the *System Administrator Guide*.

If SNMP is installed for a storage system, each SIM triggers an SNMP trap, and it is sent to the applicable host. For details about SNMP information, see the *System Administrator Guide* or *Hitachi Alert Notification Guide*.

For details about SIM reference codes, see the *System Administrator Guide* or *SIM Reference Guide*.

ShadowImage for Mainframe pair issues and corrective actions

The following table lists issues and suggested corrective actions for troubleshooting SIz pairs in HDvM - SN.

Issue	Corrective action
HDvM - SN hangs, or SIz pair tasks are not properly performed.	▪ Make sure all SIz requirements and restrictions are met. ▪ Make sure the storage system is powered on and fully functional. ▪ Make sure the input values and parameters on the SIz windows are correct (such as P-VOL and S-VOL IDs).
The volume pairs are not displaying correctly.	Select the correct volumes.
An SIz error message is displayed in HDvM - SN during a task.	In HDvM - SN, check if there is an error message for the failed task. **Note:** You can use HDvM - SN to set up email notifications of errors that occur during pair tasks. For more information about managing your tasks and setting up email notifications, see the *System Administrator Guide*. For a list of error codes and corrective actions, see *Hitachi Device Manager - Storage Navigator Messages*.

Consistency group pair-split failures

If a consistency group (CTG) pair-split fails, note the following:

- The pairs in the CTG are suspended (Suspend/SUSPER status).
- If the host server is down or has failed, many CTGs that contain no SIz pair might be created and there might not be enough available CTGs. Under such conditions, if you are using CCI to run the paircreate command with CTG pair-split, the command might be rejected.

  In this case, perform the following steps to delete the CTG that contains no SIz pair and rerun the paircreate command:

  1. In the Local Replication window, select the Consistency Groups tab.
  2. In the Status column, locate a CTG ID that is not being used by any pairs.
  3. Use CCI to explicitly specify the CTG ID you found.
  4. You can now create the SIz pair or HTI pair for CTG pair-split by running the paircreate command on the host server. If the CTG ID is 128 or more, create a HTI pair. For more information about how to create a HTI pair, see the *Hitachi Thin Image User Guide*.
  5. Delete the SIz pair or HTI pair created in step 2

- If you are using a URz S-VOL as an SIz P-VOL and you are using CCI to run commands and the status for some pairs that are assigned to a CTG are not changed, some pairs remain unsplit in the CTG and pair consistency is not guaranteed after you run the **`pairsplit`** command.

  In this case, perform the following steps:

  1. In the **Local Replication** window, select the **Consistency Groups** tab.
  2. In the **Status** column, locate a CTG ID that is not being used by any pairs.
  3. Use CCI to specify the CTG ID you found.
  4. Create a pair for CTG pair-split by running the **`paircreate`** command on the host server.

  The following are possible reasons why the status for some pairs that are assigned to a CTG are not changed:

  - The URz pair is assigned to a CTG and the P-VOL and S-VOL have the same content. The journal volumes for this pair are full.
  - The SIz license is invalid.
  - The SIz pair volumes are blocked.
  - The SIz pair is in a status that does not allow you to run the **`pairsplit`** CCI command.

    For more information about pair status, see Monitoring ShadowImage for Mainframe pair activity and status (on page 87) .
  - You are using an SIz pair volume in a TCz or URz pair, and the TCz or URz pair is in a status that does not allow you to run the **`pairsplit`** CCI command.

  If you cannot change the status, the **`pairsplit`** CCI command can end abnormally with the error code EX_EWSTOT, which indicates timeout occurrence. You cannot change the pair status during a timeout.

  Remove these factors, and then complete the following steps:

  1. Resynchronize the pairs.
  2. Split the pairs.

Pinned track recovery

If a pinned track occurs on an SIz P-VOL or S-VOL, the storage system suspends the pair. Contact customer support for assistance in recovering pinned tracks.

Extended copy time causes and corrective actions

The following table describes some causes and possible responses in the case of extended copy times.

Cause	Corrective action
The average MP usage rate of an MP unit to which the P-VOL and S-VOL are allocated exceeds 80%.	Examine the configuration. For information about checking the MP usage rate, see the *Performance Guide* of your storage system.
The HOST I/O Performance option is enabled.	Disable the option (see System options (on page 47)).
The S-VOL's HDD or external storage performance is lower than the P-VOL's.	Make the configuration of the S-VOL's HDD or external storage the same as the P-VOL's.
The P-VOL's HDD or external storage has an error.	Review the error and make the necessary correction.
The S-VOL's HDD or external storage has an error.	Review the error and make the necessary correction.
The copy multiplexing option for ShadowImage or ShadowImage for Mainframe is disabled.	Enable local replica options.*
*For details about enabling local replica options, see Changing local replica options (on page 46) .	

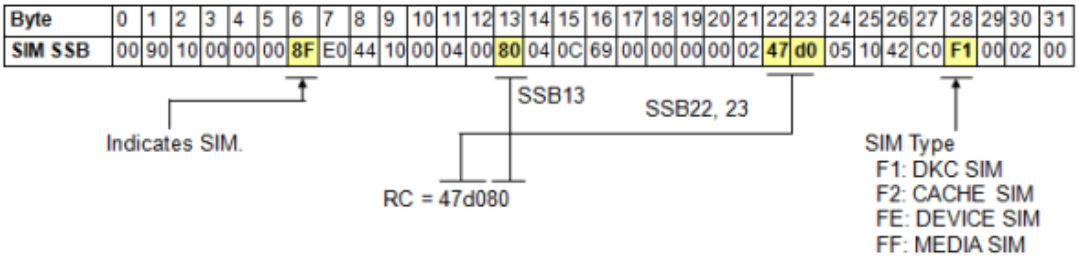
ShadowImage for Mainframe service information messages

The storage system generates a service information message (SIM) to notify users of events that have occurred in the storage system. The storage system's channel and storage path microprocessors or the service processor (SVP) can generate SIMs. The SVP reports all SIMs related to SIz tasks. The SIMs reported to the zSeries and S/390 host are logged in the `SYS1.LOGREC` dataset of the host operating system.

SIMs are classified according to the following severities: service, moderate, serious, or acute. The larger the SIM number, the more important the message.

All SIMs are recorded on the SVP and can be viewed in HDvM - SN by clicking the Alert link at the top of the HDvM - SN window. The color next to the Alert link changes to provide an indication of array internal status.

The following image shows a typical 32-byte SIM. The host console shows SIMs by reference code (RC) and severity. The six-digit RC (composed of bytes 22, 23, and 13) identifies the possible error and determines the severity. The SIM type (byte 28) indicates the component which experienced the error.



The following table describes the disk controller (DKC) SIM (byte 28 = F1) reference codes related to SIz tasks.

Reference code		Importance level	Description
SSB22	SSB23		
47	d*x*	Moderate	Copying ends abnormally and the pair is suspended (Suspend/SUSPER status). ▪ *x* indicates the last digit of the P-VOL's CU number (00 to fe). ▪ "SSB13" indicates the S-VOL's LDEV number.
47	e7	Moderate	The pair is suspended (Suspend/SUSPER status).

Interpreting error codes using Command Control Interface or Business Continuity Manager

You can use the CCI or Business Continuity Manager (BCM) operation logs to troubleshoot tasks that you have performed. The following procedure describes CCI or BCM error codes and how to locate and interpret them.

1. Open one of the following:
   - The CCI or BCM window.
   - The CCI or BCM operation log file.
2. In the log that is displayed, locate the log entry or error code you are investigating. You can use the SSB1/SSB2 error code combination to determine the cause of the error. The error codes are shown to the right of the equal symbol (=) in the log. The

SSB1 code is the last four alphanumeric characters to the left of the comma (,). The SSB2 code is the last four alphanumeric characters to the right of the comma (,).

- CCI or BCM window sample log entry:

  ```
  It was rejected due to SKEY=0x05, ASC=0x20,SSB=0xB9E1,0xB901
  on Serial#(64015)
  ```

  SSB1 code: `B9E1`

  SSB2 code: `B901`

- CCI or BCM operation log file sample error code:

  ```
  11:06:03-37897-10413- SSB = 0xb9a0,2089
  ```

  SSB1 code: `b9a0`

  SSB2 code: `2089`

3. Locate the description of the SSB2 error code in the following table. Unless otherwise indicated, these codes apply to SSB1 codes 2e31, b9a0, b9a1, b9a2, b9a5, b9a6, b9ae, and b9af.

For more information about the errors that are not described in the table, contact customer support.

SSB2 code	Description
-	An error occurred during an SIz pair task.
200D	The pair task was rejected because the specified DP-VOL is not associated with a pool.
201B	The CTG pair-split was rejected because the URz pair is other than DUPLEX/Suspend. The URz S-VOL was the SIz P-VOL included in the CTG on which the pair-split is being performed.
2026	The Quick Restore operation was rejected because the cache mode of the specified P-VOL is different from the cache mode of the external S-VOL.
2043	The volume you specified as a P-VOL was a volume using two mirrors included in a 3-URz DC multi-target or cascade configuration. The operation was rejected because the volume was used as a URz data volume.
2044	The volume you specified as an S-VOL was a volume using two mirrors included in a 3-URz DC multi-target or cascade configuration. The operation was rejected because the volume was used as a URz data volume.
2047	The pair task was rejected because the current firmware version does not support the specified P-VOL capacity.

SSB2 code	Description
2048	The pair task was rejected because the current firmware version does not support the specified S-VOL capacity.
204F	The pair task was rejected because the volume you specified as the S-VOL is the volume for Volume Migration, and the transfer process could not be interrupted. Retry the operation after the Volume Migration transfer process has completed.
205B	The pair was not created because the specified MU number is in use.
2060	The volume you specified as an SIz P-VOL was a volume of a URz pair. The pair task was rejected because the status of the URz pair is not in the required status. For more information about the required status for each pair task, see Pair status and available pair tasks (on page 92) .
2061	The volume you specified as an SIz S-VOL was a volume of a URz pair. The pair task was rejected because the status of the URz pair is not in the required status. For more information about the required status for each pair task, see Pair status and available pair tasks (on page 92) .
2067	Cause of the error could be either of the following: ▪ The Quick Restore operation was rejected because the volumes of the specified pair are shared by TCz and URz. ▪ The Reverse Copy operation was rejected because the volumes of the specified pair are shared by TCz and URz, and TCz or URz is not Suspend status.
2071	The pair task was rejected because the volume you specified as the P-VOL is the volume for Volume Migration, and the transfer process could not be interrupted. Retry the operation after the Volume Migration transfer process has completed.
2078	Because the specified P-VOL was also a URz P-VOL for delta resync, one of the following errors occurred: ▪ The Reverse Copy operation was rejected because the URz pair status is not Suspend. ▪ The Quick Restore operation was rejected.
2079	The pair task was rejected because the specified S-VOL was also a URz P-VOL for delta resync.

SSB2 code	Description
2086	The pair task was rejected because the initialization process is being performed.
2089	The Quick Restore operation was rejected because you are formatting the volume you specified as a P-VOL using Quick Format. For more information about formatting volumes using Quick Format, see the *Provisioning Guide* of your storage system.
208A	The Quick Restore operation was rejected because you are formatting the volume you specified as an S-VOL using Quick Format. For more information about formatting volumes using Quick Format, see the *Provisioning Guide* of your storage system.
208C	The pair task was rejected because the volume you specified as the S-VOL is a FICON® Data Migration volume.
2093	The pair task was rejected because the T10 PI attributes for the P-VOL and S-VOL do not match.
2097	The Quick Restore operation was rejected for one of the following reasons: ▪ The P-VOL is also an HDP V-VOL, but the S-VOL is a normal volume. ▪ The P-VOL is a normal volume, but the S-VOL also an HDP V-VOL.
2098	The Quick Restore operation was rejected because both of the following conditions were met: ▪ Either the SIz P-VOL is an HDP V-VOL, but the S-VOL is a normal volume, or the SIz P-VOL is a normal volume, but the S-VOL is an HDP V-VOL. ▪ Differential data for a TCz or URz pair is maintained in the pool with which the P-VOL is associated, and the P-VOL is linked with the TCz or URz pair.
209A	The Quick Restore operation was rejected because both of the following conditions were met: ▪ Either the SIz P-VOL is an HDP V-VOL, but the S-VOL is a normal volume, or the SIz P-VOL is a normal volume, but the S-VOL is an HDP V-VOL. ▪ Differential data for a TCz or URz pair is maintained in the pool with which the S-VOL is associated, and the S-VOL is linked with the TCz or URz pair.
209E	The pair task was rejected because the volume you specified as the P-VOL is a FICON® Data Migration volume.
20A2	The create pair task was rejected because the P-VOL is a DP-VOL for which the capacity is increasing.

SSB2 code	Description
20A3	The pair was not created because the S-VOL is a DP-VOL for which capacity is increasing.
20A9	The pair task was rejected because HTI is using the specified CTG ID.
20AA	The create pair task was rejected because the volume you specified as the P-VOL is a DP-VOL and its zero pages were being reclaimed.
20AB	The create pair task was rejected because the volume you specified as the S-VOL is a DP-VOL and its zero pages were being reclaimed.
20B0	The pair task was rejected because the volume you specified as the P-VOL is a DP-VOL and its capacity is increasing.
20B1	The pair task was rejected because the volume you specified as the S-VOL is a DP-VOL and its capacity is increasing.
20B4	The pair task was rejected because the volume you specified as the P-VOL is a DP-VOL that is not associated with a pool.
20B5	The pair task was rejected because the volume you specified as the S-VOL is a DP-VOL that is not associated with a pool.
20BD	The pair task was rejected because the emulation type of the volume you specified as the P-VOL is 3390-V.
20BE	The pair task was rejected because the emulation type of the volume you specified as the S-VOL is 3390-V.
20C5	The command was rejected because you were in the process of turning off the storage system's power.
20C9	The emulation type of the P-VOL was 3390-A, and the pair task is rejected because of one of the following reasons: ▪ Mainframe Fibre Channel Board is not mounted. ▪ Mainframe Fibre Channel Board is all blocked.
20CA	The S-VOL's emulation type was 3390-A, and the pair task was rejected because of one of the following reasons: ▪ Mainframe Fibre Channel Board is not mounted. ▪ Mainframe Fibre Channel Board is all blocked.
20D0	The P-VOL rejected the **`paircreate`** CCI command because the DP pool is initializing in the DP-VOL.
20D1	The S-VOL rejected the **`paircreate`** CCI command because the DP pool is initializing in the DP-VOL.

SSB2 code	Description
20D6	The pair task was rejected because Hitachi Compatible Software for IBM® FlashCopy® SE is using the P-VOL or the P-VOL is a TSE volume. For more information about pair volume requirements, see System requirements (on page 19) .
20D7	The pair task was rejected because the S-VOL is a TSE volume. For more information about pair volume requirements, see System requirements (on page 19) .
20DC	You cannot use the specified P-VOL for SIz, because it is being used in SI.
20DF	The volume which was specified as the S-VOL cannot be used, because the volume is undergoing online data migration.
20E4	The command was rejected because if sharing volume between UR S-VOL and SI P-VOL, ShadowImage CTG pair created by BCM or IBM PPRC and ShadowImage CTG pair created by CCI cannot coexist.
20E6	The CTG pair split function cannot be used from CCI for CTG reserved on Device Manager - Storage Navigator.
20E9	The pair task was rejected because the volume you specified as the P-VOL is a S-VOL for an existing pair, and the volume you specified as the S-VOL is the P-VOL for another existing pair.
20F0	The pair task was rejected because Soft Fence is set for the specified primary volume.
20F1	The pair task was rejected because Soft Fence is set for the specified secondary volume.
22F6	The pair task was rejected because the volume you specified as the P-VOL is a Compatible FlashCopy® T-VOL.
22F7	The pair task was rejected because the volume you specified as the S-VOL is a Compatible FlashCopy® S-VOL or T-VOL.
22F9	The pair was not restored because the volume you specified as the S-VOL is a Compatible FlashCopy® S-VOL or T-VOL.
2301	The pair task was rejected because there is not a sufficient amount of installed shared memory or SIz is not installed.
2306	The pair task was rejected because the LBA size of the specified P-VOL is not the same as the size of the specified S-VOL.
2309	The pair was not created because the number of pairs exceeded the maximum number of pairs.

SSB2 code	Description
230A	The pair was not created because the volume you specified as the S-VOL is the P-VOL of the SIz pair that has an MU number of 0.
230B	The pair task was rejected because the pair is being suspended or deleted.
2310	One of the following occurred: ▪ Pair creation was rejected because the specified CTG ID had already been used for an L1 pair. ▪ Pair creation was rejected because the specified CTG ID had already been used for an L2 pair. ▪ Quick Restore or Reverse Copy was rejected because the volume you specified as the P-VOL is the S-VOL of the pair which is in Suspend/SUSPER. ▪ Quick Restore operation was rejected because the VLL setting of the P-VOL is different from that of the S-VOL. ▪ The pair task was rejected because the specified P-VOL and S-VOLs were a Compatible FlashCopy® V2 pair. ▪ The reverse resynchronization was rejected because the pair of the specified P-VOL and S-VOLs is suspended (Suspend/SUSPER status). ▪ The reverse resynchronization was rejected because the specified P-VOL and the S-VOL is the L2 pair. ▪ The CTG pair-split was rejected because some of the pairs in the CTG were being resynchronized, split, or were already suspended. ▪ The pair task was rejected because the pair status of the P-VOL, the S-VOL, or both showed that the pair could not receive the issued command.
2312	The pair task was rejected because the volume you specified as the S-VOL is online to the host.
2314	The pair was not created because the volume you specified as the S-VOL is the S-VOL of another SIz pair that has been split (Split/SUSPOP status).
231F	The pair was not restored because the P-VOL of the specified pair is online to the host.
2322	The pair task was rejected because there is not a sufficient amount of installed shared memory or initialization is not completed.
2324	The pair task was rejected because the number of slots of the volume you specified as the P-VOL exceeded the upper limit.
2325	The pair task was rejected because the number of slots of the volume you specified as the S-VOL exceeded the upper limit.

SSB2 code	Description
2326	The pair was not created because the volume you specified as the P-VOL had already had three S-VOLs.
2327	The pair was not created because the node volume specified as the P-VOL had already had two S-VOLs.
2328	The pair task was rejected because the pair configuration exceeded the number of the layers of the cascade configuration.
2329	The pair task was rejected because the volume you specified as the S-VOL is the S-VOL of an existing pair.
232A	The pair was not created because pairs that would exceed the license capacity were going to be created.
232F	The pair task was rejected because the volume you specified as the P-VOL is allocated as the destination of the Volume Migration.
2331	The pair task was rejected because the capacity of the specified P-VOL is not the same as the capacity of the S-VOL.
2332	The pair was not created because the volume you specified as the P-VOL had already had three S-VOLs.
2333	The pair task was rejected because the volume you specified as the P-VOL is not the P-VOL of the existing pair.
2334	One of the following occurred: ▪ The pair task was rejected because the volume you specified as the P-VOL had an emulation type that BCM could not handle. ▪ The CTG pair-split was rejected because the volume you specified as the P-VOL is an intermediate volume.
2335	The pair task was rejected because the volume you specified as the S-VOL had an emulation type that could not be handled by BCM.
2336	The pair task was rejected because the emulation type of the specified P-VOL is different from the emulation type of the S-VOL. For more information about pair volumes and supported emulation types, see Pair volumes and emulation types (on page 22) .
2337	The pair operation was rejected because the volume you specified as the P-VOL had already been an S-VOL.
233A	The **`pairresync`** CCI command was rejected because the volume you specified as the P-VOL is not an SIz P-VOL.
233B	The pair task was rejected because the volume you specified as the S-VOL is a root volume.

SSB2 code	Description
233C	The pair task was rejected because the volume you specified as the S-VOL is a node volume, and the volume you specified as the P-VOL is not the P-VOL for the specified S-VOL.
233D	The **`pairsplit`** CCI command was rejected because the specified P-VOL and S-VOLs were a L2 pair, and the L1 pair is not split (Split/SUSPOP status).
233E	The pair task was rejected because the volume you specified as the P-VOL is being used as another SIz P-VOL, and also that pair's S-VOL is used as a TCz P-VOL.
233F	The pair task was rejected because the volume you specified as the S-VOL is the TCz P-VOL, and the pair is not Suspend.
2342	The pair task was rejected because the volume you specified as the S-VOL is the destination of the Volume Migration.
2343	The pair was not created because the volume you specified as the S-VOL had already been an S-VOL.
2344	The pair task was rejected because the volume you specified as the S-VOL for SIz pair tasks is not an S-VOL.
2346	The volume you specified as an SIz S-VOL is a TCz P-VOL. The pair task was rejected because the TCz pair is not in the required status. For more information about the required status for each pair task, see Pair status and available pair tasks (on page 92).
2347	The volume you specified as an SIz S-VOL was a TCz S-VOL. The pair task was rejected because the TCz pair is not in the required status. For more information about the required status for each pair task, see Pair status and available pair tasks (on page 92).
234A	The pair creation for the cascade configuration was rejected because the volume you specified as the S-VOL is an intermediate volume.
234B	The pair task was rejected because the volume you specified as the S-VOL is the volume of the Volume Migration.
2350	The pair task was rejected because the specified P-VOL and the S-VOL for SIz pair tasks is not a pair.
2351	The pair task was rejected because the volume you specified as the P-VOL and the volume you specified as the S-VOL are the same.
2352	The pair was not restored because the specified P-VOL and S-VOLs is online to the host.

SSB2 code	Description
2353	The pair was not deleted because the specified P-VOL and S-VOLs are in the process of being Quick Split.
2354	The **`pairresync`** CCI command was rejected because the P-VOL and S-VOLs is in the process of being Steady Split.
2357	The pair creation was rejected because the volume you specified as the S-VOL is the P-VOL of the pair you are splitting or the P-VOL of the pair you are reverse resynchronizing.
2358	The **`pairresync`** CCI command was rejected because the volume you specified as the S-VOL is the P-VOL of the splitting pair.
235B	The volume you specified as a P-VOL is a TCz P-VOL. The Reverse Copy or Quick Restore operation was rejected because the TCz pair is not Suspend.
235C	The volume you specified as the P-VOL is a TCz S-VOL. The Reverse Copy or Quick Restore operation was rejected because the TCz pair is not Suspend.
235D	The volume you specified as an S-VOL was a TCz P-VOL. The Reverse Copy or Quick Restore operation was rejected because the TCz pair is not Suspend.
236C	The reverse resynchronization was rejected because the volume you specified as the P-VOL has the S-VOL Disable attribute assigned by the Data Retention Utility.
236D	The pair task was rejected because the volume you specified as the S-VOL has the S-VOL Disable attribute assigned by the Data Retention Utility.
2370	The pair task was rejected because the volume you specified as the P-VOL is not mounted.
2371	The pair task was rejected because the volume you specified as the P-VOL is blocked.
2372	The pair task was rejected because the volume you specified as the P-VOL is being formatted or shredded.
2373	The pair task was rejected because the volume you specified as the P-VOL is a command device.
2380	The pair task was rejected because of one of the following reasons: ▪ The volume you specified as the S-VOL is not mounted. ▪ The MU number is 3 or greater.
2381	The pair task was rejected because the volume you specified as the S-VOL is blocked.

SSB2 code	Description
2382	The pair task was rejected because the volume you specified as the S-VOL is being formatted or shredded.
2383	The pair task was rejected because the volume you specified as the S-VOL is a command device.
2387	The pair was not created because the volume you specified as the P-VOL is the volume for Volume Migration.
2394	The pair was not registered in the CTG because the number of the pairs assigned to the CTG has exceeded the defined maximum number of pairs.
2395	The pair task was rejected because you are reverse resynchronizing the pair sharing the specified volume as the P-VOL.
2396	The pair task was rejected because you are reverse resynchronizing the L1 pair sharing the specified P-VOL as the root volume.
2397	The pair task was rejected because you are reverse resynchronizing the L2 pair sharing the specified P-VOL or S-VOL as the node volume.
2398	Quit Restore or Reverse Copy was rejected because the pair is not split (Split/SUSPOP status) or suspended (Suspend/SUSPER status).
2399	Quit Restore or Reverse Copy was rejected because some of the pairs sharing the specified volume as the P-VOL are not in split (Split/SUSPOP status) or suspended (Suspend/SUSPER status).
239D	The pair was not created because you have set the Protect attribute for the volume you specified as the P-VOL using BCM.
239E	The pair was not created because you set the Protect attribute for the volume you specified as the S-VOL using BCM.
23A8	The reverse resynchronization was rejected because the volume you specified as the P-VOL is a P-VOL for XRC.
23A9	The pair was not restored because the volume you specified is the P-VOL for CC.
23AA	The pair task was rejected because the volume you specified as the S-VOL is a P-VOL for XRC.
23AB	The pair task was rejected because the volume you specified as the S-VOL is the P-VOL for CC.
23AF	The pair was not registered in the CTG because IBM PPRC/BCM has reserved the specified CTG ID.
23BB	The pair was not created because the volume you specified as the S-VOL could not be used as the S-VOL because of Volume Security settings.

SSB2 code	Description
23EF	The pair was not deleted because the P-VOL and S-VOL are in the process of being Quick Split.
23F1	The pair was not created because the CTG identifier you specified is not supported.
23F5	The pair task was rejected because you set a split time for the CTG.
9100	You cannot run the command because the system did not authenticate your user information.
B911	The pair task was rejected because the specified volume did not exist.
B912	The pair was not created because the specified S-VOL does not exist.
B913	The pair task was rejected because the mirror ID is invalid.

Appendix A: Performing ShadowImage for Mainframe pair tasks using IBM PPRC and ICKDSF commands

This appendix includes IBM PPRC requirements, commands, and examples. You can perform SIz pair tasks using PPRC TSO and ICKDSF PPRCOPY commands.

Note: This appendix does not include all instructions for using the PPRC and ICKDSF commands.

For more information about these commands and using IBM PPRC and ICKDSF, see the IBM user documentation.

Supported PPRC and PPRCOPY commands

You can use PPRC and PPRCOPY commands to perform the following SIz pair tasks:

- Add pairs.
- Add and split pairs.
- Split the pairs.
- Resynchronize pairs.
- Delete pairs.
- Show pair status and other information.

The following table describes the PPRC TSO and ICKDSF PPRCOPY commands that SIz supports.

PPRC TSO command	ICKDSF PPRCOPY command	Description
CESTPAIR	PPRCOPY ESTPAIR	Creates a pair, starts the initial copy operation, and changes the status to DUPLEX.
CESTPAIR	PPRCOPY ESTPAIR	Adds and simultaneously splits a pair.
CSUSPEND	PPRCOPY SUSPEND	Splits a pair, and then starts a Quick Split.
CSUSPEND	PPRCOPY SUSPEND	Splits a pair, and then starts a Steady Split.

PPRC TSO command	ICKDSF PPRCOPY command	Description
CESTPAIR	PPRCOPY ESTPAIR	Resynchronizes a pair, and then starts a Normal Copy.
CESTPAIR	PPRCOPY ESTPAIR	Resynchronizes a pair, and then starts a Quick Resync.
CESTPAIR	PPRCOPY ESTPAIR	Resynchronizes a pair, and then starts a Reverse Copy.
CESTPAIR	PPRCOPY ESTPAIR	Resynchronizes the pair and starts Quick Restore.
CDELPAIR	PPRCOPY DELPAIR	Deletes the pair and the volumes are unpaired.
CQUERY	PPRCOPY QUERY	Shows detailed pair status information.

You can complete certain pair tasks with HDvM - SN that you cannot perform with PPRC, including the following:

- Set or reset the S-VOL reserve attribute.
- Suspend pairs.

PPRC command prerequisites

- SIz must be installed and enabled on the storage system.
- The serial numbers of the P-VOL and the S-VOL must be defined using one of the following methods:
  - Use the same serial number for both the P-VOL and S-VOL.
  - Use the serial number for the S-VOL, and enter an additional parameter instead of the serial number for the P-VOL.

SIz and TCz both support PPRC, so a failure to meet these requirements can result in a command being run on a TCz pair instead.

How PSF commands interact with ShadowImage for Mainframe pairs

With Perform Storage System Function (PSF) commands, you can run PPRC commands and user requests in the storage system.

The following table describes how PSF commands interact with SIz pairs.

PSF commands	Interaction with SIz pairs
Device pair status	For more information about device pair status, see PSF and DEVSERV command results (on page 121).
Rate of synchronization	The differential bitmap format is different than that of TCz. This PSF command is not available with SIz pairs.
Primary volume with 2 or more S-VOLs	Shows information for the pair with an S-VOL that has the lowest LDEV ID.
Path status	Active.
Path number	If the volume is not part of a TCz pair, 1 is displayed with TCz information.

PSF and DEVSERV command results

The following table lists the PSF and **DEVSERV** command results.

Pair status	PSF Read Subsystem Data		DEVSERV Sense Subsystem Status	
	P-VOL	S-VOL	P-VOL	S-VOL
PENDING	PPRI-PNDG	PSEC-PNDG	PPRI-PNDG	PSEC-PNDG
DUPLEX	PPRIMARY	PSECONDRY	PPRIMARY	PSECONDRY
SP-Pend/TRANS	PPRI-PNDG	PSEC-PNDG	PPRI-PNDG	PSEC-PNDG
V-Split/SUSPVS	PPRI-SUSP	PSEC-SUSP	PPRI-SUSP	Unpaired
Split/SUSPOP	PPRI-SUSP	PSEC-SUSP	PPRI-SUSP	Unpaired
Suspend/ SUSPER	PPRI-SUSP	PSEC-SUSP	PPRI-SUSP	PSEC-SUSP
Resync/ PENDING	PPRI-PNDG	PSEC-PNDG	PPRI-PNDG	PSEC-PNDG
Note: PPRIMARY and PSECONDRY indicate that the volume status is DUPLEX.				

The following image shows an example of the **DEVSERV** command:

```
97244  13:04:37.39      DS P,DE80,1
97244  13:04:38.57      IEE459I  13.04.37 DEVSERV PATHS 692
                      692  UNIT DTYPE  M  CNT VOLSER CHPID=PATH STATUS
                      692         RTYPE   SSID CFW TC DFW  PIN  DC-STATE CCA DCA
                      692  DE80,33903 ,0,000,DKDE80,54=+ 1C=+ D4=+ 9C=+
                      692                 0080  Y  YY. YY.   N  PPRIMARY  00   00
```

Performing pair operations using PPRC commands when S-VOL is online

Pair split and pair deletion operations can be done using PPRC commands when an S-VOL is online, but whether you can perform pair creation and pair resync operations depends on the ONLINSEC parameter.

The following table indicates whether pair creation and resync operations are possible using PPRC commands when an S-VOL is online.

Pair operation	ONLINSEC parameter		
	YES	NO	Not specified
Pair create	Yes	No	No
Pair resync	Yes	No	No

Creating pairs using CESTPAIR and PPRCOPY ESTPAIR

Before you begin

The S-VOL must be offline.

Procedure

1. Issue one of the following commands to the P-VOL:
   - (For PPRC) **`CESTPAIR`**
   - (For PPRCOPY) **`PPRCOPY ESTPAIR`**

CESTPAIR parameters

The following table describes the PPRC **`CESTPAIR`** command parameters used for creating pairs.

Parameter	Value	Description
DEVN	Device number	NA
PRIM	Primary volume: SSID, serial number, channel connection address, and CU number.	To request the **`Split`** directly, specify MSF00 instead of a serial number. **Note:** This parameter is valid for MODE(COPY) or MODE(NOCOPY) only.

Parameter	Value	Description
		To assign a pair to a CTG, specify MA*nn*0 instead of a serial number, where *nn* is a CTG ID. You must use these parameters to successfully run the command.
SEC	Secondary volume: SSID, serial number, channel connection address, and CU number.	NA
MODE	COPY	The storage system recognizes only COPY for the MODE parameter, even if NOCOPY is specified.
	NOCOPY[2]	
PACE	Any number	Copy speed is medium, regardless what you specify for the PACE parameter.
CRIT	Not applicable	Not used by SIz.
MSGREQ	YES[2]	MSGREQ function is applicable. **Note:** Do not specify YES for this parameter when you request the **`Split`** directly. If you specify YES for this parameter, the command is rejected and ends abnormally (reporting CC = 8).
	NO	MSGREQ function is not applicable.
ONLINSEC[1]	YES	The pair is created whether the S-VOL is online or not.
	NO	If the S-VOL is online, the pair is not created.
1. Not specifying and specifying NO for this parameter have the same affect. 2. If you specify NOCOPY as the MODE parameter and YES as the MSGREQ parameter, the **`CESTPAIR`** PPRC command ends before the copy operation is completed.		

The following is an example of the **`CESTPAIR`** command:

```
CESTPAIR DEVN(X'3E00')
PRIM(X'00C6',00002,X'00',X'C6') -
SEC(X'00C6',00002,X'01',X'C6')
MODE(COPY)
```

PPRCOPY ESTPAIR parameters

The following table describes the **PPRCOPY ESTPAIR** command parameters.

Parameters	Value	Description
DDNAME, SYSNAME, or UNITADDRESS	DDNAME = *dname* SYSNAME = *sysxxx* UNITADDRESS = *ccuu*	Only one of the three parameters can be specified. The italic term is the arbitrary name, where *dname* is the JCL statement that identifies the volume, *sysxxx* is the SYSNAME of the ASSGN system control statement, and *ccuu* is the device number.
PRI	Primary volume: SSID, serial number, channel connection address.	To request the **Split** directly, specify MSF00 instead of a serial number. **Note:** This parameter is valid for MODE(COPY) or MODE(NOCOPY) only. To assign a pair to a CTG, specify MA*nn*0 instead of a serial number, where *nn* is a CTG ID. You must use these parameters to successfully run the command.
SEC	Secondary volume: SSID, serial number, channel connection address.	NA
MODE	COPY NOCOPY	The system recognizes only COPY for the MODE parameter, even if NOCOPY is specified.
PACE	1-255	Copy speed is medium, regardless what is specified for the PACE parameter.
CRIT	Not applicable	Not used by SIz.
MSGREQ	YES	MSGREQ function is applicable.

Parameters	Value	Description
		Do not specify this parameter in the following cases: ▪ When MODE(RESYNC) is specified. If you specify YES for this parameter, the command is rejected and ends abnormally (reporting CC = 12) ▪ When you request a **`Split`** directly. If you specify YES for this parameter, MSGREQ might be ignored.
	NO	MSGREQ function is not applicable.
LSS	P-VOL or S-VOL CU number.	NA
ONLINSEC*	YES	The pair is created whether the S-VOL is online or not.
	NO	If the S-VOL is online, the pair is not created.
* Not specifying and specifying NO for this parameter has the same effect.		

The following is an example of the **`PPRCOPY ESTPAIR`** command:

```
//SIICKEST JOB
// EXEC PGM=ICKDSF
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
PPRCOPY ESTPAIR UNIT(3E00) PRI(X'00C6' 00002 X'00') -
SEC(X'00C6' 00002 X'01') LSS(X'C6' X'C6') MODE(COPY)
```

Splitting pairs using CSUSPEND and PPRCOPY SUSPEND

The P-VOL and its associated S-VOLs for pairs in DUPLEX status are typically not identical since update copy operations are asynchronous.

Splitting the pair allows the host access to the S-VOL. If the pair is not split (Split/SUSPOP status), the host can access the nonreserved S-VOL. You cannot access reserved volumes that are unpaired.

Before you begin

The volumes must be paired or you have performed Quick Resync on the pair (DUPLEX status).

Procedure

1. Issue one of the following commands to the P-VOL:
   - (For PPRC) **CSUSPEND**
   - (For PPRCOPY) **PPRCOPY SUSPEND**

CSUSPEND parameters

The following table describes the PPRC **CSUSPEND** command parameters used for splitting pairs.

Parameter	Value	Description
DEVN	Device number	NA
PRIM	Primary volume: SSID, serial number, channel connection address, and CU number.	You can specify MPS00 or MA*nn*0 instead of a serial number, where *nn* is a CTG ID. Use MPS00 for a steady split request. Use MA*nn*0 to Quick Split all pairs in a CTG. If you specify parameters other than the serial number, MPS00, or MA*nn*0, the command is rejected.
SEC	Secondary volume: SSID, serial number, channel connection address, and CU number.	NA
PRIMARY	Not Applicable	Not used by SIz.
* When executing Quick Split for all the pairs in a CTG, make sure that the status of every pair is DUPLEX. If you are copying the pair (PENDING status), Quick Split can end abnormally (reporting CC = 12). If this occurs, wait until the copy operation ends. For more information about the prerequisites for Quick Split, see Pair splitting methods (on page 62) .		

The following is an example of running the **CSUSPEND** command:

```
CSUSPEND DEVN(X'3E00')
PRIM(X'00C6',MPS00,X'00',X'C6') -
SEC(X'00C6',00002,X'01',X'C6')
```

PPRCOPY SUSPEND parameters

The following table describes the **PPRCOPY SUSPEND** command parameters used to split pairs.

Parameters	Value	Description
DDNAME, SYSNAME, or UNITADDRESS	DDNAME = *dname* SYSNAME = *sysxxx* UNITADDRESS = *ccuu*	Only one of the three parameters can be specified. The italic term is the arbitrary name, where *dname* is the JCL statement that identifies the volume, *sysxxx* is the SYSNAME of the ASSGN system control statement, and *ccuu* is the device number.
PRI	Primary volume: SSID, serial number, channel connection address.	You can specify MPS00 or MA*nn*0 instead of a serial number, where *nn* is a CTG ID. MPS00 is used for a steady split request. Use MA*nn*0 to Quick Split all pairs in a CTG.* If you specify parameters other than the serial number, MPS00, or MA*nn*0, the command is rejected.
SEC	Secondary volume: SSID, serial number, channel connection address.	NA
PRIMA	Not Applicable	Not used by SIz.
LSS	P-VOL or S-VOL CU number.	NA
* When executing Quick Split for all the pairs in a CTG, make sure that the status of every pair is DUPLEX. If you are in the process of copying the pair (PENDING status), Quick Split can end abnormally (reporting CC = 12). If this occurs, wait until the copy operation ends. For more information about the prerequisites for Quick Split, see Pair splitting methods (on page 62).		

The following is an example of running the **PPRCOPY SUSPEND** command:

```
//SIICKSUS JOB
// EXEC PGM=ICKDSF
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
PPRCOPY SUSPEND UNIT(3E00)
PRI(X'00C6' 00002 X'00') -
SEC(X'00C6' 00002 X'01') LSS(X'C6' X'C6')
```

Resynchronizing pairs with CESTPAIR and PPRCOPY ESTPAIR

Before you begin

The pair must be split (Split/SUSPOP status) or suspended (Suspend/SUSPER status).

Issue one of the following commands to the P-VOL:

- (For PPRC) **CESTPAIR**
- (For PPRCOPY) **PPRCOPY ESTPAIR**

CESTPAIR parameters

The following table describes the PPRC **CESTPAIR** command parameters used for resynchronizing pairs.

Parameter	Value	Description
DEVN	Device number	NA
PRIM	Primary volume: SSID, serial number, channel connection address, and CU number.	You can specify the following additional parameters corresponding to each request instead of a serial number. If you do not specify an additional parameter, the request triggers a normal copy: ▪ For a Quick Resync, specify MRF00. This parameter is valid for MODE(RESYNC) only. ▪ For a Quick Restore, specify MRQ00. This parameter is valid for MODE(RESYNC) only.

Parameter	Value	Description
		▪ For a Reverse Copy, specify MRR00. This parameter is valid for MODE(RESYNC) only. ▪ To resync all pairs in a CTG, specify MA*nn*0, where *nn* is a CTG ID. You can execute resync by specifying this parameter. You must use these parameters to successfully run the command.
SEC	Secondary volume: SSID, serial number, channel connection address, and CU number.	NA
MODE	RESYNC	Re-establish a split or suspended volume pair. This parameter is required.
PACE	Any number	Copy speed is medium, regardless what is specified for the PACE parameter.
CRIT	Not applicable	Not used by SIz.
MSGREQ	YES	MSGREQ function is applicable. **Note:** Do not specify YES for this parameter when you request resync on all pairs in a CTG. If you specify YES for this parameter, the command ends abnormally (reporting CC = 8).
	NO	MSGREQ function is not applicable.
ONLINSEC*	YES	You can Normal Copy when the S-VOL is online and offline. You can reverse resynchronize the pair when the P-VOL and S-VOL are online and offline.
	NO	You cannot Normal Copy when the S-VOL is online.

Parameter	Value	Description
		If the P-VOL and S-VOL are online, you cannot reverse resynchronize the pair.
* Not specifying and specifying NO for this parameter has the same effect.		

The following is an example of running the **CESTPAIR** command with MODE(RESYNC):

```
CESTPAIR DEVN(X'3E00')
PRIM(X'00C6',00002,X'00',X'C6') -
SEC(X'00C6',00002,X'01',X'C6')
MODE(RESYNC)
```

PPRCOPY ESTPAIR parameters

The following table describes the **PPRCOPY ESTPAIR** command parameters used to resynchronize pairs.

Parameters	Value	Description
DDNAME, SYSNAME, or UNITADDRESS	DDNAME = *dname* SYSNAME = *sysxxx* UNITADDRESS = *ccuu*	Only one of the three parameters can be specified. The italic term is the arbitrary name, where *dname* is the JCL statement that identifies the volume, *sysxxx* is the SYSNAME of the ASSGN system control statement, and *ccuu* is the device number.

Parameters	Value	Description
PRI	Primary volume: SSID, serial number, channel connection address.	You can specify the following additional parameters corresponding to each request instead of a serial number. If you do not specify an additional parameter, the request triggers a normal copy: ▪ For a Quick Resync, specify MRF00. This parameter is valid for MODE(RESYNC) only. ▪ For a Quick Restore, specify MRQ00. This parameter is valid for MODE(RESYNC) only. ▪ For a Reverse Copy, specify MRR00. This parameter is valid for MODE(RESYNC) only. ▪ To resync all pairs in a CTG, specify MA*nn*0, where *nn* is a CTG ID. You can execute resync by specifying this parameter. You must use these parameters to successfully run the command. **Note:** If you specify NO for the ONLINSEC parameter, and then request a Quick Restore or Reverse Copy operation, the command ends abnormally (reporting CC = 12).
SEC	Secondary volume: SSID, serial number, channel connection address.	NA
MODE	RESYNC	Re-establish a split or suspended pair.

Parameters	Value	Description
PACE	1-255	Copy speed is medium, regardless what is specified for the PACE parameter.
CRIT	Not applicable	Not used by SIz.
MSGREQ	YES	To prevent the command from ending abnormally (reporting CC = 12), do not specify the parameter if MODE(RESYNC) is set.
	NO	
LSS	P-VOL or S-VOL CU number.	NA
ONLINSEC*	YES	You can Normal Copy when the S-VOL is online or offline. You can reverse resynchronize the pair when the P-VOL and S-VOL are online or offline.
	NO	You can Normal Copy when the S-VOL is online. You can reverse resynchronize the pair when the P-VOL and S-VOL are online. The ICKDSF job ends abnormally (reporting CC = 12). **Note:** Although an error does not occur if you specify YES for this parameter, the copy operation is performed. The storage system does not check to see if the volume is online.
* Not specifying and specifying NO for this parameter has the same effect.		

The following is an example of running the **PPRCOPY ESTPAIR** command with MODE(RESYNC):

```
//SIICKRES JOB
// EXEC PGM=ICKDSF
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
PPRCOPY ESTPAIR UNIT(3E00)
PRI(X'00C6' 00002 X'00') -
SEC(X'00C6' 00002 X'01') LSS(X'C6' X'C6')
MODE(RESYNC)
```

Deleting pairs with CDELPAIR and DELPAIR

Before you begin

The pairs are split (Split/SUSPOP status), which ensures S-VOL data integrity.

Procedure

1. Issue one of the following commands to the P-VOL:
   - (For PPRC) **CDELPAIR**
   - (For PPRCOPY) **PPRCOPY DELPAIR**

CDELPAIR parameters

The following table describes the PPRC **CDELPAIR** command parameters used for deleting pairs.

Parameter	Value	Description
DEVN	Device number	NA
PRIM	Primary volume: SSID, serial number, channel connection address, and CU number.	To delete all pairs in a CTG, set this parameter to MA*nn*0, where *nn* is the CTG ID. You must use these parameters to successfully run the command.
SEC	Secondary volume: SSID, serial number, channel connection address, and CU number.	NA

The following is an example of running the **CDELPAIR** command:

```
CDELPAIR DEVN(X'3E00')
PRIM(X'00C6',00002,X'00',X'C6') -
SEC(X'00C6',00002,X'01',X'C6')
```

PPRCOPY DELPAIR parameters

The following table describes the **PPRCOPY DELPAIR** command parameters used to delete pairs.

Parameters	Value	Description
DDNAME, SYSNAME, or UNITADDRESS	DDNAME = *dname* SYSNAME = *sysxxx* UNITADDRESS = *ccuu*	Only one of the three parameters can be specified. The italic term is the arbitrary name, where *dname* is the JCL statement identifying the volume, *sysxxx* is the SYSNAME of the ASSGN system control statement, and *ccuu* is the device number.
PRI	Primary volume: SSID, serial number, channel connection address.	To delete all pairs in a CTG, set this parameter to MA*nn*0, where *nn* is the CTG ID. You must use these parameters to successfully run the command.
SEC	Secondary volume: SSID, serial number, channel connection address.	NA
LSS	P-VOL or S-VOL CU number.	NA

The following is an example of running the **PPRCOPY DELPAIR** command:

```
//SIICKEST JOB
// EXEC PGM=ICKDSF
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
PPRCOPY DELPAIR UNIT(3E00)
PRI(X'00C6' 00002 X'00') -
SEC(X'00C6' 00002 X'01') LSS(X'C6' X'C6')
```

Performing consistency group pair tasks using PPRC commands

With PPRC, you can set up, split, resynchronize, and delete pairs in a consistency group, which performs the pair task on all the pairs at the same time.

Assigning pairs to consistency groups

You can use Business Continuity Manager (BCM), PPRC, or CCI commands to assign multiple SIz pairs to a consistency group (CTG).

You can perform this task using the **YKMAKE** command. For details, see the BCM documentation.

Complete the following steps to assign pairs to CTGs using PPRC commands:

Procedure

1. If you plan to use CTGs with PPRC, use HDvM - SN to reserve a CTG for SIz so that you can perform tasks on the pairs in the group, such as CTG pair-split. Otherwise, skip this step.
2. Create the pairs by running one of the following commands:
   - (For PPRC) **CESTPAIR**
   - (For PPRCOPY) **PPRCOPY ESTPAIR**
3. In HDvM - SN, in the window, verify that the pairs are assigned to the CTG.

Splitting pairs in consistency groups

Split pairs in the consistency group (CTG) so that hosts can access the S-VOL.

You can perform this task using the **YKSUSPND** command. For details, see the BCM documentation

Procedure

1. Issue one of the following commands to the pair:
   - (For PPRC) **CSUSPEND**
   - (For PPRCOPY) **PPRCOPY SUSPEND**

   All of the pairs in the CTG are split (Split/SUSPOP status).
2. Check the pair status to make sure the pair is split (Split/SUSPOP status) by running one of the following commands:
   - (For PPRC) **CQUERY**
   - (For PPRCOPY) **PPRCOPY QUERY**

Resynchronizing pairs in consistency groups

Procedure

1. Resynchronize the pair by running one of the following commands:
   - (For PPRC) **CESTPAIR**
   - (For PPRCOPY) **PPRCOPY ESTPAIR**

   All of the pairs in the consistency group (CTG) are resynchronized.
2. Check the pair status by running one of the following commands:
   - (For PPRC) **CQUERY**
   - (For PPRCOPY) **PPRCOPY QUERY**

The storage system checks the pair status to make sure that it has changed to PENDING or DUPLEX.

Deleting pairs in consistency groups

Complete the following steps to delete all of the pairs in a consistency group (CTG).

Procedure

1. Delete all of the pairs in the CTG by running one of the following commands:
   - (For PPRC) **`CDELPAIR`**
   - (For PPRCOPY) **`PPRCOPY DELPAIR`**

   All of the pairs in the CTG are deleted.
2. Check the pair status to make sure that the volumes are unpaired by running one of the following commands:
   - (For PPRC) **`CQUERY`**
   - (For PPRCOPY) **`PPRCOPY QUERY`**

Showing pair status and volume information with CQUERY TSO and QUERY ICKDSF

You can run the commands to the P-VOL or S-VOL. If the P-VOL is paired with more than one S-VOL, the status that is displayed is for the pair that has an S-VOL with the lowest LDEV ID. To show the status for a pair that has another S-VOL, run the command to the desired S-VOL.

If the storage system contains both SIz and TCz pairs, the commands show the TCz pair status. To show the SIz status, run the command on the SIz S-VOL. If you are sharing SIz and TCz volumes, path status shows for TCz. If they do not share volumes, path status for the SIz pair shows as FFFF FFFF.

Procedure

1. Issue one of the following commands to the P-VOL or the S-VOL:
   - (For PPRC) **`CQUERY TSO`**

     For information about the parameters for this command, see CQUERY TSO parameters (on page 137).
   - (For PPRCOPY) **`QUERY ICKDSF`**

     For information about the parameters for this command, see QUERY ICKDSF parameters (on page 137).

CQUERY TSO parameters

The following table lists PPRC **CQUERY TSO** command parameters used to show pair information.

Parameter	Value
DEVN	Device number

The following image shows an example of running the **CQUERY TSO** command:

```
14.27.58 JOB04573 ANTPS802I  CQUERY DEVN(6400)
14.27.58 JOB04573 ANTP0090I CQUERY FORMATTED LVL 4 220
  220        VOLUME REPORT
  220        ************** PPRC REMOTE COPY CQUERY - VOLUME ********************
  220        *                              (PRIMARY)  (SECONDARY) *
  220        *                             SSID CCA LSS SSID CCA LSS*
  220        *DEVICE  LEVEL    STATE    PATH STATUS SERIAL#   SERIAL#  *
  220        *------ --------- ---------- ---------- ---------  --------- *
  220        * 6400 PRIMARY.. DUPLEX....  ACTIVE..  2700 00 00  2700 01 00 *
  220        *     CRIT(NO).......     CGRPLB(NO). 000000063515 000000063515*
  220        *     INCRES(NO).                                  *
  220        * PATHS SAID DEST STATUS: DESCRIPTION                    *
  220        * ----- --------- ------ -------------------               *
  220        *  1  FFFF FFFF  01   PATH ESTABLISHED...                *
  220        *     ---- ----  00   NO PATH.............                *
  220        *     ---- ----  00   NO PATH.............                *
  220        *     ---- ----  00   NO PATH.............                *
  220        * SUBSYSTEM      WWNN             LIC LEVEL          *
  220        * ----------- ----------------        -----------         *
  220        * PRIMARY.... 0000000000000000        80.9.6.255          *
  220        ********************************************************************
14.27.59 JOB04573 ANTP0001I CQUERY COMMAND COMPLETED FOR DEVICE 6400. COMPLETION CODE: 00
```

If you run the **CQUERY TSO** command on the S-VOL in a CTG, the SECONDARY serial number is displayed in the following format:

```
00|S|@|000|30158
```

where:

- S indicates that it is assigned to a CTG.
- @ indicates CTG pair-split.
- 30158 is the serial number.

QUERY ICKDSF parameters

The following table describes the PPRCOPY **QUERY ICKDSF** command parameters used to show pair information.

Parameters	Value	Description
DDNAME, SYSNAME, or UNITADDRESS	DDNAME = *dname* SYSNAME = *sysxxx* UNITADDRESS = *ccuu*	Only one of the three parameters can be specified. The italic term is the arbitrary name, where *dname* is the JCL statement identifying the volume, *sysxxx* is the SYSNAME of the ASSGN system control statement, and *ccuu* is the device number.

The following image shows an example of running the **QUERY ICKDSF** command:

```
0
0 PPRCOPY QUERY UNIT(6400)
-ICKDO700I DEVICE INFORMATION FOR 6400 IS CURRENTLY AS FOLLOWS:
-       PHYSICAL DEVICE = 3390
-       STORAGE CONTROLLER = 2105
-       STORAGE CONTROL DESCRIPTOR = E8
-       DEVICE DESCRIPTOR = 0A
-       ADDITIONAL DEVICE INFORMATION = 4A000035
-       TRKS/CYL = 15, # PRIMARY CYLS = 3339
0ICKD4030I DEVICE IS A PEER TO PEER REMOTE COPY VOLUME
0
0             QUERY REMOTE COPY - VOLUME
0
                                  (PRIMARY)   (SECONDARY)
                                  SSID   CCA SSID   CCA
 DEVICE  LEVEL    STATE        PATH STATUS  SER #  LSS  SER #  LSS
0------ -------- ------------ ---------- ---------- ----------
 6400   PRIMARY   DUPLEX       ACTIVE     2700   00  2700   01
                                  63515  00  63515  00
0
 PATHS  SAID/DEST           STATUS  DESCRIPTION
 -----  ---------           ------  ----------------
 1    FFFF FFFF           01    PATH ESTABLISHED
0
0
-ICKD2206I PPRCOPY QUERY FUNCTION COMPLETED SUCCESSFULLY
```

The following table describes the fields in the output of the PPRC **CQUERY TSO** and PPRCOPY **QUERY ICKDSF** commands.

Field	Description
DEVICE	Device number of the volume on which the **CQUERY** command is issued.
LEVEL	PRIMARY indicates that the volume is a P-VOL. SECONDARY indicates that the volume is a S-VOL.

Field	Description
STATE	Pair status
PATH STATUS	Invalid for SI; Active is displayed.
CRIT	Invalid for SI; NO is displayed.
CTGRPLB	Invalid for SI; NO is displayed.
PRIMARY-SSID	SSID of the P-VOL CU
PRIMARY-CCA	P-VOL LDEV number
PRIMARY-LSS	P-VOL CU number
PRIMARY-SERIAL	P-VOL serial number
SECONDARY-SSID	SSID of the S-VOL CU
SECONDARY-CCA	S-VOL LDEV number
SECONDARY-LSS	S-VOL CU number
SECONDARY-SERIAL	S-VOL serial number. Run the **CQUERY TSO** PPRC command for the S-VOL to show the following information: 00ab000nnnnn where "a" indicates that the pair is defined as a CTG and "b" indicates that you split the pair using CTG pair-split. "0" indicates otherwise. "nnnnn" is the S-VOL serial number.
PATHS	Invalid for SI; 1 is displayed.
SAID DEST STATUS	Invalid for SI; FFFF FFFF is displayed.
DESCRIPTION	Invalid for SI; PATH ESTABLISH is displayed.
PERCENT OF COPY COMPLETE	Invalid for SI; 100% is displayed.
SUBSYSTEM	Invalid for SI, not valid content.
WWN	Invalid for SI, not valid content.
LIC LEVEL	Invalid for SI, not valid content.
When the MCU-RCU path for TCz is created on the CU where an SIz pair exists, MCU-RCU path information is displayed.	

Appendix B: Interface support for ShadowImage for Mainframe pair tasks and options

You can review SIz pair tasks and options, and the interfaces that support them.

Supported Device Manager - Storage Navigator and CCI actions and options

The following table lists the SIz pair tasks and options that Device Manager - Storage Navigator and CCI support.

Pair task/Action	System option	HDvM - SN	CCI	
			Command	Option
Change local replica options	No options	YES	raidcom modify local_replica_opt	-opt_type -set_system_opt -reset_system_opt
Create SI pairs	No options	YES	paircreate	Not applicable
	MU number	YES	paircreate	Uses MU# in HORCM.conf file
	Copy pace	YES	paircreate	-c <size>
	Steady Split	YES	paircreate	-split -fq normal
	Quick Split	YES	paircreate	-split -fq quick
	MSGREQ	NO	NO	NO
	ONLINSEC	NO	NO	NO
	NOCOPY	NO	NO	NO[1]
Split pairs	No options	YES	pairsplit	Not applicable
	Copy pace	YES	pairsplit	-C <size>
	Steady Split	YES	pairsplit	-fq normal
	Quick Split	YES	pairsplit	-fq quick

Pair task/Action	System option	HDvM - SN	CCI	
			Command	Option
	Prevent S-VOL read	NO	paircreate	-m noread
Resynchronize pairs	No options	YES	pairresync	Not applicable
	Copy pace	YES	pairresync	-c <size>
	Normal Copy	YES	pairresync	-fq normal
	Quick Resync	YES	pairresync	-fq quick
	Reverse Copy	YES	pairresync	-fq normal -restore
	Quick Restore	YES	pairresync	-fq quick -restore
Suspend pairs	No options	YES	pairsplit	-E
Delete pairs	No options	YES	pairsplit	-S

Notes:

1. The paircreate command is rejected even if you specify the -nocopy option.

Supported Business Continuity Manager and IBM PPRC actions and options

The following table lists the SIz pair tasks and options that Business Continuity Manager and IBM PPRC support by user interface.

Pair task	System option	BCM	IBM PPRC	
			TSO command	ICKDSF command
Change system options	No options	NO	NO	NO
Create SIz pairs	No options	YKMAKE	CESTPAIR	PPRCOPY ESTPAIR
	MU number	NO	NO	NO
	Copy pace	YES[2]	NO[1]	NO[1]
	Steady Split	NO	CESTPAIR	PPRCOPY ESTPAIR
	Quick Split	NO	NO	NO
	MSGREQ	NO	CESTPAIR	PPRCOPY ESTPAIR

Pair task	System option	BCM	IBM PPRC	
			TSO command	ICKDSF command
	ONLINSEC	YKMAKE	CESTPAIR	PPRCOPY ESTPAIR
	NOCOPY	YES[4]	NO[5]	NO[5]
Split pairs	No options	YKSUSPND	CSUSPEND	PPRCOPY SUSPEND
	Copy pace	NO	NO	NO[6]
	Steady Split	YKSUSPND	CSUSPEND	PPRCOPY SUSPEND
	Quick Split	YKSUSPND	CSUSPEND	PPRCOPY SUSPEND[3]
Resynchronize pairs	No options	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
	Copy pace	YKRESYNC[2]	NO[1]	NO[1]
	Normal Copy	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
	Quick Resync	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
	Reverse Copy	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
	Quick Restore	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
	ONLINSEC	YKRESYNC	CESTPAIR	PPRCOPY ESTPAIR
Suspend pairs	No options	NO	NO	NO
Delete pairs	No options	YKDELETE	CDELPAIR	PPRCOPY DELPAIR

Notes:

1. The system uses Medium speed regardless of what you specify.
2. Normal is the default.
3. If you do not specify an option, the system uses Quick Split.
4. Specify this option only when you can ensure that the contents of the P-VOL and the S-VOL are the same.
5. Even if you specify NOCOPY, the system uses the same action as when COPY is specified.
6. Operates at a speed specified when the pair is created or resynchronized regardless of what you specify.

Supported ShadowImage for Mainframe consistency group actions and options

The following table lists the SIz consistency group (CTG) actions and options supported by HDvM - SN and CCI.

CTG action	System option	HDvM - SN	CCI	
			Command	Option
Reserve CTG	No options	YES	Not necessary	Not necessary
Cancel the CTG reservation	No options	YES	Not necessary	Not necessary
Assign pairs to a CTG	No options	NO	paircreate	-m grp [CTGID]
	MU number	NO	paircreate	Uses MU# in HORCM.conf file
	Copy pace	NO	paircreate	-m grp [CTGID] -c <size>
	User specifies the CTG ID	NO	paircreate	-m grp xx (xx = CTGID)
	System allocates the CTG ID	NO	paircreate	-m grp (CTGID is omitted)
CTG pair-split (undefined split time)	No options	NO	pairsplit	Not applicable
	Copy pace	NO	pairsplit	-C <size>
	Steady Split	NO	pairsplit	-fq normal
	Quick Split	NO	pairsplit	-fq quick
	UR-SI combination (Steady Split)	NO	pairsplit	-fq normal
	UR-SI combination (Quick Split)	NO	pairsplit	-fq quick
Resynchronize pairs	No options	NO	pairresync *	Not applicable
	Copy pace	NO	pairresync *	-c <size>
	Normal Copy	NO	pairresync *	-fq normal

CTG action	System option	HDvM - SN	CCI	
			Command	Option
	Quick Resync	NO	pairresync *	-fq quick
	Reverse Copy	NO	pairresync *	-fq normal -restore
	Quick Restore	NO	pairresync *	-fq quick -restore
	ONLINSEC	NO	NO	NO
Delete pairs	No options	NO	pairsplit*	-S
* You must use a CCI pair group to run the command on pairs in a CTG.				

The following table lists the CTG actions and options supported by Business Continuity Manager (BCM) and IBM PPRC.

CTG action	System option	BCM	IBM PPRC	
			TSO command	ICKDSF command
Reserve CTG	No options	NO	NO	NO
Cancel the CTG reservation	No options	NO	NO	NO
Assign pairs to a CTG	No options	YKMAKE	CESTPAIR	PPRCOPY ESTPAIR
	MU number	NO	NO	NO
	Copy pace	YKMAKE[1]	NO[2]	NO[2]
	User specifies the CTG ID	YKMAKE	CESTPAIR	PPRCOPY ESTPAIR
	System allocates the CTG ID	NO	NO	NO
ATTIME Suspend	No options	YKSUSPND	NO	NO
	Steady Split	YKSUSPND	NO	NO
	Quick Split	YKSUSPND	NO	NO

CTG action	System option	BCM	IBM PPRC	
			TSO command	ICKDSF command
	(If you share SIz volumes with UR) Steady Split	YKSUSPND	NO	NO
	(If you share SIz volumes with UR) Quick Split	YKSUSPND	NO	NO
Cancel ATTIME Suspend	No options	YKSUSPND	NO	NO
CTG pair-split (undefined split time)	No options	YKSUSPND	CSUSPEND	PPRCOPY SUSPEND
	Copy pace	NO	NO[2]	NO[2]
	Steady Split	YKSUSPND	NO	NO
	Quick Split	YKSUSPND	NO	NO
	(If you share SI volumes with UR) Steady Split	NO	NO	NO
	(If you share SI volumes with UR) Quick Split	NO	NO	NO
Resynchronize pairs	No options	YKRESYNC	CESTPAIR	PPRCOPY ES2TPAIR
	Copy pace	YKRESYNC[1]	NO[2, 4]	NO[2, 4]
	Normal Copy	YKRESYNC	NO	NO
	Quick Resync	YKRESYNC	NO	NO
	Reverse Copy	YKRESYNC	NO	NO
	Quick Restore	YKRESYNC	No	No
	ONLINSEC	YKRESYNC	CESTPAIR	PPRCOPY ES2TPAIR
Delete pairs	No options	YKDELETE[4]	CDELPAIR	PPRCOPY DELPAIR

Notes:

1. Values: Normal is the default.

CTG action	System option	BCM	IBM PPRC	
			TSO command	ICKDSF command
2. Medium speed is used regardless of what you specify. **3.** You must use a CCI pair group to run the command for the CTG. **4.** Operates at a speed specified when the pair is created or resynchronized regardless of what you specify.				

Parameter ranges for CCI options

The following table lists the valid ranges of parameters for CCI options.

For details, see the *Command Control Interface Command Reference*.

Parameter	Range
Mirror ID (MU#)	0, 1, or 2
CTG ID	0 to 127

Appendix C: ShadowImage for Mainframe windows and wizards

To supplement tasks and for general reference, you can review information about the SIz windows and dialog boxes that are available in HDvM - SN.

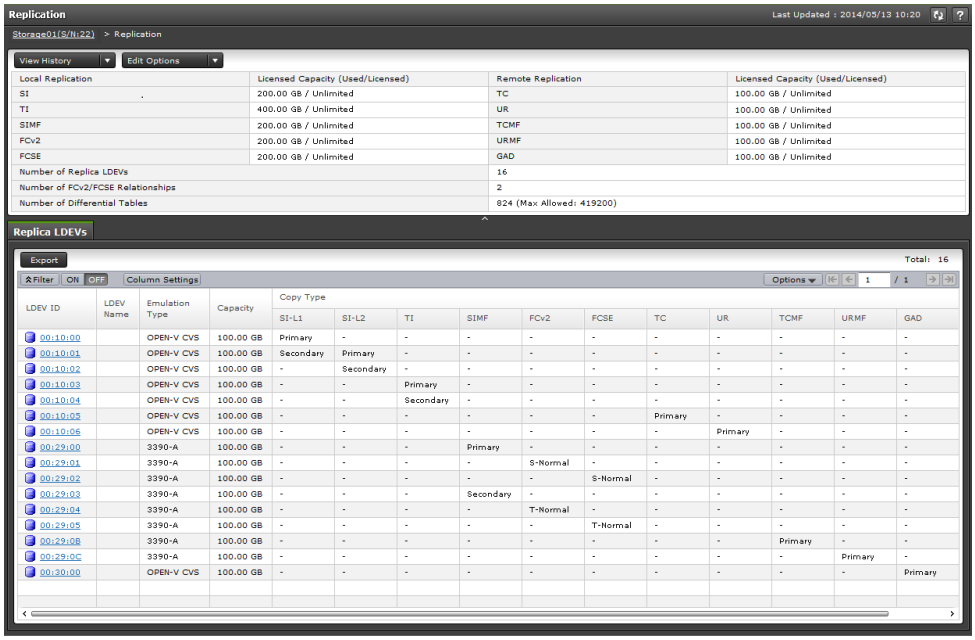
Replication window

Use this window to view pair information for local replication.

This window contains the following information:

- Summary section
- Replica LDEVs tab

The following image shows this window, with the summary section and Replica LDEVs tab in view.



Summary section

The following table describes the items in this section of the **Replication** window.

Item	Description
Licensed Capacity	The amount of used and licensed capacity of each software application.
Number of Replica LDEVs	The number of LDEVs used for all local replication pairs.
Number of FCv2/FCSE Relationships	The number of Compatible FlashCopy® V2 and Compatible FlashCopy® SE relationships in use.
Number of Differential Tables	The number of differential tables in use and the differential table limit, for local replication. Differential tables in use for remote replication are not included. Because differential tables are not used for all operations, the number of differential tables does not change when you execute the following operations: ▪ Thin Image pair operations. ▪ SI pair operations for a DP-VOL that exceeds 4 TB. ▪ SIz pair operations for a DP-VOL that exceeds 262,668 cylinders. ▪ Compatible FlashCopy® V2 or Compatible FlashCopy® SE relationship operations.
View History button	Click to show options. Options: ▪ Local Replication: Click to open the **History** window for local replication. ▪ Remote Replication: Click to open the **History** window for remote replication.
Edit Options button	Click to show options. Options: ▪ Local Replication: Click to open the Edit Local Replica Options wizard. ▪ Remote Replication: Click to open the **Edit Remote Replica Options** window. For more information about how to use this window, see the *Hitachi TrueCopy® for Mainframe User Guide*. ▪ SCP Time: Click to open the **Edit SCP Time** window.

Replica LDEVs tab

The following table describes the items on this tab of the **Replication** window.

Item	Description
LDEV ID	Selected LDEV's identifier. Click to open the **LDEV Properties** window, which contains additional information for the selected replica LDEV.
LDEV Name	The selected LDEV's name.
Emulation Type	The selected LDEV's emulation type.
Capacity	The selected LDEV's capacity.
Copy Type	The copy type. Values: ▪ SI-L1: ShadowImage L1 P-VOL or S-VOL ▪ SI-L2: ShadowImage L2 P-VOL or S-VOL ▪ TI: Thin Image P-VOL or S-VOL ▪ SIMF: ShadowImage for Mainframe P-VOL or S-VOL ▪ FCv2: Compatible FlashCopy® V2 relationship ▪ FCSE: Compatible FlashCopy® SE relationship ▪ TC: TrueCopy P-VOL or S-VOL ▪ UR: Universal Replicator P-VOL or S-VOL ▪ TCMF: TrueCopy for Mainframe P-VOL or S-VOL ▪ URMF: Universal Replicator for Mainframe P-VOL or S-VOL ▪ GAD: Global-active device P-VOL or S-VOL Volume types for SI, SIz, TI, TC, TCz, UR, URz, and GAD are: ▪ Primary: P-VOL ▪ Secondary: S-VOL Volume types for FCv2 and FCSE are: ▪ S-Normal: Normal source volume ▪ T-Normal: Normal target volume ▪ ST-Normal: Normal volume set for both source and target volumes ▪ S-Failed, S-Full, S-Full & Failed: Abnormal source volumes ▪ T-Failed, T-Full, T-Full & Failed: Abnormal target volumes ▪ ST-Failed, ST-Full, ST-Full & Failed: Abnormal volumes set for both source and target volumes

Item	Description
	A hyphen (-) is displayed if the pair is not configured.
Virtual Storage Machine*	Information about the virtual storage machine to which the LDEV belongs. Values: ▪ Model/Serial Number: The model type and serial number of the virtual storage machine. ▪ LDEV ID: The identification number of the volume's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed. ▪ Device Name: The name of the volume's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ SSID: The virtual SSID of the volume. If no virtual SSID is specified, a blank is displayed.
Export button	Click to open a dialog for downloading table information to a tab-separated values (TSV) file.
* These items are not shown in the table by default. You must add them using the **Column Settings** window. For more information about how to add items to a table using this window, see the *System Administrator Guide*.	

Local Replication window

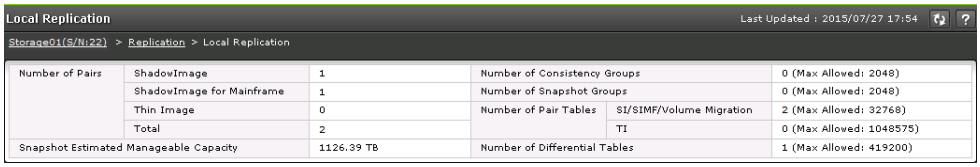
Use this window to perform the following tasks:

- Viewing SIz pairs, HTI pairs, and CTG information for local replication.
- Creating ShadowImage for Mainframe pairs in HDvM - SN (on page 53)
- Splitting ShadowImage for Mainframe pairs (on page 63)
- Resynchronizing or restoring ShadowImage for Mainframe pairs (on page 77)
- Deleting ShadowImage for Mainframe pairs (on page 83)

This window contains the following section and tabs:

- Summary section
- SI Pairs tab
- TI Root Volumes tab
- Consistency Groups tab
- Snapshot Groups tab

The following image shows the summary section of this window.



Summary section

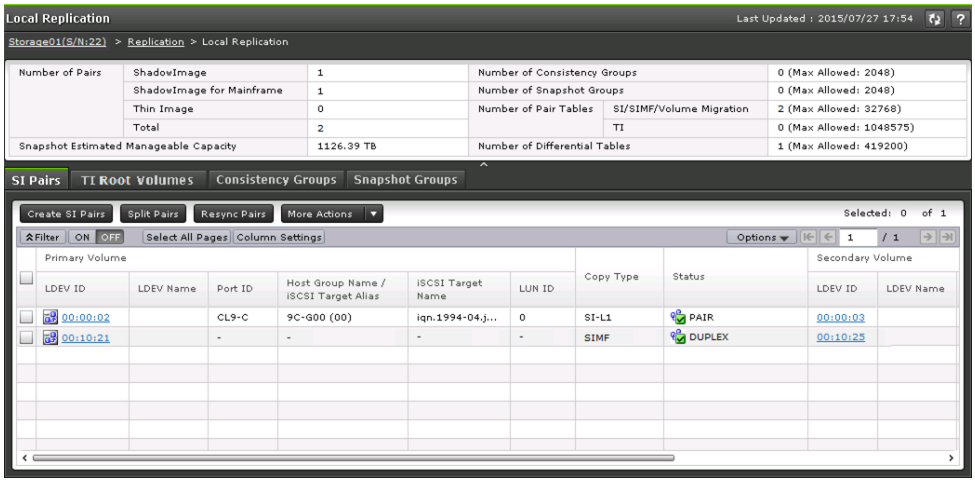
Item	Description
Number of Pairs	The number of pairs for each local replication software type.
Snapshot Estimated Manageable Capacity*	The estimated HTI pair capacity. The ⚠ icon appears when the estimated capacity is less than 5% of the capacity supported by the installed shared memory. For more information about snapshot estimated manageable capacity, see the *Hitachi Thin Image User Guide*.
Number of Consistency Groups	The number of consistency groups (CTGs) that have a status other than Free, and the maximum number of CTGs allowed.
Number of Snapshot Groups	The number of snapshot groups that are in use, and the maximum number of snapshot groups allowed.
Number of Pair Tables	The number of pair tables in use, and the maximum number of pair tables allowed. Values: ▪ SI/SIMF/Volume Migration: SI/SIMF, Volume Migration ▪ SI/Volume Migration: SIz, Volume Migration ▪ TI: HTI
Number of Differential Tables	The number of differential tables in use, and the maximum number of differential tables allowed.

Item	Description
	Because differential tables are not used for all operations, the number of differential tables does not change when you execute the following operations: ▪ Thin Image pair operations. ▪ SI pair operations for a DP-VOL that exceeds 4 TB. ▪ SIz pair operations for a DP-VOL that exceeds 262,668 cylinders.
*Snapshot Estimated Manageable Capacity is an estimation of Thin Image pair capacity that is calculated by subtracting shared memory used by Thin Image pools and Thin Image pairs from the shared memory capacity. Snapshot Estimated Manageable Capacity is only a reference estimation and does not guarantee that the space is available. The Snapshot Estimated Manageable Capacity value changes when Thin Image pool volumes or Thin Image pairs are added or deleted.	

SI Pairs tab

This tab of the **Local Replication** window shows the SIz pairs for which the P-VOLs or S-VOLs are allocated to you.

The following image shows this tab.



The following table describes the items on this tab.

Item	Description
Primary Volume	The P-VOL information.

Item	Description
	Values: ▪ LDEV ID: The P-VOL's LDEV identifier. Click to open the **LDEV Properties** window, which contains additional information for the selected replica LDEV. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Port ID: The P-VOL's port identifier. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ Host Group Name / iSCSI Target Alias: The P-VOL's host group name and ID or iSCSI target alias and ID. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ iSCSI Target Name: The P-VOL's iSCSI target name. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ LUN ID: The P-VOL's LUN identifier. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ Provisioning Type*: The P-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume • External MF: Migration volume ▪ Emulation Type*: The P-VOL's emulation type. ▪ Capacity*: The P-VOL's volume capacity. ▪ CLPR*: The P-VOL's CLPR ID.

Item	Description
	▪ Encryption*: The P-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the P-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the P-VOL is an external volume or migration volume. When the P-VOL is a DP-VOL, the pool to which the P-VOL's LDEV belongs is an external volume or blocked. ▪ Capacity Saving*: Information about the P-VOL's capacity saving function. • Compression: The compression function is used. • Deduplication and Compression: The deduplication function and the compression function are used. • Disabled: The capacity saving function is not used. ▪ T10 PI*: The P-VOL's T10 PI attribute information. • Enabled: The P-VOL's T10 PI attribute is enabled. • Disabled: The P-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed. ▪ Virtual Storage Machine*: The model type and serial number of the virtual storage machine to which the P-VOL belongs. ▪ Virtual LDEV ID*: The identification number of the P-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed.

Item	Description
	▪ Virtual Device Name*: The name of the P-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID*: The virtual SSID of the P-VOL. If no virtual SSID is specified, a blank is displayed.
Copy Type	The pair type. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz
Status	The status of the pair. For SIz status descriptions, see Device Manager - Storage Navigator pair status names and descriptions (on page 88). For SIz status descriptions, see the *Hitachi ShadowImage® for Mainframe User Guide*.
Processing Status	The processing status for a pair volume is displayed. Expanding: The capacity of the SI pair volume is being expanded. If the volume capacity is not being expanded, or if V-VOLs other than DP-VOLs are used as pair volumes, this field remains blank.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. Click the LDEV ID to open the **LDEV Properties** window, which contains additional information for the selected LDEV. ▪ LDEV Name: The S-VOL's LDEV name ▪ Port ID: The name of the S-VOL LUN path. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed.

Item	Description
	▪ Host Group Name / iSCSI Target Alias: The S-VOL's host group name and ID or iSCSI target alias and ID. For SIz pairs, a hyphen (-) is displayed.For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ iSCSI Target Name: The S-VOL's iSCSI target name. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ LUN ID: The S-VOL's LUN identifier. For SIz pairs, a hyphen (-) is displayed. For SIz, a hyphen (-) is displayed. For SI pairs with an undefined path, a blank is displayed. ▪ Provisioning Type*: The S-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume ▪ Emulation Type*: The S-VOL's emulation type. ▪ Capacity*: The S-VOL's capacity ▪ CLPR*: The S-VOL's CLPR ID

Item	Description
	▪ Encryption*: The S-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the S-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the S-VOL is an external volume or migration volume. When the S-VOL is a DP-VOL, the pool to which S-VOL's LDEV belongs is an external volume or blocked. ▪ Capacity Saving*: Information about the S-VOL's capacity saving function. • Compression: The compression function is used. • Deduplication and Compression: The deduplication function and the compression function are used. • Disabled: The capacity saving function is not used. ▪ T10 PI*: The S-VOL's T10 PI attribute information. • Enabled: The S-VOL's T10 PI attribute is enabled. • Disabled: The S-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed. ▪ Virtual Storage Machine*: The model type and serial number of the virtual storage machine to which the S-VOL belongs. ▪ Virtual LDEV ID*: The identification number of the S-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed.

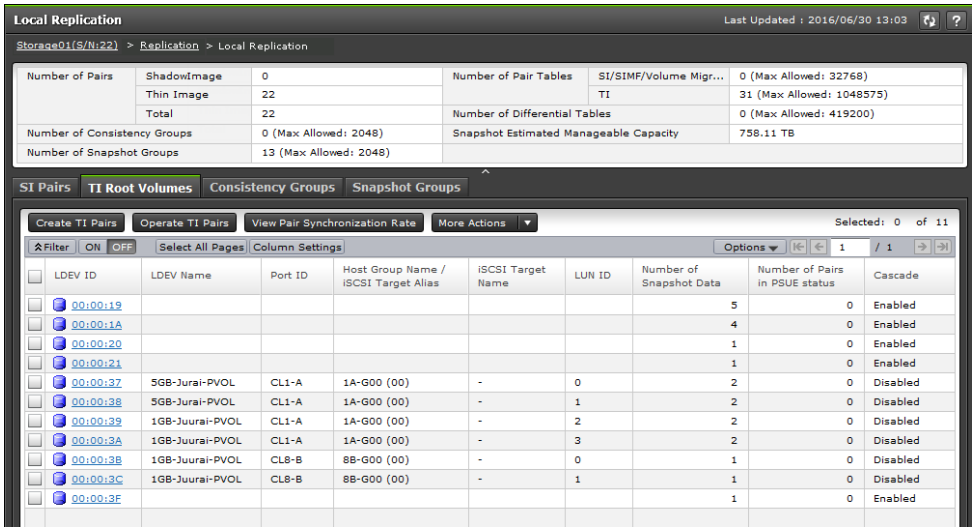
Item	Description
	▪ Virtual Device Name*: The name of the S-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID*: The virtual SSID of the S-VOL. If no virtual SSID is specified, a blank is displayed.
Copy Pace*	The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance. For HTI pairs, a hyphen is displayed.
CTG ID*	The identifier of the consistency group to which the SIz pair is assigned.
Mirror Unit*	The mirror unit number.
Topology ID	The LDEV's topology identifier. Example: 00.00.00 (MU0-MU1)
Create SI Pairs button	Click to open the Create SI Pairs wizard.
Split Pairs button	Click to open the Split Pairs wizard.
Resync Pairs button	Click to open the Resync Pairs wizard.
More Actions	Click to show options. Options: ▪ View Pair Synchronization Rate: Click to open the **View Pair Synchronization Rate** window. ▪ View Pair Properties: Click to open the **View Pair Properties** window. ▪ Suspend Pairs: Click to open the **Suspend Pairs** window.

Item	Description
	▪ Delete Pairs: Click to open the **Delete Pairs** window. ▪ Export: Click to open a dialog for downloading table information to a tab-separated values (TSV) file.
* These items are not shown in the table by default. You must add them using the **Column Settings** window. For more information about how to add items to a table using this window, see the *System Administrator Guide*.	

TI Root Volumes tab

Use this tab of the **Local Replication** window to view HTI pair information for local replication. Only HTI pairs for which a P-VOL is assigned to each user are displayed.

The following image shows this tab.



The following table describes the items on this tab.

Item	Description
LDEV ID	The P-VOL's LDEV identifier. Click to open the **TI Pairs** window. Use this window to search for P-VOL information.
LDEV Name	The P-VOL's LDEV name.
Port ID	The port name of the P-VOL. If the path is not defined, a blank is displayed.

Item	Description
Host Group Name / iSCSI Target Alias	The P-VOL's host group name and ID or iSCSI target alias and ID. If the path is not defined, a blank is displayed.
iSCSI Target Name	The P-VOL's iSCSI target name. If the path is not defined, a blank is displayed.
LUN ID	The LUN ID of the P-VOL LDEV's LUN path. If the path is not defined, a blank is displayed.
Capacity*	The P-VOL's capacity.
Encryption*	The P-VOL's encryption information. ▪ Enabled: Encryption is enabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. ▪ Disabled: Encryption is disabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. ▪ Mixed: The pool to which the P-VOL's LDEV belongs contains two or more of the following: • Volume for which encryption is enabled • Volume for which encryption is disabled • External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the P-VOL is an external volume or migration volume. When the P-VOL is a DP-VOL, the pool to which a P-VOL's LDEV belongs is an external volume or blocked.
Capacity Saving*	Information about the P-VOL's capacity saving function. ▪ Compression: The compression function is used. ▪ Deduplication and Compression: The deduplication function and the compression function are used. ▪ Disabled: The capacity saving function is not used.
Pool Name (ID)*	The P-VOL's pool name and identifier.
Number of Snapshot Data	The number of P-VOL snapshot data.
Number of Pairs in PSUE status	The number of pairs in PSUE status.

Item	Description
Number of Pairs in Expanding status*	The number of pairs in Expanding status.
Cascade	Indicates whether cascade pairs can be created. ▪ Enabled: Cascade pairs can be created. ▪ Disabled: Cascade pairs cannot be created.
T10 PI*	The P-VOL's T10 PI attribute information. ▪ Enabled: The P-VOL's T10 PI attribute is enabled. ▪ Disabled: The P-VOL's T10 PI attribute is disabled.
Virtual Storage Machine*	The Virtual Storage Machine information. Values: ▪ Model/Serial Number: The model type and serial number of the virtual storage machine to which the P-VOL belongs. ▪ LDEV ID: The identification number of the P-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed. ▪ Device Name: The name of the P-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ SSID: The virtual SSID of the P-VOL. If no virtual SSID is specified, a blank is displayed.
Create TI Pairs button	Click to open the Create TI Pairs wizard.
Operate TI Pairs button	Click to open the TI Pairs wizard.
View Pair Synchronization Rate button	Click to open the **View Pair Synchronization Rate** window.
More Actions	Click to show options. Options: ▪ View Pair Properties: Click to open the **View Pair Properties** window. ▪ View LDEV Properties: Click to open the **View LDEV Properties** window. ▪ Split Pairs: Click to open the **Split Pairs** window.

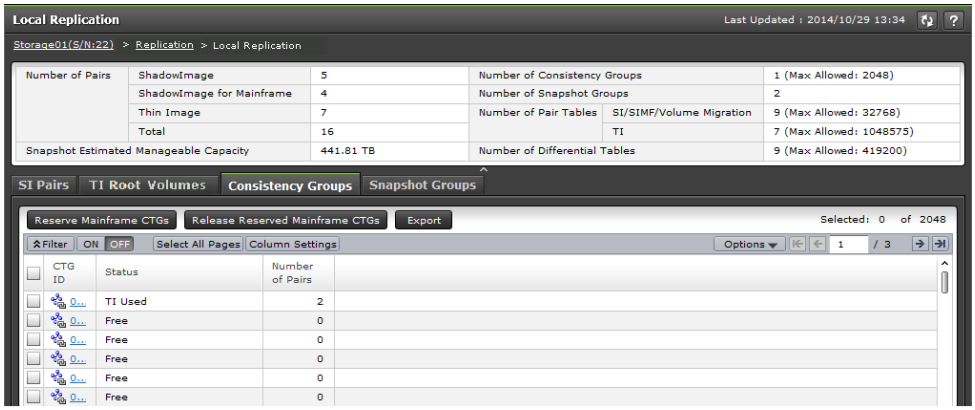
Item	Description
	▪ Resync Pairs: Click to open the **Resync Pairs** window. ▪ Assign Secondary Volumes: Click to open the **Assign Secondary Volumes** window. ▪ Remove Secondary Volumes: Click to open the **Remove Secondary Volumes** window. ▪ Delete Pairs: Click to open the **Delete Pairs** window. ▪ Export: Click to open a dialog for downloading table information to a tab-separated values (TSV) file.
* These items are not shown in the table by default. You must add them using the **Column Settings** window. For more information about how to add items to a table using this window, see the *System Administrator Guide*.	

Consistency Groups tab

Use this tab of the **Local Replication** window to perform the following tasks:

- Managing consistency group IDs for ShadowImage for Mainframe using Device Manager - Storage Navigator (on page 43).
- Releasing reserved mainframe consistency groups (on page 45).

The following image shows this tab.



The following table describes the items on this tab of the **Local Replication** window.

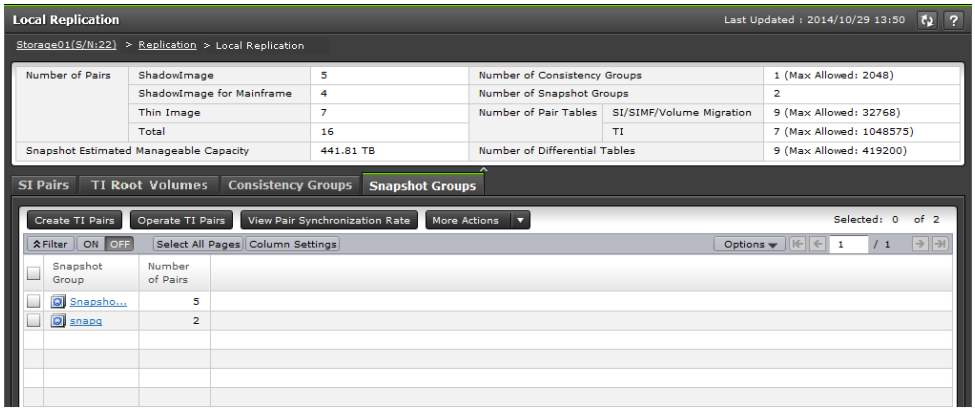
Item	Description
CTG ID	The SIz pair's CTG identification number. Click to open the **Consistency Group Properties** window.

Item	Description
Status	The consistency group's status. Values: ▪ SI Used: The CTG is being used by SIz. ▪ SIMF Used (CCI): SIz is using the CTG, and you are using CCI to manage the CTG. ▪ SIMF Used (PPRC/BCM): SIz is using the CTG, and you are using Business Continuity Manager (BCM) or IBM PPRC to manage the CTG. ▪ TI Used: HTI is using the CTG. ▪ Mainframe Reserved: The CTG is reserved for use with BCM or IBM PPRC. ▪ Free: The CTG is not being used and is not reserved. ▪ (Changing...): The status is in the process of changing.
Number of Pairs	The number of pairs assigned to the CTG.
Reserve Mainframe CTGs button	Click to open the **Reserve Mainframe CTGs** window.
Release Reserved Mainframe CTGs button	Click to open the **Release Reserved Mainframe CTGs** window.
Export button	Click to open a dialog for downloading table information to a tab-separated values (TSV) file.

Snapshot Groups tab

This tab of the **Local Replication** window shows your snapshot groups.

The following image shows this tab.



The following table describes the items on this tab of the **Local Replication** window.

Item	Description
Snapshot Group	The snapshot group name. Click to open the HTI pairs window.
Number of Pairs	The number of pairs currently used by the snapshot group.
Create TI Pairs button	Click to open the Create TI Pairs window.
Operate TI Pairs button	Click to open the TI Pairs window.
View Pair Synchronization Rate button	Click to open the **View Pair Synchronization Rate** window.
More Actions	Click to show options. Options: ▪ Split Pairs: Click to open the **Split Pairs** window. ▪ Resync Pairs: Click to open the **Resync Pairs** window. ▪ Assign Secondary Volumes: Click to open the **Assign Secondary Volumes** window. ▪ Remove Secondary Volumes: Click to open the **Remove Secondary Volumes** window. ▪ Delete Pairs: Click to open the **Delete Pairs** window. ▪ Export: Click to open a dialog for downloading table information to a tab-separated values (TSV) file.

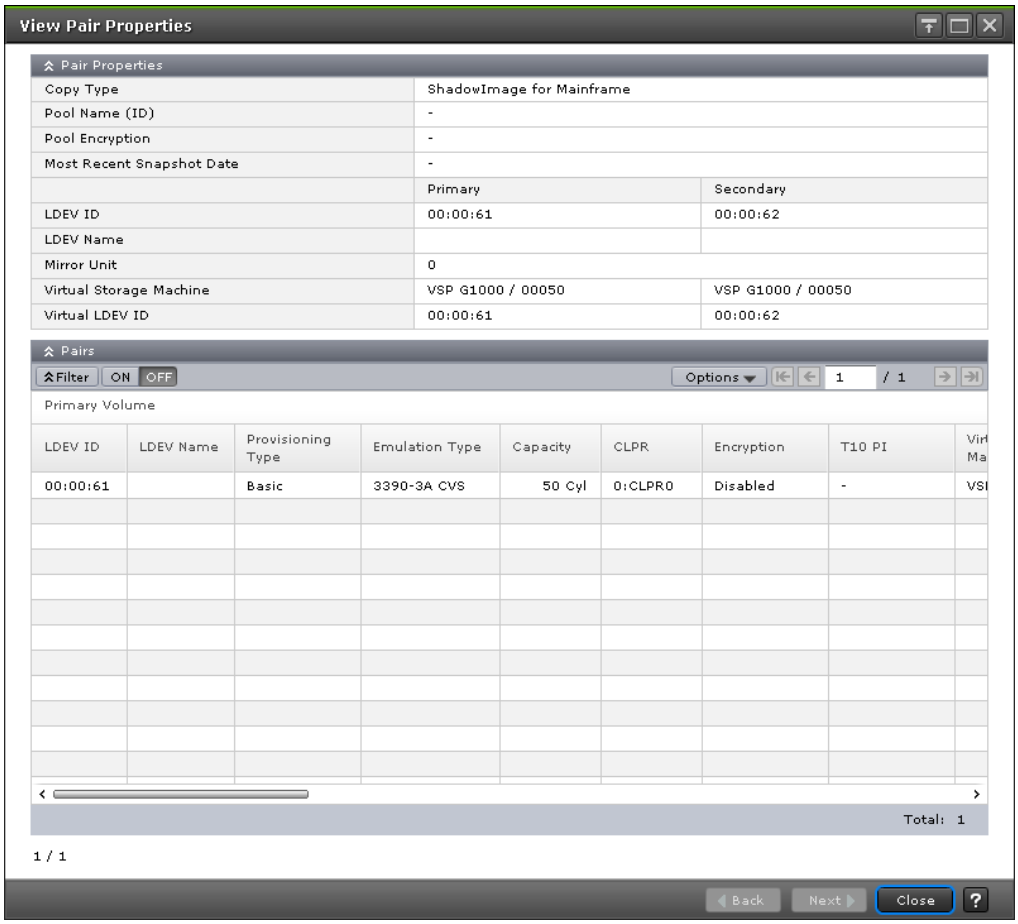
View Pair Properties window

Use this window to review pair and volume details for local replication.

This window contains the following section and table:

- Pair Properties section
- Pairs table

For more information about this window, see Monitoring ShadowImage for Mainframe pair and volume details (on page 93) .



Pair Properties section

The following table describes the items in this section of the **View Pair Properties** window.

Item	Description
Copy Type	The type of pair. Values: ▪ ShadowImage: SI pair ▪ ShadowImage for Mainframe (default): SIz pair ▪ Thin Image: HTI pair
Pool Name (ID)	HTI pairs only. The pool name and identification number. For non-HTI pairs, a hyphen is displayed.
Pool Encryption	HTI pairs only.

Item	Description
	The pool's encryption information. ▪ Enabled: Encryption is enabled for the pool volume that created the pool. ▪ Disabled: Encryption is disabled for the pool volume that created the pool. ▪ Mixed: A pool contains two or more of the following: • Volume for which encryption is enabled • Volume for which encryption is disabled • External volume Displayed when at least two of the following are specified for the pool volume: • Volume of which encryption is enabled • Volume of which encryption is disabled • External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. For pools created in external volumes, blocked pools, and non-HTI pairs, a hyphen is displayed.
Most Recent Snapshot Date	HTI pairs only. The date and time the snapshot was acquired. For non-HTI pairs, a hyphen is displayed.
LDEV ID	The identification number of the LDEVs for the P-VOL and S-VOLs.
LDEV Name	The name of the LDEVs for the P-VOL and S-VOLs.
Mirror Unit	The mirror unit number.
Virtual Storage Machine	The model type and serial number of the virtual storage machine to which the P-VOL and S-VOL belong.
Virtual LDEV ID	The identification number of the virtual LDEV for the P-VOL and S-VOLs. If no virtual LDEV ID is assigned, a blank is displayed.

Pairs table

The following table describes the items in this table on the **View Pair Properties** window.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Provisioning Type: The P-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity. ▪ CLPR: The P-VOL's CLPR ID. ▪ Encryption: The P-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the P-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the P-VOL is an external volume or migration volume. When the P-VOL is a DP-VOL, the pool to which a P-VOL's LDEV belongs is an external volume or blocked. ▪ T10 PI: The P-VOL's T10 PI attribute information. • Enabled: The P-VOL's T10 PI attribute is enabled. • Disabled: The P-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen is displayed.

Item	Description
	▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the P-VOL belongs. ▪ Virtual LDEV ID: The identification number of the P-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed. ▪ Virtual Device Name: The name of the P-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the P-VOL. If no virtual SSID is specified, a blank is displayed.
Snapshot Group	HTI pairs only. The snapshot group name. If you have not assigned the pair to a snapshot group, a blank is displayed. For non-HTI pairs, a hyphen is displayed.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88) .
Processing Status	The processing status for a pair volume is displayed. Expanding: The capacity of the SI pair volume is being expanded. If the volume capacity is not being expanded, or if V-VOLs other than DP-VOLs are used as pair volumes, this field remains blank.
Snapshot Date	HTI pairs only. The date and time the snapshot was acquired. For non-HTI pairs, a hyphen is displayed.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ LDEV name: The S-VOL's LDEV name.

Item	Description
	▪ Provisioning Type: The S-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume • Snapshot: HTI volume ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity. ▪ CLPR: The S-VOL's CLPR ID. ▪ Encryption: The S-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the S-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the S-VOL is an external volume or migration volume. When the S-VOL is a DP-VOL, the pool to which S-VOL's LDEV belongs is an external volume or blocked.

Item	Description
	▪ Mode: Indicates whether the storage system has written to the S-VOL. For SI, this item also indicates whether the storage system can read the S-VOL. • For SI: - W is displayed when the storage system has written data to the S-VOL. W is also shown when the storage system has written data to the S-VOL and the S-VOL cannot be read when its pair status is PSUS(SP)/PSUS or PSUS. - N is displayed when the S-VOL cannot be read because you specified "-m noread" using CCI. - A hyphen indicates that the storage system has not written to the S-VOL. • For HTI: - W is displayed if the storage system has written data to the S-VOL when its pair status is PSUS. - A hyphen indicates that the storage system has not written to the S-VOL. • For SIz: - W is displayed when the storage system has written data to the S-VOL when its pair status is V-Split/SUSPVS or Split/SUSPOP. - Protect is displayed when you have set the Protect attribute using Business Continuity Manager (BCM) when the S-VOL's pair status is Split/SUSPOP, SP-Pend/TRANS, or V-Split/SUSPVS. - A hyphen indicates that the storage system has not written to the S-VOL. ▪ T10 PI: The S-VOL's T10 PI attribute information. • Enabled: The S-VOL's T10 PI attribute is enabled. • Disabled: The S-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen is displayed. ▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the S-VOL belongs. ▪ Virtual LDEV ID: The identification number of the S-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed.

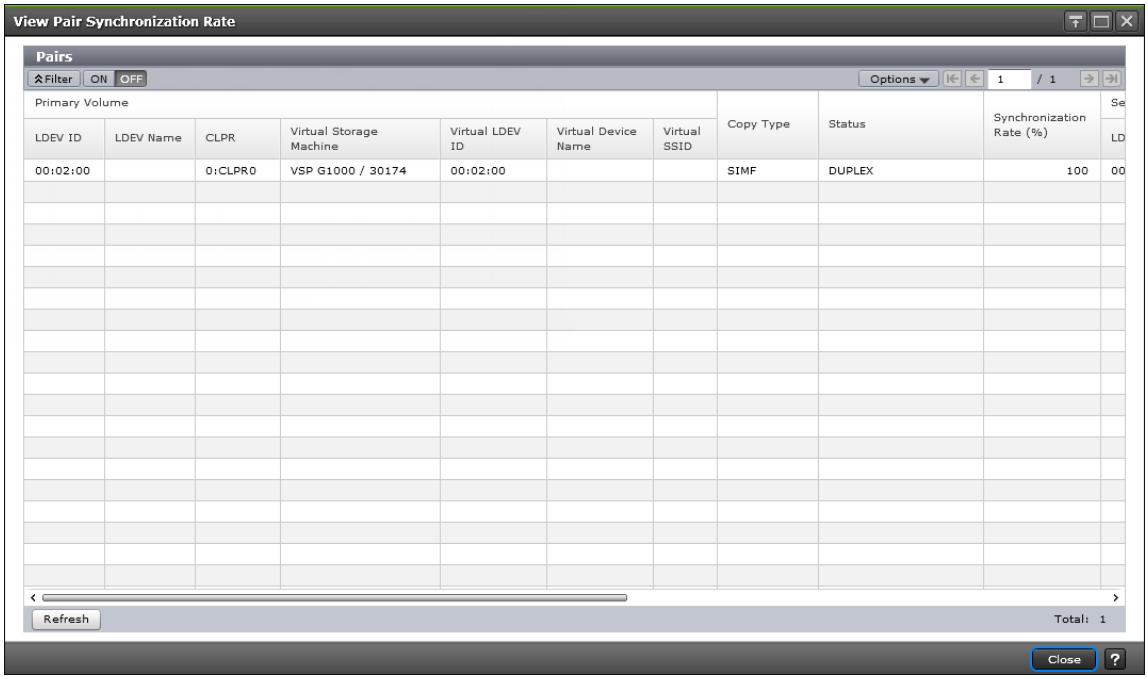
Item	Description
	▪ Virtual Device Name: The name of the S-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the S-VOL. If no virtual SSID is specified, a blank is displayed.
CTG ID	The identification number for the CTG to which the pair is assigned.
Copy Pace	SI and SIz pairs only. For HTI pairs, a hyphen is displayed. The system option that determines the rate at which you want the storage system to copy data.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen is displayed.
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.

View Pair Synchronization Rate window

Use this window to view the percentage of synchronized data between the P-VOL and S-VOL. This window contains the Pairs table.

For more information about using this window, see Monitoring ShadowImage for Mainframe pair synchronization rates (on page 95) .

The following image shows this window.



Pairs table

The following table describes the items in this table.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ CLPR: The P-VOL's CLPR ID. ▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the P-VOL belongs. ▪ Virtual LDEV ID: The identification number of the P-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed.

Item	Description
	▪ Virtual Device Name: The name of the P-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the P-VOL. If no virtual SSID is specified, a blank is displayed.
Copy Type	Not displayed for HTI pairs. The pair type. Values: ▪ SI-L1: SIz L1 pair ▪ SI-L2: SIz L2 pair ▪ SIMF: SIz pair
Snapshot Group	Displayed for HTI pairs only. The snapshot group name. If you have not assigned the pair to a snapshot group, a blank is displayed.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88) .
Synchronization Rate (%)	For SI pairs: ▪ If the pair status is COPY(PD)/COPY, COPY(SP)/COPY, or PSUS (SP)/PSUS, the copy progress rate is displayed. ▪ If the pair status is PAIR, PSUS, COPY(RS-R)/RCPY, or PSUE, the synchronization rate between P-VOL and S-VOL is displayed. ▪ If the pair status is COPY(RS)/COPY changed from PSUE, the copy progress rate is displayed. ▪ If the pair status is COPY(RS)/COPY changed from other than PSUE, the synchronization rate between P-VOL and S-VOL is displayed. ▪ If the pair status is SMPL(PD), a hyphen is displayed.

Item	Description
	For SIz pairs: ▪ If the pair status is PENDING, SP-Pend/TRANS, or V-Split/SUSPVS, the copy progress rate is displayed. ▪ If the pair status is DUPLEX, Split/SUSPOP, Resync-R/REVRSY, or Suspend/SUSPER, the synchronization rate between P-VOL and S-VOL is displayed. ▪ If the pair status is Resync/PENDING changed from Suspend/SUSPER, the copy progress rate is displayed. ▪ If the pair status is Resync/PENDING changed from other than Suspend/SUSPER, the synchronization rate between P-VOL and S-VOL is displayed. ▪ If the pair status is Deleting/TRANS, a hyphen is displayed. For HTI pairs with an invalid cascade attribute: ▪ The synchronization rate is computed by comparing the current S-VOL and the next new generation of the S-VOL. ▪ When the S-VOL is the latest one, the synchronization rate is computed by comparing the S-VOL and the P-VOL. For HTI pairs with a valid cascade attribute, according to pair status: ▪ When the pair status is PAIR, PSUS, or PSUE, the synchronization rate is computed by comparing the current S-VOL and the next new generation of the S-VOL. If the S-VOL is the latest one, the synchronization rate is computed by comparing the S-VOL and the P-VOL. ▪ When the pair status is COPY, PSUS(SP), RCPY, or SMPL(PD), the synchronization rate is computed by the progress rate of each process.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ LDEV Name: The S-VOL's LDEV name. ▪ CLPR: The S-VOL's CLPR ID. ▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the S-VOL belongs.

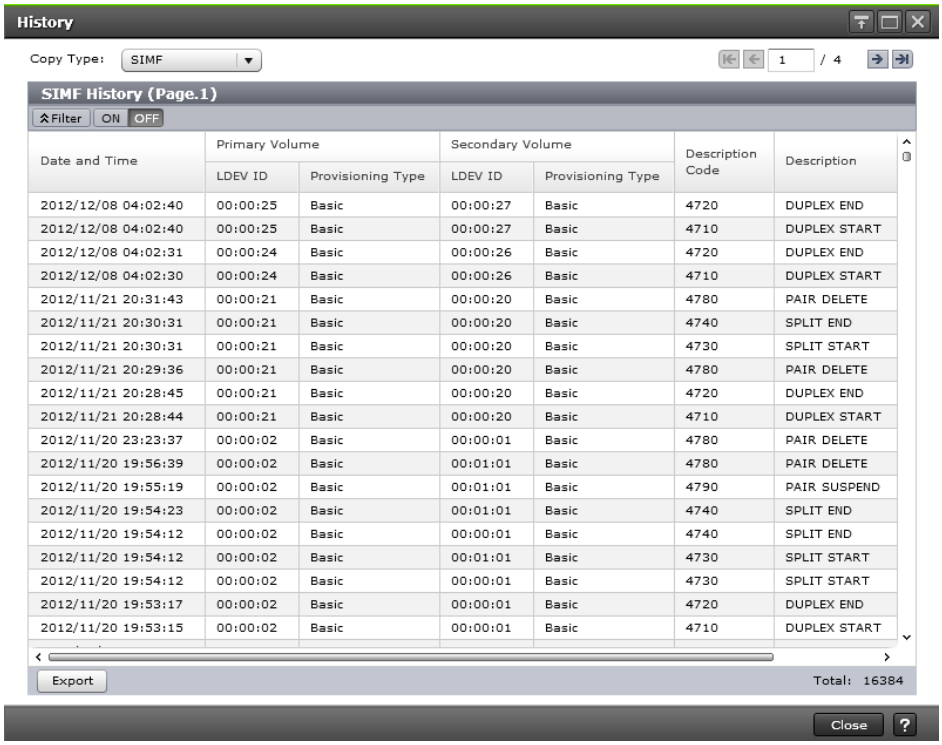
Item	Description
	▪ Virtual LDEV ID: The identification number of the S-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed. ▪ Virtual Device Name: The name of the S-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the S-VOL. If no virtual SSID is specified, a blank is displayed.
Copy Pace	Not displayed for HTI pairs. The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair For non-HTI pairs, a hyphen is displayed.

Item	Description
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.
Refresh button	Click to update the information in the Pairs table.

History window

Use this window to monitor pair tasks performed on pairs consisting of P-VOLs and S-VOLs allocated to you.

For more information about monitoring pairs, see Monitoring pair task history (on page 98).



Setting fields

The following table describes the setting fields for this window.

Item	Description
Copy Type	The pair type.

Item	Description
	Values: ▪ SI: SIz ▪ TI: HTI ▪ SIMF: SIz ▪ FCv2/FCSE: Compatible FlashCopy® V2 and Compatible FlashCopy® SE

SI or SIz History table

The following table describes the items in the History table. Only the tasks that are completed for the pairs consisting of the P-VOL or S-VOLs to which you are allocated are shown.

This window shows up to 16,384 of the latest user tasks for each page, and up to 1,024,000 of the latest user tasks are retained in a storage system.

Item	Description
Date	The operation date and time.
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ Provisioning type: The P-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume • External MF: Migration volume, which is only displayed for SIz pairs.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ Provisioning type: The S-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume

Item	Description
Description Code	The code for the type of operation performed.
Description	The description of the operation.
Export button	Click to open a dialog for downloading table information to a tab-separated values (TSV) file.

HTI History table

The following table describes the items in the HTI History table. Only tasks performed on the pairs consisting of the P-VOL or S-VOLs to which you are allocated are shown.

This window shows up to 16,384 of the latest user tasks for each page, and up to 1,024,000 of the latest user tasks are retained in a storage system.

Item	Description
Date and Time	The date and time the operation was performed.
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ Provisioning type: The P-VOL's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ Provisioning type: The S-VOL's provisioning type, which can be one of the following: • DP: DP-VOL • Snapshot: Thin Image volume
Mirror Unit	The mirror unit number.
Pool ID	The pool identifier.
Diff Compare Volume	The LDEV ID of the diff compare volume for Diff Clone copy operation used in a VASA environment.

Item	Description
Description Code	The code for the type of operation performed.
Description	The description of the operation performed. For details on displayed words, refer to *Hitachi Thin Image User Guide*.
Export button	Click to open a dialog for downloading table information to a tab-separated values (TSV) file.

Compatible FlashCopy® V2 or Hitachi Compatible Software for IBM® FlashCopy® SE history table

The following table describes the items in the FC History table. Only tasks performed on the pairs consisting of the P-VOL or S-VOLs to which you are allocated are shown. This window shows up to 16,384 of the latest user tasks for each page, and up to 1,024,000 of the latest user tasks are retained in a storage system.

Item	Description
Date and Time	The date and time the operation was performed.
Source Volume	The source volume information. Values: ▪ LDEV ID: The source volume's LDEV identifier. ▪ Provisioning type: The source volume's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume
Target Volume	The target volume information. Values: ▪ LDEV ID: The target volume's LDEV identifier. ▪ Provisioning type: The target volume's provisioning type, which can be one of the following: • Basic: Internal volume • DP: DP-VOL • External: External volume
Relationship ID	The relationship identifier.
Description Code	The code for the type of operation performed.

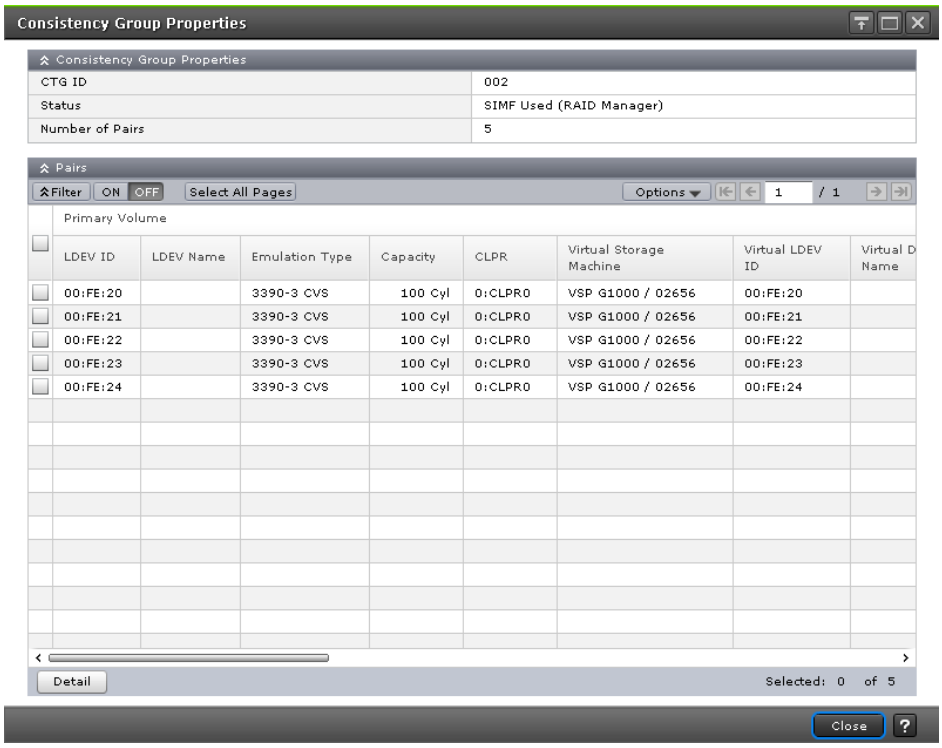
Item	Description
Description	The description of the operation performed. For details about displayed words, see the *Hitachi Compatible FlashCopy/FlashCopy SE User Guide*.
Export button	Click to open a dialog for downloading table information to a tab-separated values (TSV) file.

Consistency Group Properties window

Use this window to perform the following tasks:

- Viewing a list of CTGs, with information about status and number of pairs.
- Viewing CTG properties.

For more information about this window, see Monitoring consistency groups (on page 96) .



Consistency Group Properties table

The following table describes the items in this table.

Item	Description
CTG ID	The SIz pair's CTG identification number.
Status	The CTG status. Values: ▪ SI Used: The CTG is being used by SIz. ▪ SIMF Used (CCI): SIz is using the CTG, and you are using CCI to manage the CTG. ▪ SIMF Used (PPRC/BCM): SIz is using the CTG, and you are using Business Continuity Manager (BCM) or IBM PPRC to manage the CTG. ▪ TI Used: HTI is using the CTG. ▪ Mainframe Reserved: The CTG is reserved for use by BCM or IBM PPRC. ▪ Free: The CTG is not being used and is not reserved. ▪ (Changing...): The status is in the process of changing.
Number of Pairs	The number of pairs assigned to the CTG.

Pairs table

The Pairs table shows pairs with a P-VOL or S-VOL allocated to you.

The following table describes the items in this table.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity. ▪ CLPR: The P-VOL's CLPR ID. ▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the P-VOL belongs. ▪ Virtual LDEV ID: The identification number of the P-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed.

Item	Description
	▪ Virtual Device Name: The name of the P-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the P-VOL. If no virtual SSID is specified, a blank is displayed.
Copy Type	The pair type. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ TI: HTI ▪ SIMF: SIz
Snapshot Group	HTI pairs only. The snapshot group name. If you have not assigned the pair to a snapshot group, a blank is displayed. For non-HTI pairs, a hyphen is displayed.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).
Snapshot Date	HTI pairs only. The date and time the snapshot was acquired. For non-HTI pairs, a hyphen is displayed.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ LDEV Name: The S-VOL's LDEV name. ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity. ▪ CLPR: The S-VOL's CLPR ID.

Item	Description
	▪ Virtual Storage Machine: The model type and serial number of the virtual storage machine to which the S-VOL belongs. ▪ Virtual LDEV ID: The identification number of the S-VOL's virtual LDEV. If no virtual LDEV ID is assigned, a blank is displayed. ▪ Virtual Device Name: The name of the S-VOL's virtual device, in a combined format of *virtual emulation type*, *number of virtual LUSE volumes*, and *virtual CVS attribute*. Each of these three items is displayed only if it is specified. If none of them are specified, a blank is displayed. "CVS" is displayed at the end of the device name, if the virtual CVS attribute is specified. ▪ Virtual SSID: The virtual SSID of the S-VOL. If no virtual SSID is specified, a blank is displayed.
Pool Name (ID)	HTI pairs only. The pool name and identification number. For non-HTI pairs, a hyphen is displayed.
Copy Pace	SI and SIz pairs only. The system option that determines the rate at which you want the storage system to copy data. For HTI pairs, a hyphen is displayed. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute.

Item	Description
	Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen is displayed.
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.
Detail button	Click to open the **View Pair Properties** window.

Create SI Pairs wizard

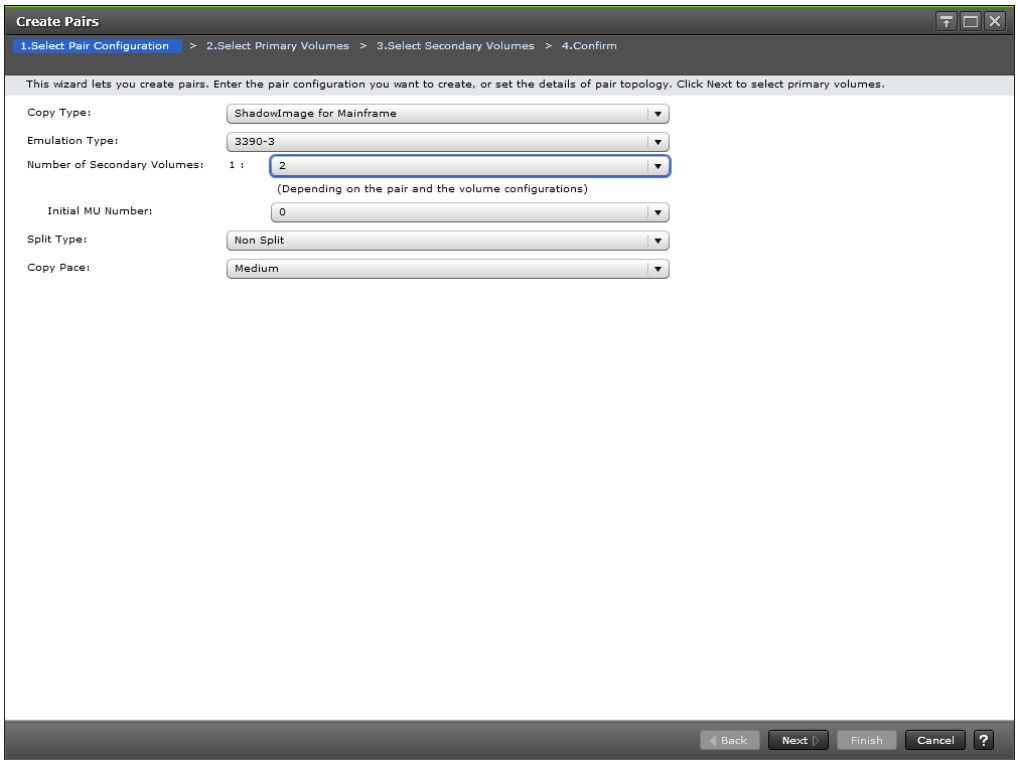
Use this wizard to create pairs and specify pair details.

For more information about using this wizard, see Creating ShadowImage for Mainframe pairs in HDvM - SN (on page 53) .

Select Pair Configuration window

Use this window of the Create SI Pairs wizard to configure the pairs you plan to create.

The following image shows this window of the Create SI Pairs wizard.



The following table describes the items in this window.

Item	Description
Copy Type	The copy type. Values: ▪ ShadowImage ▪ ShadowImage for Mainframe (default)
Emulation Type	The emulation type.
Pair Topology Type	The SI pair configuration. Values: ▪ Cleared but available: You can configure the pair. ▪ Selected but not available: The SI pair exists. ▪ Cleared but not available: You cannot configure the pair. ▪ Select All: Selects all configurations. This item is displayed only if you specify ShadowImage as Copy Type.
Number of Secondary Volumes	Displayed when ShadowImage for Mainframe is selected as Copy Type.

Item	Description
	The total number of S-VOLs assigned to the P-VOL. This value includes the volumes for pairs that you are creating and volumes in existing pairs. Default: 1
Initial MU Number	Displayed when ShadowImage for Mainframe is selected as Copy Type. The initial MU number.
Split Type	The split type. Values: ▪ Non Split (default): The pair is not split. ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. ▪ Steady Split: Differential data is copied, and then the pair is split.
Copy Pace	The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium (default): Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.

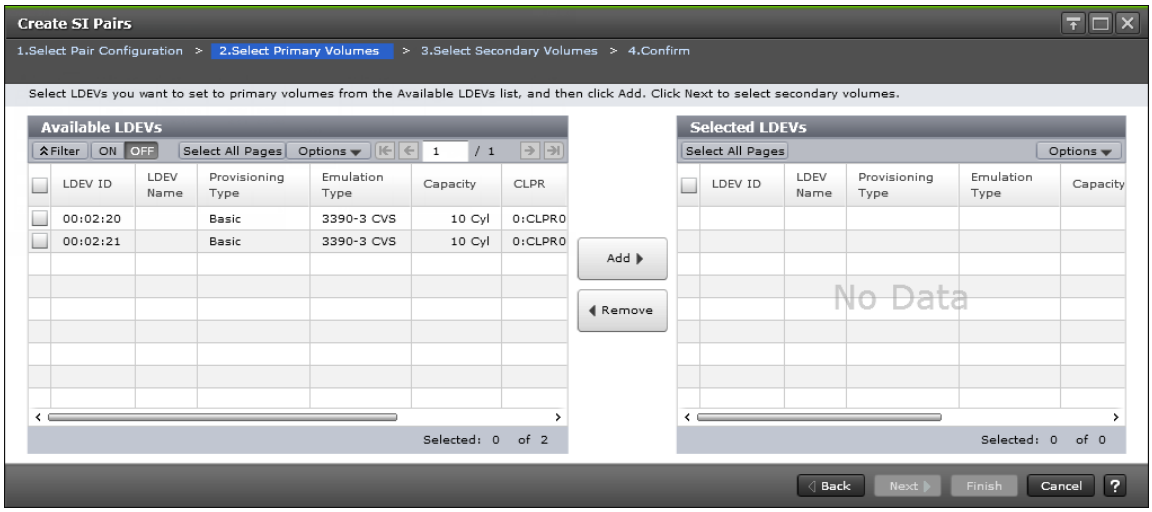
Select Primary Volumes window

Use this window of the Create SI Pairs wizard to select LDEVs that are P-VOLs.

This window contains the following tables:

- Available LDEVs table
- Selected LDEVs table

The following image shows this window of the Create SI Pairs wizard.



The following table describes items in this window.

Item	Description
Port ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table according to the port ID. Default: Any
Host Group Name	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table by the host group name. This item is displayed if you select a Fibre Channel port for Port ID. Default: Any
iSCSI Target Alias	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table by the iSCSI target alias. This item is displayed if you select an iSCSI port for Port ID. Default: Any

Available LDEVs table

This table is displayed on the **Select Primary Volumes** window.

The following table describes the items in this table.

Item	Description
LDEV ID	The LDEV's identifier.
LDEV Name	The LDEV's name.
Port ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The port name of the LDEV's LUN path.
Host Group Name / iSCSI Target Alias	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The host group name and ID or iSCSI target alias and ID of the LDEV's LUN path.
iSCSI Target Name	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The iSCSI target name.
LUN ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The LUN identifier of the LDEV's LUN path.
Provisioning Type	The LDEV's provisioning type. Values: ▪ Basic: Internal volume ▪ DP: DP-VOL ▪ External: External volume ▪ ALU: Volume with ALU attribute.
Attribute	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The LDEV's attribute. Values: ▪ ALU: Volume with ALU attribute. ▪ SLU: Volume with SLU attribute. ▪ Data Direct Mapping: Volume with Data Direct Mapping attribute. If the attribute is not set, a hyphen (-) is displayed.
Emulation Type	The LDEV's emulation type.
Capacity	The LDEV's capacity.
CLPR	The LDEV's CLPR ID.

Item	Description
Encryption	Encryption information. ▪ Enabled: Encryption is enabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption enabled. ▪ Disabled: Encryption is disabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption disabled. ▪ Mixed: The pool to which the LDEV belongs contains two or more of the following: • Volume for which encryption is enabled • Volume for which encryption is disabled • External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the LDEV is an external volume or migration volume. When the LDEV is a DP-VOL, the pool to which LDEV belongs is an external volume or blocked.
Capacity Saving	Information about the LDEV's capacity saving function. ▪ Compression: The compression function is used. ▪ Deduplication and Compression: The deduplication function and the compression function are used. ▪ Disabled: The capacity saving function is not used.
T10 PI	The LDEV's T10 PI attribute. ▪ Enabled: The T10 PI attribute is enabled. ▪ Disabled: The T10 PI attribute is disabled. ▪ A hyphen is displayed for ShadowImage for Mainframe pairs.
Number of Secondary Volumes	The total number of S-VOLs assigned to the P-VOL. This value includes the volumes for pairs that you are creating, volumes in existing pairs. When ShadowImage is selected for Copy Type, the number of S-VOLs for the L1 P-VOL does not include the number of L2 S-VOLs.
Add button	Click to move the selected LDEVs from the Available LDEVs table to the Selected LDEVs table.

Item	Description
Remove button	Click to move the selected LDEVs from the Selected LDEVs table to the Available LDEVs table.

Selected LDEVs table

This table is displayed on the **Select Primary Volumes** window.

The following table describes the items in this table.

Item	Description
LDEV ID	The selected P-VOL's LDEV identifier.
LDEV Name	The selected P-VOL's LDEV name.
Port ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The port name of the LDEV's LUN path.
Host Group Name / iSCSI Target Alias	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The host group name and ID or iSCSI target alias and ID of the LDEV's LUN path.
iSCSI Target Name	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The iSCSI target name.
LUN ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The LUN identifier of the LDEV's LUN path.
Provisioning Type	The LDEV's provisioning type. Values: ▪ Basic: Internal volume ▪ DP: DP-VOL ▪ External: External volume ▪ ALU: Volume with ALU attribute.
Attribute	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The LDEV's attribute.

Item	Description
	Values: ▪ ALU: Volume with ALU attribute. ▪ SLU: Volume with SLU attribute. ▪ Data Direct Mapping: Volume with Data Direct Mapping attribute. If the attribute is not set, a hyphen (-) is displayed.
Emulation Type	The LDEV's emulation type.
Capacity	The LDEV's capacity.
CLPR	The LDEV's CLPR ID.
Encryption	Encryption information. ▪ Enabled: Encryption is enabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption enabled. ▪ Disabled: Encryption is disabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption disabled. ▪ Mixed: The pool to which the LDEV belongs contains two or more of the following: • Volume for which encryption is enabled • Volume for which encryption is disabled • External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the LDEV is an external volume or migration volume. When the LDEV is a DP-VOL, the pool to which LDEV belongs is an external volume or blocked. For an external volume or migration volume, a hyphen (-) is displayed.
Capacity Saving	Information about the LDEV's capacity saving function. ▪ Compression: The compression function is used. ▪ Deduplication and Compression: The deduplication function and the compression function are used. ▪ Disabled: The capacity saving function is not used.

Item	Description
T10 PI	The LDEV's T10 PI attribute. ▪ Enabled: The T10 PI attribute is enabled. ▪ Disabled: The T10 PI attribute is disabled. ▪ A hyphen is displayed for ShadowImage for Mainframe pairs.
Number of Secondary Volumes	The total number of S-VOLs assigned to the P-VOL. This value includes the volumes for pairs that you are creating, volumes in existing pairs. When ShadowImage is selected for Copy Type, the number of S-VOLs for the L1 P-VOL does not include the number of L2 S-VOLs.

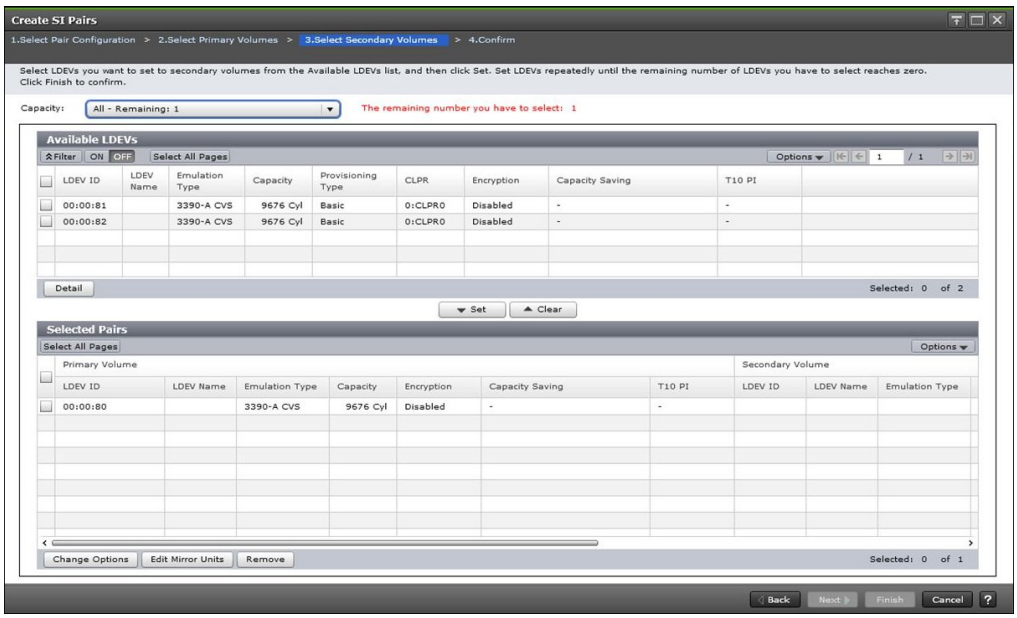
Select Secondary Volumes window

This window is the third window of the Create SI Pairs wizard. Use this window to select the LDEVs that are the S-VOLs and to remove unwanted pairs or LDEVs.

This window contains the following tables:

- Available LDEVs table
- Selected LDEVs table

The following image shows this window.



The following table describes the items in this window.

Item	Description
Capacity list	Click to select the capacity by which to filter the available LDEVs.
The remaining number you have to select	This item refers to the P-VOLs in the Selected Pairs table that do not have an assigned S-VOL.
Exclude Paired Volumes	Displayed only when ShadowImage is selected for Copy Type. Select to hide volumes already in a pair. Values: ▪ Selected (default): Paired volumes are not shown in the list. ▪ Cleared: Paired volumes are shown in the list.
Port ID list	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table according to the port ID.
Host Group Name list	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table according to the host group name. This item is displayed when you select a Fibre Channel port for Port ID. Default: Any
iSCSI Target Alias	Not displayed when ShadowImage for Mainframe is selected for Copy Type. Filters LDEVs in the Available LDEVs table by the iSCSI target alias. This item is displayed if you select an iSCSI port for Port ID. Default: Any
Set button	Click to move an LDEV that you have selected in the Available LDEVs table to the Selected Pairs table. You can also click to configure a pair you have selected in the Available LDEVs table and a pair you have selected in the Selected Pairs table.
Clear button	Click to return the selected S-VOL from the Selected Pairs table to the Available LDEVs table.
Sort Pairs button	Displayed only when ShadowImage is selected for Copy Type.

Item	Description
	Click to sort the Selected Pairs table in one of the following ways: ▪ Arrange in Mirror Unit: Data is sorted by mirror units. ▪ Arrange in Topology: Data is sorted by topology; for example, L1 or L2 pairs.

Available LDEVs table

The following table describes the items in this table in the **Select Secondary Volumes** window of the Create SI Pairs wizard.

Item	Description
LDEV ID	The identifier of an LDEV that can be specified for an S-VOL.
LDEV Name	The LDEV's name.
Port ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The port name of the LDEV's LUN path.
Host Group Name / iSCSI Target Alias	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The host group name and ID or iSCSI target alias and ID of the LDEV's LUN path.
iSCSI Target Name	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The iSCSI target name.
LUN ID	Not displayed when ShadowImage for Mainframe is selected for Copy Type. LUN identifier of the LDEV's LUN path.
Emulation Type	The LDEV's emulation type.
Capacity	The LDEV's capacity.
Provisioning Type	The LDEV's provisioning type. Values: ▪ Basic: Internal volume ▪ DP: DP-VOL ▪ External: External volume

Item	Description
	▪ Snapshot: HTI volume ▪ ALU: Volume with ALU attribute.
Attribute	Not displayed when ShadowImage for Mainframe is selected for Copy Type. The LDEV's attribute. Values: ▪ ALU: Volume with ALU attribute. ▪ SLU: Volume with SLU attribute. ▪ Data Direct Mapping: Volume with Data Direct Mapping attribute. If the attribute is not set, a hyphen (-) is displayed.
CLPR	The LDEV's CLPR ID.
Encryption	Encryption information. ▪ Enabled: Encryption is enabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption enabled. ▪ Disabled: Encryption is disabled for the parity group to which the LDEV belongs, or the LDEV is a V-VOL associated with a pool in which a pool volume has encryption disabled. ▪ Mixed: The pool to which the LDEV belongs contains two or more of the following: • Volume for which encryption is enabled • Volume for which encryption is disabled • External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the LDEV is an external volume or migration volume. When the LDEV is a DP-VOL, the pool to which LDEV belongs is an external volume or blocked.
Capacity Saving	Information about the LDEV's capacity saving function. ▪ Compression: The compression function is used. ▪ Deduplication and Compression: The deduplication function and the compression function are used. ▪ Disabled: The capacity saving function is not used.

Item	Description
T10 PI	The LDEV's T10 PI attribute information. ▪ Enabled: The LDEV's T10 PI attribute is enabled. ▪ Disabled: The LDEV's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed.
Number of Secondary Volumes	Displayed only when ShadowImage is selected for Copy Type. The number of S-VOLs that have been assigned to the selected P-VOL.
Detail button	Click to open the **LDEV Properties** window, which contains additional information for the selected LDEV.

Selected Pairs table

The following table describes the items in this table in the **Select Secondary Volumes** window of the Create SI Pairs wizard.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Port ID: The port name of the P-VOL LDEV's LUN path. ▪ Host Group Name / iSCSI Target Alias: The host group name and ID or iSCSI target alias and ID of the P-VOL LDEV's LUN path. ▪ iSCSI Target Name: The P-VOL's iSCSI target name. ▪ LUN ID: The LUN identifier of the P-VOL LDEV's LUN path. ▪ Attribute: The P-VOL's attribute. ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity.

Item	Description
	▪ Encryption: The P-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the P-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the P-VOL is an external volume or migration volume. When the P-VOL is a DP-VOL, the pool to which P-VOL's LDEV belongs is an external volume or blocked. ▪ Capacity Saving: Information about the P-VOL's capacity saving function. • Compression: The compression function is used. • Deduplication and Compression: The deduplication function and the compression function are used. • Disabled: The capacity saving function is not used. ▪ T10 PI: The P-VOL's T10 PI attribute information. • Enabled: The P-VOL's T10 PI attribute is enabled. • Disabled: The P-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed. For SIz, Port ID, Host Group Name / iSCSI Target Alias, iSCSI Target Name, LUN ID, and Attribute are not displayed.
Secondary Volume	The S-VOL information.

Item	Description
	Values: ▪ LDEV ID: The S-VOL's LDEV identifier. If no LDEV is assigned, a blank is displayed. ▪ LDEV Name: The S-VOL's LDEV name. A hyphen (-) is displayed if no LDEV is assigned. ▪ Port ID: Port name of the S-VOL LDEV's LUN path. ▪ Host Group Name / iSCSI Target Alias: The host group name and ID or iSCSI target alias and ID of the S-VOL LDEV's LUN path. ▪ iSCSI Target Name: The S-VOL's iSCSI target name. ▪ LUN ID: The LUN identifier of the S-VOL LDEV's LUN path. ▪ Attribute: The S-VOL's attribute. ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity. ▪ Encryption: The S-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the S-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the S-VOL is an external volume or migration volume. When the S-VOL is a DP-VOL, the pool to which S-VOL's LDEV belongs is an external volume or blocked.

Item	Description

	▪ Capacity Saving: Information about the S-VOL's capacity saving function.
	  • Compression: The compression function is used.
	  • Deduplication and Compression: The deduplication function and the compression function are used.
	  • Disabled: The capacity saving function is not used.
	▪ T10 PI: The S-VOL's T10 PI attribute information.
	  • Enabled: The S-VOL's T10 PI attribute is enabled.
	  • Disabled: The S-VOL's T10 PI attribute is disabled.
	  For SIz pairs, a hyphen (-) is displayed.
	For SIz, Port ID, Host Group Name / iSCSI Target Alias, iSCSI Target Name, LUN ID, and Attribute are not displayed.

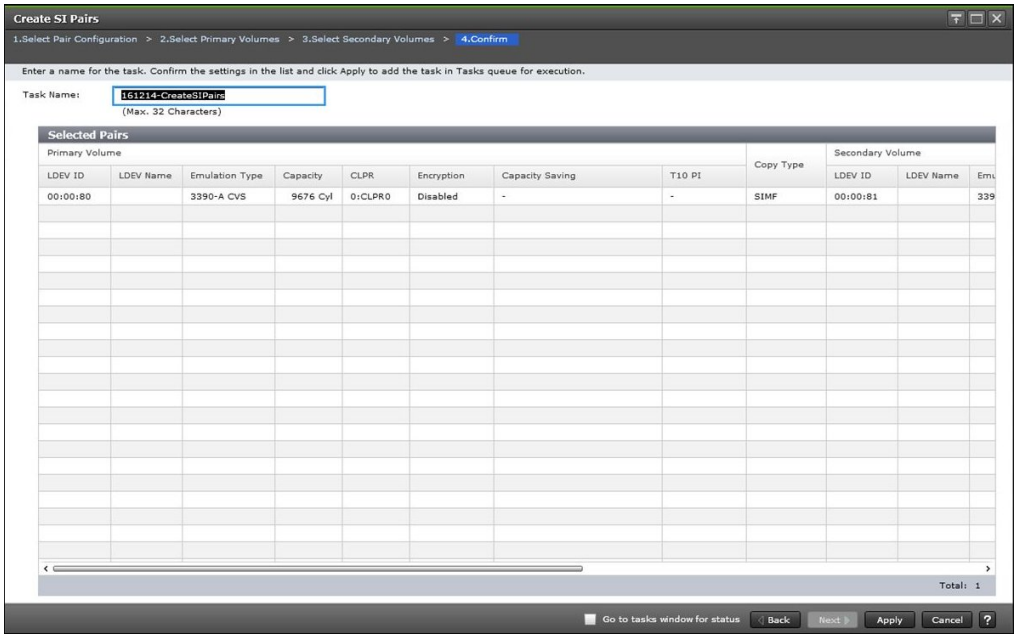
Copy Type	The copy type. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz
Mirror Unit	The mirror unit number.
Split Type	The split type. Values: ▪ Non Split: The pair is not split. ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. ▪ Steady Split: Differential data is copied, and then the pair is split.
Copy Pace	The system option that determines the rate at which you want the storage system to copy data.

Item	Description
	Values: ▪ Slower: Improved host server I/O performance but slower processing speed. ▪ Medium: Average processing speed and host server I/O performance. ▪ Faster: Faster processing speed but slower host server I/O performance.
Change Options button	Click to open the Change Options window. Options set in this window are applied to all newly created pairs.
Edit Mirror Units button	Click to open the Edit Mirror Units window. Use this window to change the S-VOL's L1 mirror unit numbers.
Remove button	Click to remove the unwanted pairs or LDEV from the Selected Pairs table. **Note:** When ShadowImage is selected for Copy Type, you cannot remove L1 pairs that have an L2 pair.

Create SI Pairs confirmation window

This window is the last window of the Create SI Pairs wizard. This window contains the Selected Pairs table.

The following image shows this window of the Create SI Pairs wizard.



Selected Pairs table

The following table describes the items in this table in the **Confirm** window of the Create SI Pairs wizard.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Port ID: Port name of the P-VOL LDEV's LUN path. ▪ Host Group Name / iSCSI Target Alias: The host group name and ID or iSCSI target alias and ID of the P-VOL LDEV's LUN path. ▪ iSCSI Target Name: The P-VOL's iSCSI target name. ▪ LUN ID: The LUN identifier of the P-VOL LDEV's LUN path. ▪ Attribute: The P-VOL's attribute. ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity. ▪ CLPR: The P-VOL's CLPR ID.

Item	Description
	▪ Encryption: The P-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the P-VOL's LDEV belongs, or the P-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the P-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the P-VOL is an external volume or migration volume. When the P-VOL is a DP-VOL, the pool to which a P-VOL's LDEV belongs in an external volume or blocked. ▪ Capacity Saving: Information about the P-VOL's capacity saving function. • Compression: The compression function is used. • Deduplication and Compression: The deduplication function and the compression function are used. • Disabled: The capacity saving function is not used. ▪ T10 PI: The P-VOL's T10 PI attribute information. • Enabled: The P-VOL's T10 PI attribute is enabled. • Disabled: The P-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed. For SIz, Port ID, Host Group Name / iSCSI Target Alias, iSCSI Target Name, LUN ID, and Attribute are not displayed.
Copy Type	The types of pairs.

Item	Description
	Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier. ▪ LDEV Name: The S-VOL's LDEV name. ▪ Port ID: Port name of the S-VOL LDEV's LUN path. ▪ Host Group Name / iSCSI Target Alias: The host group name and ID or iSCSI target alias and ID of the S-VOL LDEV's LUN path. ▪ iSCSI Target Name: The S-VOL's iSCSI target name. ▪ LUN ID: The LUN identifier of the S-VOL LDEV's LUN path. ▪ Attribute: The S-VOL's attribute. ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity. ▪ CLPR: The S-VOL's CLPR ID.

Item	Description
	▪ Encryption: The S-VOL's encryption information. • Enabled: Encryption is enabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption enabled. • Disabled: Encryption is disabled for the parity group to which the S-VOL's LDEV belongs, or the S-VOL is a V-VOL associated with a pool in which a pool volume has encryption disabled. • Mixed: The pool to which the S-VOL's LDEV belongs contains two or more of the following: ▪ Volume for which encryption is enabled ▪ Volume for which encryption is disabled ▪ External volume **Note:** Data encryption is not ensured in an LDEV with Mixed encryption status. A hyphen (-) is displayed if the S-VOL is an external volume or migration volume. When the S-VOL is a DP-VOL, the pool to which S-VOL's LDEV belongs is an external volume or blocked. ▪ Capacity Saving: Information about the S-VOL's capacity saving function. • Compression: The compression function is used. • Deduplication and Compression: The deduplication function and the compression function are used. • Disabled: The capacity saving function is not used. ▪ T10 PI: The S-VOL's T10 PI attribute information. • Enabled: The S-VOL's T10 PI attribute is enabled. • Disabled: The S-VOL's T10 PI attribute is disabled. For SIz pairs, a hyphen (-) is displayed. For SIz, Port ID, Host Group Name / iSCSI Target Alias, iSCSI Target Name, LUN ID, and Attribute are not displayed.
Split Type	The split type.

Item	Description
	Values: ▪ Non Split: The pair is not split. ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. ▪ Steady Split: Differential data is copied, and then the pair is split.
Copy Pace	The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.
Mirror Unit	The mirror unit number.

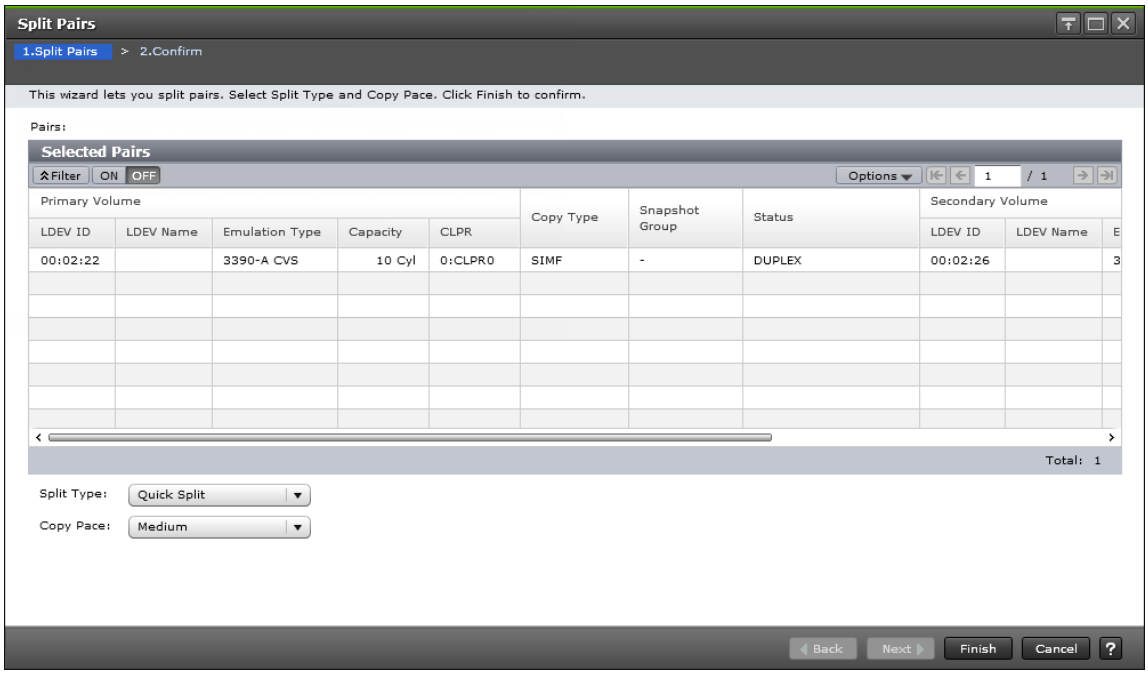
Split Pairs wizard

Use this wizard to split pairs.

Split Pairs window

Use this window of the Split Pairs wizard to split pairs. This window contains the Selected Pairs table.

For more information about using this window, see Splitting ShadowImage for Mainframe pairs (on page 63).



Selected Pairs table

The following table describes the items in this table.

Note: The Selected Pairs table appears on the **Confirm** window and the **Split Pairs** window of the Split Pairs wizard. The table for the items on the **Confirm** window is displayed with that window.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier. ▪ LDEV Name: The P-VOL's LDEV name. ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID.
Copy Type	The types of pairs. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz ▪ TI: HTI

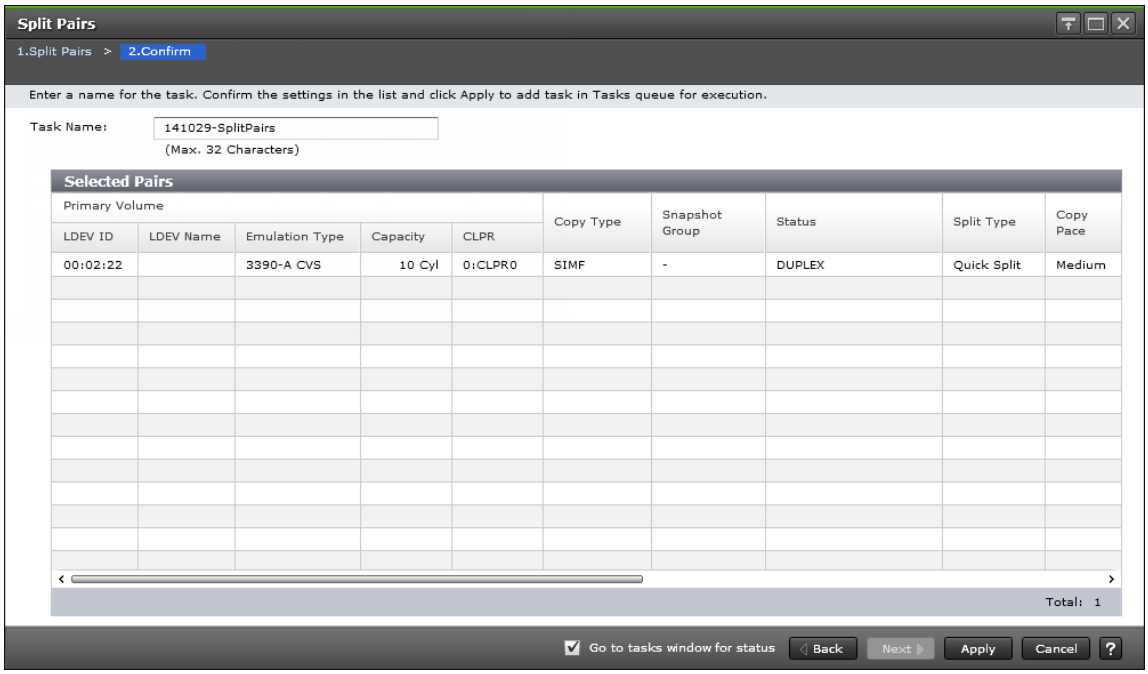
Item	Description
Snapshot Group	HTI pairs only. The snapshot group name. For non-HTI pairs, a hyphen is displayed. If the pair is a Thin Image pair and the snapshot group is not set, a blank appears.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88) .
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Pool Name (ID)	HTI pairs only. The pool name and identifier. For non-HTI pairs, a hyphen is displayed.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen is displayed.

Item	Description
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.
Split Type list	The split type. Values: ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. For HTI pairs, this value is not shown. ▪ Steady Split: Splits the pair after all of the differential data is copied.
Copy Pace list	SI and SIz pairs only. The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance. For HTI pairs with the snapshot attribute, you cannot select the copy pace and a hyphen appears.

Split Pairs confirmation window

This window of the Split Pairs wizard contains the Selected Pairs table.

The following image shows this window.



Selected Pairs table

The following table describes the items in this table in the **Confirm** window of the Split Pairs wizard.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier ▪ LDEV Name: The P-VOL's LDEV name ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID
Copy Type	The pair type. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz ▪ TI: HTI
Snapshot Group	HTI pairs only. The snapshot group name.

Item	Description
	If you have not assigned the pair to a snapshot group, a blank is displayed. For non-HTI pairs, a hyphen is displayed.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88) .
Split Type	The split type. Values: ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. ▪ Steady Split: Differential data is copied, and then the pair is split.
Copy Pace	The system option that determines the rate at which you want the storage system to copy data. For HTI pairs, a hyphen is displayed. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Pool Name (ID)	HTI pairs only. The pool name and ID number. For non-HTI pairs, a hyphen is displayed.

Item	Description
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen is displayed.
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.

Resync Pairs wizard

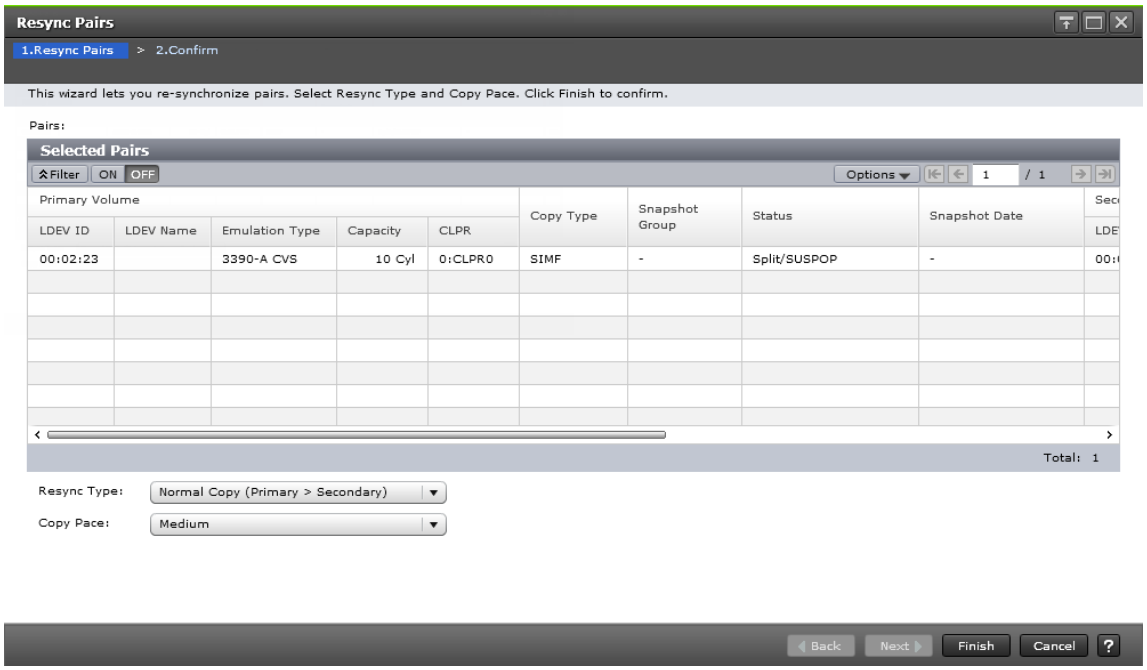
Use this wizard to resynchronize pairs.

Resync Pairs window

Use this window of the Resync Pairs wizard to resynchronize a pair.

For more information about using this wizard, see Resynchronizing or restoring ShadowImage for Mainframe pairs (on page 77) .

The following image shows this window.



Selected Pairs table

The following table describes the items in this table in the **Resync Pairs** window of the Resync Pairs wizard.

Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier ▪ LDEV Name: The P-VOL's LDEV name ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID
Copy Type	The pair type. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz ▪ TI: HTI
Snapshot Group	The snapshot group name. For non-HTI pairs, a hyphen is displayed.

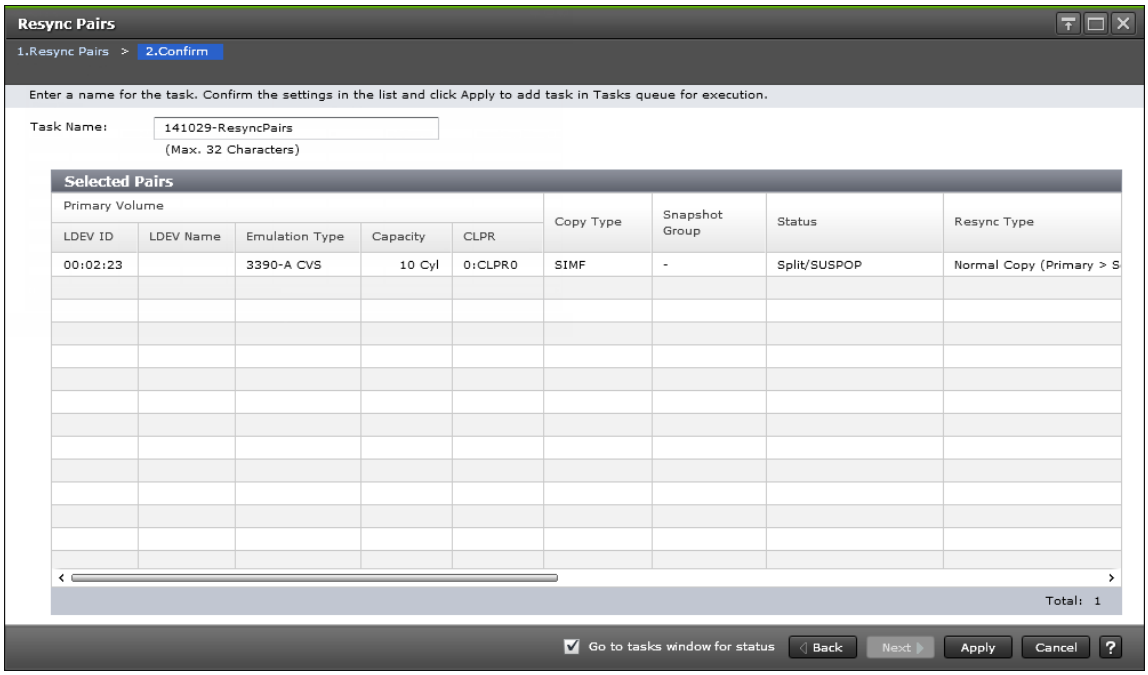
Item	Description
	If the pair is a Thin Image pair and the snapshot group is not set, a blank is displayed.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).
Snapshot Date	HTI pairs only. The date and time the snapshot was acquired. For non-HTI pairs, a hyphen is displayed.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Pool Name (ID)	The pool name and identification number. For non-HTI pairs, a hyphen is displayed.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen is displayed.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen is displayed.

Item	Description
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.
Resync Type	The type of resynchronization. Values: ▪ Normal Copy (Primary > Secondary) (default) A full forward resynchronization from the P-VOL to the S-VOL. The differential data is updated to the S-VOL. ▪ Reverse Copy (Secondary > Primary) Resyncs the pairs from S-VOL to P-VOL. The differential data is updated to the P-VOL. You cannot use Reverse Copy with SI L2 or SIz pair sharing the P-VOL with an FCv2/FCSE pair. ▪ Quick Resync (Primary > Secondary) A forward resynchronization from the P-VOL to the S-VOL where data is not copied or resynchronized. The volumes are paired ("PAIR" status). The update copy operation copies the differential data to the S-VOL. You can use Quick Resync with SI or SIz pairs only. ▪ Quick Restore (Secondary > Primary) Swaps the P-VOL and S-VOLs. The update copy operation copies the differential data to the S-VOL. Can be selected for SI or SIz pairs. You cannot use Quick Restore with the following pairs: • SI L2 pairs • Only one of the P-VOL or S-VOL is DP-VOL • SI pairs with HTI pairs in P-VOL and S-VOL • SIz pairs sharing the P-VOL with an FCv2/FCSE pair For more information about the methods you can use to resynchronize pairs, see Types of pair resynchronization (on page 74) .
Copy Pace	SI and SIz pairs only. For HTI pairs, you cannot select the rate. The system option that determines the rate at which you want the storage system to copy data.

Item	Description
	A hyphen appears for HTI pairs. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.

Resync Pairs confirmation window

The following image shows this window of the Resync Pairs wizard.



Selected Pairs table

The following table describes the items in this table in the **Confirm** window of the Resync Pairs wizard.

Item	Description
Primary Volume	The P-VOL information.

Item	Description
	Values: ▪ LDEV ID: The P-VOL's LDEV identifier ▪ LDEV Name: The P-VOL's LDEV name ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID
Copy Type	The types of pairs. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz ▪ TI: HTI
Snapshot Group	HTI pairs only. The snapshot group name. If you have not assigned the pair to a snapshot group, a blank appears. For non-HTI pairs, a hyphen appears. If the pair is Thin Image and the snapshot group is not set, a blank appears.
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88) .
Resync Type	The type of resynchronization. Values: ▪ Normal Copy (Primary > Secondary) (default) Resync pair from P-VOL to S-VOL. ▪ Reverse Copy (Secondary > Primary) Resync pair from S-VOL to P-VOL.

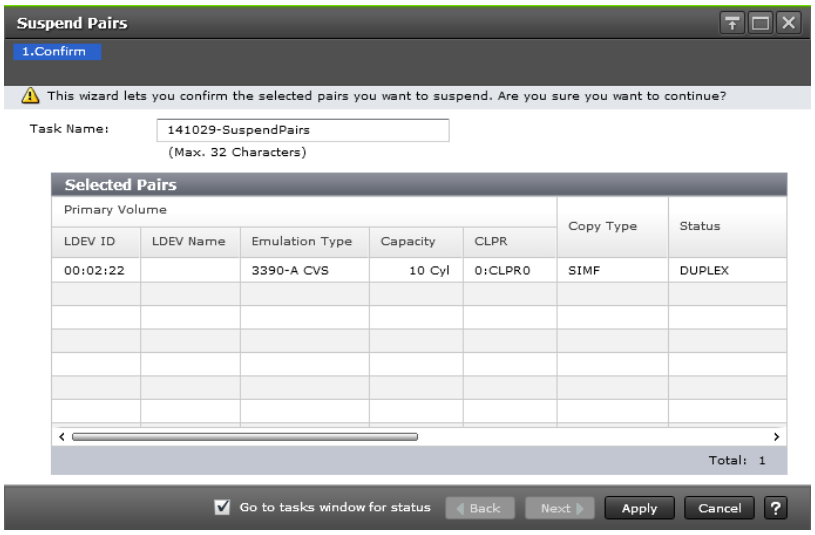
Item	Description
	▪ Quick Resync (Primary > Secondary) Resync pair from P-VOL to S-VOL and immediately change the status to DUPLEX. ▪ Quick Restore (Secondary > Primary) Swaps the P-VOL and S-VOL. For more information about the types of resynchronization, see Types of pair resynchronization (on page 74) .
Copy Pace	SI and SIz pairs only. The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium: Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance. ▪ For HTI pairs, a hyphen appears.
Snapshot Date	HTI pairs only. For non-HTI pairs, a hyphen appears. The date and time the snapshot was acquired.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Pool Name (ID)	HTI pairs only. The pool name and identifier. For non-HTI pairs, a hyphen appears.
Mirror Unit	The mirror unit number.

Item	Description
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen appears.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen appears.
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.

Suspend Pairs window

Use this window to suspend pair creation. This window contains the Selected Pairs table.

For more information about using this window, see Suspending ShadowImage for Mainframe pairs (on page 80).



Selected Pairs table

The following table describes the items in this table in the **Suspend Pairs** window.

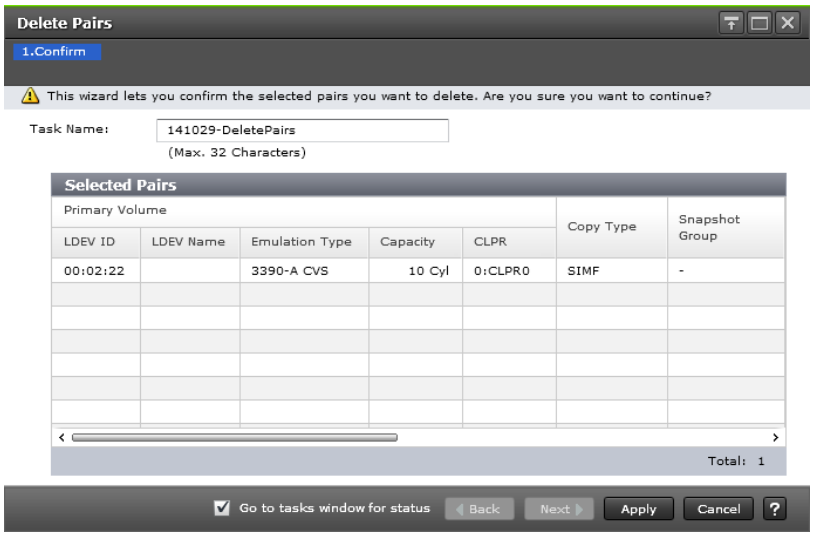
Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier ▪ LDEV Name: The P-VOL's LDEV name ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID
Copy Type	The types of pairs. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz
Status	The status of the pair. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Mirror Unit	The mirror unit number.

Delete Pairs window

Use this window to delete pairs. This window contains the Selected Pairs table.

For more information about deleting pairs, see Deleting ShadowImage for Mainframe pairs (on page 83).

The following image shows this window.



Selected Pairs table

The following table describes the items in this table in the **Delete Pairs** window.

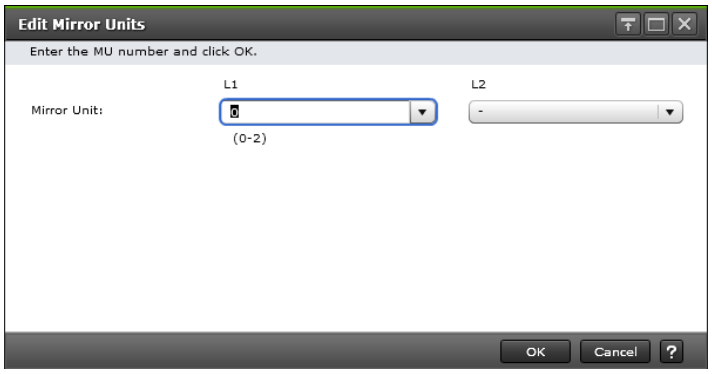
Item	Description
Primary Volume	The P-VOL information. Values: ▪ LDEV ID: The P-VOL's LDEV identifier ▪ LDEV Name: The P-VOL's LDEV name ▪ Emulation Type: The P-VOL's emulation type. ▪ Capacity: The P-VOL's volume capacity ▪ CLPR: The P-VOL's CLPR ID
Copy Type	The types of pairs. Values: ▪ SI-L1: SIz L1 ▪ SI-L2: SIz L2 ▪ SIMF: SIz ▪ TI: HTI
Snapshot Group	HTI pairs only. The snapshot group name. If you have not assigned the pair to a snapshot group, a blank appears. For non-HTI pairs, a hyphen appears.

Item	Description
	If the pair is Thin Image and the snapshot group is not set, a blank appears.
Status	The pair status. For more information about pair status, see Device Manager - Storage Navigator pair status names and descriptions (on page 88).
Snapshot Date	HTI pairs only. The date and time the snapshot was acquired. For non-HTI pairs, a hyphen appears.
Secondary Volume	The S-VOL information. Values: ▪ LDEV ID: The S-VOL's LDEV identifier ▪ LDEV Name: The S-VOL's LDEV name ▪ Emulation Type: The S-VOL's emulation type. ▪ Capacity: The S-VOL's volume capacity ▪ CLPR: The S-VOL's CLPR ID
Pool Name (ID)	HTI pairs only. The pool name and identifier. For non-HTI pairs, a hyphen appears.
Mirror Unit	The mirror unit number.
Cascade	Indicates whether cascade pairs can be created. Enabled: Cascade pairs can be created. Disabled: Cascade pairs cannot be created. For non-HTI pairs, a hyphen appears.
Type	The pair type. Snapshot: The pair has the snapshot attribute. Clone: The pair has the clone attribute or diff clone attribute. In the **TI Pairs** window, if **Diff Compare Volume** displays the **LDEV ID**, the diff clone attribute is set for the pair. If **Diff Compare Volume** displays a hyphen (-), the clone attribute is set for the pair. For non-HTI pairs, a hyphen appears.

Item	Description
Topology ID	The topology ID, which indicates the layer of the pair based on the mirror unit. The topology ID consists of the LDEV ID of the volume (root volume for Thin Image pairs), which is the base of the target pair, and the mirror unit number.

Edit Mirror Units dialog box

Use this dialog box to change the S-VOL's L1 and L2 mirror unit numbers. To open the dialog box, click Edit Mirror Units in the **Select Secondary Volumes** window of the Create SI Pairs wizard.



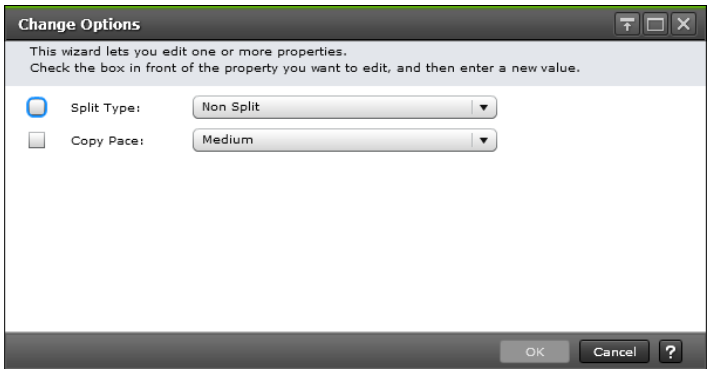
The following table describes the items in this dialog box.

Item	Description
Mirror Unit	The mirror unit number. For SIz (open), the mirror unit assigned to L1 and L2 volumes. For more information about the values you can set for the mirror unit number, see Creating ShadowImage for Mainframe pairs in HDvM - SN (on page 53).

Change Options dialog box

Use this dialog box to change the split type and copy pace for pairs that you create.

For information about how to navigate to this dialog box, see Changing ShadowImage for Mainframe pair options (on page 60).



Item	Description
Split Type	The split type. Values: ▪ Non Split (default): The pair is not split. ▪ Quick Split: The pair is split, and then the data is copied so that the S-VOL is immediately available for read and write I/O. Any remaining differential data is copied to the S-VOL in the background. ▪ Steady Split: Differential data is copied, and then the pair is split.
Copy Pace	The system option that determines the rate at which you want the storage system to copy data. Values: ▪ Slower: Improved host I/O performance but slower processing speed. ▪ Medium (default): Average processing speed and host I/O performance. ▪ Faster: Faster processing speed but slower host I/O performance.

Reserve Mainframe CTGs wizard

Use this wizard to reserve CTGs for SIz.

Reserve Mainframe CTGs window

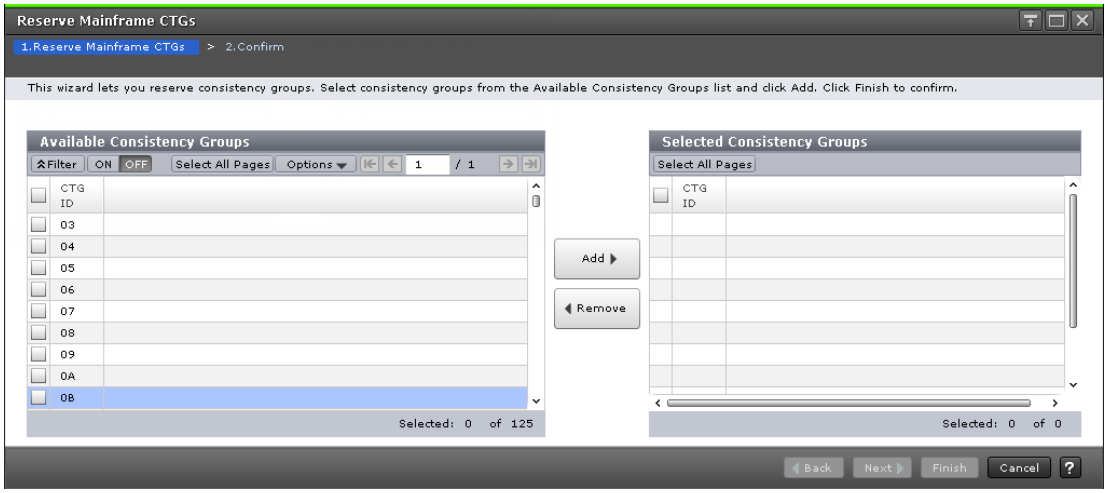
Use this window of the Reserve Mainframe CTGs wizard to reserve a CTG for SIz. This is the first window in the wizard.

This window contains the following tables:

- Available Consistency Groups table
- Selected Consistency Group table

For more information about using this window, see Managing consistency group IDs for ShadowImage for Mainframe using Device Manager - Storage Navigator (on page 43) .

The following image shows this window.



Available and Selected Consistency Groups tables

These tables are shown on the **Reserve Mainframe CTGs** window of the Reserve Mainframe CTGs wizard.

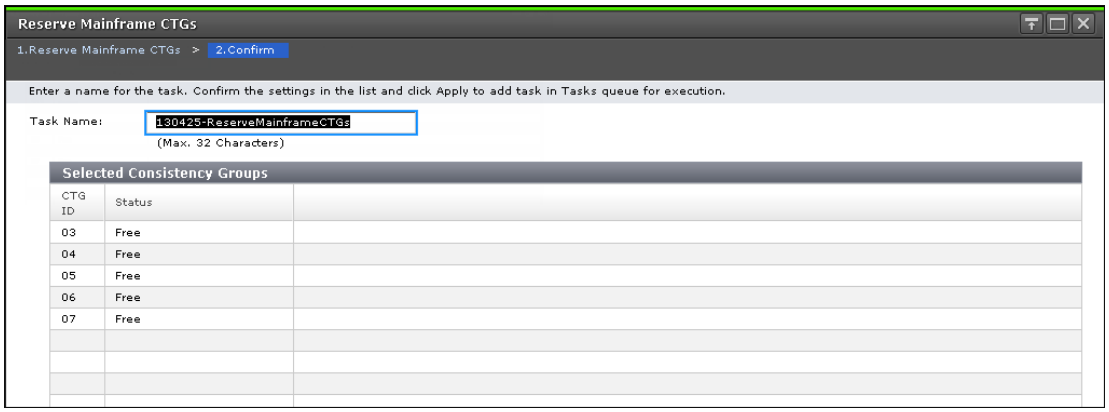
The following table describes the items in the Available Consistency Groups and Selected Consistency Groups tables.

Item	Description
CTG ID	The SIz pair's CTG identification number.

Reserve Mainframe CTGs confirmation window

This window is the second and last window of the Reserve Mainframe CTGs wizard.

The following image shows this window of the Reserve Mainframe CTGs wizard.



Selected Consistency Groups table

This table is displayed on the **Confirm** window of the Reserve Mainframe CTGs wizard.

The following table describes the items in the Selected Consistency Groups table.

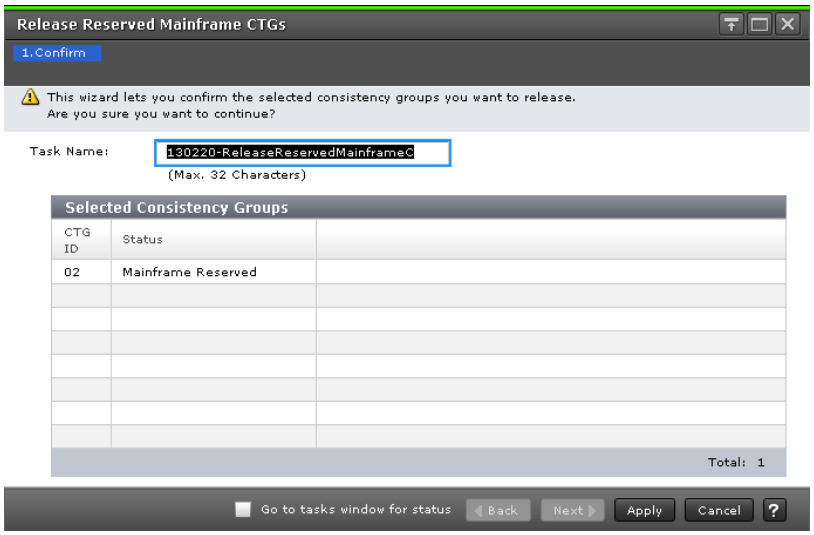
Item	Description
CTG ID	The SIz pair's CTG identification number.
Status	The status of the CTG that is reserved for SIz. Value: Mainframe Reserved

Release Reserved Mainframe CTGs window

Use this window to release reserved mainframe consistency groups (CTGs). To open this window, click Release Reserved Mainframe CTGs on the Consistency Groups tab in the Local Replication window.

For more information about releasing reserved mainframe CTGs, see Releasing reserved mainframe consistency groups (on page 45) .

The following image shows this window.



Selected Consistency Groups table

The following table describes the items in this table.

Item	Description
CTG ID	The SIz pair's CTG identification number for which you want to release the reserved status.
Status	The status of CTG reserved for SIz. Value: Mainframe Reserved

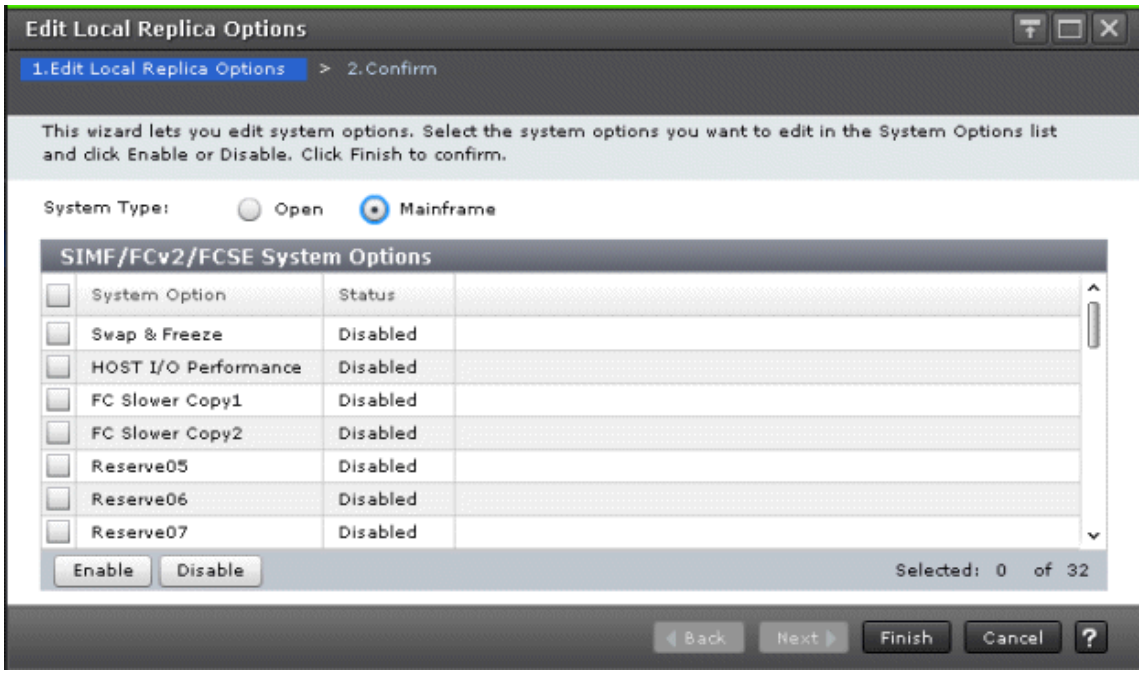
Edit Local Replica Options wizard

Use this wizard to enable or disable options that affect host I/O performance.

Edit Local Replica Options window

Use this window to specify options that affect host I/O performance. This is the first window of the Edit Local Replica Options wizard.

For more information, see System options (on page 47) .



Setting fields

The following table describes the setting fields for this window.

Item	Description
System Type	The system type. Values: ▪ Open: SI or HTI ▪ Mainframe: SIz, FCv2, or FCSE

System Options table

The following table describes the items in this table.

Item	Description
System Option	Displays the system options. The number next to each system option indicates the system option number.

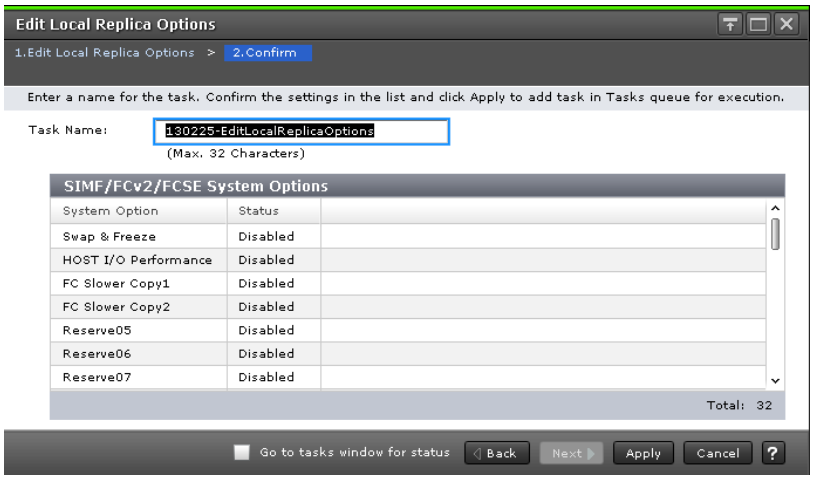
Item	Description
	Values: ▪ Swap & Freeze (1): Use this option to suppress the storage system's update copy operations. After a Quick Restore and the pair is in DUPLEX status (for SIz, FCv2, or FCSE) or PAIR status (for SI or HTI), the S-VOL (target volume for FCv2 or FCSE) remains unchanged, and differential data is not copied to the new S-VOL. Default status: Disabled ▪ HOST I/O Performance (2): Suppresses copy operations at all times, regardless of the workload. This system option increases I/O performance. Default status: Disabled

Item	Description
	▪ Copy Pace: Maximizes host server I/O performance by suppressing copy processing only if the pair status is DUPLEX (for SIz, FCv2, or FCSE) or PAIR (for SI or HTI). Processing-suppression/performance-improvement levels: • (FCv2, SIz, and FCSE only) FC Slower Copy1 (3): Reduces background copying multiplicity (number of FCv2 or FCSE relationships for which you can perform background copying concurrently) to one half, which improves host I/O response. • (FCv2, SIz, and FCSE only) FC Slower Copy2 (4): Reduces background copying multiplicity (number of FCv2 or FCSE relationships for which you can perform background copying concurrently) to one quarter, which improves host I/O response. • (FCv2, SIz, and FCSE only) FC Ext. Slower Copy1 (17): When the MP operating ratio of the MP unit to which the source volume or target volume in a FCv2 or FCSE relationship is allocated exceeds 65%, background copy operations are suppressed, thereby improving the host I/O response. • (FCv2, SIz, and FCSE only) FC Ext. Slower Copy2 (18): When the MP operating ratio of the MP unit to which the source volume or target volume in a FCv2 or FCSE relationship is allocated exceeds 50%, background copy operations are suppressed, thereby improving the host I/O response. • Copy Pace Ext. Slower1 (20) Default status: Disabled • Copy Pace Ext. Slower2 (21) Default status: Disabled • Copy Pace Ext. None (22) Default status: Disabled The I/O performance of the host server is improved most effectively with Copy Pace Ext. None, followed by Copy Pace Ext. Slower2, and then Copy Pace Ext. Slower1.

Item	Description
	▪ Nondisruptive Migration Data Consistency (16): Use this option to keep the latest data in the source storage system instead of distributing data in both the destination and source storage systems during data migration. ▪ Quick/Steady Split Multiplexing (ShadowImage/ ShadowImage for Mainframe) (24): Accelerates ShadowImage or ShadowImage for Mainframe pair split. The number of jobs for which copy processing can be executed concurrently for each pair is changed from 1 to 24. ▪ Reverse Copy Multiplexing (ShadowImage/ ShadowImage for Mainframe) (25): Accelerates the resynchronization (secondary to primary) of ShadowImage or ShadowImage for Mainframe pairs. The number of jobs for which copy processing can be executed concurrently for each pair is changed from 1 to 24. ▪ Normal Resync Multiplexing (ShadowImage/ ShadowImage for Mainframe) (26): Accelerates the resynchronization of ShadowImage or ShadowImage for Mainframe pairs. The number of jobs for which copy processing can be executed concurrently for each pair is changed from 1 to 24. For more information about the system options, see System options (on page 47) .
Status	Shows whether the option is currently enabled or disabled.
Enable button	Click to enable the option.
Disable button	Click to disable the option.

Edit Local Replica Options confirmation window

The following image shows this window of the Edit Local Replica Options wizard.



SI/TI System Options or SIMF/FCv2/FCSE System Options table

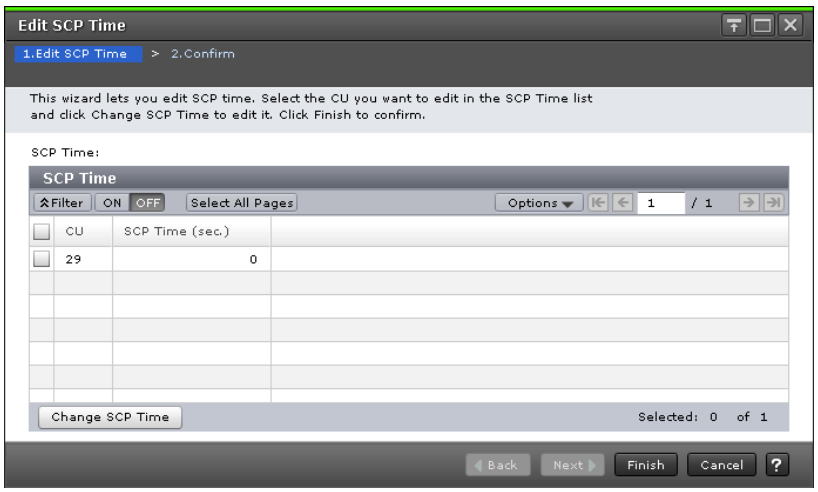
The following table describes the items in this table.

Item	Description
System Option	Options that you can change.
Status	Shows whether the option is currently enabled or disabled.

Edit SCP Time window

State Change Pending (SCP) time is the interval that I/O for the host is suspended. SCP time is a value you set and is shared between TCz and FCv2.

The following image shows this window.



For more information about how to use this window, including how to change the SCP time, see the *Hitachi TrueCopy® for Mainframe User Guide*.

Glossary

2DC

two-data-center. Refers to the local and remote sites, or data centers, in which TrueCopy (TC) and Universal Replicator (UR) combine to form a remote replication configuration.

In a 2DC configuration, data is copied from a TC primary volume at the local site to the UR master journal volume at an intermediate site, then replicated to the UR secondary volume at the remote site. Since this configuration side-steps the TC secondary volume at the intermediate site, the intermediate site is not considered a data center.

administrative logical unit (ALU)

An LU used for the conglomerate LUN structure, a SCSI architecture model. In the conglomerate LUN structure, all host access is through the ALU, which functions as a gateway to sort the I/Os for the subsidiary logical units (SLUs) grouped under the ALU.

The host requests I/Os by using SCSI commands to specify the ALU and the SLUs grouped under the ALU. An ALU is called a Protocol Endpoint (PE) in vSphere. See also *subsidiary logical unit (SLU)*.

alternate path

A secondary path (for example, port, target ID, or LUN) to a logical volume, in addition to the primary path, that is used as a backup in case the primary path fails.

ALU

See *administrative logical unit (ALU)*.

array group

A set of drives in a storage system that have the same capacity and are treated as one RAID unit. An array group contains user data and parity information, which ensures user data integrity in the event of a disk drive failure in the array group.

audit log

Files that store a history of the operations performed from Device Manager - Storage Navigator and the commands that the storage system received from hosts, and data encryption operations.

blade

A computer module, generally a single circuit board, used mostly in servers.

C/T

See consistency time.

cache logical partition (CLPR)

Consists of virtual cache memory that is set up to be allocated to different hosts in contention for cache memory.

capacity

The amount of data storage space available on a physical storage device, usually measured in bytes (MB, GB, TB, and so on).

cascade configuration

In a 3DC cascade configuration for remote replication, data is copied from a local site to an intermediate site and then to a remote site using TrueCopy and Universal Replicator. See also *3DC*.

In a ShadowImage cascade configuration, two layers of secondary volumes can be defined for a single primary volume. Pairs created in the first and second layer are called cascaded pairs.

CCI

Command Control Interface

channel adapter (CHA)

The hardware component that processes channel commands from hosts and manages host access to cache.

CLPR

See *cache logical partition (CLPR)*.

cluster

Multiple storage servers working together to respond to multiple read and write requests.

command device

A dedicated logical volume used only by Command Control Interface and Business Continuity Manager to interface with the storage system. Can be shared by several hosts.

configuration definition file

A text file that defines the configuration, parameters, and options of Command Control Interface (CCI) operations. It also defines the connected hosts and the volumes and groups known to the CCI instance.

consistency group (CTG)

A group of copy relationships between virtual disks that are managed as a single entity. A group of pairs on which copy operations are performed simultaneously. When a CTG ID is specified for a specific operation, the operation is performed simultaneously on all pairs belonging to the CTG while keeping data consistency. See also *extended consistency group (EXCTG)*.

consistency time (C/T)

A replication policy or threshold that indicates the amount of time that a replication target (volume, journal group, or extended consistency group, for example) is allowed to lag behind replication of the master, or source, volume.

copy pair

A pair of volumes in which one volume contains original data and the other volume contains the copy of the original. Copy operations can be synchronous or asynchronous, and the volumes of the copy pair can be located in the same storage system (local copy) or in different storage systems (remote copy).

A copy pair can also be called a volume pair, or just pair. A pair created by Compatible FlashCopy® is called a relationship.

data consistency

When the data on the secondary volume is identical to the data on the primary volume.

data path

The physical paths used by primary storage systems to communicate with secondary storage systems in a remote replication environment.

data pool

One or more logical volumes designated to temporarily store original data. When a snapshot is taken of a primary volume, the data pool is used if a data block in the primary volume is to be updated. The original snapshot of the volume is maintained by storing the changeable data blocks in the data pool.

delta resync

A disaster recovery solution in which TrueCopy and Universal Replicator systems are configured to provide a quick recovery using only differential data stored at an intermediate site.

device

A physical or logical unit with a specific function.

device emulation

Indicates the type of logical volume. Mainframe device emulation types provide logical volumes of fixed size, called logical volume images (LVIs), which contain EBCDIC data in CKD format. Typical mainframe device emulation types include 3390-9 and 3390-M. Open-systems device emulation types provide logical volumes of variable size, called logical units (LUs), that contain ASCII data in FBA format. The typical open-systems device emulation type is OPEN-V.

differential data

Changed data in the primary volume not yet reflected in the secondary volume of a copy pair.

disaster recovery

A set of procedures to recover critical application data and processing after a disaster or other failure.

disk adapter (DKA)

The hardware component that controls the transfer of data between the drives and cache. A DKA feature consists of a pair of boards.

disk controller (DKC)

The hardware component that manages front-end and back-end storage operations. The term DKC can refer to the entire storage system or to the controller components.

DKA

See *disk adapter (DKA)*.

DKC

See *disk controller (DKC)*.

DKCMAIN

disk controller main. Refers to the microcode or software for the storage system.

DP-VOL

Dynamic Provisioning virtual volume. A virtual volume that has no memory space that is used by Dynamic Provisioning.

DRU

Hitachi Data Retention Utility

Dynamic Provisioning (HDP)

An approach to managing storage. Instead of "reserving" a fixed amount of storage, it removes capacity from the available pool when data is actually written to disk.

emulation

The operation of a storage system to emulate the characteristics of a different storage system. For device emulation, the mainframe host recognizes the logical devices on the storage system as 3390-x devices. For controller emulation, the mainframe host recognizes the control units (CUs) on the storage system as 2105 or 2107 controllers.

The storage system operates the same as the storage system being emulated.

extended consistency group (EXCTG)

Universal Replicator for Mainframe journals in which data consistency is ensured. Journal registration in an EXCTG is required if you are performing copy operations between multiple primary and secondary systems.

external volume

A logical volume whose data resides on drives that are physically located outside the Hitachi storage system.

FC

Fibre Channel; FlashCopy

free capacity

The amount of storage space (in bytes) that is available for use by the host systems.

HDP

Hitachi Dynamic Provisioning. See Dynamic Provisioning.

HDT

Hitachi Dynamic Tiering

host failover

The process of switching operations from one host to another host when the primary host fails.

host group

A group of hosts of the same operating system platform.

host mode

Operational modes that provide enhanced compatibility with supported host platforms. Used with Fibre Channel ports on RAID storage systems.

host mode option

Operational modes that provide enhanced compatibility with supported host platforms. Used with Fibre Channel ports on RAID storage systems.

I/O

input/output

I/O mode

I/O actions on the primary volume and secondary volume of a global-active device pair.

initial copy

An initial copy operation is performed when a copy pair is created. Data on the primary volume is copied to the secondary volume before any updates are processed.

internal volume

A logical volume whose data resides on drives that are physically located within the storage system. See also *external volume*.

JNLG

See *journal group (JNLG)*.

journal group (JNLG)

In a Universal Replicator system, journal groups manage data consistency between multiple primary volumes and secondary volumes. See also *consistency group (CTG)*.

journal volume

A volume that records and stores a log of all events that take place in another volume. In the event of a system crash, the journal volume logs are used to restore lost data and maintain data integrity.

In Universal Replicator, differential data is held in journal volumes until you copy it to the S-VOL.

LBA

logical block address

LDEV

See logical device.

LDKC

See *logical disk controller (LDKC)*.

leaf volume

A layer-2 secondary volume in a ShadowImage cascade configuration. The primary volume of a layer-2 pair is called a node volume. See also *cascade configuration*.

license key

A specific set of characters that unlocks an application and allows it to be used.

logical device (LDEV)

An individual logical device (on multiple drives in a RAID configuration) in the storage system. An LDEV might or might not contain any data and might or miight not be defined to any hosts. Each LDEV has a unique identifier, or address, within the storage system. The identifier is composed of the logical disk controller (LDKC) number, control unit (CU) number, and LDEV number. The LDEV IDs within a storage system do not change.

An LDEV formatted for use by mainframe hosts is called a logical volume image (LVI). An LDEV formatted for use by open-system hosts is called a logical unit (LU).

logical disk controller (LDKC)

A group of 255 control unit (CU) images in the RAID storage system that is controlled by a virtual (logical) storage system within the single physical storage system. For example, the Hitachi Universal Storage Platform V storage system supports two LDKCs, LDKC 00 and LDKC 01.

logical unit (LU)

A volume, or LDEV, created in an open storage system, or configured for use by an open-systems host, for example, OPEN-V.

logical unit (LU) path

The path between an open-systems host and a logical unit.

logical unit number (LUN)

A unique management number that identifies a logical unit (LU) in a storage system. A logical unit can be an end user, a file, a disk drive, a port, a host group that is assigned to a port, an application, or virtual partitions (or volumes) of a RAID set.

Logical unit numbers (LUNs) are used in SCSI protocols to differentiate disk drives in a common SCSI target device, such as a storage system. An open-systems host uses a LUN to access a particular LU.

logical volume (LV)

See *volume*.

logical volume image (LVI)

An LDEV that is configured for use by mainframe hosts (for example, 3390-3).

LU

See *logical unit (LU)*.

LV

logical volume. See *volume*.

main control unit (MCU)

A storage system at a primary, or main, site that contains primary volumes of remote replication pairs. The main control unit (MCU) is configured to send remote I/O instructions to one or more storage systems at the secondary, or remote, site, called remote control units (RCUs). RCUs contain the secondary volumes of the remote replication pairs. See also remote control unit (RCU).

main site

See *primary site*.

Mb

megabit

MB

megabyte

Mbps

megabits per second

MBps

megabytes per second

MCU

See main control unit.

MF, M/F

mainframe

MIH

missing interrupt handler

mirror

In Universal Replicator, each pair relationship in and between journal groups is called a "mirror." Each pair is assigned a mirror ID when it is created. The mirror ID identifies individual pair relationships between journal groups.

MP

microprocessor

MU

mirror unit

node volume

A layer-2 primary volume in a ShadowImage cascade configuration. The secondary volume of a layer-2 pair is called a leaf volume. See also *cascade configuration*.

NUM

number

OPEN-V

A logical unit (LU) of user-defined size for use by open-systems hosts.

OPEN-x

A logical unit (LU) of fixed size (for example, OPEN-3, OPEN-9) that is used primarily for sharing data between mainframe and open-systems hosts using Hitachi Cross-OS File Exchange.

P-VOL

See primary volume.

pair

Two logical volumes in a replication relationship in which one volume contains original data to be copied and the other volume contains the copy of the original data. The copy operations can be synchronous or asynchronous, and the pair volumes can be located in the same storage system (in-system replication) or in different storage systems (remote replication).

pair status

Indicates the condition of a copy pair. A pair must have a specific status for specific operations. When a pair operation completes, the status of the pair changes to a different status determined by the type of operation.

parity group

See *RAID group*.

PG

parity group. See RAID group.

pool

A set of volumes that are reserved for storing Hitachi Thin Image data or Dynamic Provisioning write data.

pool volume (pool-VOL)

A logical volume that is reserved for storing snapshot data for Thin Image operations or write data for Dynamic Provisioning, Dynamic Provisioning for Mainframe, Dynamic Tiering, Dynamic Tiering for Mainframe, active flash, or active flash for mainframe.

A logical volume that is reserved for storing snapshot data for Thin Image operations or write data for Dynamic Provisioning, Dynamic Tiering, or active flash.

PPRC

Peer-to-Peer Remote Copy

primary site

The physical location of a storage system that contains original data to be replicated and that is connected to one or more storage systems at a remote or secondary site via remote copy connections. A primary site can also be called a “main site” or “local site”.

The term "primary site" is also used for host failover operations. In that case, the primary site is the location of the host on which the production applications are running, and the secondary site is the location of the host on which the backup applications that run when the applications at the primary site have failed.

primary volume (P-VOL)

The volume in a copy pair that contains the original data to be replicated. The data on the P-VOL is duplicated synchronously or asynchronously on the secondary volume (S-VOL).

The following Hitachi products use the term P-VOL: Thin Image, Copy-on-Write Snapshot, ShadowImage, TrueCopy, Universal Replicator, Universal Replicator for Mainframe, and High Availability Manager.

See also secondary volume.

R/W

read/write

RAID

redundant array of inexpensive disks

RAID group

A redundant array of inexpensive drives (RAID) that have the same capacity and are treated as one group for data storage and recovery. A RAID group contains both user data and parity information, which allows the user data to be accessed in the event that one or more of the drives within the RAID group are not available. The RAID level of a RAID group determines the number of data drives and parity drives and how the data is "striped" across the drives. For RAID1, user data is duplicated within the RAID group, so there is no parity data for RAID1 RAID groups.

A RAID group can also be called an array group or a parity group.

RAID level

The type of RAID implementation. RAID levels include RAID 0, RAID 1, RAID 2, RAID 3, RAID 4, RAID 5 and RAID 6.

RCU

See *remote control unit (RCU)*.

remote control unit (RCU)

A storage system at a secondary, or remote, site that is configured to receive remote I/O instructions from one or more storage systems at the primary, or main, site. See also main control unit.

remote site

See *secondary site*.

resync

resynchronize

RMI

Remote Method Invocation

root volume

A layer-1 primary volume in a ShadowImage cascade configuration. The secondary volume of a layer-1 pair is called a node volume. See also *cascade configuration*.

RTC

real-time clock

RTO

recovery time objective

S#

serial number

S/N

serial number

s/w

software

SC

storage control

SCDS

source control dataset

SCI

state change interrupt

scripting

The use of command line scripts, or spreadsheets downloaded by Configuration File Loader to automate storage management operations.

SCSI

Small Computer System Interface. A standard that defines I/O buses primarily intended for connecting storage systems and devices to hosts through host bus adapters.

secondary site

The physical location of the storage system that contains the primary volumes of remote replication pairs at the primary site. The storage system at the secondary site is connected to the storage system at the primary site via remote copy connections. The secondary site can also be called the “remote site”. See also *primary site*.

secondary volume (S-VOL)

The volume in a copy pair that is the copy of the original data on the primary volume (P-VOL). The following Hitachi products use the term "secondary volume": Thin Image, Copy-on-Write Snapshot, ShadowImage, TrueCopy, Universal Replicator, Universal Replicator for Mainframe, and High Availability Manager.

See also primary volume.

service information message (SIM)

Messages generated by a RAID storage system when it detects an error or service requirement. SIMs are reported to hosts and displayed on Device Manager - Storage Navigator.

severity level

Applies to service information messages (SIMs) and Device Manager - Storage Navigator error codes.

shared volume

A volume that is being used by more than one replication function. For example, a volume that is the primary volume of a TrueCopy pair and the primary volume of a ShadowImage pair is a shared volume.

SI

Hitachi ShadowImage®

sidefile

An area of cache memory that is used to store updated data for later integration into the copied data.

SIM

service information message

SIz

Hitachi ShadowImage® for Mainframe

size

Generally refers to the storage capacity of a memory module or cache. Not usually used for storage of data on disk or flash drives.

SLU

See subsidiary logical unit.

SM

shared memory

snapshot

A point-in-time virtual copy of a Hitachi Thin Image primary volume (P-VOL). The snapshot is maintained when the P-VOL is updated by storing pre-updated data (snapshot data) in a data pool.

space

Generally refers to the storage capacity of a data drive (for example, hard disk drive, flash drive).

SSB

sense byte

SSID

See *storage subsystem identifier*.

storage subsystem identifier (SSID)

In a mainframe environment, SSIDs are used for reporting information from the control unit (CU) image to the mainframe operating system. An SSID is assigned to each group of 64 or 256 volumes to define one or four SSIDs per CU image. The user-specified SSIDs are assigned during storage system installation and must be unique to all connected host operating environments.

subsidiary logical unit (SLU)

An LU used for the conglomerate LUN structure, a SCSI architecture model. An SLU is an LU that stores actual data. You can use a DP-VOL or snapshot data (or a V-VOL allocated to snapshot data) as an SLU. All host access to SLUs is through the administrative logical unit (ALU). An SLU is called a virtual volume (VVol) in vSphere. See administrative logical unit.

TC

Hitachi TrueCopy®

TCz

Hitachi TrueCopy® for Mainframe

total capacity

The aggregate amount of storage space in a data storage system.

UR

Hitachi Universal Replicator

URz

Hitachi Universal Replicator software for Mainframe

V

version; variable length and de-blocking (mainframe record format)

V-VOL

See *virtual volume*.

V-VOL management area

Contains the pool management block and pool association information for Dynamic Provisioning, Dynamic Provisioning for Mainframe, Dynamic Tiering, and Dynamic Tiering for Mainframe, and Thin Image operations. The V-VOL management area is created automatically when additional shared memory is installed.

VB

variable length and blocking (mainframe record format)

virtual device (VDEV)

A group of logical devices (LDEVs) in a RAID group. A VDEV typically consists of some fixed volumes (FVs) and some free space. The number of fixed volumes is determined by the RAID level and device emulation type.

Virtual LVI/LUN

A custom-size volume whose size is defined by the user using Virtual LVI/LUN. Also called a custom volume (CV).

virtual volume (V-VOL)

A logical volume in a storage system that has no physical storage space. Hitachi Thin Image uses V-VOLs as secondary volumes of copy pairs. In Hitachi Dynamic Provisioning, V-VOLs are referred to as DP-VOLs.

VOL, vol

See *volume (VOL or vol)*.

volume (VOL or vol)

A logical device (LDEV), or a set of concatenated LDEVs in the case of LUSE, that has been defined to one or more hosts as a single data storage unit. An open-systems volume is called a logical unit (LU), and a mainframe volume is called a logical volume image (LVI).

volume pair

See *copy pair*.

write order

The order of write I/Os to the primary volume (P-VOL) of a copy pair. The data on the secondary volume (S-VOL) is updated in the same order as on the P-VOL, particularly when there are multiple write operations in one update cycle. This feature maintains data consistency at the secondary volume. Update records are sorted in the cache at the remote system to ensure proper write sequencing.

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