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Hitachi TagmaStore®
Adaptable Modular Storage
and Workgroup Modular Storage

Modular Volume Migration User's Guide

MK-96DF796-01

Trademarks

Notice of Export Controls

Document Revision Level

Revision	Date	Description
MK-96DF796-00	October 2006	Initial Release
MK-96DF796-01	January 2007	Revision 1, supersedes and replaces MK-96DF796-00

Changes in this Revision

- Added figure and table references to text.

Preface

The *Modular Volume Migration User's Guide (DF700)* describes and provides instructions for performing volume migration operations on the DF700 array subsystem using the Volume Migration software.

Note:

- The term "**Volume Migration"** refers to the Modular Volume Migration.
- The term "**TrueCopy"** refers to the TrueCopy remote replication.
- The term "**SnapShot"** refers to the Copy-on-write SnapShot.
- The term "**TCE"** refers to the TrueCopy Extended Distance.

Software Version

This document revision applies to Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Products version 7.0 and higher.

Convention for Storage Capacity Values

Storage capacity values for hard disk drives (HDDs) are calculated based on the following values:

1 KB (kilobyte) = 1,000 bytes
1 MB (megabyte) = $1,000^2$ bytes
1 GB (gigabyte) = $1,000^3$ bytes
1 TB (terabyte) = $1,000^4$ bytes

Storage capacity values for logical units (LUs) are calculated based on the following values:

1 KB (kilobyte) = 1,024 bytes
1 MB (megabyte) = $1,024^2$ bytes
1 GB (gigabyte) = $1,024^3$ bytes
1 TB (terabyte) = $1,024^4$ bytes

Referenced Documents

- *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide* (MK-95DF701)
- *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular (for GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)

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Chapter 1 Overview of Volume Migration

Modular Volume Migration (MVM) enables you to resolve performance bottlenecks, reduce storage costs and change RAID security on-line without application downtime. It accomplishes this by allowing you to migrate your data from its current physical location (source) to a target in a different physical location in the background while maintaining the same Logical Unit number. The host is completely unaware that the change has taken place.

Modular Volume Migration allows you to remove performance bottlenecks on-line by letting you migrate data to volumes consisting of more spindles or HDDs with high performance. You can reduce cost by migrating to targets consisting of lower performance HDD or fewer spindles. Lastly, you can modify your level of data protection by moving to volumes with different RAID geometry such as RAID 5 to RAID 0. All this can take place in the background while your application continues without interruption.

The concept of Volume Migration is shown in Figure 1.1.

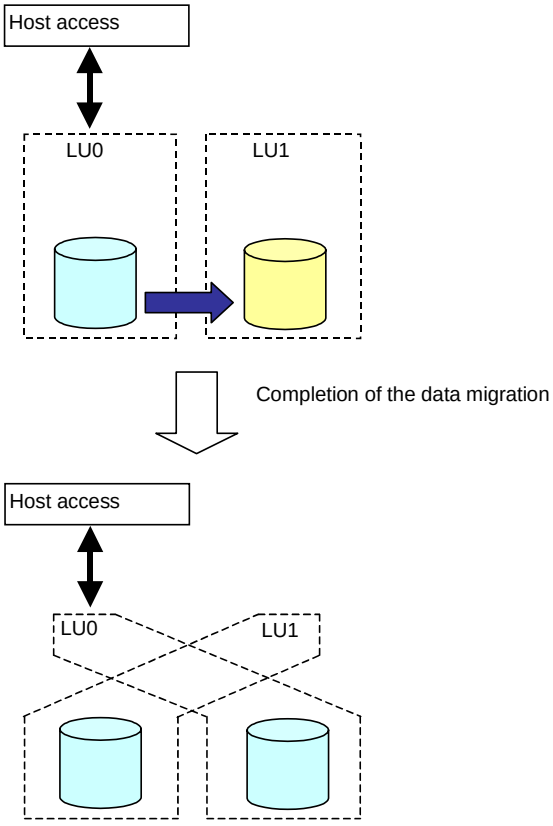


Figure 1.1 Data Migration

In Figure 1.1, the storage administrator decided to move the data located on LU0 (source) to the faster LU1 (target). The migration is accomplished on-line by copying the data on LU0 to LU1. During this time, the application continues operations by accessing the data on LU0. Once the copy is complete and the volumes are identical, the microcode changes the internal LU number mapping. The faster target volume is LU0 and the source volume is LU1. There is a brief interruption to I/O while the mapping is changed. However, it is so brief that the application is unaffected.

Note 1: When data migration is completed, all of the LU attributes are taken over by the target LU. Pre-fetch data size is not assumed by the target LU because this value varies greatly depending on the disk type, RAID level, and the number of data disks of a RAID group. The default pre-fetch data size value for the RAID group of the target LU is applied when the migration is completed. It may be adjusted as required. For information on setting the basic pre-fetch data size, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular User's Guide*.

Note 2: Application write I/O performance may be affected during the migration because of the added overhead to the array.

Chapter 2 About Volume Migration Operations

This chapter contains the following:

- Components of Volume Migration, see section 2.1
- Volume Migration Operations, see section 2.2
- Operations Procedure, see section 2.3
- Pair Status, see section 2.4
- Interoperability with other Products, see section 2.5

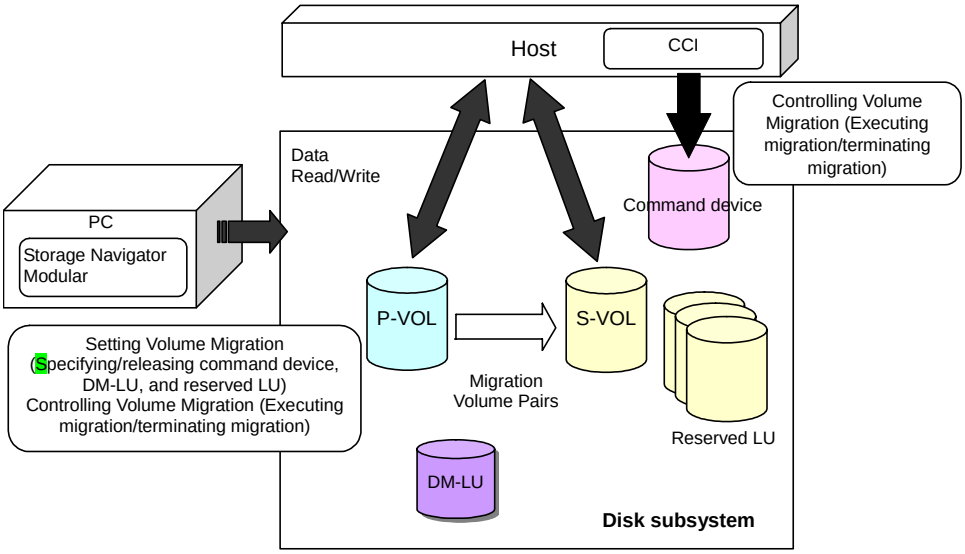
2.1 Components of Volume Migration

Volume Migration requires a volume pair consisting of a P-VOL and an S-VOL, a reserved LU, and Storage Navigator. Command Control Interface (CCI) can also be used for some of the operation. The typical configuration of Volume Migration is shown in Figure 2.1.

Note:
P-VOL (Primary Volume) is the migration source of the data.
S-VOL (Secondary Volume) is the migration destination of the data.

The Volume Migration system components include:

- Volume Migration volume pairs (P-VOLs and S-VOLs) (see section 2.1.1)
- Reserved LU (see section 2.1.2)
- Storage Navigator (see section 2.1.3)
- CCI on the UNIX® and/or PC-server host. Refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.



DM-LU: Differential Management LU

Figure 2.1 Volume Migration Components

2.1.1 Volume Migration Pairs (P-VOLs and S-VOLs)

The disk subsystem controls the P-VOL, which is the migration source of the data, and the S-VOL, which is the migration destination of the data in a pair. The P-VOL and S-VOL together are called a migration pair or simply a pair. A host can read and write to the P-VOL, but not to the S-VOL.

2.1.2 Reserved LU

Volume Migration registers the migration destination as a reserved LU before execution in order to prevent hosts from reading and writing to the destination volume. When executing the migration using Storage Navigator, the LU that is selectable as an S-VOL is the reserved LU only. The reserved LU is the migration destination of the data when the migration is executed. The data copied to the destination is guaranteed. However, the data that remains in the reserved LU and is overwritten when the user executes the migration is not guaranteed.

2.1.3 Storage Navigator

You can configure the Volume Migration settings using Storage Navigator software that is installed on a server connected to the disk subsystem via a LAN.

Storage Navigator allows you to set or release the reserve LU, execute the migration, and display the pair status of the migration done by Volume Migration.

2.2 Volume Migration Operations

This section describes the operations of Volume Migration. Volume Migration operations can be performed from the UNIX®/PC server host using Storage Navigator or CCI software. However, Storage Navigator is more convenient because CCI requires additional preparations. When a LU that you are going to operate is the NAS system LU or NAS user LU, use Storage Navigator. For further information on using the CCI, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

2.2.1 Executing Volume Migration

Volume Migration manages a P-VOL and an S-VOL as a migration pair. When executing the migration using Storage Navigator, only the reserved LU can be specified as an S-VOL (see section 4.3). When executing the migration using CCI, map the S-VOL to the port to which no hosts are connected, or the host group to which no hosts are registered by using LUN Manager (see section 6.1).

2.2.2 Releasing Volume Migration Pairs

The relationship between the migration pair is maintained after the migration is completed or fails so that the P-VOL and the S-VOL cannot be specified as targets for any of the following migration operations. Upon checking the status of the migration operation, you can make the P-VOL and the S-VOL available for future migration targets by splitting (releasing) the pair. Only a pair in the status of **Completed** or **Error** accepts an operation to release the pair.

When releasing volume migration pairs using Storage Navigator, see section 4.6. When releasing volume migration pairs using CCI, see section 6.3.

2.2.3 Canceling Volume Migration

When you stop migrating data from the P-VOL to the S-VOL and release the migration pairs, the LU status returns to what it was before the migration. Only a pair in **Copy** or **Waiting** status accepts an operation to cancel the migration.

Note: The migration cannot be temporarily stopped or resumed once it is executed. When the migration is canceled and then executed again, Volume Migration copies of all the data again.

When canceling volume migration using Storage Navigator, see section 4.7. When canceling volume migration using CCI, see section 6.4.

2.3 Operations Procedure

Figure 2.2 shows the transfer of an LU with Volume Migration using Storage Navigator.

Note: Refer to Chapter 3 before starting the system operation, and prepare the necessary items.

To migrate the LU0 created in the RAID group 0 to the RAID group 1:

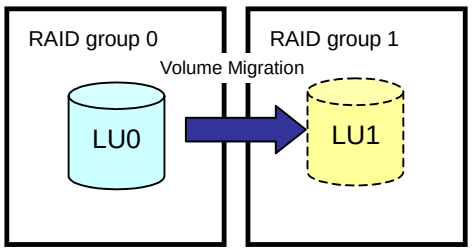


Figure 2.2 Volume Migration using Storage Navigator

1. Create a LU in the AID group 1 and format the LU.

   Note: The size of the LU to be created must be same size as the LU to be migrated. Although any number can be used for the LU, suppose that it is LU1 for this example. When the LU is already formatted, it is not necessary to format it again.

2. Set the LU1 as a reserved LU (refer to section 4.1).

3. Execute the migration. Specify the LU0 and the LU1 as the P-VOL and the S-VOL, respectively (refer to section 4.3).

   Note: The migration cannot be executed when the reserved LU is being formatted. Execute the migration after formatting the reserved LU.

4. Confirm the status of the migration pair. When the copy operation is in progress, the pair status is displayed as **Copy** and the progress rate can be viewed (refer to section 4.5).

5. Release the migration pair when the status of the migration pair becomes **Completed**. The relation between the P-VOL/S-VOL of LU0/LU1 is released and the two LUs are returned to their status before the migration.

   Note: If a failure occurs during the migration, the pair status displays as **Error**. After recovering the failure, delete the migration pair and execute the migration again.

   When the migration completes, the LU0 has migrated to RAID group 1 in which the LU1 was created and LU1 has migrated to RAID group 0 where the LU0 was located before the migration was executed. If the migration fails, the LU0 is not migrated from the original RAID group 0.

6. The LU1 that migrated to the RAID group 0 can be specified as an S-VOL when the next migration is executed. If the next migration is not scheduled, delete the LU1 from the reserved LU so it can be used for the usual system operation as a formatted LU (refer to section 4.2).

Note: The host configuration may be unable to operate correctly if it recognizes two LUs with the same data simultaneously. Format the volume that was the original source using Storage Navigator before making the LU recognized by a host. For more details refer to the section 3.2.1.

2.4 Pair Status

Volume Migration can check the status of the migration pair using Storage Navigator. The relation between the pair status transitions and Volume Migration operations is shown in Figure 2.3.

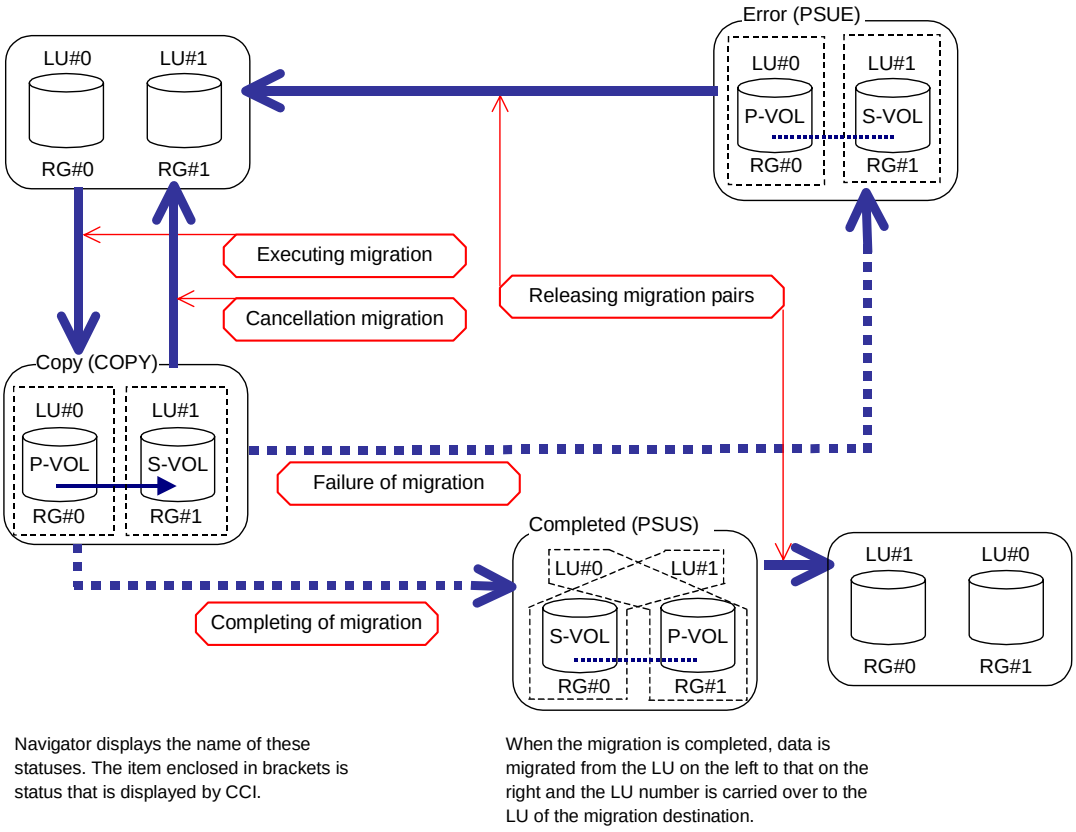


Figure 2.3 Volume Migration Pair Status Transitions

2.5 Interoperability with other Products

2.5.1 LUN Expansion

In Volume Migration, a unified LU can be used as a P-VOL or an S-VOL. Preconditions and restrictions of concurrent use with Volume Migration and LUN Expansion are as follows:

- P-VOL and S-VOL Capacities

  The P-VOL and S-VOL can be migrated as long as their capacities are the same even if the number of LUs composing them (unified LUs) are different (see Figure 2.4).

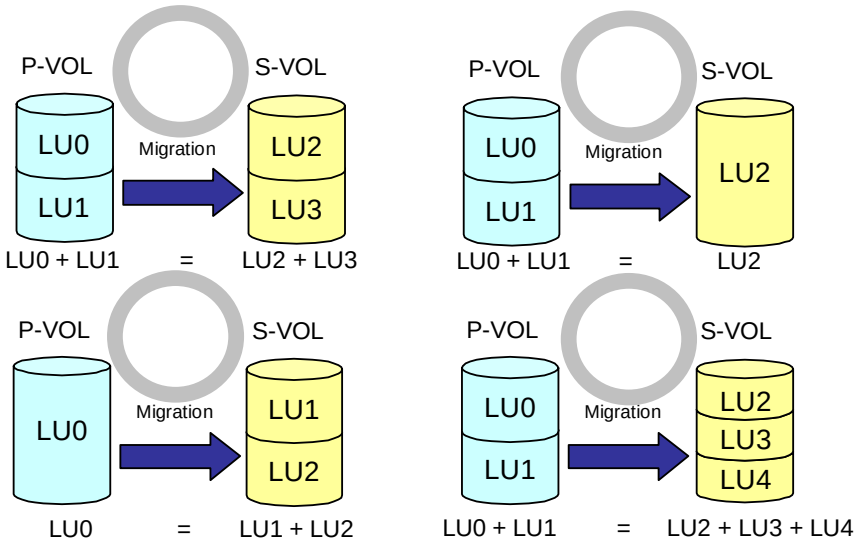


Figure 2.4 Unified LUs can be Assigned to the P-VOL or S-VOL (Capacities)

- Unified LU of P-VOL and S-VOL

  There is no limitation to the number of LUs that can be unified as components of a P-VOL or an S-VOL. The migration can be executed for a unified LU consisting of the maximum number (128) of LUs (see Figure 2.5).

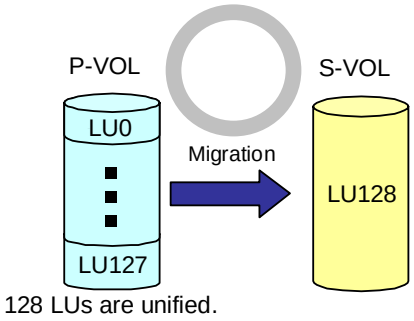


Figure 2.5 Unified LUs can be Assigned to the P-VOL or S-VOL (Unified LUs)

- P-VOL and S-VOL RAID Levels

  All of the LUs, including the unified LU(s), assigned to the P-VOL and S-VOL do not have to be on the same RAID level and have the same number of data disks (see Figure 2.6 and Figure 2.7).

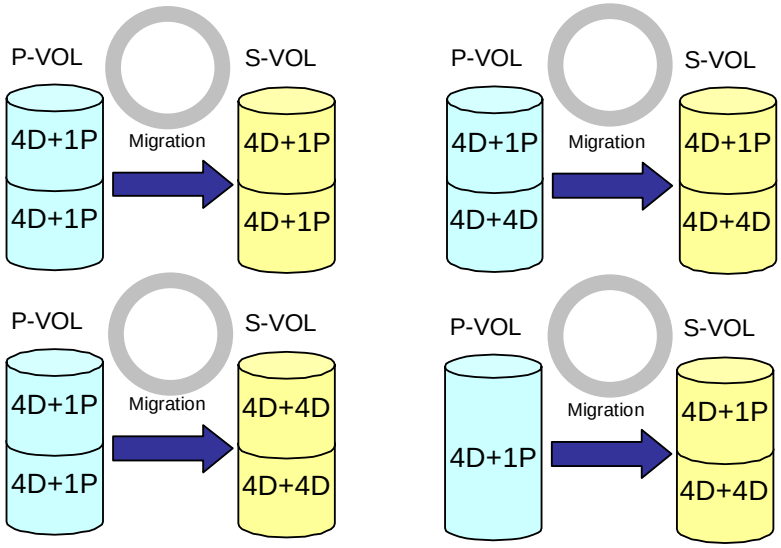


Figure 2.6 RAID Level Combinations

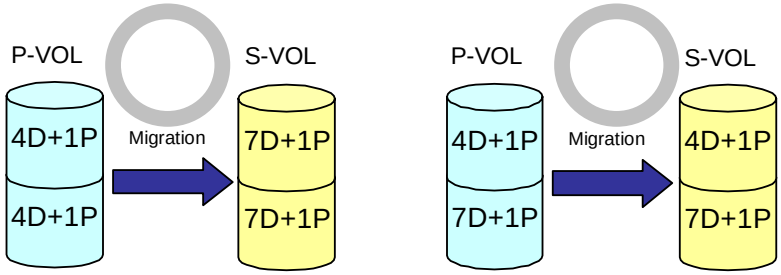


Figure 2.7 Data Disk Number Combinations

- Execution of the migration to the same RAID group

  When the main LUs of the P-VOL and the S-VOL belong to the same RAID group, the migration cannot be executed. However, the migration can be executed if the Sub LUs unified with the P-VOL and the S-VOL belongs to the same RAID group.

  Note: It is not recommended to execute the migration within the same RAID group because it may cause performance deterioration.

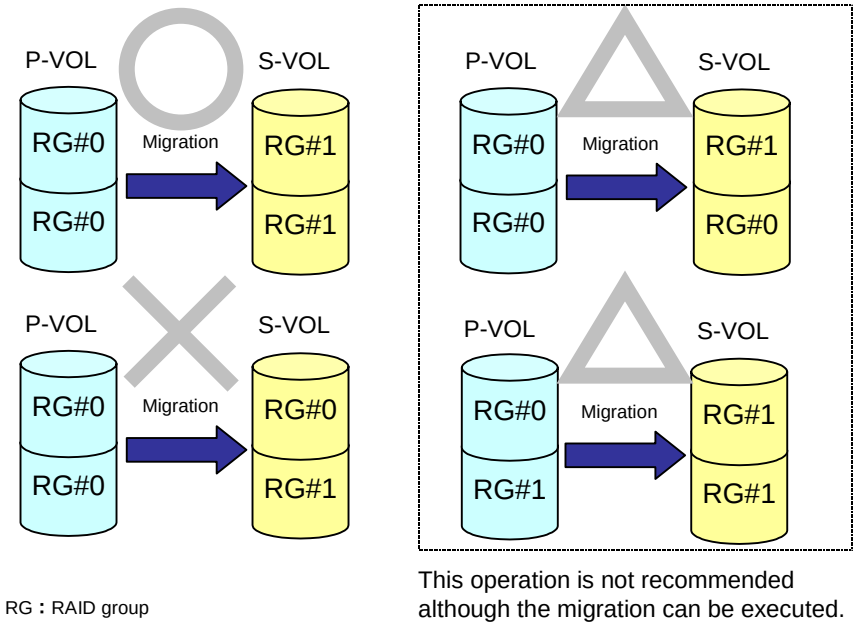


Figure 2.8 Combination of RAID Groups to which the Unified LUs belong

Note: In Figure 2.8, the main LU is the top LU.

2.5.2 Data Retention Utility

The LU that executes the migration carries over the access attribute and the retention term set by the Data Retention Utility to the LU of the migration destination. When the access attribute is other than Read/Write, the LU cannot be specified as an S-VOL of Volume Migration.

- To execute the migration of a LU with Read Only attribute

  When LU0 with the Read Only attribute migrates to LU1 in the RAID group 1, the Read Only attribute is carried over to the LU of the migration destination (see Figure 2.9). Therefore, LU0 is in Read Only status irrespective of the migration execution. The Read Only attribute is not copied to LU1. When the migration pair is released and the LU1 is deleted from the reserved LU, a host can Read/Write to LU1.

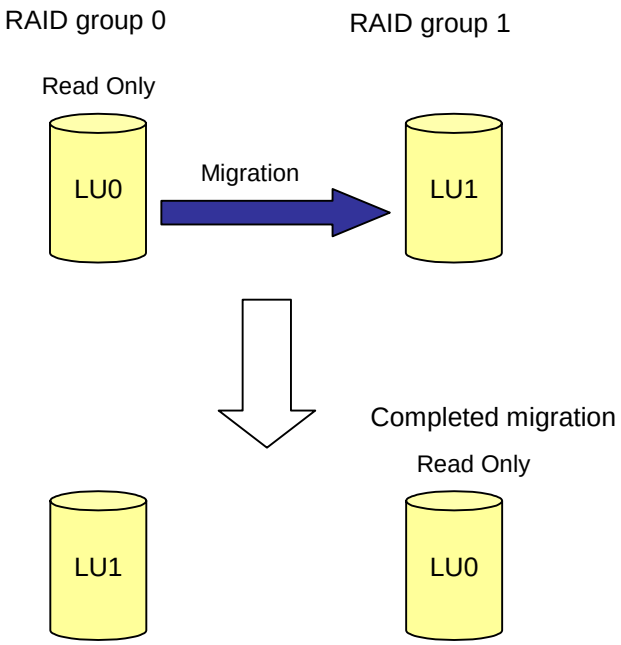


Figure 2.9 Volume Migration of the Read Only Attribute

2.5.3 ShadowImage

When Volume Migration is used together with ShadowImage, the maximum number of pairs and the copying operations are limited.

- Maximum number of pairs

  AMS200/WMS100 = 255 pairs max

  AMS500 = 1,023 pairs max

  AMS1000 = 2,047 pairs max

  Note: The number of migration pairs that can be executed are calculated by subtracting the number of ShadowImage pairs from the maximum number of pairs (see Figure 2.10).

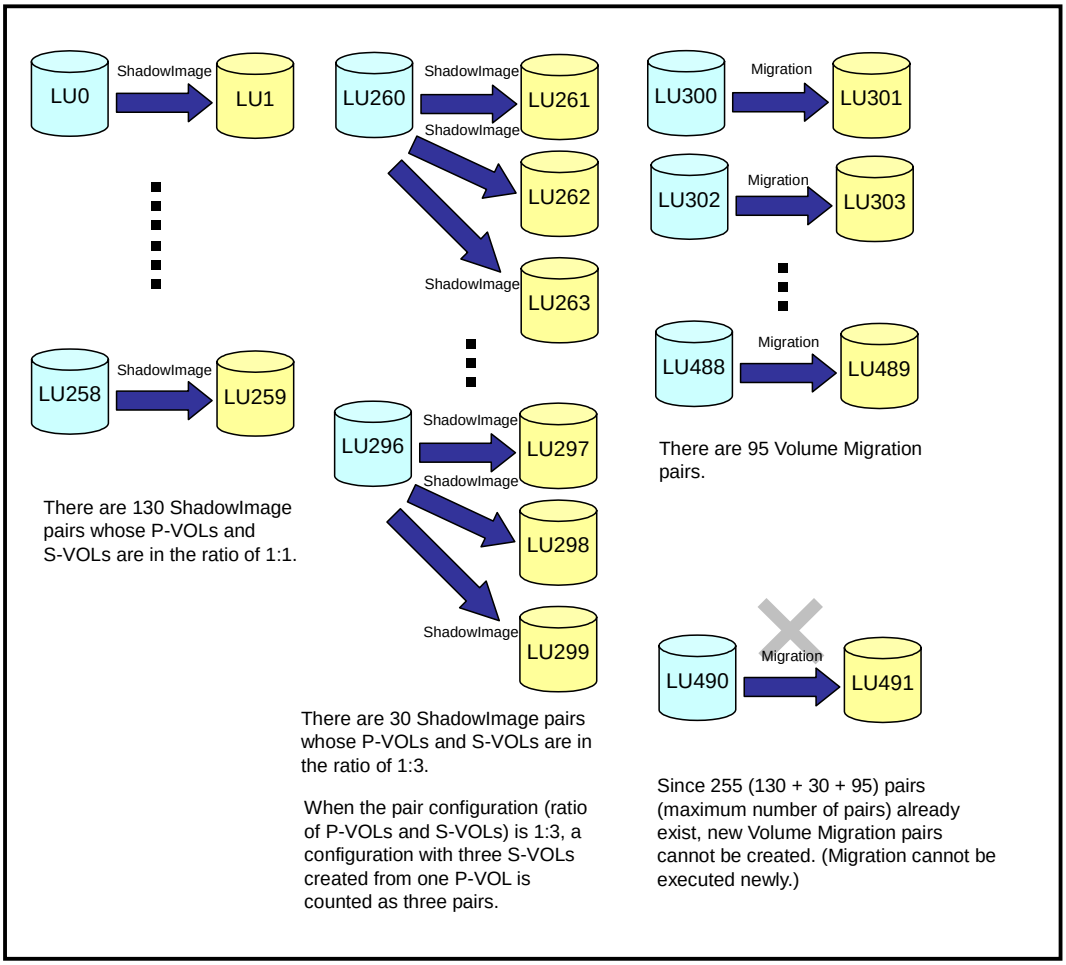


Figure 2.10 Number of Pairs of Volume Migration is Limited

- The number of copying operations that can be performed in the background

  The number of copying operations that can be performed simultaneously in the background is called the copying multiplicity. The disk subsystem limits the copying multiplicity of both the Volume Migration pairs and ShadowImage pairs to four per controller (see Figure 2.11 and Figure 2.12).

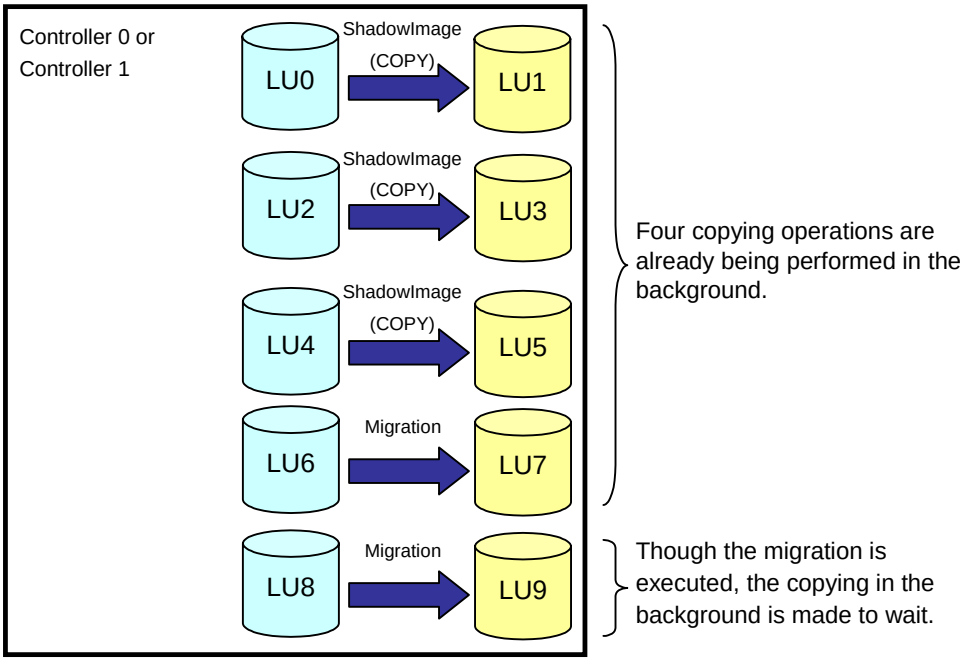


Figure 2.11 Copying Operation of Volume Migration is made to Wait

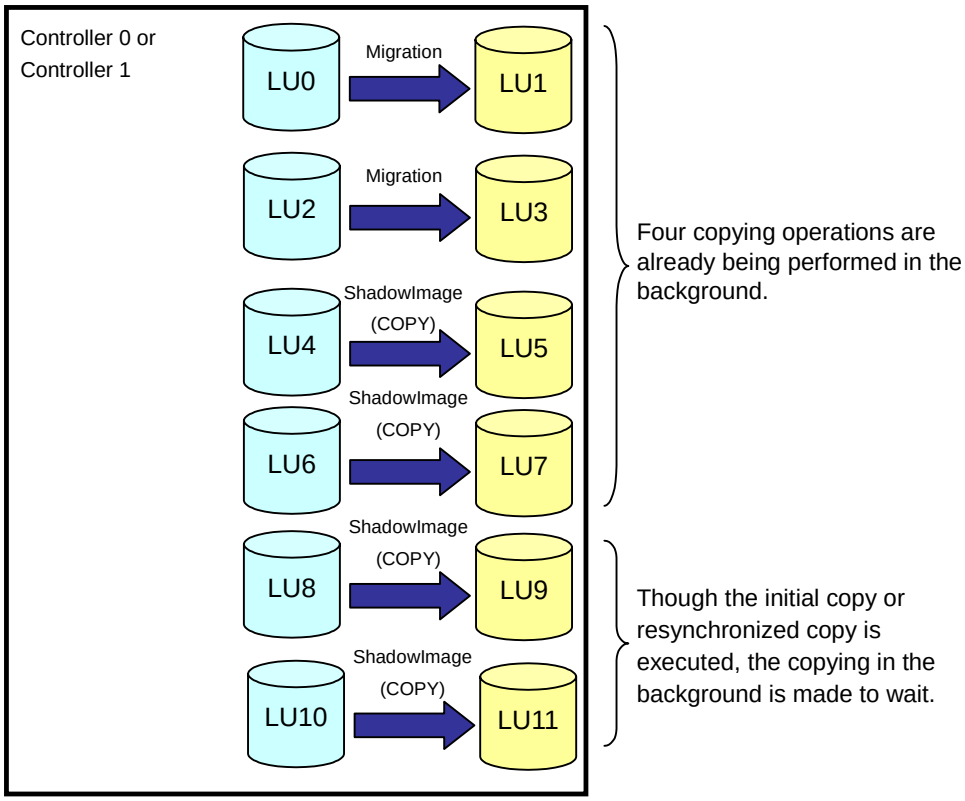


Figure 2.12 Copying Operation of ShadowImage is made to Wait

Chapter 3 Preparing for Volume Migration Operations

The following preparation is required for Volume Migration operations:

- Volume Migration Requirements and Restrictions, see section 3.1
- Cautions, see section 3.2
- Preparing for Volume Migration Operations (GUI), see section 3.3
- Preparing for Volume Migration Operations (CLI), see section 3.4
- Preparing for Volume Migration Operations (CCI), see section 3.5

3.1 Volume Migration Requirements and Restrictions

Volume Migration operations provide subsystem-internal copies of UNIX®/PC server volumes (LUs) on the subsystem. Table 3.1 lists and describes the operational requirements for Volume Migration. Table 3.2 lists the Volume Migration restrictions. The guard conditions of a reserved LU are shown in Table 3.3.

Table 3.1 Volume Migration Requirements

Parameters	Requirements
User interface	▪ Storage Navigator version 6.0 or more is required. Storage Navigator issues instructions such as execution and cancellation of the migration. It is also used for specifying or releasing command devices and for adding or deleting reserved LUs. ▪ CCI can also be used for some of the operation. ▪ CCI issues instructions such as execution and cancellation of the migration.
Number of controllers	2
Max number of command devices	2 The command device is required only when CCI is used for the operation of Volume Migration. The command device LU size must be greater than or equal to 33 MB.
Max number of Differential Management LU	2 The Differential Management LU size must be greater than or equal to 5 GB. It is recommended that two Differential Management LUs are set according to the following conditions. ▪ Created in different RAID group ▪ Allocated in different controllers
Unit of Pair Management	LU
Max number of pairs	AMS200/WMS100: 255 AMS500: 1,023 AMS1000: 2,047 Volume Migration and ShadowImage share the number of pairs. For details, see section 2.5.3.
Number of pairs whose data can be copied in the background simultaneously	Max 2 for Volume Migration Max 4 for ShadowImage and Volume Migration *Note:* Volume Migration and ShadowImage share copy jobs. For details, see section 2.5.3.
Max number of reserved LU	AMS200/WMS100: 255 AMS500: 1,023 AMS1000: 2,047
Pair Structure	One copy (S-VOL) per P-VOL
Supported RAID level	Unlimited
Combination of RAID levels	Unlimited
Size of LU	The P-VOL size must equal the S-VOL LU size.

Parameters	Requirements
Types of the drive for P-VOL/S-VOL	Unlimited
Allocation of P-VOL and S-VOL	The P-VOL and S-VOL can only be allocated in the same controller differential RAID group.
Host interface	Fibre, iSCSI, or NAS
Canceling and resuming of migration	The migration cannot be temporarily stopped or resumed once it has been executed. When the migration is canceled and then executed again, Volume Migration copies of all the data again.
Handling of reserved LU	LU deletion cannot be performed. RAID group deletion cannot be performed inclusive of defined reserved LU.
Handling of LU for which the migration is being executed	Neither LU formatting nor LU deletion can be performed. Also, the RAID group in which the LU under execution of the migration is defined cannot be deleted. Delete the pair after waiting for the completion of the migration or execute the operation of LU formatting, LU deletion, or RAID group deletion after stopping the migration.
Restriction of the formatting	A LU being formatted cannot be specified as a P-VOL or an S-VOL of Volume Migration. Execute the migration after the formatting is completed.
Restriction of the LU for the special use	Data POOL LU, DM-LU, and Command Device cannot be specified as a P-VOL or an S-VOL of Volume Migration
Concurrent use of LUN Expansion	Available. The unified LUs by LUN Expansion execute the migration in units of LU after the unification. For details, see section2.5.1.
Concurrent use of Data Retention Utility	The LU specified for Data Retention Utility can be set to P-VOL, and data is not deleted by Volume Migration. When the access attribute is other than Read/Write, the LU cannot be specified as an S-VOL. The LU which executed the migration carries over the access attribute and the retention term set by the Data Retention Utility to the LU of the migration destination. For details, see section 2.5.2.
Concurrent use of SNMP Agent	Available.
Concurrent use of Password Protection	Available.
Concurrent use of LUN Manager	Available. When the migration is performed using CCI, it is recommended that S-VOL be set in a separate Host Group from the other LUs that are accessed by the Host using the LUN Manager function.
Concurrent use of Cache Residency Manager	The LU specified for Cache Residency (LU cache residence) cannot be set to the P-VOL or S-VOL.
Failures	When the copying from the P-VOL to the S-VOL becomes unable to be continued, the migration fails and the pair status becomes Error. If the migration fails when a LU blockade occurs, the status may become Error when started from Storage Navigator or PSUE when started from CCI. Execute “releasing volume migration pairs” or “pairsplit –S” to release the pair and then redo the migration. If the status does not become Error or PSUE, the migration will continue.
Reduction of the memory	The memory cannot be reduced when the Volume Migration, TrueCopy, TCE, or SnapShot function is validated. Make the reduction after invalidating the function.

Table 3.2 Volume Migration Restrictions

Parameters	Restriction
Concurrent use of TrueCopy	Available. A P-VOL and an S-VOL of TrueCopy cannot be specified as a P-VOL or an S-VOL of Volume Migration unless their pair status is SMPL.
Concurrent use of TCE	Available. A P-VOL and an S-VOL of TCE cannot be specified as a P-VOL or an S-VOL of Volume Migration unless their pair status is SMPL.
Concurrent use of ShadowImage	Available. A P-VOL and an S-VOL of ShadowImage cannot be specified as a P-VOL or an S-VOL of Volume Migration unless their pair status is SMPL.
Concurrent use of SnapShot	Available. A P-VOL of SnapShot cannot be specified as a P-VOL or an S-VOL of Volume Migration when the Snapshot image (V-VOL) is defined. The V-VOL of SnapShot cannot be specified as a P-VOL or an S-VOL of Volume Migration.
Concurrent use of Cache Partition Manager	Available. A LU belonging to a partition and stripe size cannot carry over. When the migration is completed, a LU belonging to a partition and stripe size is changed to a destination partition and stripe size. Besides, a LU for which a change to the partition whose owner controller is different is reserved or a LU belonging to a partition for which a change of the owner controller is reserved cannot be specified as a P-VOL or an S-VOL of Volume Migration.

Table 3.3 Guard Condition for Reserved LU

Parameters	Guard Condition
Concurrent use of TrueCopy	P-VOL or S-VOL of TrueCopy
Concurrent use of TCE	P-VOL or S-VOL of TCE
Concurrent use of ShadowImage	P-VOL or S-VOL of ShadowImage
Concurrent use of SnapShot	P-VOL or V-VOL of SnapShot
Concurrent use of Data Retention Utility	Data Retention LU
Restriction of the LU for the special use	Data POOL LU, DM-LU, command device
Restriction for NAS	NAS system LU, NAS user LU
Others	Unformatted LU. A LU being formatted can be set as a reserved LU even though the formatting is not completed.

3.2 Cautions

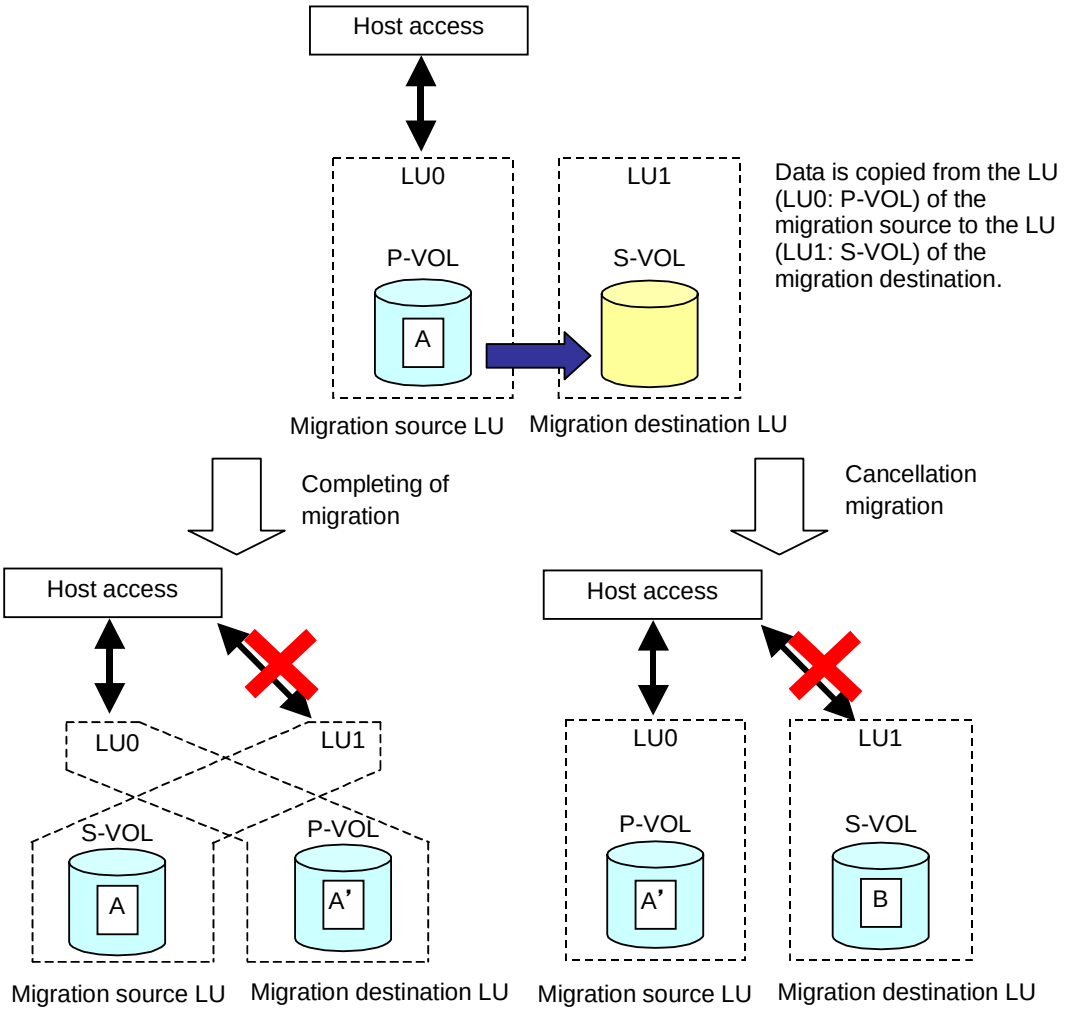
3.2.1 Cautions for Setting LUs to be Recognized by the Host

When the migration is executed, the user data is copied to a LU of the migration destination (S-VOL), and the user data of a LU of the migration source (P-VOL) is not erased. When the migration is completed, the LU of the migration destination becomes a P-VOL, and the LU of the migration source becomes an S-VOL. After the migration is complete and the S-VOL is made recognizable to a host, a malfunction of the system (host) might be caused because the user data in the LU of the migration source (S-VOL) has not been erased. When the migration is suspended halfway, the data that has been copied from the LU of the migration source (P-VOL) remains in the LU of the migration destination (S-VOL). The host configuration may be unable to operate correctly if it recognizes two LUs with the same data simultaneously. Format the volume that was the original source using Storage Navigator before making the LU recognized by a host.

Note:

- In both cases where the migration is completed or suspended halfway, the latest valid data is stored in a LU that is referred to as a P-VOL by Storage Navigator or CCI. The reserved LU is a LU that is the migration destination of the data when the migration is executed. The data copied to the destination is guaranteed, however, the data that remains in the reserved LU and is overwritten when the user executes the migration is not guaranteed.
- When performing the formatting, format the S-VOL. If the P-VOL is formatted in error, some user data may be lost.

  For the formatting procedure after the migration is completed, refer to sections 4.2, 5.2, 6.3, and 6.4.



At the time when the migration is completed, data of the LU (LU1: S-VOL) of the migration source remains being not deleted.

When the migration is canceled halfway, the data that has been copied from the LU0 (P-VOL) of the migration source remains in the LU1 (S-VOL) of the migration destination.

A: The data right before the migration is completed
A': The data that is updated by the host after completing or failure of migration
B: The data that is remained after the migration is cancelled

When the S-VOL is made recognized by the same host with the data retained, it is possible to cause a malfunction of the host. In this case, perform the formatting to the S-VOL using Navigator before making it recognized by the host.

- Volume migration using VxVM

  When the P-VOL and the S-VOL are recognized by the host simultaneously, the VxVM does not operate correctly. Do not make the host recognize the S-VOL by changing the mapping information or releasing the reserved LU because the host will recognize the P-VOL.

- Volume migration using MSCS
  - Do not make the P-VOL and the S-VOL recognized by the host simultaneously. Make the LU of the migration source recognized by the other host.
  - Do not place the MSCS Quorum Disk in RAID Manager (CCI).
  - Shutdown MSCS before executing the CCI `sync` command.
- Volume migration using AIX®

  Do not make the P-VOL and the S-VOL recognize the host simultaneously.

- Volume migration using Windows® 2000/Window Server™ 2003
  - When describing a command device in the configuration definition file, specify it as Volume {GUID}. (For detailed information, see the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*)
  - When a LU of the migration source is used with a drive letter assigned, the drive letter is taken over to a LU of the migration destination by executing the migration. However, when the P-VOL and the S-VOL are recognized simultaneously, the drive letter may be assigned to the S-VOL by restarting the host.
- Linux® and LVM Configuration

  Do not make the P-VOL and the S-VOL recognized by the host simultaneously.

- Windows® 2000/Windows Server™ 2003 and Dynamic Disk

  Do not make the P-VOL and the S-VOL recognized by the host simultaneously.

3.2.2 Cautions for the Performance

- Executing the migration affects the performance of host I/O to the P-VOL and other LUs. The recommended Copy Pace is **Normal**, but if the copying is executed in the **Normal** mode when the host I/O load is heavy, the host I/O performance may deteriorate remarkably. Select **Slow** to prevent performance deterioration. Only select **Prior** when you want to shorten the time to the completion of the copying more than the host I/O performance in the time period when the P-VOL is rarely accessed. Changing the Copy Pace can be executed during the data copy.
- The RAID structure of the P-VOL and the S-VOL affects the performance of the host I/O.
- Do not execute Volume Migration to LUs that are created in the same RAID group simultaneously.
- Do not execute Volume Migration in the case that LUs that the migration will be executed and LUs that is COPY status in ShadowImage initial copy or resynchronization are included in the same RAID group. Also do not execute ShadowImage initial copy or resynchronization in the case that LUs that the ShadowImage initial copy or resynchronization will be executed and LUs that the migration is being executed are included in the same RAID group.
- In the case that executing Volume Migration to heavy Write I/O load LUs, execute Volume Migrate when the Write I/O load is light or after decreasing.

3.3 Preparing for Volume Migrations (GUI)

3.3.1 Installing and Uninstalling Volume Migration

Because Volume Migration is an extra-cost option, Volume Migration usually cannot be selected (locked) when first using the disk subsystem. To make Volume Migration available, you must install the Volume Migration and make its function selectable (unlock).

Note: Before installing/uninstalling Volume Migration, verify that the disk subsystem is operating in a normal state. If a failure such as a controller blockage has occurred, installation and uninstallation cannot be performed. For details on the GUI version of Storage Navigator, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular (for GUI) User's Guide* (MK-95DF711).

3.3.1.1 Installing Volume Migration

To install Volume Migration, the key code or key file provided with the optional feature is required. The following describes the installation procedure.

To install Volume Migration:

1. Start Storage Navigator, and change the operation mode to **Management Mode** (administrator mode).
2. Register the disk subsystem in which the Volume Migration is to be installed, and connect to the disk subsystem.

   The Array System Viewer panel displays (see Figure 3.1), and the connected disk subsystem displays.
3. Select the **Logical Status** tab.
4. Select the **License Key** icon.

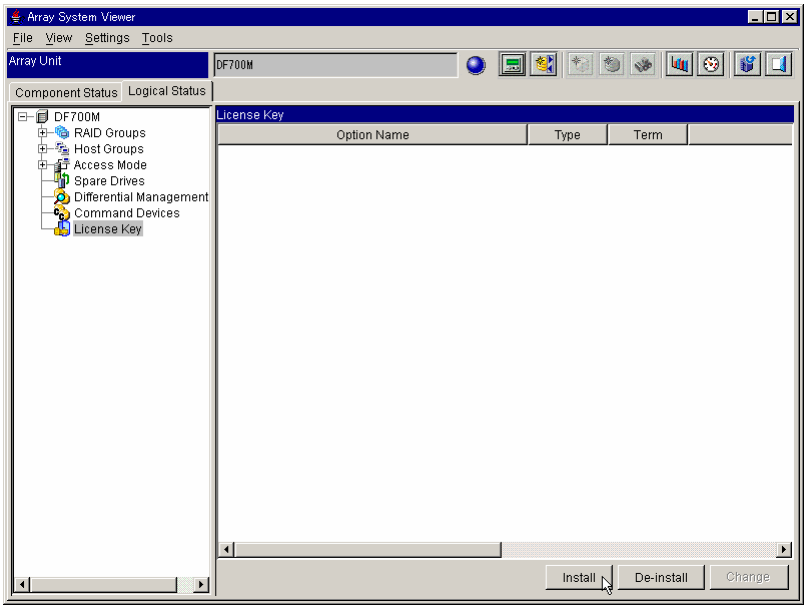


Figure 3.1 Array System Viewer Panel (Logical Status Page)

5. Select the **Install**.

   The **Install Options** dialog displays (see Figure 3.2).

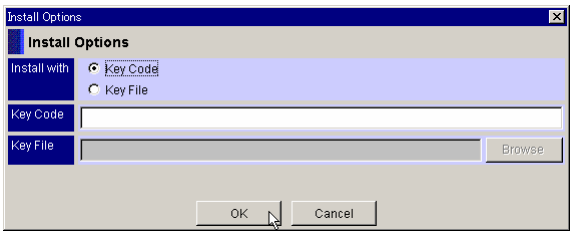


Figure 3.2 Install Options Dialog

6. When you install the option using the key code, click the **Key Code** radio button, and then set up the key code. When you install the options using the key file, click the **Key File** radio button or the **Browse** button, and then set up the path for the key file. Click **OK**.

7. When you install the options using the key file, the **Install Options** selection dialog displays (see Figure 3.3). Click **OK**.

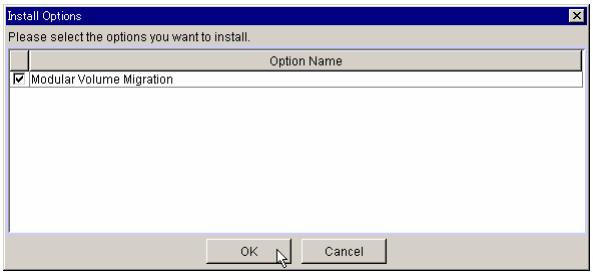


Figure 3.3 Options Selection Dialog

8. A message displays asking you to confirm that you want to install Volume Migration (see Figure 3.4. Click **OK**.

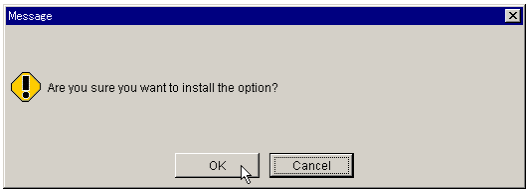
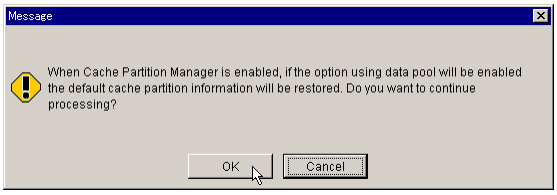


Figure 3.4 Volume Migration Installation Confirmation

9. When Cache Partition Manager is enabled, the following message displays.

   Since Volume Migration does not use the data pool, click **OK.**



10. When you install the options using the key file, the Result dialog displays (see Figure 3.5). Click **Close**.

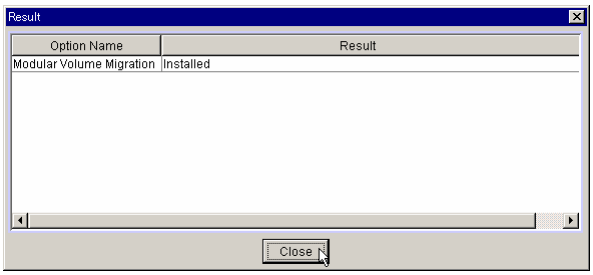


Figure 3.5 Result Dialog

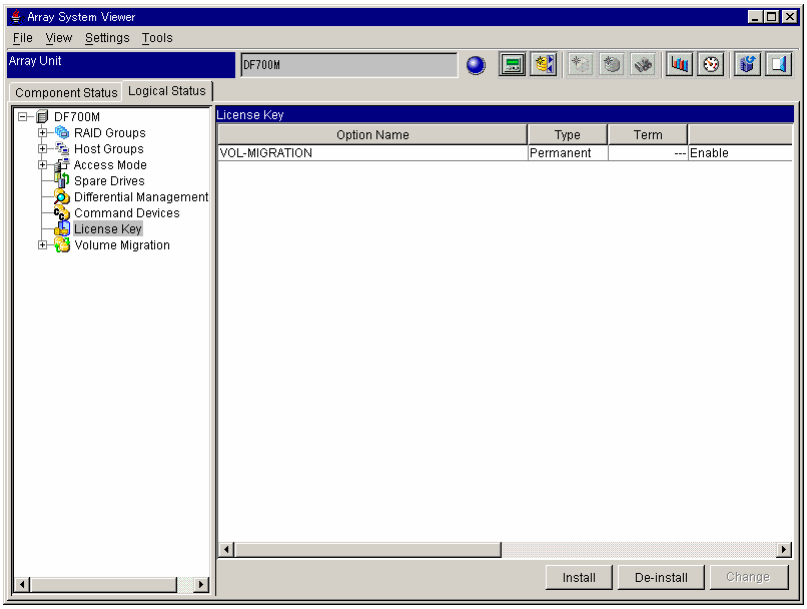


Figure 3.6 Array System Viewer Panel (Logical Status Page Option: Enable)

The Volume Migration installation is now complete (see Figure 3.6).

3.3.1.2 Uninstalling Volume Migration

To uninstall Volume Migration, the key code provided with the optional feature is required. Once uninstalled, Volume Migration cannot be used (locked) until it is reinstalled using the key code or key file.

Note: The following conditions must be satisfied in order to uninstall Volume Migration.

- All the Volume Migration pairs must have been released (including the pair whose statuses are **Completed** or **Error**).
- There should be no LUs registered as reserved LUs.

To uninstall Volume Migration:

1. Start Navigator, and change the operation mode to **Management Mode** (administrator mode).
2. Register the disk subsystem in which the Volume Migration is to be uninstalled, and then connect to the disk subsystem.

   The Array System Viewer panel opens displaying the connected disk subsystem.
3. Select the **Logical Status** tab.
4. Select the **License Key** icon (see Figure 3.6).
5. Select **De-install**.

   The **De-install Options** dialog displays (see Figure 3.7).

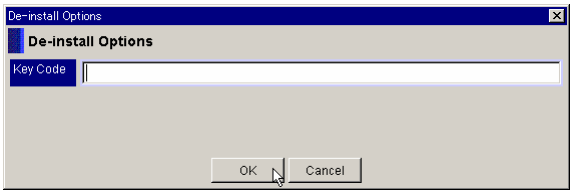


Figure 3.7 De-install Options Dialog

6. Enter a **key code** in the text box and click **OK**.
7. A message displays asking you to confirm that you want to uninstall Volume Migration.

   Select **OK**.

The Volume Migration is now uninstalled.

3.3.1.3 Enabling or Disabling Volume Migration

Once Volume Migration is installed, it can be enabled or disabled.

Note: The following conditions must be satisfied in order to disable Volume Migration.

- All the Volume Migration pairs must have been released (including the pair whose statuses are **Completed** or **Error**).
- There should be no LUs registered as reserved LUs.

The following describes the enabling/disabling procedure.

1. Start Storage Navigator, and change the operation mode to **Management Mode** (administrator mode).
2. Register the disk subsystem from which the status of Volume Migration is to be changed and connect to the disk subsystem.

   The Array System Viewer panel opens displaying the connected disk subsystem.
3. Select the **Logical Status** tab.
4. Select the **License Key** icon (see Figure 3.6).
5. From **Option Name**, select **VOL-MIGRATION**, and then select **Change**.
6. A message displays asking you to confirm that you want to change the status (enable or disable).

   Select **OK**.

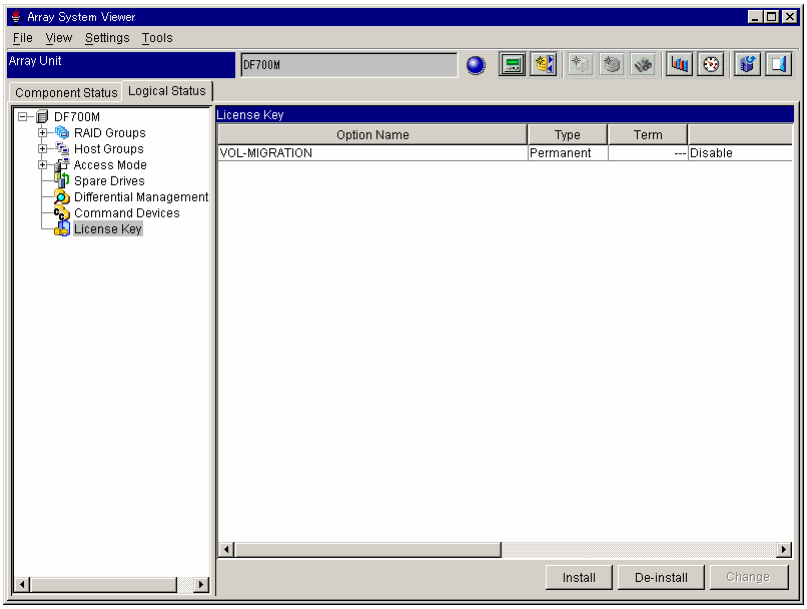


Figure 3.8 Array System Viewer Panel (Logical Status Page Option: Disable)

Enabling or disabling Volume Migration is now complete (see Figure 3.8).

3.3.2 Setting the Differential Management LU

The Differential Management LU is an exclusive logical unit for storing the differential data while the volume is being copied. The Differential Management LU in the disk subsystem is treated in the same way as the other logical units. However, a logical unit that is set as the Differential Management LU is not recognized by a host (it is hidden).

When the Differential Management LU is not set, it must be created. Set a logical unit with a size of 5 GB minimum as the Differential Management LU. It is recommended that two Differential Management LUs be set. The second one is used for the mirroring.

To designate Differential Management LUs:

1. On the Array System Viewer panel, select the **Logical Status** tab (see Figure 3.9).
2. Select the **Differential Management LU** icon.

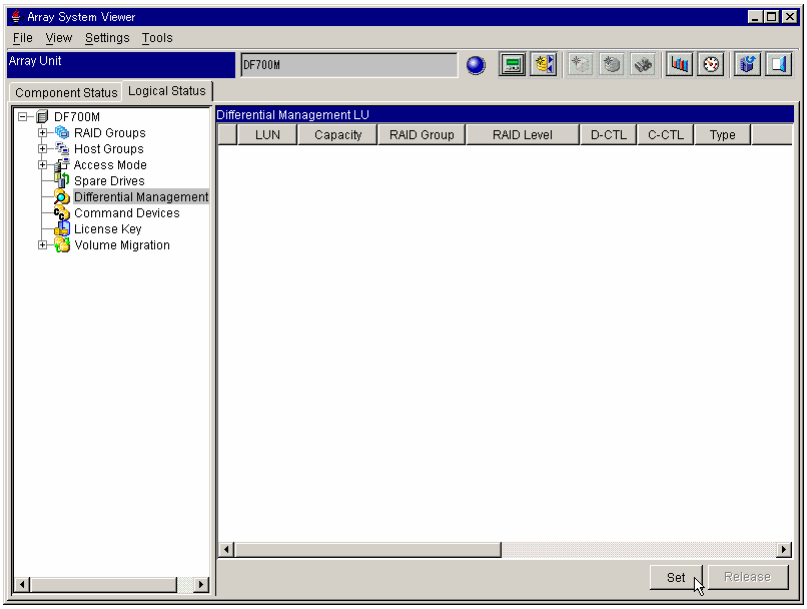


Figure 3.9 Array System Viewer Panel (Differential Management LU Page: Before Setting)

3. Select **Set**.

   The **Select Logical Unit** dialog displays (see Figure 3.10).

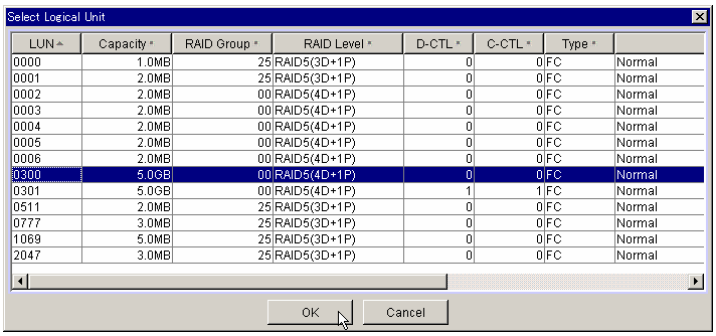


Figure 3.10 Select Logical Unit Dialog

4. Select the **LUN** you want to set as the differential management LU.

   Click **OK**.

5. A message displays. Click **OK**.

   The setting information displays (see Figure 3.11).

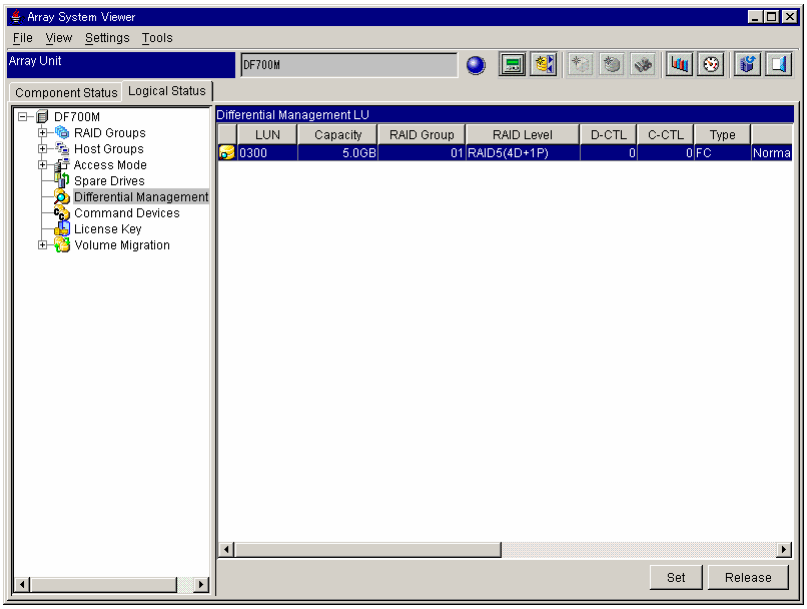


Figure 3.11 Array System Viewer Panel (Differential Management LU Page: After Setting)

Designating the differential management LU is now complete. Leave the Array System Viewer panel open, and go to section 3.5.2.

The following restrictions apply when Volume Migration, ShadowImage, SnapShot, TrueCopy, or TCE pairs exist, the TrueCopy or TCE path is defined, or SnapShot or TCE data pool is defined.

- When two differential management LUs are set, only one differential management LU can be released.
- When only one differential management LU is set, the differential management LU cannot be released.

3.4 Preparing for Volume Migration Operations (CLI)

3.4.1 Installing

The Volume Migration feature is usually unselectable (locked). To make it available, you must install the Volume Migration feature and make its functions selectable (unlocked). **To install this function, the key code or key file provided with the optional feature is required.**

Note: Before installing and uninstalling, make sure that the subsystem is in normal operating condition. If a failure such as a controller blockade has occurred, installation and uninstallation operations cannot be performed.

The following procedure describes how to install Volume Migration using the Storage Navigator CLI:

1. From the command prompt, register the subsystem in which you will install the Volume Migration feature. Connect to the subsystem.
2. Install the optional features by using the following:

   Example: The text in gray displays when the Cache Partition Manager is enabled.

```
% auopt -unit subsystem-name -lock off -keycode manual-attached-keycode
Password: manager-password
Are you sure you want to install the option? (y/n [n]): y
When Cache Partition Manager is enabled, if the option using data pool will be e
nabled the default cache partition information will be restored.
Do you want to continue processing? (y/n [n]): y
The option is installed successfully.
%
```

   Example:

```
% auopt -unit subsystem-name -refer
Password: manager-password
Option Name                    Type      Term     Status
VOL-MIGRATION                  Permanent ---      Enable
%
```

3.4.2 Uninstalling

To uninstall Volume Migration, the key code provided with the optional feature is required. Once uninstalled, Volume Migration cannot be used (locked) until it is again installed using the key code or key file.

Note: The following conditions must be satisfied in order to uninstall Volume Migration.

- All the Volume Migration pairs must have been released (including the pair whose statuses are **Completed** or **Error**).
- There should be no LUs registered as reserved LUs.

The following procedure describes how to uninstall Volume Migration, using the Storage Navigator CLI:

1. From the command prompt, register the subsystem in which you will uninstall the Volume Migration feature. Connect to the subsystem.
2. Uninstall the optional features by using the following:

   Example:

```
% auopt -unit subsystem-name -lock on -keycode manual-attached-keycode
Password: manager-password
Are you sure you want to de-install the option? (y/n [n]): y
The option is de-installed successfully.
%
```

   Example:

```
% auopt -unit subsystem-name -refer
Password: manager-password
DMEC002015: No information displayed.
%
```

3.4.3 Enabling/Disabling

Volume Migration can be enabled or disabled without uninstalling this function. The following procedure describes how to enable or disable Volume Migration without uninstalling this function using the CLI version of Storage Navigator.

Note: The following conditions must be satisfied in order to disable Volume Migration.

- All of the Volume Migration pairs must have been released (including the pair whose statuses are **Completed** or **Error**).
- There should be no LUs registered as reserved LUs.

1. From the command prompt, register the subsystem in which you will change the status of the Volume Migration feature. Connect to the subsystem.
2. Execute the `auopt` command to change the status (enable or disable) of the Volume Migration feature.

   The following example shows how to change the status from enable to disable. To change the status from disable to enable, enter `enable` after the `-st` option.

Example:

```
% auopt -unit subsystem-name -option VOL-MIGRATION -st disable
Password: manager-password
Are you sure you want to disable the option? (y/n [n]): y
The option has been set successfully.
%
```

3. Execute the `auopt` command to verify that the Volume Migration feature status has changed.

   Example:

```
% auopt -unit subsystem-name -refer
Password: manager-password
Option Name                    Type      Term     Status
VOL-MIGRATION                  Permanent ---      Disable
%
```

3.4.4 Setting the Command Device

Note: The command device needs to be set when the operation is performed using CCI.

The command device is a user-selected, dedicated logical volume on the disk subsystem, which functions as the interface to the CCI software. The Volume Migration commands are issued by the CCI (HORCM) to the disk subsystem through the command device.

A command device must be designated in order to issue Volume Migration commands. The command device must be defined in the HORCM_CMD section of the configuration definition file for the CCI instance on the attached host. Two command devices can be designated for the disk subsystem. You can designate command devices using Storage Navigator.

Note:

- LUs set for command devices must be recognized by the host.
- The Command Device LU size must be greater than or equal to 33 MB.
- The following restrictions apply when either pair of Volume Migration, SnapShot, or TrueCopy, or TCE exists or the path of TrueCopy or TCE is defined.
  - When two command devices are set, only one command device can be released.
  - When only one command device is set, the command device cannot be released.

To designate command device(s):

1. From the command prompt, register the subsystem to which you want to create the command device. Connect to the subsystem.
2. Execute the `aucmddev` command to create a command device.

   This command first displays LUs that can be assigned as command device LUs, and later creates a command device. The following example shows how to specify LU 2 for command device 1. When you want to use the protection function of CCI, enter “enable” following the**-dev** option.

Example:

```
% aucmddev –unit subsystem-name –availablelist
Password: manager-password
Available Logical Units
  LUN  Capacity    RAID Group RAID Level  D-CTL C-CTL Type Status
    2   35.0 Mbyte          0  5( 4D+1P)      0     0 FC   Normal
    3   35.0 Mbyte          0  5( 4D+1P)      1     1 FC   Normal
%
% aucmddev –unit subsystem-name –set –dev 1 2
Password: manager-password
Are you sure you want to set the command devices? (y/n [n]): y
The command devices have been set successfully.
%
```

3. Execute the `aucmddev` command to verify that the command device has been created.

   Example:

```
% aucmddev –unit subsystem-name –refer
Password: manager-password
Command Device    LUN  RAID Manager Protect
1                   2  Disable
%
```

   Note: Two command devices should be designated to set the alternate command device function or to avoid data loss and subsystem downtime. When two command devices are set within one disk subsystem, they should be assigned to separate RAID groups to avoid both command devices from becoming unavailable because of a drive failure. For details on alternate command device functions, see *Hitachi TagmaStore™ Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide* (MK-95DF701).

4. Release an already set command device.

   The following example shows how to release command device 1.

   Example:

```
% aucmddev –unit subsystem-name –rm –dev 1
Password: manager-password
Are you sure you want to release the command devices? (y/n [n]): y
The command devices have been released successfully.
%
```

5. Change the LU number.

   The following example shows how to specify LU 3 for command device 1.

   Example:

```
% aucmddev –unit subsystem-name –set –dev 1 3
Password: manager-password
Are you sure you want to set the command devices? (y/n [n]): y
The command devices have been set successfully.
%
```

3.4.5 Setting the Differential Management LU

The Differential Management LU is an exclusive logical unit for storing the differential data during migration and is treated in the same way as the other logical units. The Differential Management LU must be created if it has not been set. However, a logical unit that is set as the Differential Management LU is not recognized by a host (it is hidden).

Set a logical unit with a size of 5 GB minimum as the Differential Management LU. It is recommended that two differential Management LUs are set with the second one used for mirroring.

To designate Differential Management LUs:

1. From the command prompt, register the subsystem on which you want to create the differential management LU and connect to that subsystem.
2. Execute the `audmlu` command to create a differential management LU.

   This command first displays LUs that can be assigned as Differential Management LUs and later creates a Differential Management LU.

   Example:

```
% audmlu  -unit subsystem-name -availablelist
Password: manager-password
Available Logical Units
  LUN Capacity     RAID Group  RAID Level  D-CTL  C-CTL Type Status
    0  5.0 GByte            0   5( 4D+1P)      0      0 FC   Normal
%
% audmlu  -unit subsystem-name -set -lu 0
Password: manager-password
Are you sure you want to set the DM-LU? (y/n [n]): y
The DM-LU has been set successfully.
%
```

3. To release an already set differential management LU, specify the –rm and –lu options in the `audmlu` command.

   Example:

```
% audmlu  -unit subsystem-name -rm -lu 0
Password: manager-password
Are you sure you want to release the DM-LU? (y/n [n]): y
The DM-LU has been released successfully.
%
```

The following restrictions apply when Volume Migration, ShadowImage, SnapShot, TrueCopy, or TCE pairs exist, the TrueCopy or TCE path is defined, or SnapShot or TCE data pool is defined.

- When two differential management LUs are set, only one differential management LU can be released.
- When only one differential management LU is set, the differential management LU cannot be released.

3.4.6 Setting the Target ID (LU Mapping)

Note 1: The target ID must be set when the operation is performed using CCI.

Note 2: Map the S-VOL to the port that is not connected to a host or the host group in which no host has been registered using LUN Manager.

The following procedure shows you how to specify the target ID using Storage Navigator.

1. From the command prompt, register the subsystem to which you want to set the target ID, and then connect to that subsystem.
2. Execute the `auhgmap` command to set the target ID. The following example shows the LU0 settings that are recognized as 6 by the host. The port is connected via host group 0 of port 0A on controller 0.

   Note: For iSCSI model, use an `autargetmap` command instead of an `auhgmap` command.

   Example:

```
% auhgmap -unit subsystem-name -MappingMode on
Password: manager-password
Are you sure you want to set the mapping mode? (y/n [n]): y
when setting starts, the subsystem stops accepting access to the controller from the
host.
Before setting, stop access to the controller from the host.
Do you want to continue processing? (y/n [n]): y
The mapping mode has been set successfully.
%

% auhgmap -unit subsystem-name -add 0 A 0 6 0
Password: manager-password
Are you sure you want to add the mapping information? (y/n [n]): y
The mapping information has been set successfully.
%
```

3. Execute the `auhgmap` command to verify that the target ID has been set.

   Example:

```
% auhgmap -unit subsystem-name -refer
Mapping mode = ON
Port  Group  H-LUN    LUN
  0A      0      6      0
%
```

3.5 Preparing for Volume Migration Operations (CCI)

3.5.1 Setting the Command Device

Note: The command device needs to be set when the operation is performed using CCI.

The command device is a user-selected, dedicated logical volume on the disk subsystem, which functions as the interface to the CCI software. The Volume Migration commands are issued by the CCI (HORCM) to the disk subsystem through command device.

A command device must be designated in order to issue the Volume Migration commands.
The command device must be defined in the HORCM_CMD section of the configuration definition file for the CCI instance on the attached host. Two command devices can be designated for the disk subsystem. You can designate command devices using Storage Navigator.

Note:

- LUs set for command devices must be recognized by the host.
- The Command Device LU size must be greater than or equal to 33 MB.
- The following restrictions apply when either pair of Volume Migration, SnapShot, or TrueCopy, or TCE exists or the path of TrueCopy or TCE is defined.
  - When two command devices are set, only one command device can be released.
  - When only one command device is set, the command device cannot be released.

To designate command device(s):

1. Start Storage Navigator, and change the operation mode to **Management Mode** (administrator mode).
2. Connect to the disk subsystem. The Array System Viewer panel opens displaying the connected disk subsystem (see Figure 3.12).
3. Select the **Logical Status** tab.
4. Select the **Command Devices** icon.

Figure 3.12 Array System Viewer Panel (Command Device Page: Before Setting)

5. Select **Set**.

   The **Command Devices Settings** dialog displays (see Figure 3.13).

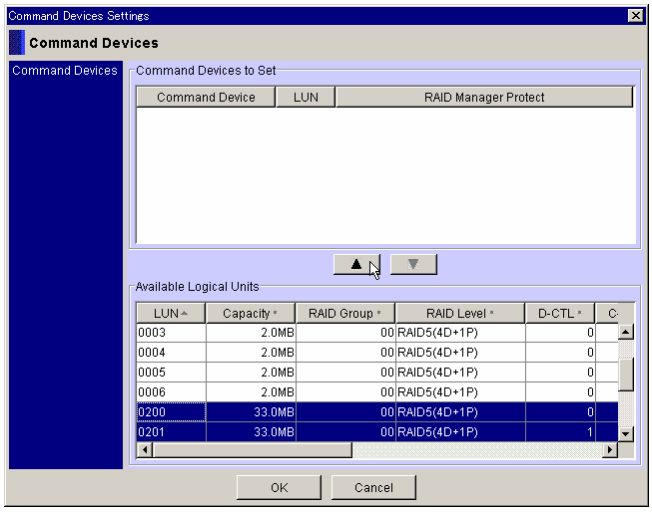


Figure 3.13 Command Devices Settings Dialog (Before Setting)

6. In the **Available Logical Units** list, select the **LUN** you want to set the command devices, and click the ▲ button.

   The selected **LUN** moved to the **Command Devices to Set** list (see Figure 3.14).

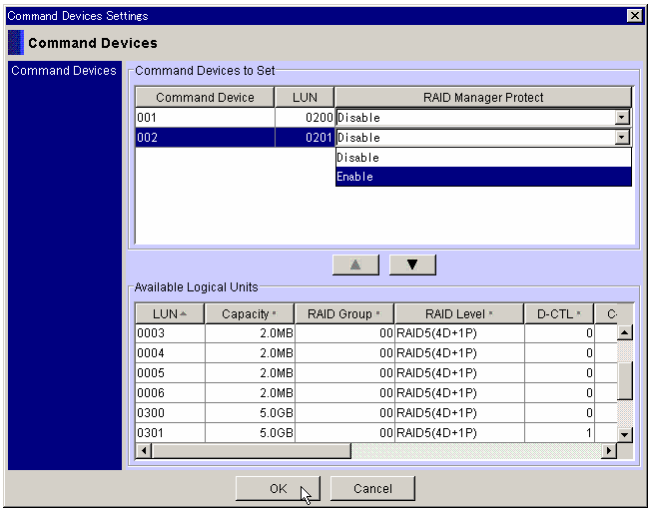


Figure 3.14 Command Devices Settings Dialog (After Setting)

7. In the **RAID Manager Protect** drop-down list, select **Disable** or **Enable** to use the protection function of CCI.

   Note: When you select **Enable**, the **RAID Manager Protect** function is not available on NAS Modular.

   When you want to change the already set command devices, select the **LUN** on the **Command Devices to Set** list, and click the ▼ button.

   The selected **LUN** moved to the **Available Logical Units** list.

8. Select **OK**.

   The setting information displays (see Figure 3.15).

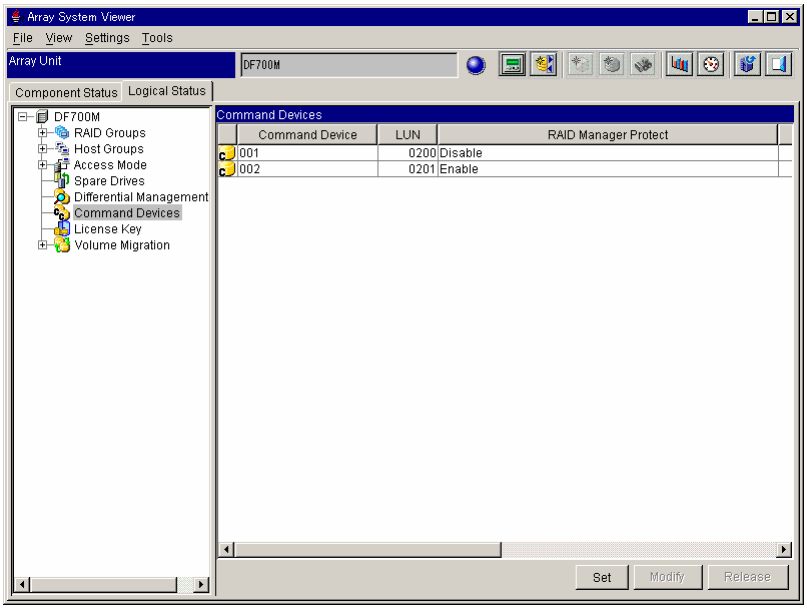


Figure 3.15 Array System Viewer Panel (Command Device Page: After Setting)

Note: You can use the alternate command device function to avoid data loss and subsystem downtime. Designate two command devices set within the one disk subsystem and assign them to the respective RAID groups. If they are assigned to the same RAID group, both command devices become unavailable and may cause a drive failure. For details on the alternate command device function, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

9. To release an already set command device, select the LUN of the command device you want to release, and select **Release**.
10. A message displays. Click **OK**.

Designating the command device is now complete. Leave the Array System Viewer panel open, and go to section 3.3.2.

3.5.2 Setting the Target ID (LU Mapping)

Note: It is necessary to set the target ID when CCI is used.

3.5.2.1 Specifying Mapping Mode

1. On the Array System Viewer panel, select the **Logical Status** tab (see Figure 3.16).
2. Select the **Access Mode** plus signs next to the **Mapping Mode**.

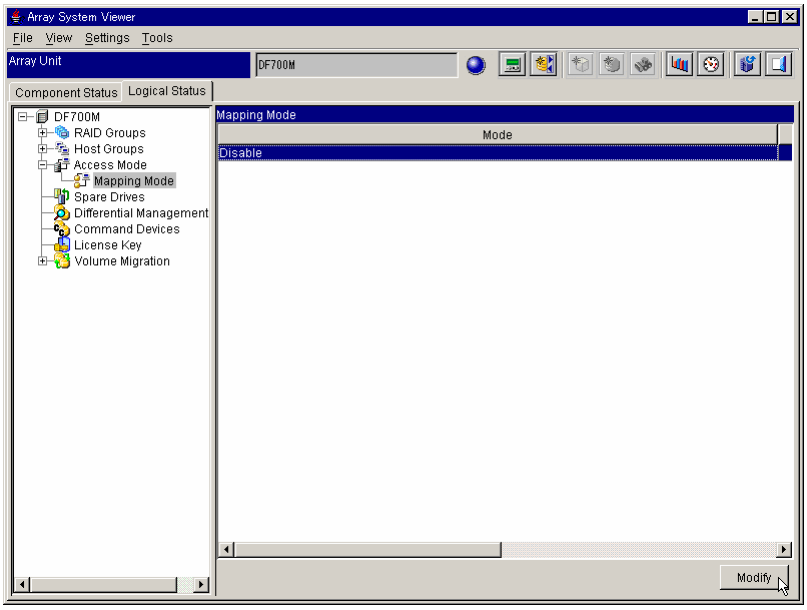


Figure 3.16 Array System Viewer Panel (Specifying Mapping Mode)

3. Select **Disable** in the **Mapping Mode** list, and click **Modify**.

   The **Mapping Mode** dialog displays (see Figure 3.17).

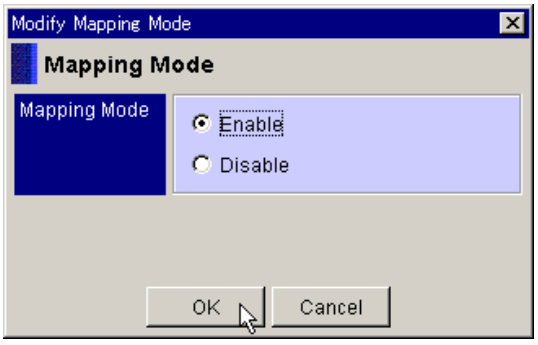


Figure 3.17 Mapping Mode Dialog

4. Select the **Enable** radio button, and click **OK**.
5. A confirmation message displays. Click **OK** three times.

3.5.2.2 Setting Mapping Information

1. Click the **Port** plus signs next to the **000:G000** or **000:T000,** and select **000:G000** or **000:T000**.

   Note: Map the S-VOL to the port that is not connected to a host or the host group in which no host has been registered using LUN Manager.

2. Select the **Logical Unit** icon. Select **Modify Mapping**.

   The **Mapping Property** panel displays (see Figure 3.18 and Figure 3.19).

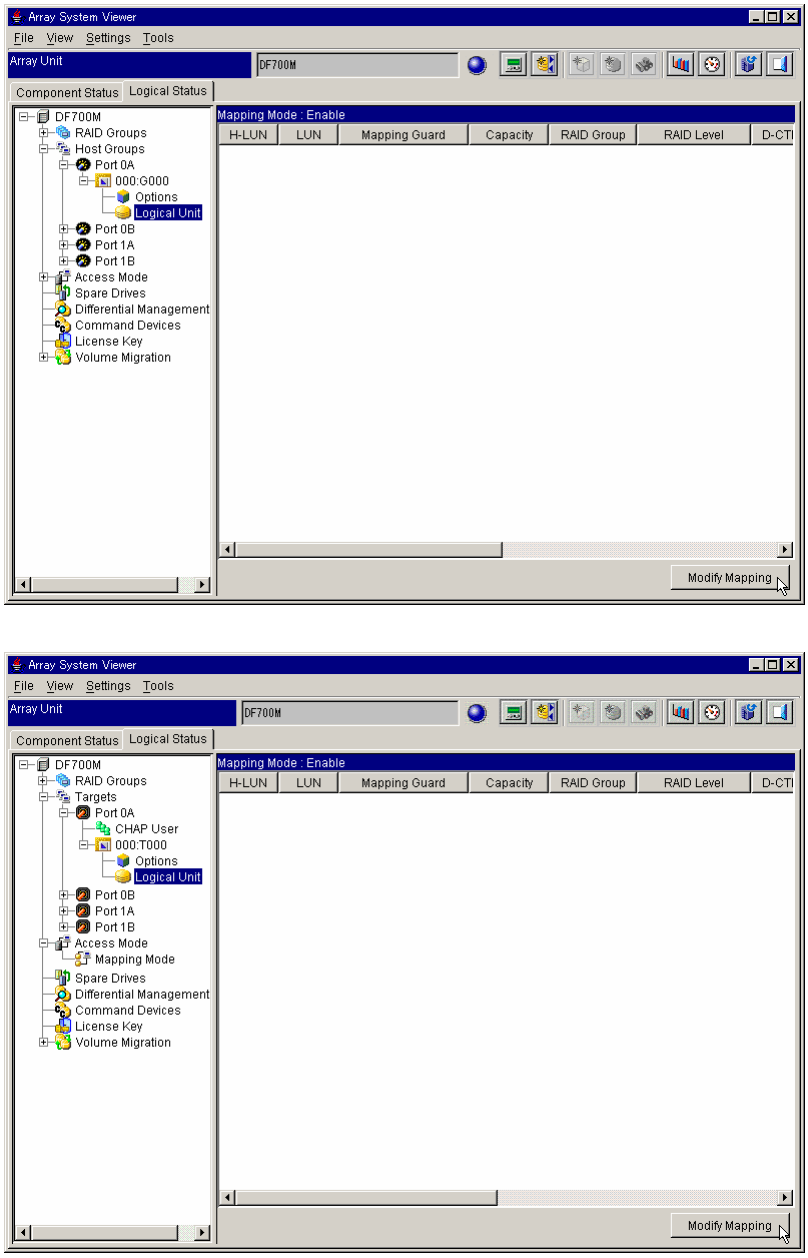
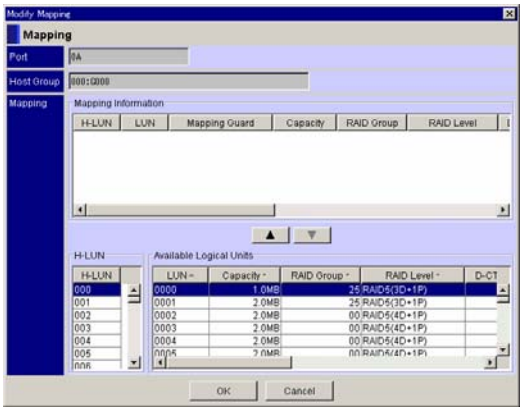
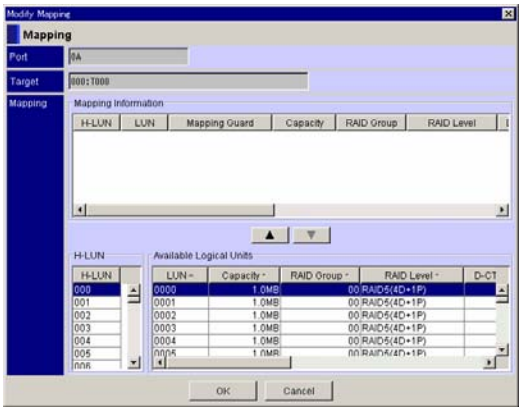


Figure 3.18 Array System Viewer Panel (Setting Mapping Information)



(Host Group)



(Target)

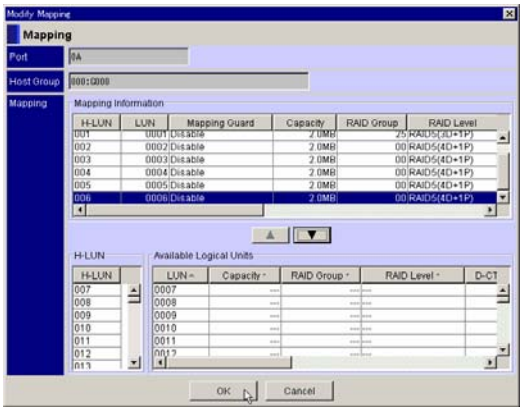
Figure 3.19 Mapping Property Panel (Before Setting)

3. Select **H-LUN** to be added. Select **LUN**, and click the ▲ button. The added contents display in the **Mapping Information** list (see Figure 3.20).

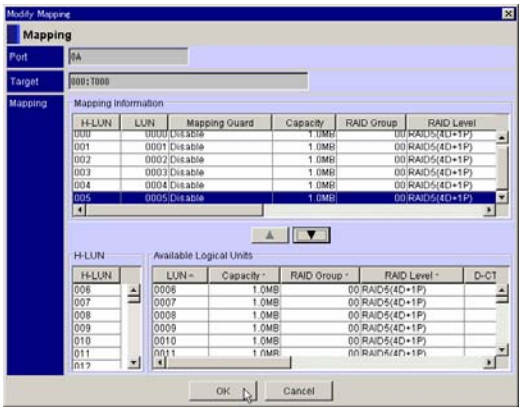
   Select the following items:

   – For **H-LUN**, select the LU number of the host to be recognized.

   – For **LUN**, select the LU number of the subsystem.



(Host Group)



(Target)

Figure 3.20 Mapping Property Panel (After Setting)

4. Click **OK**.

5. A confirmation message displays. Click **OK**.

   The set mapping information is updated and the Array System Viewer displays (see Figure 3.21).

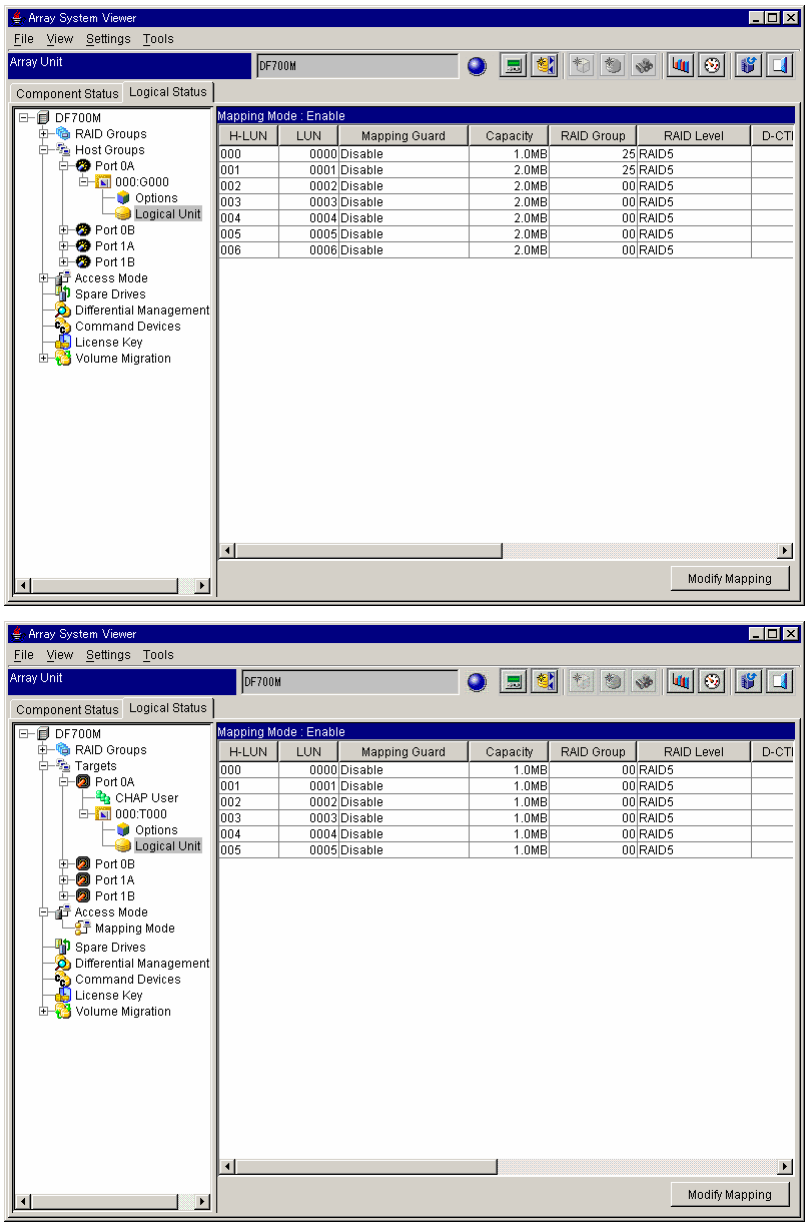


Figure 3.21 Array System Viewer

Setting the target ID is now complete.

3.5.3 Defining the Configuration Definition File

Note: The configuration definition file must be defined if the operation is performed using CCI.

The configuration definition file describes the system configuration in order to make CCI operational. The configuration definition file is a text file created and/or edited using any standard text editor, and can be defined from the PC where the CCI software is installed. The sample configuration definition file (HORCM_CONF), is included with the CCI software, and should be used as the basis for creating your configuration definition file(s). The system administrator should copy this sample file, set the necessary parameters in the copied file, and place the copied file in the proper directory. For details about the configuration definition file, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

The configuration definition file can be automatically created using the mkconf command tool. However, the parameters such as poll(10ms) must be set manually (see step 4 below). For details on the mkconf command tool, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

The following example shows how to manually define the configuration definition file for a configuration with two instances within the same server (Windows®).

1. On the host where CCI is installed, verify that the CCI is not running. If the CCI software is still running, shut down the CCI software using the horcmshutdown command. For details on horcmshutdown, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.
2. In the command prompt, make two copies of the sample file (horcm.conf).

   Example:

   ```
   c:\HORCM\etc> copy \HORCM\etc\horcm.conf \WINNT\horcm0.conf
   c:\HORCM\etc> copy \HORCM\etc\horcm.conf \WINNT\horcm1.conf
   ```

3. Open horcm0.conf using the text editor.
4. In the **HORCM_MON** section, set the necessary parameters.

   Important: A value more than or equal to 6000 must be set for poll(10ms). Refer to the *Command Control Interface (CCI) User and Reference Guide (DF700)* for details about calculating the poll(10ms) value. Specifying the value incorrectly may cause resource contention in the internal process causing the process to suspend temporarily and pause the internal processing of the disk subsystem. For more details about configuration parameters, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

5. In the **HORCM_CMD** section, specify the physical drive (command device) on the disk subsystem (see Figure 3.22).

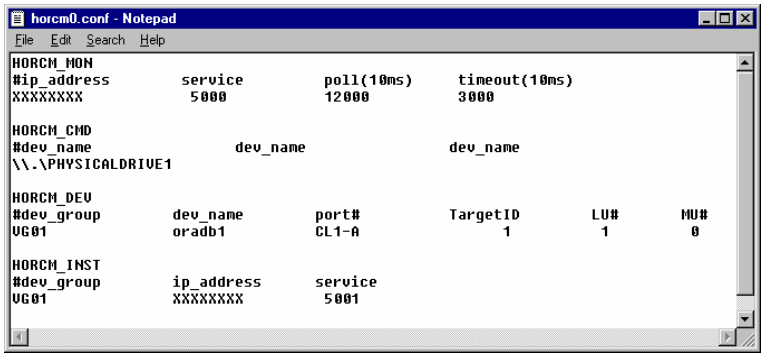


Figure 3.22 Horcm0.conf File

6. Save the configuration definition file and use the horcmstart command to start the CCI software. For details on horcmstart, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.
7. Execute the raidscan command, and write down the target ID displayed in the execution result. For details on the raidscan command, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.
8. Shut down the CCI software, and then open the configuration definition file again.
9. In the **HORCM_DEV** section, set the necessary parameters. For the target ID, set the ID of the raidscan result you wrote down. Also, the item MU# must be added after the LU#, and the value must be set as 0 (zero).
10. In the **HORCM_INST** section, set the necessary parameters, and then save (overwrite) the file.
11. Repeat steps 3 to 10 for the horcm1.conf file (see Figure 3.23).

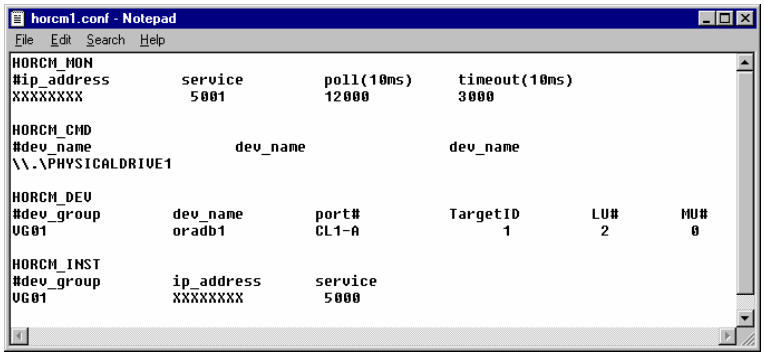


Figure 3.23 Horcm1.conf Example

12. Enter the following in the command prompt to verify the connection between CCI and the disk subsystem.

    Example:

```
C:\>cd horcm\etc

C:\horm\etc>echo hd1-2 | .\inqraid
Harddisk 1 -> [ST] CL1-A Ser =75000174 LDEV =   0 [HITACHI  ] [DF600F-CM       ]
Harddisk 2 -> [ST] CL1-A Ser =75000174 LDEV =   1 [HITACHI  ] [DF600F          ]
              HORC = SMPL  HOMRCF[MU#0 = SMPL  MU#1 = NONE  MU#2 = NONE]
              RAID5[Group  1-0] SSID = 0x0000

C:\horm\etc>
```

For details on configuration definition file, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

3.5.4 Setting the Environment Variable

Note: The environment variable must be set when the operation is performed using CCI.

To perform Volume Migration operations, you must set the environment variable for the execution environment. The following describes an example for configuration with two instances within the same server (Windows®).

1. Set the environment variable for each instance. Enter the following from the command prompt.

   Example:

```
C:\HORCM\etc>set HORCMINST=0
```

2. To use Volume Migration, you must set the environment variable shown below.

   Example:

```
C:\HORCM\etc>set HORCC_MRCF=1
```

3. Execute the horcmstart script, and then execute the pairdisplay command to verify the configuration.

   Example:

```
C:\HORCM\etc>horcmstart 0 1
starting HORCM inst 0
HORCM inst 0 starts successfully.
starting HORCM inst 1
HORCM inst 1 starts successfully.

C:\HORCM\etc>pairdisplay -g VG01
group   PairVOL(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.SMPL -----,-----   ----  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.SMPL -----,-----   ----  -
```

Preparing for Volume Migration operation is now complete.

Chapter 4 Performing Volume Migration Operations (GUI)

This chapter provides examples of Volume Migration operations using Storage Navigator. The icons of the pairs, which indicate pair status in Storage Navigator, are also displayed.

This chapter contains the following:

- Setting a Reserved LU, see section 4.1
- Deleting the Reserved LU, see section 4.2
- Executing Volume Migration, see section 4.3
- Change the Copy Pace, see section 4.4
- Confirming Volume Migration Pairs, see section 4.5
- Splitting Volume Migration Pairs, see section 4.6
- Cancelling Volume Migration Pairs, see section 4.7

4.1 Setting a Reserved LU

The following procedure shows you how to set a reserved LU for Migration:

Note: When the mapping mode displays, the host cannot access the LU if it has been allocated to the reserved LU. Also when the mapping mode is enabled, the host cannot access the LU if the mapped LU has been allocated to the reserved LU.

WARNING: Systems or applications that use the specified LU may terminate abnormally, so be sure to stop host access to the LU before performing this operation.

1. Select the **Reserve LU** icon, and then click **Add**.

   Alternatively, right-click the **Reserve LU** icon (see Figure 4.1), and then click **Add** from the pop-up menu.

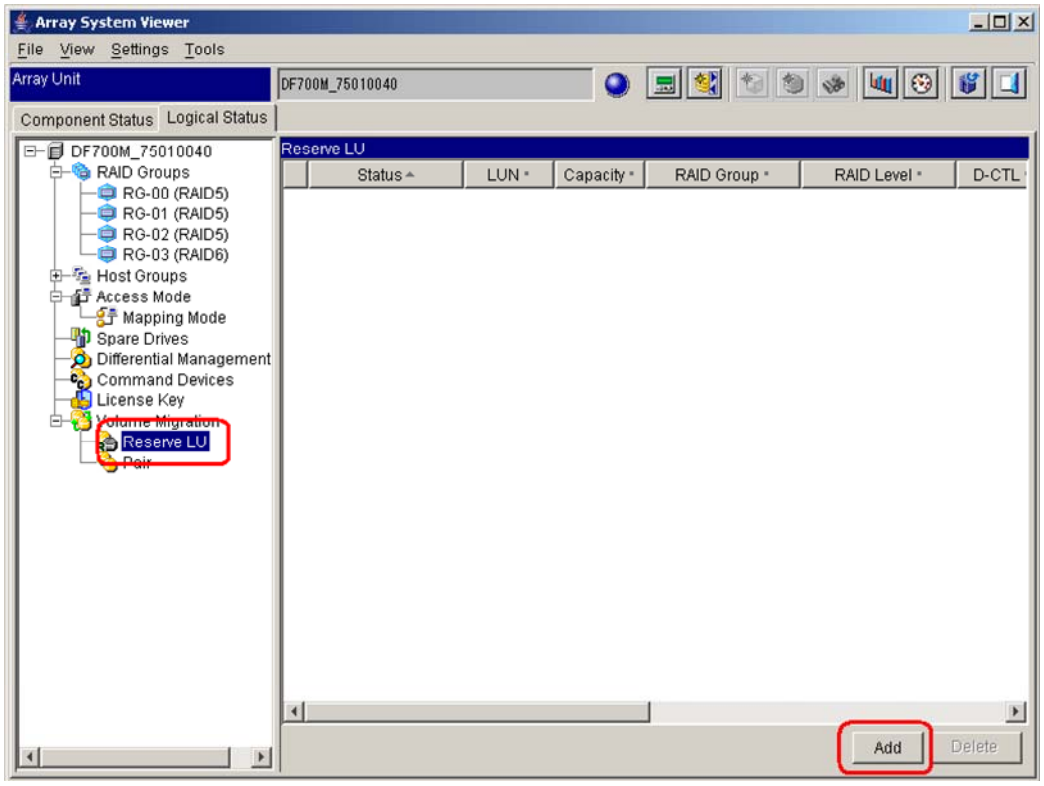


Figure 4.1 Array System Viewer (Reserved LU: Before Setting)

2. Select the LUN for the reserved LU and click **OK (see** Figure 4.2**)**.

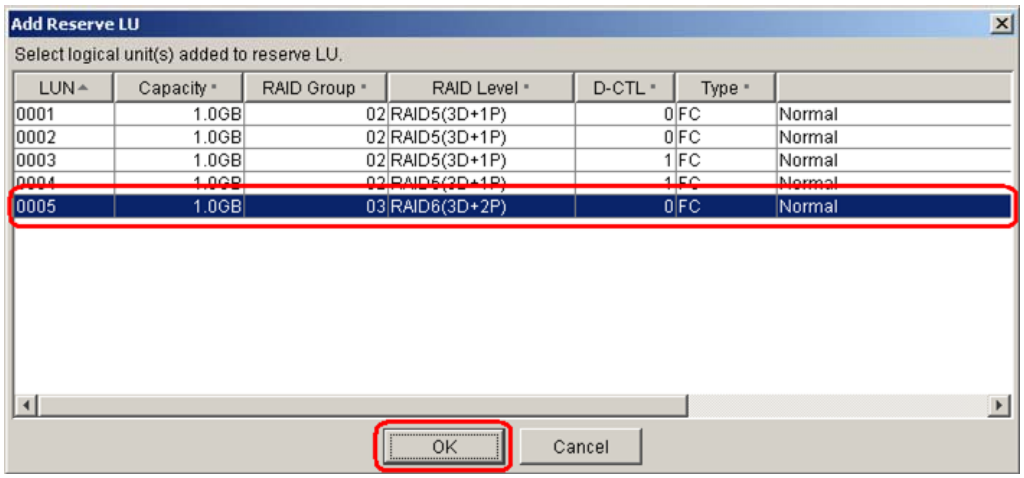
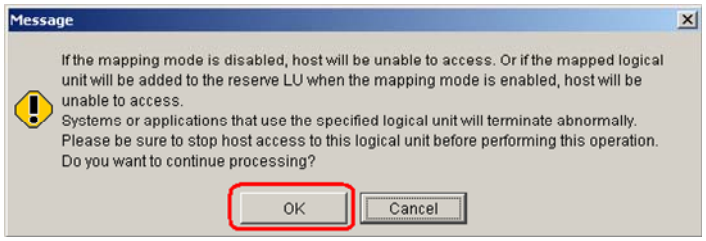
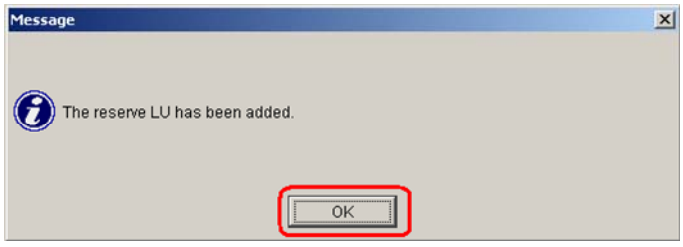


Figure 4.2 Reserved LU Selection Panel

3. In the resulting message boxes, click **OK**.





The reserve LU is now set (see Figure 4.3).

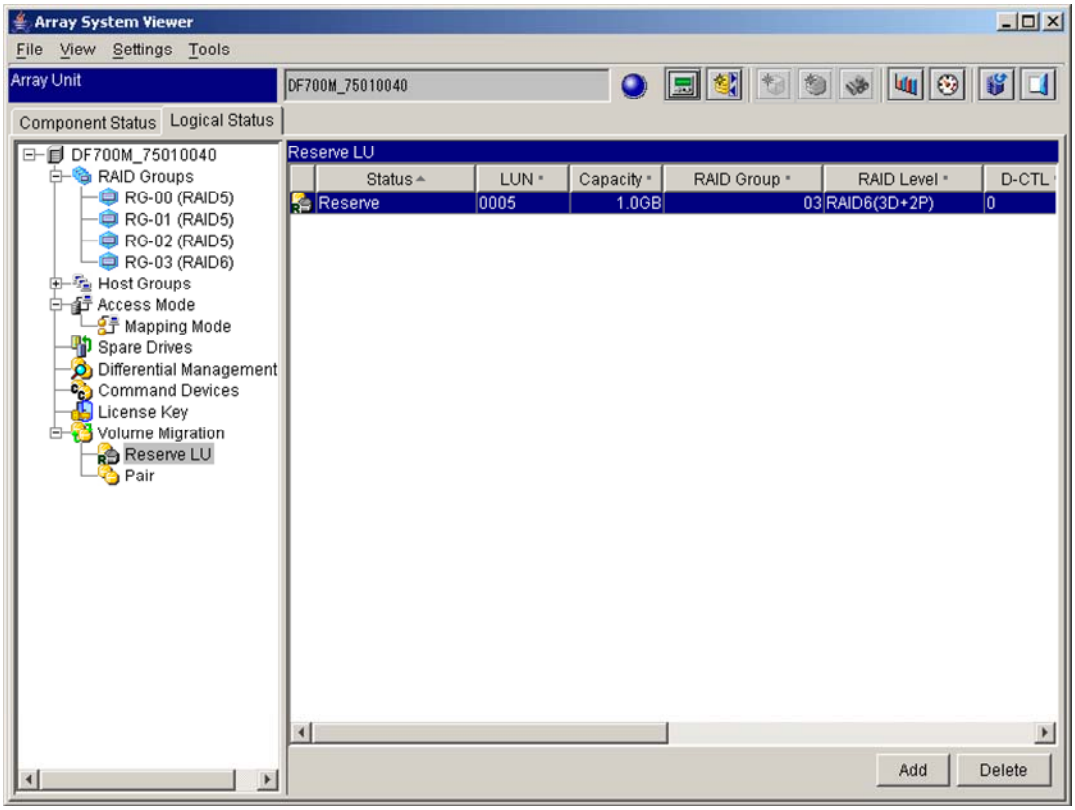


Figure 4.3 Reserve LU

4.2 Deleting the Reserved LU

Note: Be careful when the host recognizes the LU that has been used by Volume Migration. After releasing the Volume Migration pair or canceling Volume Migration, delete the reserve LU or change LU mapping. For more details refer to the section 3.2.1.

Before making the LU(s) recognizable to the host, format the LU(s) released from the **Reserve LU**. Refer to section 3.2.1 for cautions.

The following procedure shows you when formatting is necessary.

1. Select the **RAID Groups** icon.
2. Select the LU(s) released from the **Reserve LU**, and right-click the LU(s).

   Select **Format** from the pop-up menu (see Figure 4.4).

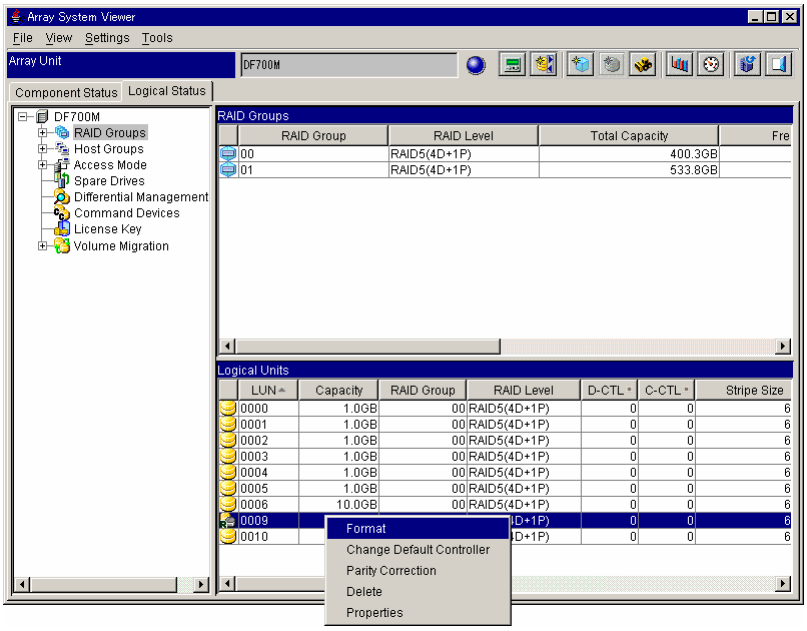
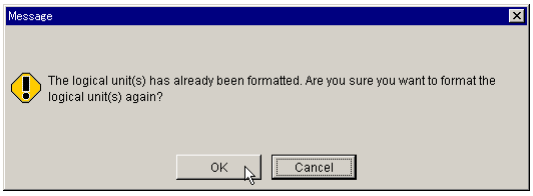


Figure 4.4 Selecting Format from the Pop Up Menu

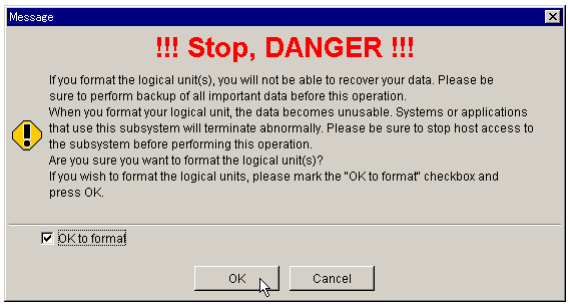
3. The confirmation message displays.

   Click **OK**.



4. A caution message displays.

   Select **OK to format** and then click **OK**.



The reserve LU(s) is now formatted (see Figure 4.5).

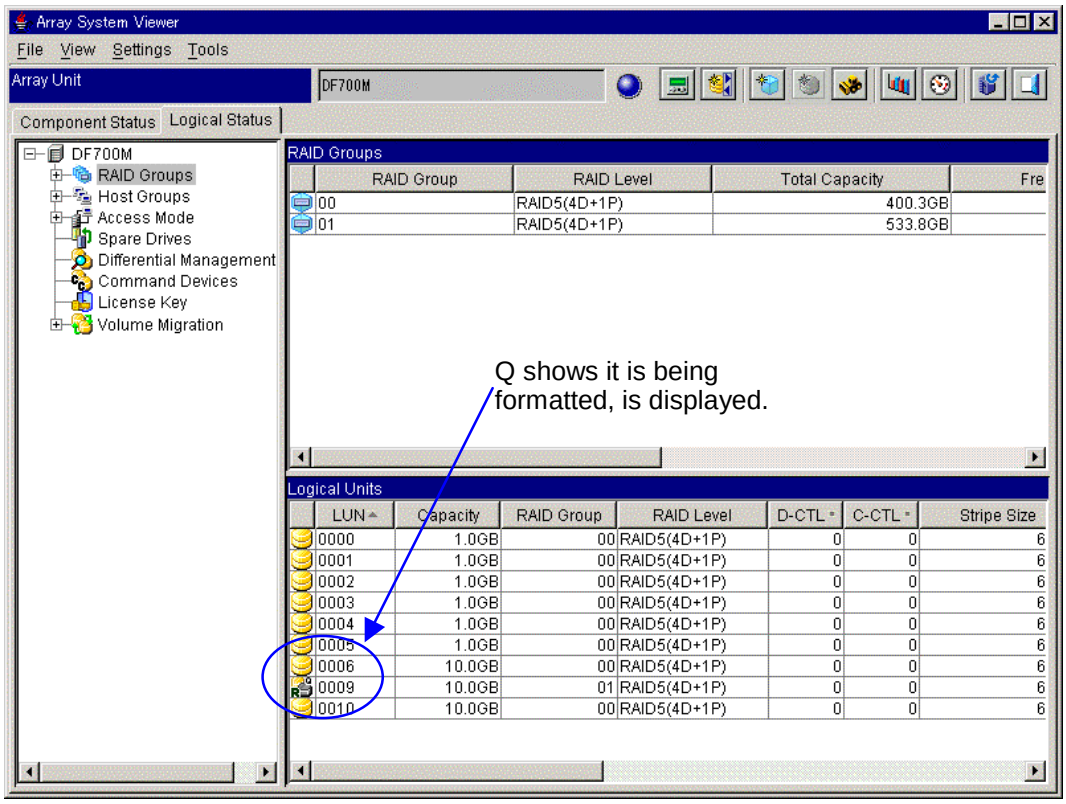


Figure 4.5 Formatted Reserve LU(s)

To delete the reserved LU:

1. Select the LUN to be deleted, and then click **Delete**.

   Alternatively, right-click on the **Reserve LU** list (see Figure 4.6), and then select **Delete** from the pop-up menu.

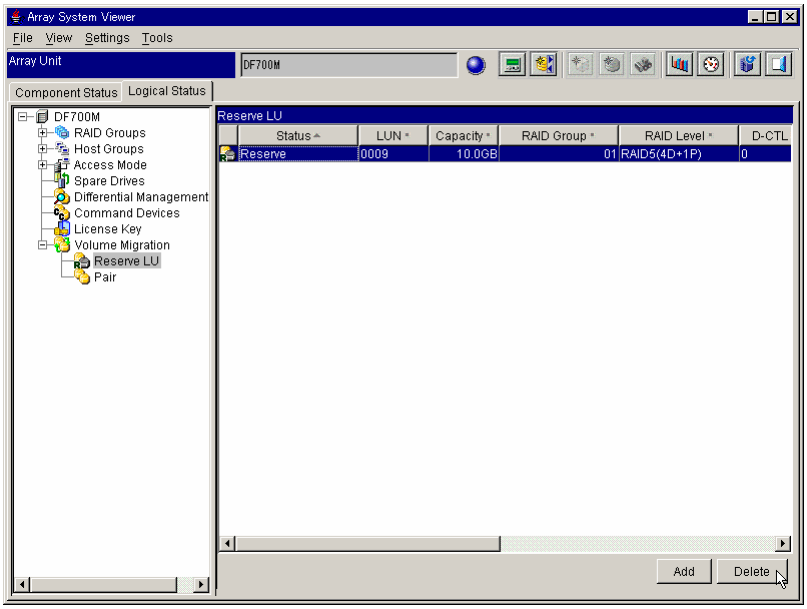


Figure 4.6 Array System Viewer (Reserved LU: Before Deleting)

2. In the resulting message boxes, click **OK**.

4.3 Executing Volume Migration

To execute Volume Migration:

1. Select **Pair** icon under **Volume Migration** (see Figure 4.7), and then click **Create**.

   Alternatively, right-click on the **Pair** icon, and then select **Create** from the pop-up menu.

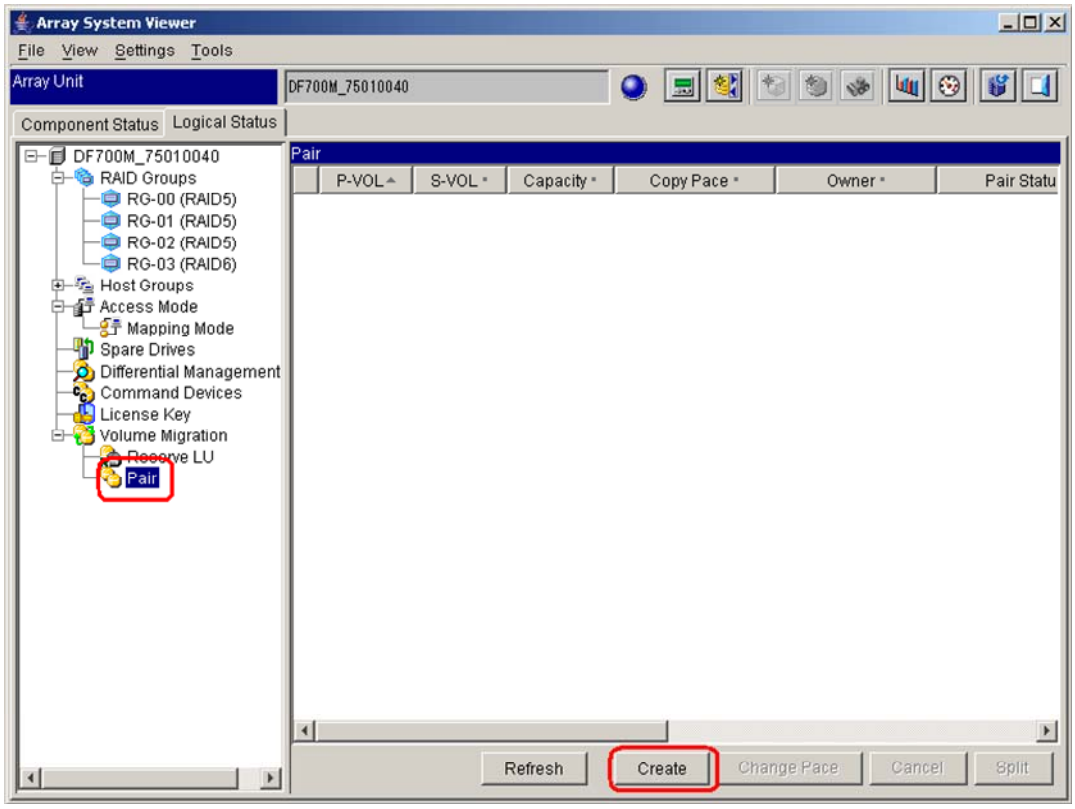
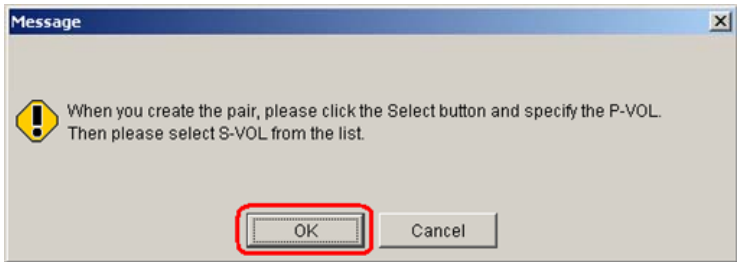


Figure 4.7 Array System Viewer (Before Pair Creating)

2. The method for specifying P-VOL and S-VOL displays.

   In the resulting message box, click **OK**.



3. To specify P-VOL, click **Select** (see Figure 4.8).

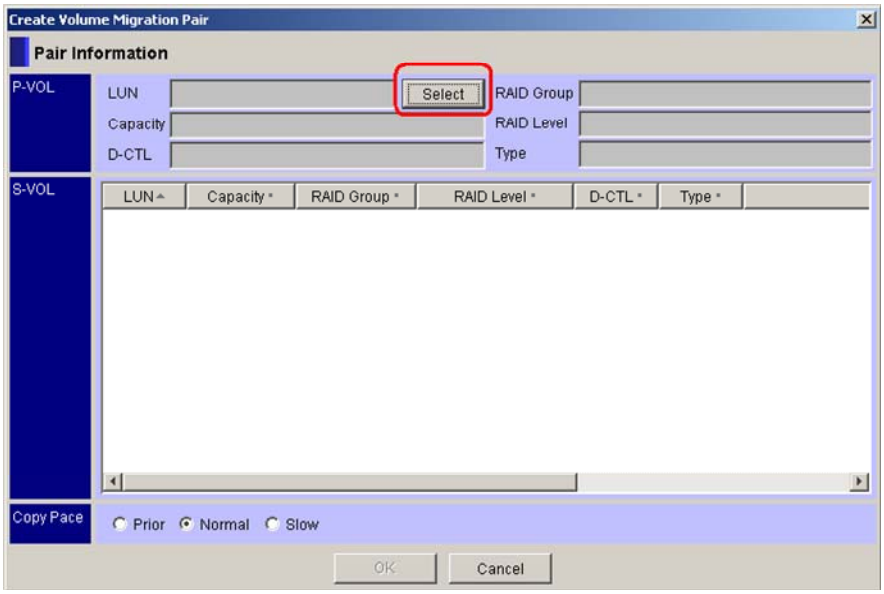


Figure 4.8 P-VOL Specifying Panel (Before Setting)

4. Select the LUN for P-VOL and click **OK** (see Figure 4.9).

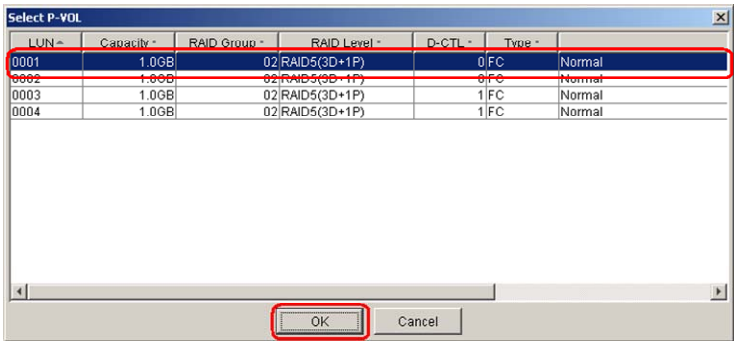


Figure 4.9 P-VOL Selection Panel

5. Select the LUN for S-VOL and **Copy Pace**, and then click **OK** (see Figure 4.10).

   Note: **Normal** is selected for the **Copy Pace** in standard. If the copying is made in **Normal** mode when the host I/O load is heavy, the host I/O performance may deteriorate remarkably. Select **Slow** to prevent the deterioration of the performance. Select **Prior** only when you want to shorten the time to the completion of the copying in priority to the host I/O performance in the time period when the P-VOL is rarely accessed.

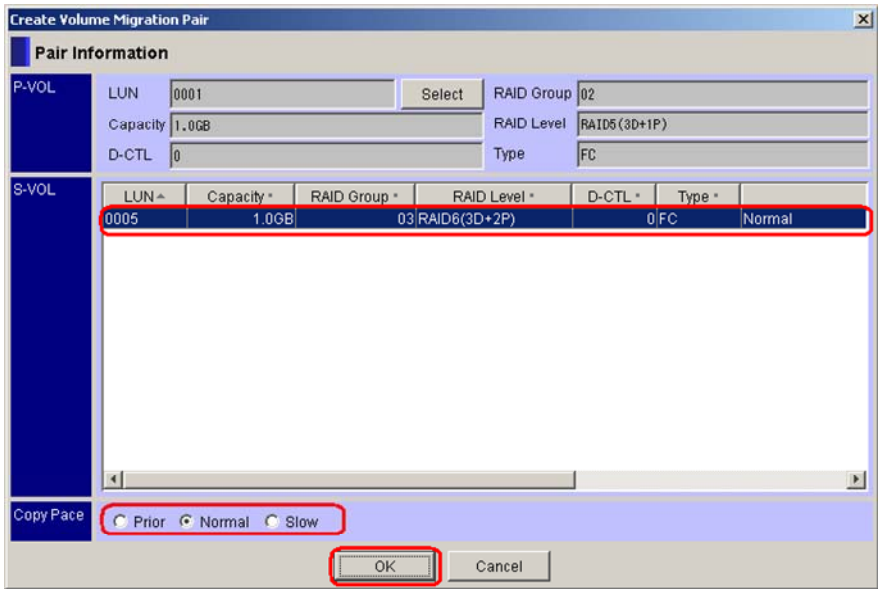
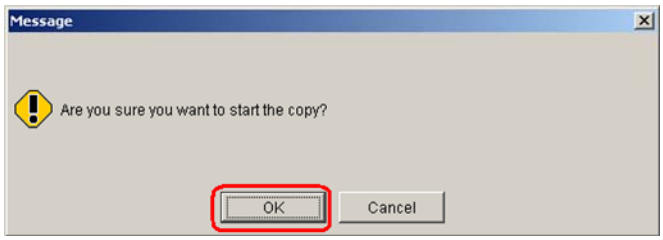
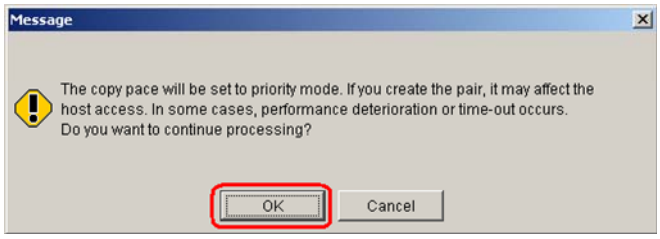


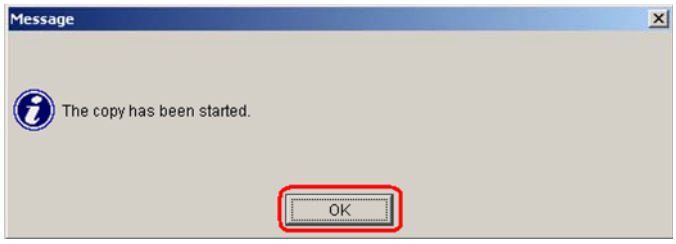
Figure 4.10 S-VOL Specifying Panel (After Setting)

6. In the resulting message boxes, click **OK**.



Note: A caution for the performance is displayed if **Prior** was selected for **Copy Pace**.





Volume Migration is now started.

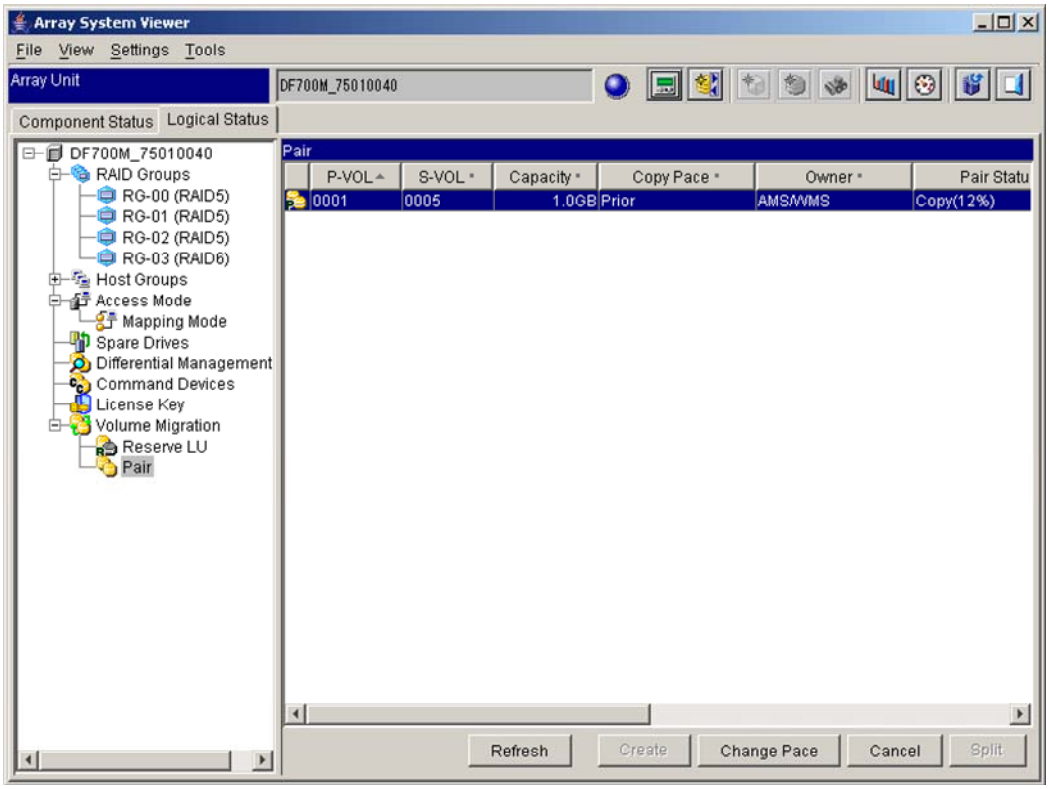


Figure 4.11 Copying from a P-VOL to an S-VOL

Note: When copying from a P-VOL to an S-VOL, Pair Status displays as Copy, and the copying progress rate displays (see Figure 4.11).

4.4 Changing the Copy Pace

Note 1: The copy pace for a pair can only be changed if it is in the **Copy** or **Waiting** status.

Note 2: **Normal** is selected for the **Copy Pace** in standard. If the copying is made in **Normal** mode when the host I/O load is heavy, the host I/O performance may deteriorate remarkably. Select **Slow** to prevent the deterioration of the performance. Select **Prior** only when you want to shorten the time to the completion of the copying in priority to the host I/O performance in the time period when the P-VOL is rarely accessed.

To change the copy pace:

1. Select the **Pair** icon under **Volume Migration**.
2. Select the pair to be changed in the **Pair** list, and then select **Change Pace**. The **Change Copy Pace** panel displays (see Figure 4.12).

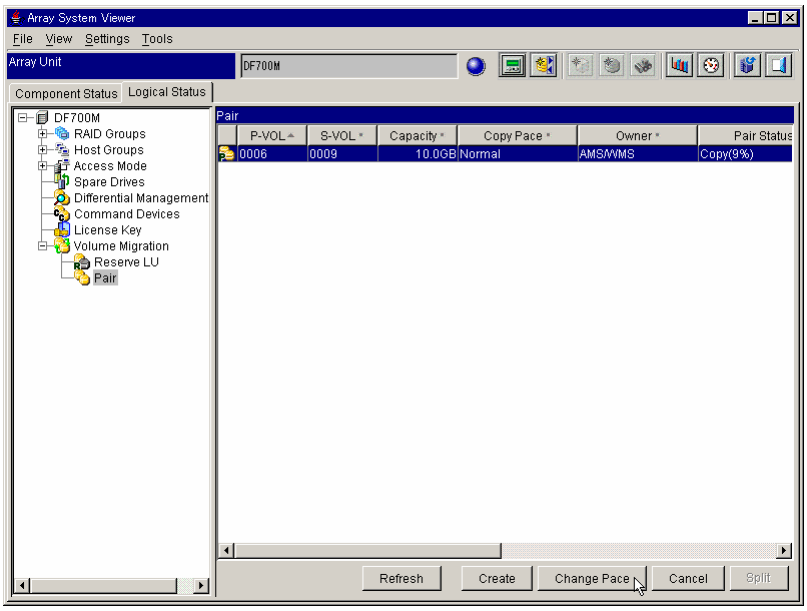


Figure 4.12 Changing the Copy Pace

3. Select the **Copy Pace** and click **OK** (see Figure 4.13).

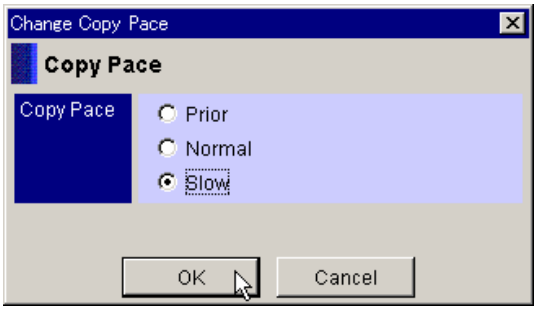


Figure 4.13 Change Copy Pace Panel

4. In the resulting message boxes, click **OK**.

4.5 Confirming Volume Migration Pairs

The status of the logical units displays, in icon format, in the **Logical Status** dialog box of the **Array System Viewer** window. **P** is used to designate a primary volume (see Figure 4.14).

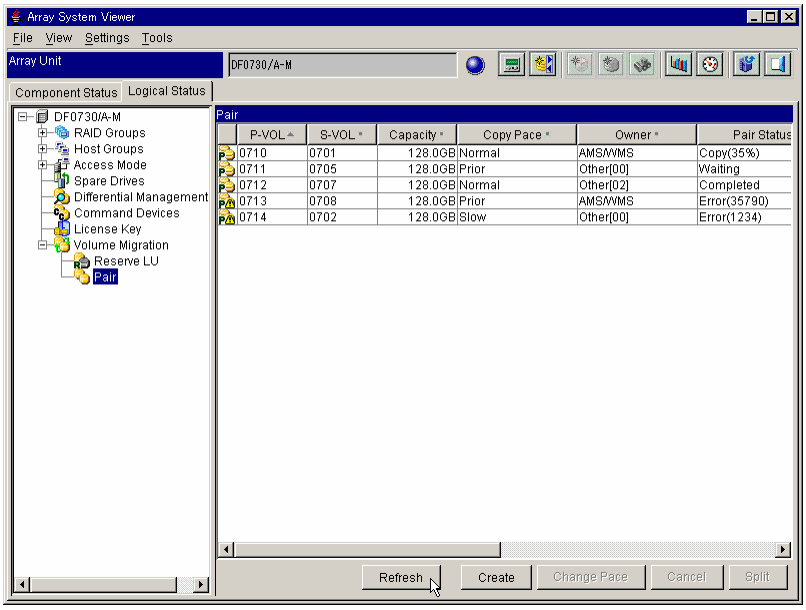


Figure 4.14 Array System Viewer Window (Pair Display)

Table 4.1 Volume Migration Pair Status

Displayed Items	Contents
P-VOL	LUN displays for P-VOL.
S-VOL	LUN displays for S-VOL.
Capacity	Capacity is displayed for P-VOL and S-VOL (P-VOL=S-VOL)
Copy Pace	Copy pace displays.
Owner	Migration owner displays. AMS/WMS: Storage Navigator Other: CCI
Pair Status	Pair status displays. ▪ Copy: Copying is being made from a P-VOL to an S-VOL. The percentage enclosed in parentheses shows the progress rate. ▪ Waiting: The migration has been executed but the background copying is waiting to start. ▪ Completed: The copying is complete and waiting for instruction to release the pair. ▪ Error: The migration failed because the copying from a P-VOL to an S-VOL was unable to continue. The number enclosed in parentheses is an error code that shows the cause of the failure. When you contact the service personnel, inform them of an error code.

4.6 Splitting Volume Migration Pairs

Note: A pair can only be split if it is in **Completed** or **Error** status. A pair in the **Copy** or **Waiting** status cannot be split.

To release the Volume Migration pair:

1. Select the **Pair** icon (see Figure 4.15).
2. Select the migration pair to split, and then click **Split**.

   Alternatively, right-click on the **P-VOL** Pair list, and then select **Split** from the pop-up menu.

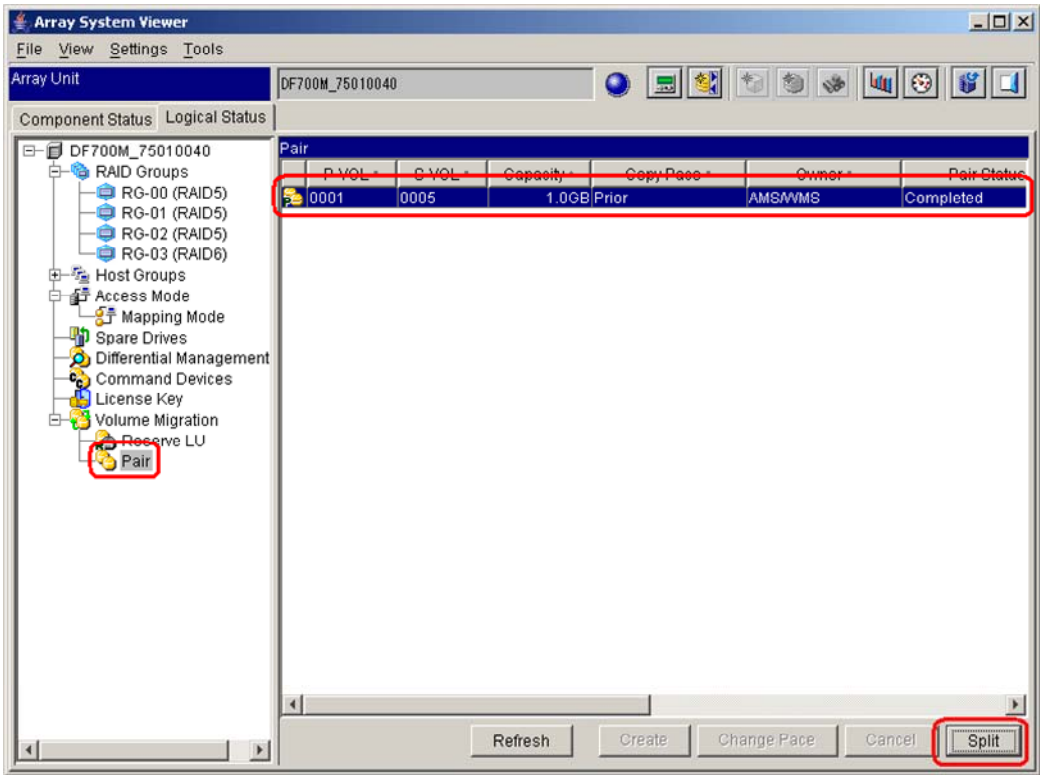
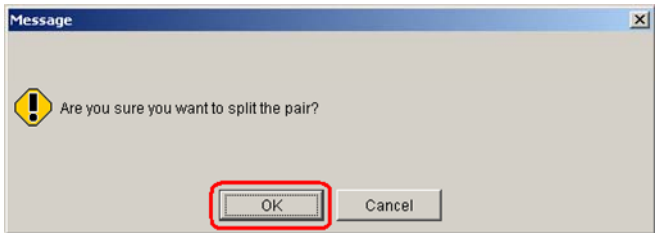
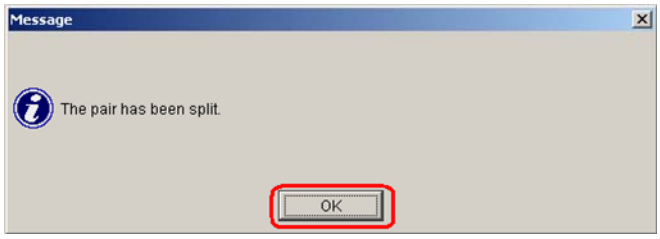


Figure 4.15 Array System Viewer Window (Pair Releasing)

3. In the resulting message boxes, click **OK**.





The pair has been split.

4.7 Cancelling Volume Migration Pairs

Note 1: A pair can only be cancelled if it is in the **Copy** or **Waiting** status.

Note 2: The migration cannot be temporarily stopped or resumed once it has been executed. When the migration is canceled and then executed again, Volume Migration copies of all the data again.

1. Select the **Pair** icon in the **Volume Migration** icon.
2. Select the P-VOL to be canceled, and then click **Cancel**.

   Alternatively, right-click on the **P-VOL** Pair list, and then select **Cancel** from the pop-up menu.

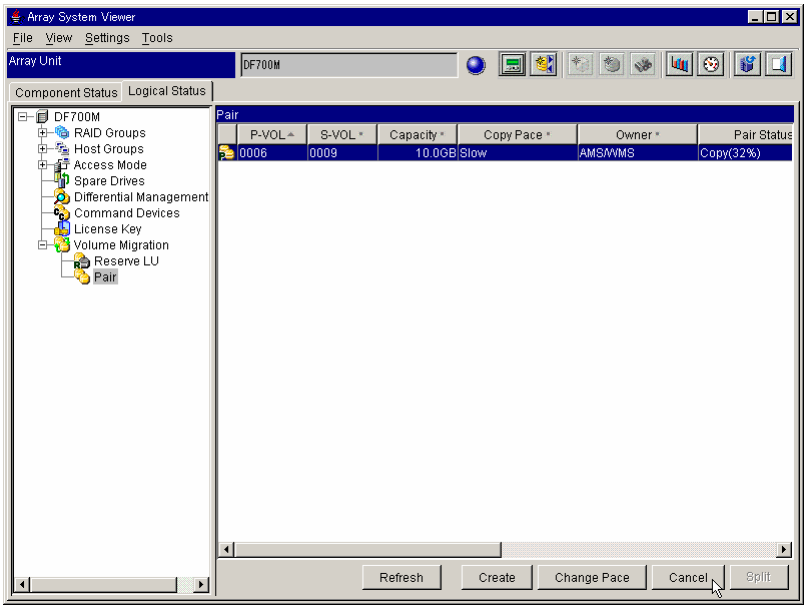


Figure 4.16 Array System Viewer Panel (Pair Cancellation)

3. In the resulting message boxes, click **OK**.

Chapter 5 Performing Volume Migration Operations (CLI)

This chapter is divided into the following sections:

- Setting a Reserved LU, see section 5.1
- Deleting the Reserved LU, see section 5.2
- Executing Volume Migration, see section 5.3
- Changing the Copy Pace, see section 5.4
- Confirming Volume Migration Pairs, see section 5.5
- Releasing Volume Migration Pairs, see section 5.6
- Cancelling Volume Migration Pairs, see section 5.7

5.1 Setting a Reserved LU

Note: When the mapping mode is disabled, the host cannot access the LU if it has been allocated to the reserved LU. Also when the mapping mode is enabled, the host cannot access the LU if the mapped LU has been allocated to the reserved LU.

WARNING: Systems or applications that use the specified LU may terminate abnormally. Ensure that you stop host access to the LU before performing this operation.

To set a reserved LU for Migration:

1. From the command prompt, register the subsystem to which you want to set a reserve LU, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to set a reserve LU.

   Example:

```
% aumvolmigration -unit subsystem-name -availablelist -reservelu
Password: manager-password
Available Logical Units
  LUN Capacity     RAID Group RAID Level  D-CTL Type Status
    0    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    1    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    2    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    3    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
   10    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
   11    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
   12    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
   13    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
%
% aumvolmigration -unit subsystem-name -add -lu 10
Password: manager-password
Are you sure you want to add the reserve LU? (y/n [n]): y
If the mapping mode is disabled, host will be unable to access. Or if the mapped
 logical unit will be added to the reserve LU when the mapping mode is enabled,
host will be unable to access.
Systems or applications that use the specified logical unit will terminate abnor
mally. Please be sure to stop host access to this logical unit before performing
 this operation.
Do you want to continue processing? (y/n [n]): y
The reserve LU has been added successfully.
%
```

5.2 Deleting the Reserved LU

Note: Be careful when the host recognizes the LU that has been used by Volume Migration. After releasing the Volume Migration pair or canceling Volume Migration, delete the reserve LU or change the LU mapping. For more details refer to the section 3.2.1.

Before making the LU(s) recognizable to the host, format the LU(s) released from the **Reserve LU**. Refer to section 3.2.1 for cautions.

Use the following procedure when formatting is necessary.

1. From the command prompt, register the subsystem to which you want to delete the reserve LU, and then connect to the subsystem.
2. Execute the `auformat` command to format LU(s) released from the **Reserve LU**.

   Example:

```
% auformat -unit subsystem-name –lu 10
Password: manager-password
The logical unit(s) will be formatted.
The logical unit(s) has already been formatted.
Are you sure you want to format the logical unit(s)? (y/n [n]): y
If you format the logical unit(s), you will not be able to recover your data. Pl
ease be sure to perform backup of all important data before this operation.
When you format your logical unit, the data becomes unusable. Systems or applica
tions that use this subsystem will terminate abnormally. Please be sure to stop
host access to the subsystem before performing this operation.
Are you sure you want to format the logical unit(s)? (y/n [n]): y
The logical unit(s) will be formatted.
Are you sure you want to execute? (y/n [n]): y
The format was started.
%
```

3. Execute the `auluref` command to confirm the formatting.

   Example:

```
% auluref -unit subsystem-name –lu 10
         Capacity             Stripe   RAID  RAID
   LU     [block] C-CTL D-CTL Size[KB] Group Level       Type Status
   10     2097152     1     1       64     1 5( 4D+1P)   FC   Normal(Quick Format
ting(50%))
%
```

To delete the reserved LU:

1. Execute the `aumvolmigration` command to delete the reserve LU.

   Example:

```
% aumvolmigration -unit subsystem-name -rm -lu 10
Password: manager-password
Are you sure you want to delete the reserve LU? (y/n [n]): y
The reserve LU has been deleted successfully.
%
```

5.3 Executing Volume Migration

To execute Volume Migration:

1. From the command prompt, register the subsystem to which you want to execute the migration, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to execute the migration.

   Specify an S-VOL to be set as the reserve LU.

   Example:

```
% aumvolmigration -unit subsystem-name -availablelist -pvol
Password: manager-password
Available Logical Units
  LUN Capacity     RAID Group RAID Level  D-CTL Type Status
    0    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    1    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    2    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
    3    1.0 Gbyte          0   5( 4D+1P)     0 FC   Normal
   11    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
   12    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
   13    1.0 Gbyte          1   5( 4D+1P)     1 FC   Normal
%
% aumvolmigration -unit subsystem-name -create -pvol 0 -svol 10
Password: manager-password
Are you sure you want to create the pair and start the copy? (y/n [n]): y
The copy has been started.
%
```

   Note: **Normal** is selected for the **Copy Pace** in standard. If the copying is made in **Normal** mode when the host I/O load is heavy, the host I/O performance may deteriorate remarkably. Select **Slow** to prevent the deterioration of the performance. Select **Prior** only when you want to shorten the time to the completion of the copying in priority to the host I/O performance in the time period when the P-VOL is rarely accessed.

3. Execute the `aumvolmigration` command to display the pair status.

   Example:

```
% aumvolmigration -unit subsystem-name -refer -pair
Pair
P-VOL  S-VOL  Capacity      Copy Pace   Owner      Pair Status
    0     10     1.0 Gbyte  Normal      AMS/WMS    Completed
%
```

5.4 Changing the Copy Pace

Note 1: In order for the copy pace to be changed, a pair must be in the **Copy** or **Waiting** status.

Note 2: **Normal** is selected for the **Copy Pace** in standard. If the copying is made in **Normal** mode when the host I/O load is heavy, the host I/O performance may deteriorate remarkably. Select **Slow** to prevent the deterioration of the performance. Select **Prior** only when you want to shorten the time to the completion of the copying in priority to the host I/O performance in the time period when the P-VOL is rarely accessed.

To change the copy pace:

1. From the command prompt, register the subsystem to which you want to change the copy pace, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to change the copy pace.

   Example:

```
% aumvolmigration -unit subsystem-name -chg -pvol 0 -svol 10 -pace slow
Password: manager-password
Are you sure you want to change the copy pace? (y/n [n]): y
The copy pace has been changed.
%
```

5.5 Confirming Volume Migration Pairs

To confirm the Volume Migration pairs:

1. From the command prompt, register the subsystem to which you want to confirm the volume migration pairs, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to confirm the volume migration pairs.

   Example:

```
% aumvolmigration -unit subsystem-name -refer
Reserve LU
Status      LUN  Capacity      RAID Group  RAID Level   D-CTL  Type
Reserve      10     1.0 Gbyte           1    5( 4D+1P)      1  FC
Pair          1     1.0 Gbyte           1    5( 4D+1P)      1  FC

Pair
P-VOL  S-VOL  Capacity      Copy Pace   Owner      Pair Status
    0     10     1.0 Gbyte  Slow        AMS/WMS    Completed
%
```

5.6 Releasing Volume Migration Pairs

Note: A pair can be released if it is in the **Completed** or **Error** status.

To release the Volume Migration pair:

1. From the command prompt, register the subsystem to which you want to release the volume migration pairs, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to release the volume migration pairs.

   Example:

```
% aumvolmigration -unit subsystem-name -split -pvol 0 -svol 10
Password: manager-password
Are you sure you want to split the pair? (y/n [n]): y
The pair has been split.
%
```

5.7 Cancellation Volume Migration Pairs

Note 1: A pair can be cancelled if it is in the **Copy** or **Waiting** status.

Note 2: The migration cannot be temporarily stopped or resumed once it has been executed. When the migration is canceled and then executed again, Volume Migration copies of all the data again.

To cancel the Volume Migration pairs:

1. From the command prompt, register the subsystem to which you want to cancel the volume migration pairs, and then connect to the subsystem.
2. Execute the `aumvolmigration` command to cancel the volume migration pairs.

   Example:

```
% aumvolmigration -unit subsystem-name –cancel –pvol 0 –svol 10
Password: manager-password
Are you sure you want to cancel the copy? (y/n [n]): y
The copy has been canceled.
%
```

Chapter 6 Performing Volume Migration Operations (CCI)

This chapter provides examples of Volume Migration operations using CCI.

This chapter contains the following:

- Executing Volume Migration (paircreate –m cc), see section 6.1
- Confirming Volume Migration Pairs (inqraid), see section 6.2
- Splitting Volume Migration Pairs (pairsplit –S), see section 6.3
- Cancelling Volume Migration Pairs (pairsplit –S), see section 6.4

6.1 Executing Volume Migration (paircreate -m cc)

Note: A P-VOL or an S-VOL can be operated by CCI if it is mapped to a port in the configuration definition file. The S-VOL should be mapped to a port that is not connected to the host or to a host group in which no host has been registered using LUN manager. A LU set as a reserved LU by Storage Navigator cannot be specified as an S-VOL when the migration is executed by CCI.

For example, if the group name in the configuration definition file is VG01, perform the following steps:

1. Map the LU that was created for S-VOL (see Figure 6.1).

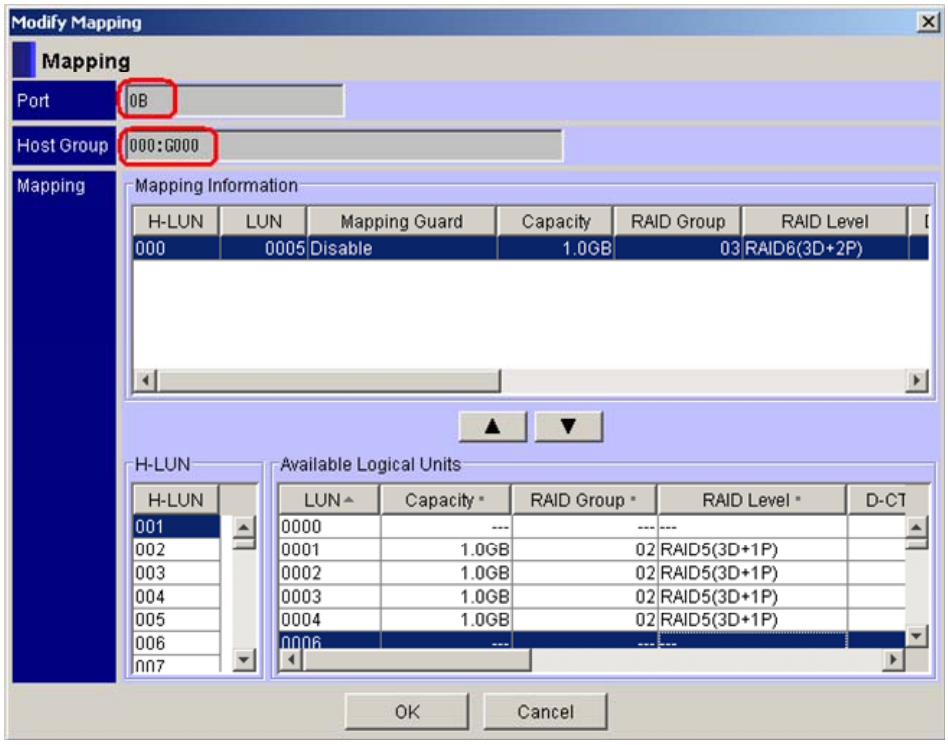


Figure 6.1 Modify Mapping Dialog

2. Execute the `pairdisplay` command to verify that the status of the migration volumes is SMPL.

   Note: P-VOL and S-VOL must be specified at the Configuration Definition File.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.SMPL -----,-----   ----  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.SMPL -----,-----   ----  -
```

3. Execute the `paircreate –m cc` command to execute Volume Migration (see Figure 6.2).

   Note: When executing this command, recommend the **-c** option with the value "medium" (6 to 10) for the copying pace. However, when "medium" (6 to 10) is selected, host I/O performance may be lowered. Therefore, when you need to prevent performance from being lowered, select "slow" (1 to 5). Select "fast" (11 to 15) for the -c option when copying pace is preceded. If omitted, select "slow" (1 to 5).

```
C:\HORCM\etc>paircreate -g VG01 –vl –m cc -c 6
C:\HORCM\etc>pairevtwait -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.P-VOL COPY,75000174     2  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.S-VOL COPY,-----        1  -
```

Figure 6.2 Paircreate -m cc Command Example

4. Execute the `pairevtwait` command to verify that the status of each volume is PSUS.

```
C:\HORCM\etc>pairevtwait -g VG01 –s psus –t 300 10
pairevtwait : Wait status done.
```

5. Execute the `pairdisplay` command to verify the pair status and the configuration.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.P-VOL PSUS,75000174     2  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.S-VOL SSUS,-----        1  -
```

The Volume Migration is completed. For details on the paircreate command and its options, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

6.2 Confirming Volume Migration Pairs (inqraid)

To confirm the Volume Migration pairs:

For example, if the group name in the configuration definition file is VG01, perform the following steps:

1. Execute the `pairdisplay -fc` command to verify that the copy progress rate of the Migration volumes.

```
#C:\HORCM\etc> pairdisplay -g oradb -fc
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status,   % ,P-LDEV# M
oradb   oradev3(L)   (CL2-A , 3,  4-0 )75000174    1.P-VOL COPY,  14     2  -
oradb   oradev3(R)   (CL2-A , 3,  5-0 )75000174    2.S-VOL COPY,  14     1  -
```

   Contents of Pair display status:

   - COPY: The current status in which the migration is executed and copying from P-VOL to S-VOL is either in progress or waiting to be copied. In Storage Navigator, the status in the above is displayed as “Copy” or “Waiting”.
   - PSUS: Copying is completed and waiting for instructions to release the pair. In Storage Navigator, the status above is displayed as “Completed”.
   - PSUE: The migration failed because the copying from P-VOL to S-VOL became unable to continue. In Storage Navigator, the status above is displayed as “Error”.

2. You can verify that the P-VOL has migrated to the other RAID group after migration is complete by using the `inqraid` command (see Figure 6.3).

```
C:\HORCM\etc>echo hd0 | inqraid
Harddisk0 -> [ST] CL1-A Ser =75000067 LDEV =   1 [HITACHI ] [DF600F         ]
             HORC = SMPL  HOMRCF[MU#0 = P-VOL MU#1 = SMPL MU#2 = SMPL]
             RAID5[Group  1- 0] SSID = 0x0000

C:\HORCM\etc>paircreate -g vg01 -m cc -vl

C:\HORCM\etc>echo hd0 | inqraid
Harddisk0 -> [ST] CL1-A Ser =75000067 LDEV =    1 [HITACHI ] [DF600F         ]
             HORC = SMPL  HOMRCF[MU#0 = P-VOL MU#1 = SMPL MU#2 = SMPL]
             RAID5[Group  2- 0] SSID = 0x0000

                                  The LU has been migrated to the other RAID group.
```

Figure 6.3 Inqraid Command Example

For details on the inqraid command and its options, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

6.3 Splitting Volume Migration Pairs (pairsplit -S)

In the case of CCI, release of a migration pair and cancellation of the migration are executed by the same command.

The following procedure describes releasing a pair and placing the migration volume in the simplex status (SMPL) after the migration was completed or failed.

For example, if the group name in the configuration definition file is VG01, follow these steps:

1. Execute the `pairdisplay` command to verify that you want to release the Volume Migration pair status to be PSUS or PSUE.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.P-VOL PSUS,75000174     2  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.S-VOL SSUS,-----        1  -
```

2. Execute the `pairsplit` (`pairsplit –S`) command to release the Volume Migration pair (see Figure 6.4).

```
C:\HORCM\etc>pairsplit -g VG01 –S
```

Figure 6.4 Pairsplit -S Command Example

3. Execute the `pairdisplay` command to verify that the pair status changed to SMPL.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.SMPL -----,-----   ----  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.SMPL -----,-----   ----  -
```

4. Execute the `inqraid` command to confirm that the RAID group to which the LU belongs to has changed.

```
C:\HORCM\etc>inqraid hd1
Harddisk1 -> [ST] CL1-A Ser =75000174 LDEV =   1 [HITACHI ] [DF600F          ]
             HORC = SMPL  HOMRCF[MU#0 = SMPL MU#1 = SMPL MU#2 = SMPL]
             RAID6[Group  3- 0] SSID = 0x0000
```

The Volume Migration pair is released. For details on the pairsplit command and the -S option, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

Note: When an S-VOL is changed from PSUS (SSUS) to SMPL due to a pair release or from COPY to SMPL because of a migration cancellation, be careful when making it recognized by the same host as the P-VOL through a change of mapping information. For more details refer to the section 3.2.1.

Before making the LU(s) recognizable to the host, format the LU(s) released from the **Reserve LU**. Refer to section 3.2.1 for cautions.

Follow the procedure below when formatting is necessary using Storage Navigator.

1. Select the **RAID Groups** icon.
2. Select the LU(s) for the S-VOL that released the pair, and right-click the LU(s).

   Select **Format** from the pop-up menu.

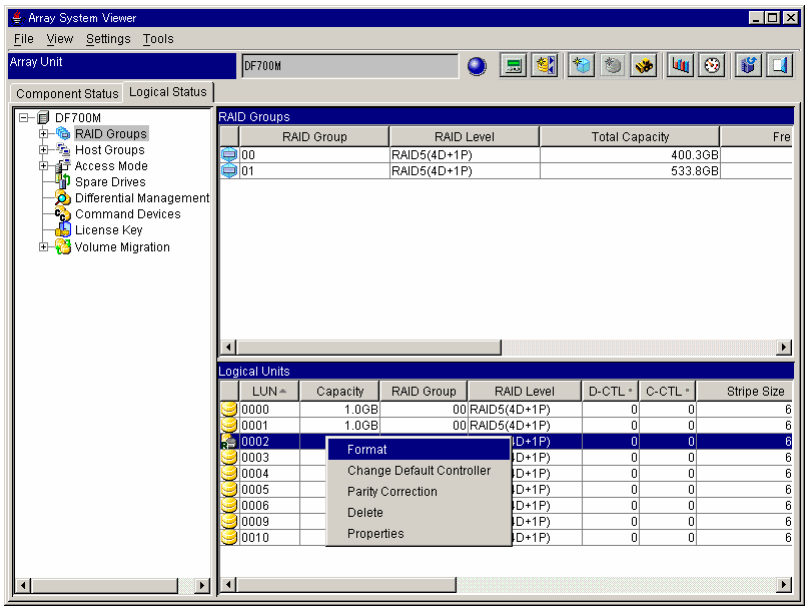
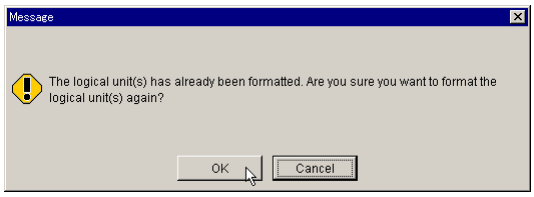


Figure 6.5 Formatting using Storage Navigator

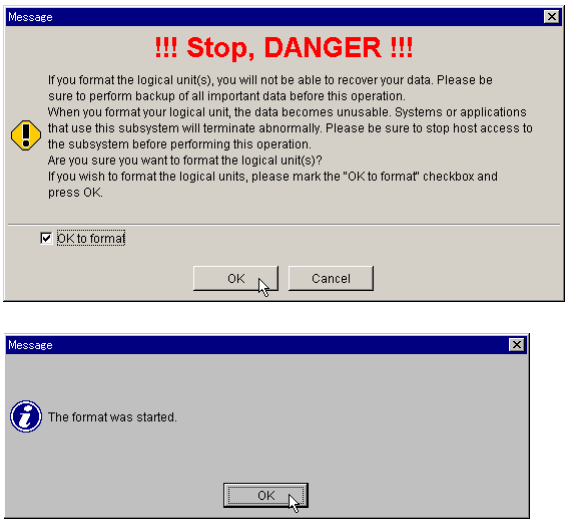
3. A confirmation message displays.

   Click **OK**.



4. A caution message displays.

   Select **OK to format,** and then click **OK**.



   The LU(s) for the S-VOL, which released the pair, is now formatted (see Figure 6.6).

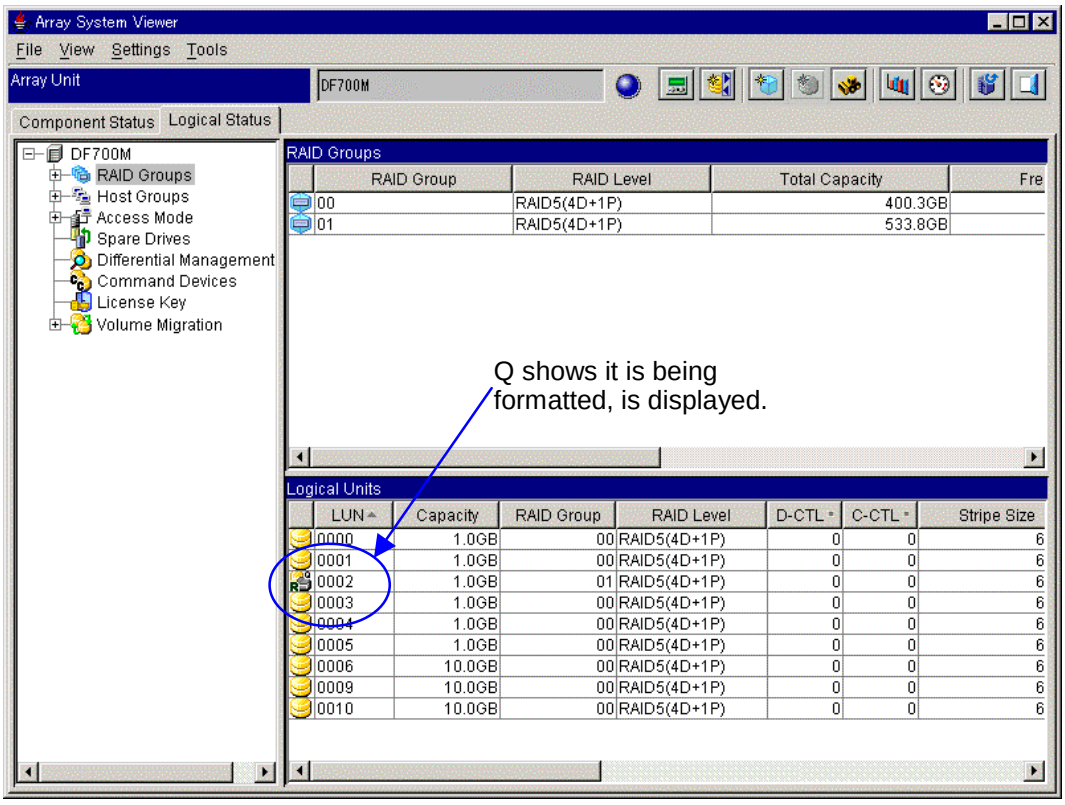


Figure 6.6 Formatting the LUs

6.4 Canceling Volume Migration Pairs (pairsplit -S)

In the case of CCI, releasing the migration pair and canceling the migration are executed by the same command.

Note: The migration cannot be temporarily stopped or resumed once it has been executed. When the migration is canceled and then executed again, Volume Migration copies all of the data again.

The following procedure describes canceling the migration and placing the migration volume in the simplex status (SMPL) by releasing the pair.

For example, if the group name in the configuration definition file is VG01, follow these steps:

1. Execute the `pairdisplay` command to verify that you want to change the Volume Migration pair status to be COPY.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.P-VOL COPY,75000174     2  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.S-VOL COPY,-----        1  -
```

2. Execute the `pairsplit` (`pairsplit –S`) command to cancel the Volume Migration pair.

```
C:\HORCM\etc>pairsplit -g VG01 -S
```

3. Execute the `pairdisplay` command to verify that the pair status changed to SMPL.

```
C:\HORCM\etc>pairdisplay -g VG01
Group   PairVol(L/R) (Port#,TID, LU-M) ,Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01    oradb1(L)    (CL1-A , 1,  1-0 )75000174     1.SMPL -----,-----   ----  -
VG01    oradb1(R)    (CL1-A , 1,  2-0 )75000174     2.SMPL -----,-----   ----  -
```

The Volume Migration pair is cancelled. For details on the pairsplit command and the -S option, refer to the *Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage Command Control Interface (CCI) User and Reference Guide (MK-95DF701)*.

Note 1: When an S-VOL is changed from PSUS (SSUS) to SMPL because of a pair release or from COPY to SMPL because of a migration cancellation, be careful when making it recognized by the same host as the P-VOL through a change of mapping information. For more details refer to the section 3.2.1.

Note 2: Even if the purpose of the “pairsplit –S” command is cancellation of the Volume Migration “pairs”, the “pairsplit –S” command also functions for releasing Volume Migration pairs when the migration process has completed. After cancellation of the Volume Migration pairs, confirm the LU is allocated in the same RAID group as before executing Volume Migration by confirming Volume Migration pairs.

When canceling Volume Migration, format the LU(s) for the S-VOL before making the LU(s) recognizable to the host. Refer to section 3.2.1 for cautions.

Follow the procedure below when formatting is necessary using Storage Navigator.

1. Select the **RAID Groups** icon.
2. Select LU(s) for the S-VOL when canceling Volume Migration.

   Right-click the LU(s), and then select **Format** from the pop-up menu (see Figure 6.7).

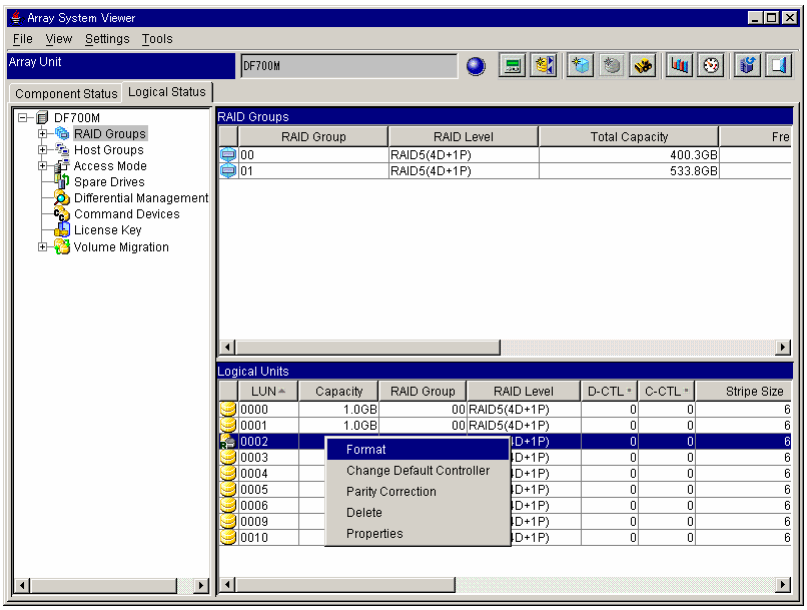
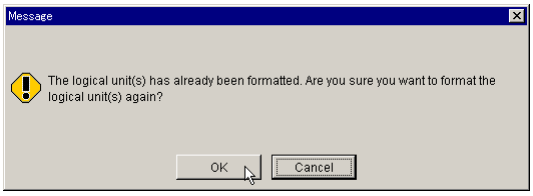


Figure 6.7 Cancelling Volume Migration

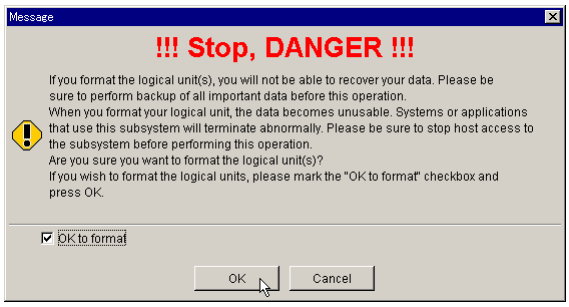
3. A confirmation message displays.

   Click **OK**.



4. A caution message displays.

   Select **OK to format** and then click **OK**.



The LU(s) for S-VOL at the time of the Volume Migration cancellation is now formatted (see Figure 6.8).

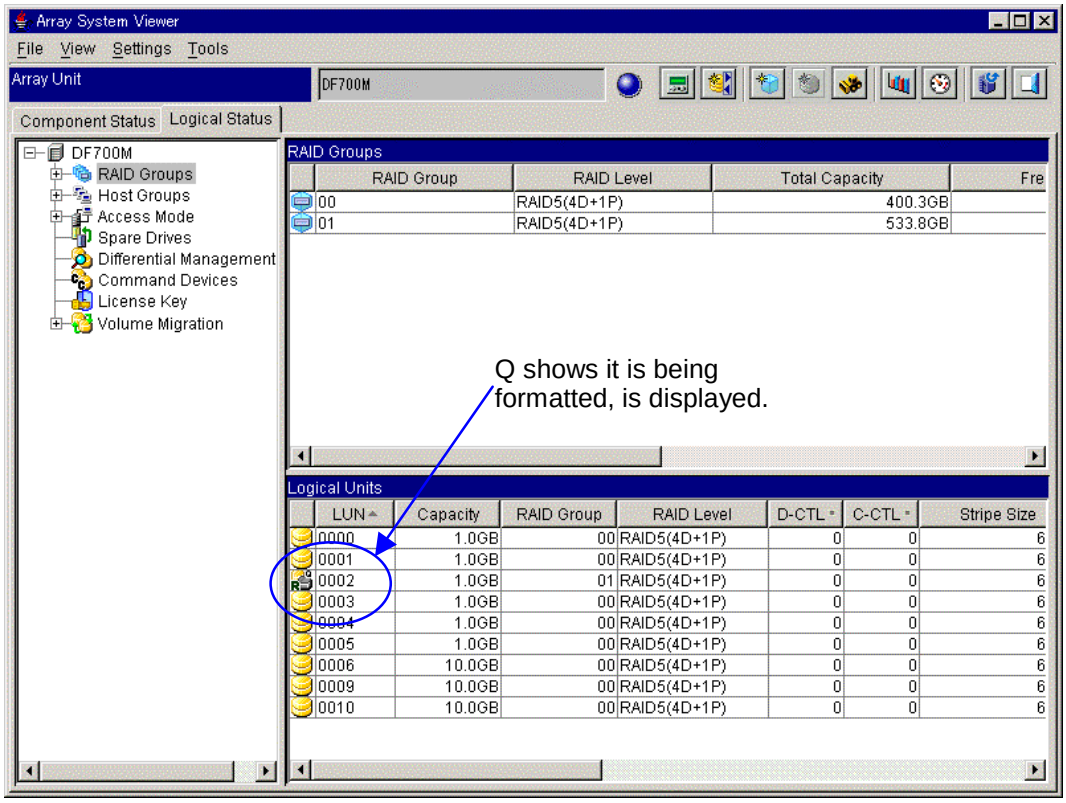


Figure 6.8 Formatted S-VOLs

Acronyms and Abbreviations

Acronym	Expansion
AMS	Adaptable Modular Storage
CCI	Command Control Interface
CLI	Command Line Interface
GUI	graphical user interface
HDD	hard disk drive
I/O	input/output
LAN	local area network
LU	logical unit
LUN	logical unit number
MVM	Modular Volume Migration
NAS	network attached storage
OSI	Open Systems Interconnection
PSUE	pair suspended-error status
PSUS	pair suspended-split
P-VOL	primary volume
RAID	redundant array of independent disks
SMPL	simplex status
S-VOL	secondary volume
TCE	TrueCopy Extended Distance
V-VOL	virtual volume
VxVM	Veritas Volume Manager
WMS	Workgroup Modular Storage

Glossary

A

Attribute

As used in this document, an attribute is one or more qualities possessed by an object.

B

background copy

A physical copy of all tracks from the source volume to the target volume

C

Cache

Cache is a temporary, high-speed storage mechanism. It can be either a reserved section of main memory or an independent high-speed storage device. Two types of caching are found in computers: memory caching and disk caching. Memory caches are built into the architecture of microprocessors and often computers have external cache memory. Disk caching works like memory caching; however, it uses slower, conventional main memory that on some devices is called a memory buffer.

Capacity

Capacity is the amount of information (in bytes) that can be stored on a disk drive. The capacity of a hard disk drive is usually expressed in megabytes. Capacity is the measure of the potential contents of a device; the volume it can contain or hold. In communications, capacity refers to the maximum possible data transfer rate of a communications channel under ideal conditions.

Channel

A channel is the path data communication follows between two nodes of a network. It is the link between the central processor and the peripherals. A channel can be the physical cabling that connects the nodes on a network, an electronic signal traveling over a pathway, or a sub-channel in a carrier frequency.

Configuration

Configuration for hardware involves setting various switches and jumpers. For software it means defining the values of parameters. For hardware and software respectively, configuration is the arrangement of the components that make up the system or the set up and set values of the software.

Cluster

A cluster is group of disk sectors. The operating system assigns a unique number to each cluster and then keeps track of files according to which clusters they use.

command devices

Command devices are dedicated logical volumes that are used only by management software such as CCI, to interface with the storage subsystems. Command devices are not used by ordinary applications. Command devices can be shared between several hosts. Up to two command devices can be configured per TCE subsystem.

configuration

Configuration for hardware involves setting various switches and jumpers. For software it means defining the values of parameters. For hardware and software respectively, configuration is the arrangement of the components that make up the system or the set up and set values of the software

configuration definition file

The configuration definition file describes the system configuration for making CCI operational in a TCE environment. The configuration definition file is a text file created and/or edited using any standard text editor, and can be defined from the PC where the CCI software is installed. The configuration definition file describes configuration of new TCE pairs on the primary or remote subsystem.

control unit (CU)

The control unit is a CPU component that implements microprocessor instructions.

I

iSCSI

iSCSI (Internet-Small Computer Systems Interface) is used as an IP-based standard for carrying SCSI commands over IP networks which link data storage devices and allows the transfer of data.

L

logical

Logical is used to describe a user's view of the way data or systems are organized. The opposite of logical is physical, which refers to the real organization of a system. A logical description of a file is that it is a quantity of data collected together in one place. The file appears this way to users. Physically, the elements of the file could live in segments across a disk.

logical device (LDEV)

A logical device is a group of hardware items that the operating system treats as a single unit.

Logical Unit (LU)

See User Logical Unit (LU)

logical unit number (LUN)

LUN is a three-bit code identifier for a logical unit. LUN0-7 can be assigned.

M

microcode

Microcode is the lowest-level instructions directly controlling a microprocessor. Microcode is generally hardwired and cannot be modified.

P

pair splitting

Pair splitting refers to the termination of a volume pair relationship to temporarily stop update copy processing for the specified volume pair. Pairs may also be split before system reduction tasks.

Pair status

The status of the logical volume that is paired.

Panel

In this document, a *panel* is equivalent to a *window*.

primary volume (P-VOL)

A primary volume is the storage volume in a volume pair, used as the source of a copy operation. In copy operations a copy source volume is called the "P-VOL" while the copy destination volume is called "S-VOL" (secondary volume).

S

secondary volume (S-VOL)

A secondary volume (S-VOL) is a replica of the primary data volume (P-VOL), maintained on the standby subsystem. Recurring differential data updates are performed to keep the data in the S-VOL consistent with data in the P-VOL.

Service

A service is the set of functions that one of the seven (7) Open Systems Interconnection (OSI) model layers delivers to the layer above it. For example, the TCP layer provides a reliable byte-stream service to the application layer above it.

ShadowImage

ShadowImage is a software program that replicates user data on TagmaStore AMS/WMS disks, bypassing the host system.

Snapshot

A term used to denote a copy of the data and data-file organization on a node in a disk file system. A snapshot is a replica of the data as it existed at a particular point in time.

SNMP

Simple Network Management Protocol is a protocol used to facilitate monitoring and management of clusters through an external interface. SNMP sends notifications to IP addresses whenever certain types of events occur.

Status transition

To change the pair status of the pair volume

Storage Navigator

The TagmaStore Storage Navigator consists of a group of Java™ applet programs that enable users to manage the TagmaStore subsystem. Storage Navigator Java™ applet programs run on a web browser to provide a user-friendly interface for TagmaStore web client functions.

T

TrueCopy

TrueCopy is a software program that replicates data between two TagmaStore disks, independent of the host system. TrueCopy versions are available for TagmaStore AMS/WMS and USP/NSC subsystems. TrueCopy for z/OS is a mainframe version.

V

volume

A volume is the basic unit of storage that includes recovery logs and storage pools. A volume can be a logical volume management (LVM) logical volume, a standard file system file, a tape cartridge, or an optical cartridge. The various types of defined volumes include: external, internal, copy source, copy destination, reserve, data, journal, virtual, pool, system, LUSE, copy pair, and USP.

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