PRELIMINARY RELEASE

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Hitachi Freedom Storage™ Lightning 9900™ V Series

LUN Expansion and Virtual LVI/LUN User's Guide

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Referenced Documents

Hitachi Lightning 9900V documentation referenced in this document:

- *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK-92RD101)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD104)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series FlashAccess User's Guide* (MK-92RD102)

Preface

This *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Expansion Virtual LVI/LUN User's Guide* provides instructions for using these options on the 9900V Remote Console, using the web client Java™ applet program for the 9900V subsystem.

This user's guide assumes that:

- The user has a background in data processing and understands direct-access storage device (DASD) subsystems and their basic functions,
- The user is familiar with the Hitachi 9900V array subsystem, and the user is familiar with the Windows NT® or Windows® 2000 operating systems.

For further information on the 9900V Remote Console and Java™ applet, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK-92RD100), or contact your Hitachi Data Systems account team.

For further information on the 9900V subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100), or contact your Hitachi Data Systems account team.

Note: The term "9900V" refers to the entire Lightning 9900™ V Series subsystem family, unless otherwise noted. The use of the Lightning 9900™ V Series Remote Console, the web client Java™ applet and any other optional functions is governed by the terms of the applicable license and other agreement(s) with Hitachi Data Systems.

Note: This product includes software developed by the Apache Group for use in the Apache HTTP server project (http://www.apache.org/)

Microcode Level

This document revision applies to 9900V microcode versions 21-01-*XX* and higher.

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Please refer to specific page(s) and paragraph(s) whenever possible.

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Thank you!

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1.1 Overview of LUSE Operations

LUSE operations allow hosts that can only use a limited amount of LUs per fibre interface to have access to larger amounts of data using expanded LUs. LUSE operations include the following:

- Creating new expanded LUs (LUSE volumes) (see section 3.2).
- Releasing expanded LUs (LUSE volumes) to individual LUs (see section 3.2.2).
- Changing the size of a LUSE volume (see section 3.2.3).

The following guidelines apply to LUN Expansion:

- A maximum of 256 expanded LUs can be configured on the same port.
- LDEVs that are to be combined into LUSE volumes must have no assigned SCSI paths and be unmounted from the host. These are known as free (or available) LDEVs. For instructions on deleting SCSI paths, please see *Hitachi Freedom Storage™ Lightning 9900™ LUN Manager User's Guide* (MK-92RD105).
- Combining non-sequential LDEVs into a LUSE is supported, provided they are on the same CU.
- Combining Virtual LVI/LUN volumes into a LUSE is supported, provided they are the same size and emulation type and on the same CU. The order of operations is important: you must first create one or more Virtual LVI/LUN volumes, and then combine those volumes into a LUSE volume. You cannot perform Virtual LVI/LUN operations on an existing LUSE volume because a LUSE volume must have a SCSI path already specified.
- Combining Virtual LVI/LUN volumes and normal volumes into the same LUSE is not supported.
- Combining command devices, Just In Time and CruiseControl volumes into a LUSE is not supported.
- Combining RAID 1 and RAID 5 into the same LUSE is not supported.
- Combining emulation types (OPEN-3, OPEN-8, OPEN-9, OPEN-E, or OPEN-L) into the same LUSE is not supported.
- Some operating systems may experience slow disk access times with large logical units, if they contain a large number of high usage files.
- The size of a LUSE can affect the amount of time required to perform backups.

Note: The queue depth for open systems can vary, depending on the type of platform. Please contact your Hitachi Data Systems Customer Support Center for assistance.

Warning: Except for systems running Windows NT® or Windows® 2000, creating and releasing expanded LUs is a destructive process. Be sure to back up your data before proceeding.

Table 1.1 LUSE Specifications

Parameter	OPEN-8	OPEN-9	OPEN-E	OPEN-L
LU Capacity	7.3 GB	7.3 GB	14.5 GB	36.4 GB
Possible number of expanded LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs
Expanded LU Capacity	14.6 GB - 264.4 GB	14.7 GB - 265.8 GB	29.1 GB - 524.4 GB	72.9 GB - 1312.2 GB
Product Name	OPEN-8*n (n = # of LUs in the expanded LU)	OPEN-9*n (n = # of LUs in the expanded LU)	OPEN-E*n (n = # of LUs in the expanded LU)	OPEN-L*n (n = # of LUs in the expanded LU)

Table 1.2 VLL LUSE Specifications

Parameter	OPEN-3	OPEN-8	OPEN-9	OPEN-E
LU Capacity	35 MB - 2.4 GB	35 MB - 7.3 GB	35 MB - 7.3 GB	35 MB - 14.5 GB
Possible number of connected LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs
Capacity of expanded LUs	70 MB - 84.2 GB	70 MB - 250.2 GB	70 MB - 252.6 GB	70 MB - 524.4 GB
Product Name	OPEN-3*n-VLL (n = # of LUs in the expanded LU)	OPEN-8*n-VLL (n = # of LUs in the expanded LU)	OPEN-9*n-VLL (n = # of LUs in the expanded LU)	OPEN-E*n-VLL (n = # of LUs in the expanded LU)

Note: Virtual LVI/LUN is not applicable to OPEN-L.

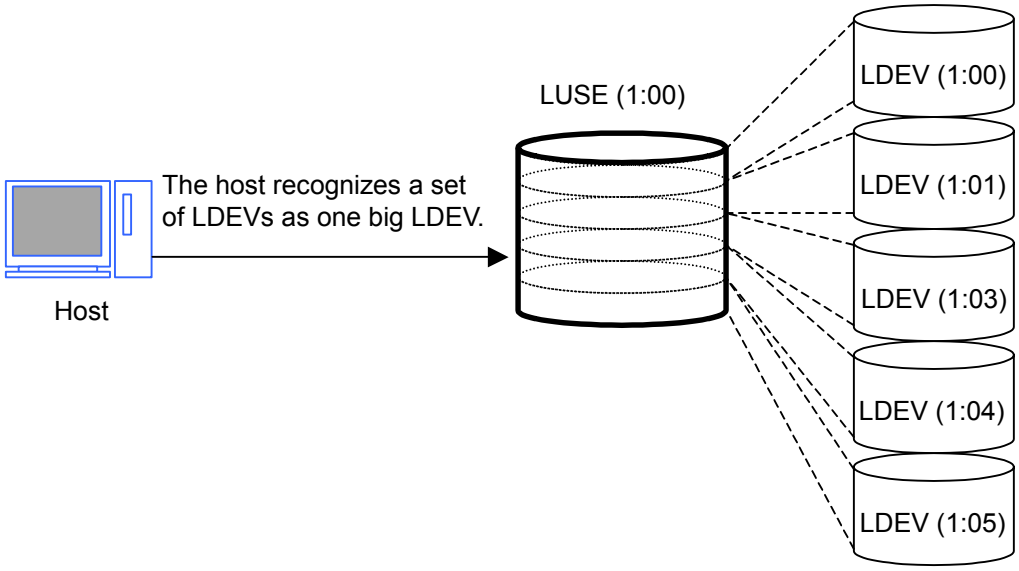


Figure 1.1 LUSE Configuration

1.2 Overview of Virtual LVI/LUN

1.2.1 Virtual LVI/LUN Parameters

The Virtual LVI/LUN (VLL) option allows you to configure variable-size volumes, which are usually smaller than normal (fixed-size) volumes. Virtual LVI/LUN improves data access performance by reducing logical device contention and host I/O queue times, particularly when several frequently accessed files are located on the same volume. Virtual LVI/LUN enables better utilization of the physical storage capacity of the 9900V, and reduces the amount of administrative effort required to balance I/O workloads.

Virtual LVI/LUN allows you to perform the following types of operations:

- Converting a normal volume into free space (see section 4.2.1),
- Defining and installing a Virtual LVI/LUN (customized) volume (see section 4.2.2),
- Deleting a Virtual LVI/LUN volume (see section 4.2.3), and
- Initializing a Virtual LVI/LUN volume (see section 4.2.4).

Figure 1.2 illustrates the available Virtual LVI/LUN functions:

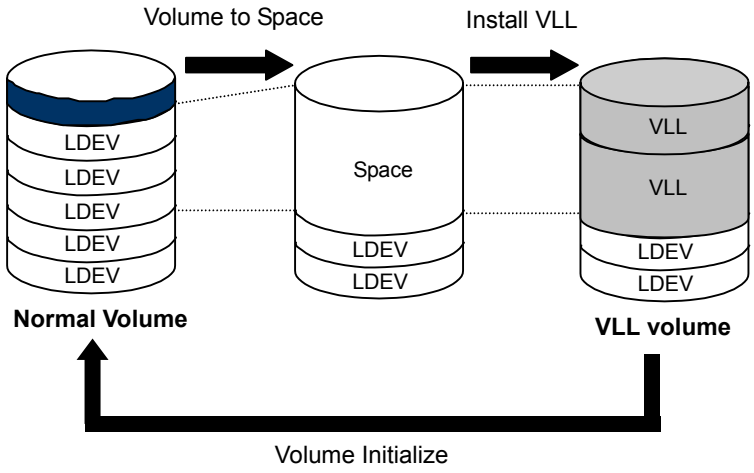


Figure 1.2 Illustration of Virtual LVI/LUN Operations

Note: Virtual LVI/LUN used in conjunction with FlashAccess can achieve greater performance improvements than when either of these options is used individually. For more information on FlashAccess, see *Hitachi Freedom Storage™ Lightning 9900™ V Series FlashAccess User's Guide* (MK-92RD102).

A parity group is called a normal or fixed-size volume (FV) when all of its member LDEVs are fixed-size. In a normal volume, the size of the member LDEVs is determined by type of device that is being emulated, and the number of LDEVs is determined by the physical size of the parity group.

Generally, each array group will have a certain amount of free space available after the standard LDEVs for the array group have been defined. On the 9900V, Virtual LVI/LUN formats one or more of the LDEVs on a selected volume into free space. That free space can either be used to install one or more variable-sized volumes, or left as free space for future use. ***Note:*** At least one LDEV must remain defined as a normal volume in each array group.

The following parameters apply to Virtual LVI/LUN operations:

- S/390® volumes must be offline from the host OS, and open volumes must be either offline or unmounted from the host OS with no SCSI paths assigned to them. For more information on configuring SCSI paths, please see *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager/SANtinel User's Guide (*MK-92RD104).
- Multiple LDEVs can be selected for conversion to Virtual LVI/LUN volumes but they must be in the same parity group.
- When space in an LDEV is converted to a Virtual LVI/LUN volume, an LDEV address is assigned to that Virtual LVI/LUN volume automatically. For mainframes, each Virtual LVI/LUN volume will also have its own assigned unit control block (UCB). The UCB can be assigned either automatically or manually, at the user's option.
- LUSE, volumes secured by LUN Security, and Hitachi SANtinel – S/390® volumes are not available for Virtual LVI/LUN operations, because these volumes must have SCSI paths already defined. To create a VLL/LUSE volume, you must first create two or more Virtual LVI/LUN volumes with the same size, emulation type and CU number, and then combine those volumes into a LUSE device. For more information on creating LUSE devices see Chapter 3.
- Virtual LVI/LUN operations are not available for OPEN-L volumes.
- When you convert a normal volume to a Virtual LVI/LUN volume, you can use all or part of the space previously assigned to that volume (e.g., 3339 cylinders for a 3390-3) for use in Virtual LVI/LUN volumes. Each array group can support a total of 256 volumes, including both fixed-size and Virtual LVI/LUN volumes.

WARNING: The Virtual LVI/LUN function is destructive. Be sure to back up your data before performing Virtual LVI/LUN operations.

A normal volume consists of a certain number of fixed volumes, depending on the emulation type, and some free space. A Virtual LVI/LUN volume usually consists of at least one fixed volume (FV), customized volumes (CV or VLL volumes), and free space (see Figure 1.3).

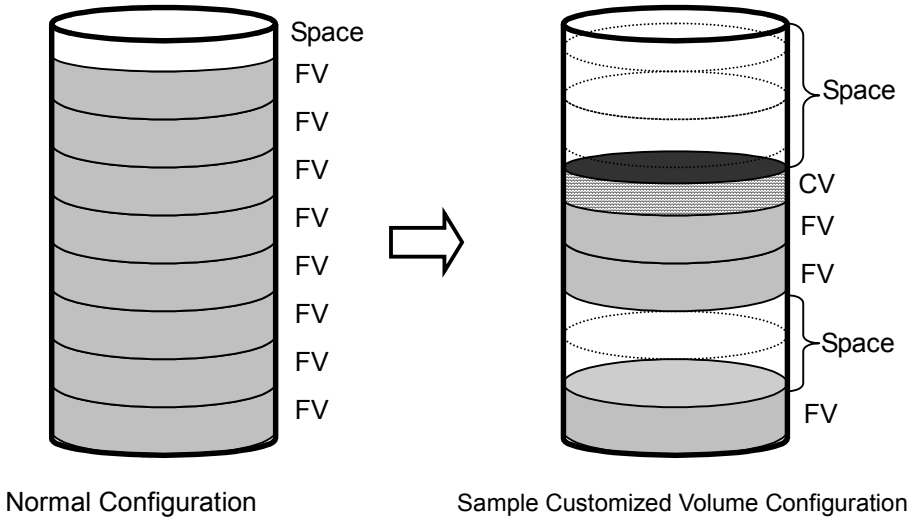


Figure 1.3 Volume Configuration

Table 1.3 lists the Virtual LVI/LUN specifications, and Table 1.4 lists the minimum and maximum Virtual LVI/LUN volume capacities for open systems. Each Virtual LVI/LUN volume has its own assigned unit control block (UCB), and multiple LVI/LUN types can be configured within each Virtual LVI/LUN volume, so long as the device type is from the same device family (e.g. all open volumes, or all 3390s). Open and 3390 volumes are not allowed in the same parity group because they have different formats.

Table 1.3 Virtual LVI/LUN Specifications

Parameter	Mainframe	Open Systems
Track format	3390	OPEN-3, OPEN-8, OPEN-9, OPEN-E
Emulation type	3390-3, -3A, -3B, -3C, -3R, -9, -L	OPEN-3, OPEN-8, OPEN-9, OPEN-E
Ability to intermix emulation type	Yes, for 3390. No for open-system volumes or Hitachi SANtinel - S/390® volumes	Yes, by track geometry (except for AIX®). No for 3390® volumes.
Maximum number of volumes (normal and Virtual LVI/LUN) per parity group	256	256
Maximum number of volumes (normal and Virtual LVI/LUN) per subsystem	8,192	8,192
Minimum size for one Virtual LVI/LUN volume	1 user cylinder (+ control cylinders)	35 MB (+ control area)
Maximum size for one Virtual LVI/LUN volume	See Table 1.5	See Table 1.5
Size increment	1 user cylinder	1 MB
Disk location for Virtual LVI/LUN volumes	Anywhere	Anywhere

Note: VLL functions are not applicable to OPEN-L volumes.

Table 1.4 Minimum and Maximum Virtual LUN Volume Capacities (Open Systems)

Setting size (MB)	Actual Size (MB)	Notes
35	35.15625	Minimum VLL volume capacity
500	500.625	
1000	1000.546875	
2000	2000.390625	
2347	2347.03125	Maximum OPEN-3 volume size
7007	7007.34375	Maximum OPEN-8 volume size
7042	7042.5	Maximum OPEN-9 volume size
13893	13893.04688	Maximum OPEN-E volume size

Table 1.5 shows maximum VLL volume capacities of each emulation type.

Table 1.5 Control Cylinders/Control Area for Each LVI/LU Type

LVI Type	Control Cylinders	Maximum User Cylinders	LU Type	Maximum User MB	Control Area (MB)
3390-3 (A/B/C)	6	3339	OPEN-3	2347	5
3390-3R	6	3339	OPEN-8	7007	19
3390-9	25	10017	OPEN-9	7042	19
3390-L	23	32,760	OPEN-E	13893	13
			OPEN-L	Not applicable	

Note: VLL functions are not applicable to OPEN-L volumes.

1.2.2 Virtual LVI/LUN Size Calculation

The Virtual LVI/LUN Remote Console function enables you to configure LDEVs by dividing them into several devices. Virtual LVI/LUN allows you to assign a specific number of physical cylinders or MB to each Virtual LVI/LUN volume for maximum control over the volume size.

For S/390®, each Virtual LVI volume contains the user-specified number of user cylinders plus a predetermined number of control cylinders, which is calculated as follows:

Physical Tracks = (# User Cylinders) × 15 + (# Control Cylinders) × 15 + Adjustment Tracks

1 Cylinder = 15 Tracks

Where:

Control Cylinders =4, 5, 6, 7, 8, 9, 25, or 27, depending on LVI type (see Table 1.5)

Adjustment Tracks

$$\left(\uparrow \frac{(\text{\# User Cylinders}) + (\text{\# Control Cylinders})) \times 15}{48} \uparrow \times 48\right) - ((\text{\# User Cylinders}) + (\text{\# Control Cylinders})) \times 15$$

($\uparrow\uparrow$ means round up to the next integer, e.g. $\uparrow 3.96 \uparrow = 4.00$)

For example, if you specify 1015 user cylinders for a 3390-3 Virtual LVI volume, the total number of physical cylinders allocated for that device is $1015 \times 15 + 6 \times 15 + 45 = 15360$ tracks (1024 cylinders).

In open systems, the size of the Virtual LUN volume is expressed in MB. The total size of the Virtual LUN volume consists of the user-specified size plus an amount for the control area (see Table 1.5). The amount for the control area is automatically assigned by the Virtual LVI/LUN software. The size calculation is as follows:

X = User specified MB × 1024 ÷ 720 (Any remainder is rounded up to the next whole number).
Y = (X × 96 × 15 × 512) ÷ 1024 ÷ 1024

X is a value of converting the capacity specified by user into number of cylinders.
Y is a value of converting value X into capacity (MB).

For example, if an open-systems user specifies a Virtual LUN volume size of 100 MB, the software will calculate the actual size of the volume as follows: $100 \times 1024 \div 720 = 142.2222$ (rounded up to 143). $(143 \times 96 \times 15 \times 512) \div 1024 \div 1024 = 100.546875$ (MB).

1.2.3 SSID Requirements)

The 9900V subsystem is configured with one SSID for each of 256 devices and up to four SSIDs per CU image. Each SSID must be unique within each host system. Table 1.6 shows the relationship between emulation types of controllers and SSIDs.

Table 1.6 SSID Requirements

Controller emulation type	SSID requirement	LVI/LUN Support
3990-6, 3390-6E	$(0104)_x$ - $(FFFD)_x$	3390, OPEN-3, OPEN-8 and OPEN-9 volumes
2105-F20	$(0104)_x$ - $(FFFD)_x$	3390, OPEN-3, OPEN-8 and OPEN-9 volumes

Chapter 2 Preparing To Use LUN Expansion or Virtual LVI/LUN

2.1 Set Up the 9900V Subsystem and Remote Console PC(s)

Before launching LUN Expansion or Virtual LVI/LUN, you must take several preliminary steps. For detailed instructions, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK-92RD101). These include the following:

- Install the 9900 subsystem.
- Install the PC(s) that you intend to use as Remote Consoles, and connect them to the 9900V internal LAN.
- Enable LUN Expansion and/or Virtual LVI/LUN on each subsystem where you intend to use these options.

2.2 Launch LUN Expansion or Virtual LVI/LUN

To use LUN Expansion or Virtual LVI/LUN, you must first log on to the primary SVP. For detailed instructions on the login process, see *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK-92RD101).

If you successfully log on to the primary SVP, the Remote Console Main panel opens (see Figure 2.1). The **Option** buttons are displayed vertically on the left side of the panel. The **LUN Expansion (LUSE) Virtual LVI/LUN (VLL)** button () opens the LUSE/VLL panel (see Figure 3.1).

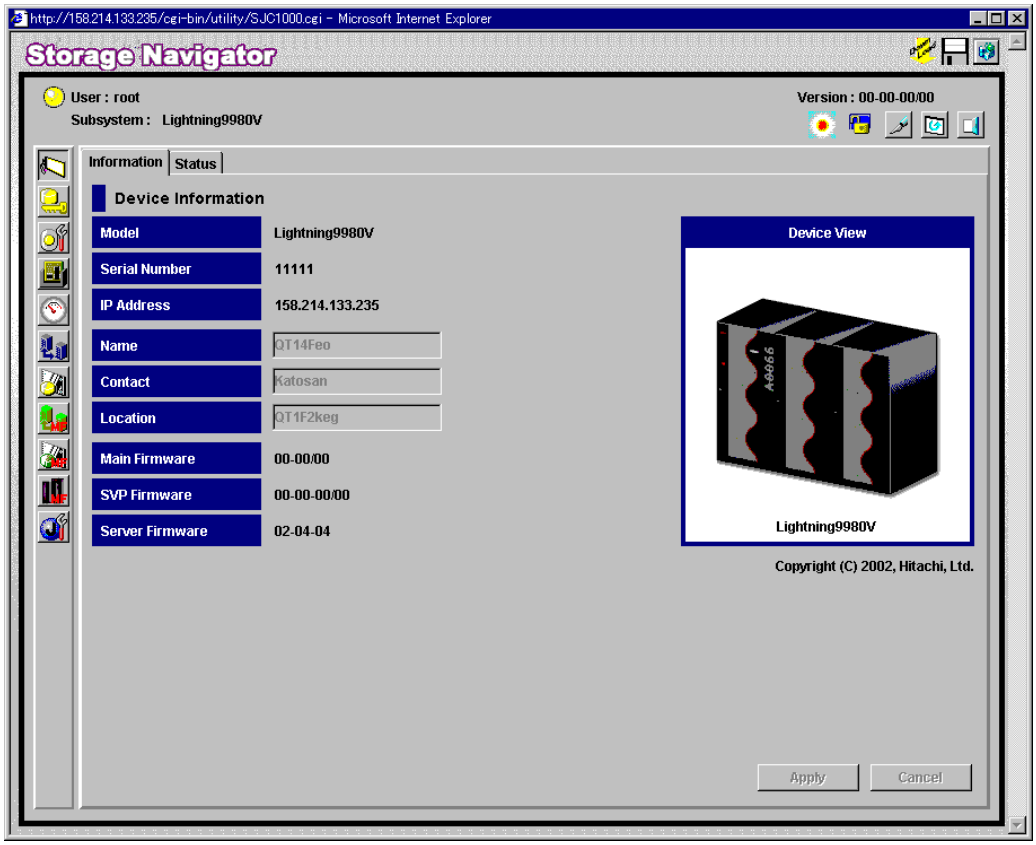


Figure 2.1 Remote Console Main Panel, Information Tab

2.3 Changing to Modify Mode

If you are going to implement any changes for LUN Expansion or Virtual LVI/LUN, you must be in **Modify** mode. The subsystem information icons (see Figure 2.2) are on the upper right corner of the Remote Console Main panel, and they appear on all option panels as well. These icons are described in detail in *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator* (MK-92RD101). If you want to change from **View** mode to **Modify** mode and back, two of the icons are important:

- The exclusive lock icons indicate the operation mode of all currently logged-in users. If all users are operating in **View** mode, the **Unlocked** icon () is displayed. If a user is operating in **Modify** mode, or if subsystem maintenance or SNMP operations are being performed, the **Locked** icon () is displayed.
- The **Mode-Changing** buttons allow users to change the operation mode between **View** mode () and **Modify** mode (). ***Note*:** Only one user at a time can be in **Modify** mode.

To change between View mode to Modify mode:

1. You must have administrator or write access for the option that you want to use. For details on assigning user access, see *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator* (MK-92RD101).
2. Verify that the subsystem is unlocked. If all users are operating in **View** mode, the **Unlocked** icon () and the **View** Mode icon () are displayed (see Figure 2.2). If a user is operating in **Modify** mode, or if subsystem maintenance is being performed, the **Locked** icon () is displayed, and you will not be able to change to **Modify** mode.
3. Select the **Mode Changing** icon, which should be in **View** mode (). Select on the icon, and a confirmation message will display (see Figure 2.3). Select **OK**.
4. The **Mode Changing** icon will change from **View** mode to **Modify** mode (), and the **Locked** icon () will be displayed (see Figure 2.4).
5. Once you have applied your desired changes, you need to change back to **View** mode. Select the **Mode Changing** icon (). The confirmation message will display (see Figure 2.3). Select **OK**, and you will be back in **View** mode.

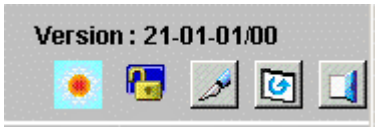


Figure 2.2 View Mode

Figure 2.3 Mode Changing Confirmation Message

Figure 2.4 Modify Mode

Chapter 3 LUN Expansion (LUSE) Operations

3.1 The LUSE/VLL Panel, LUSE Tab Components

The **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button ( ) opens the LUSE/VLL panel. The **LUSE** tab is the default view (see Figure 3.1).

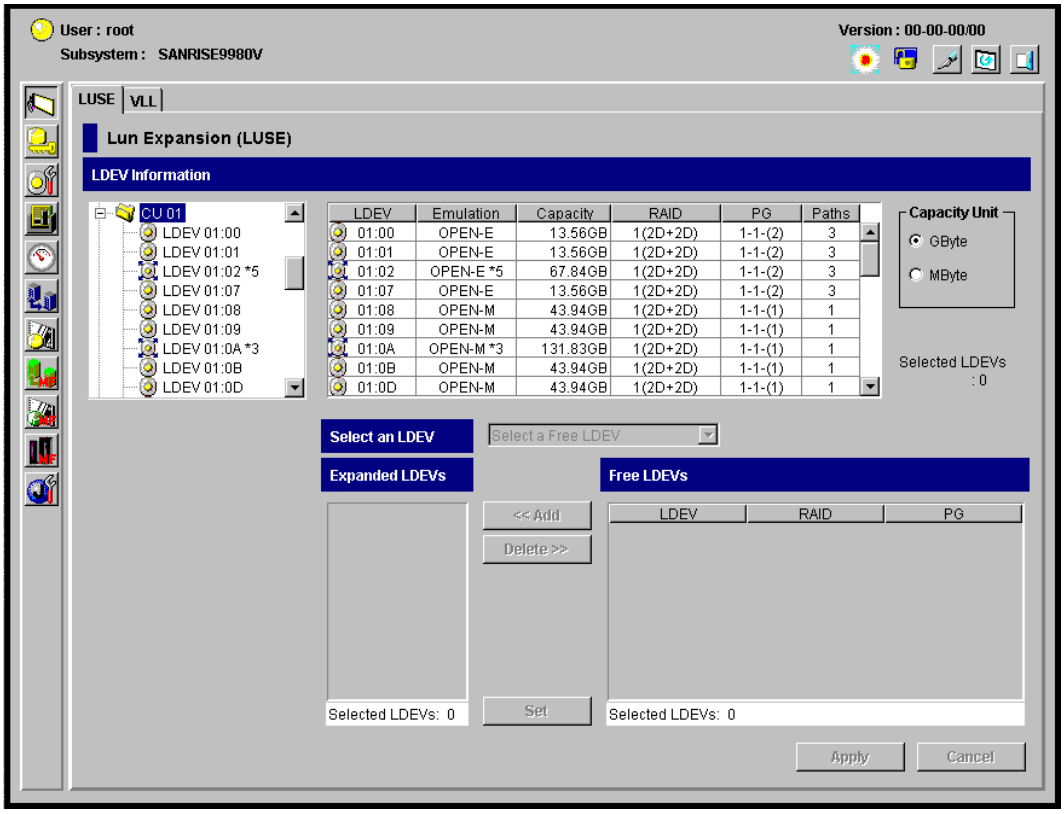


Figure 3.1 LUSE/VLL Main Panel, LUSE Tab

The LDEV Information outline (see Figure 3.2) is on the upper left of the panel.

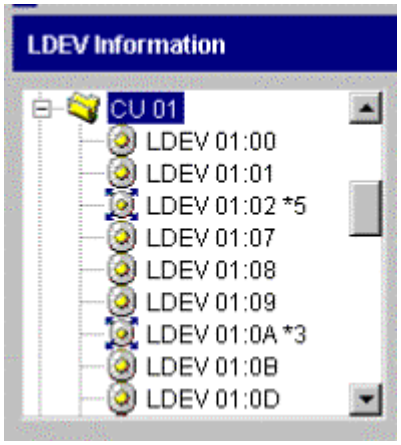
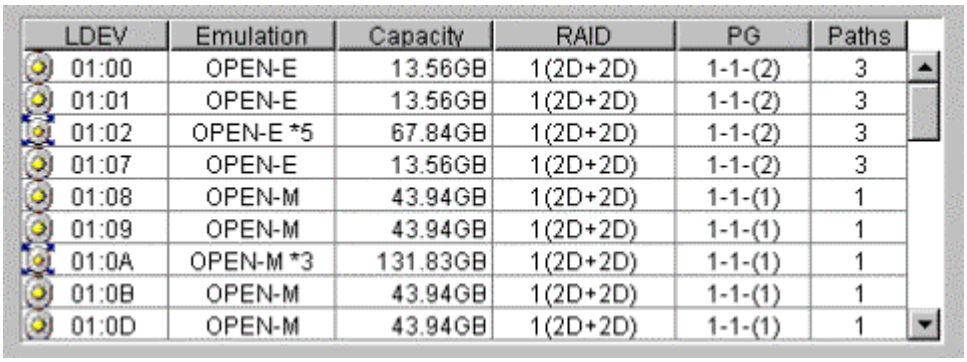


Figure 3.2 LDEV Information Outline Detail (From the LUSE/VLL Panel, LUSE Tab)

LDEV Information outline displays an outline view of the CU and LDEV numbers installed on the subsystem (e.g., CU 00 and has a number of LDEVs, including 00:00). The format of the LDEV number changes if the LDEV is an expanded (LUSE) volume, e.g., if LDEV volume 00:00 consisted of five concatenated LDEVs, its number would change to 00:00*5. The icon will be one of the following:

- indicates a normal (free) LDEV
- indicates an expanded (LUSE) volume

The LDEV table is on the upper right corner of the LUSE tab, and displays data for the LDEV that you have selected in the LDEV Information outline.



LDEV	Emulation	Capacity	RAID	PG	Paths
01:00	OPEN-E	13.56GB	1(2D+2D)	1-1-(2)	3
01:01	OPEN-E	13.56GB	1(2D+2D)	1-1-(2)	3
01:02	OPEN-E *5	67.84GB	1(2D+2D)	1-1-(2)	3
01:07	OPEN-E	13.56GB	1(2D+2D)	1-1-(2)	3
01:08	OPEN-M	43.94GB	1(2D+2D)	1-1-(1)	1
01:09	OPEN-M	43.94GB	1(2D+2D)	1-1-(1)	1
01:0A	OPEN-M *3	131.83GB	1(2D+2D)	1-1-(1)	1
01:0B	OPEN-M	43.94GB	1(2D+2D)	1-1-(1)	1
01:0D	OPEN-M	43.94GB	1(2D+2D)	1-1-(1)	1

Figure 3.3 LDEV Detail Table (From the LUSE/VLL Panel, LUSE Tab)

The LDEV Detail table displays detailed information for all open-system LDEVs in the selected CU. If you have selected a normal LDEV, the information in this section is for the top LDEV. If you have selected a LUSE volume, the information in this table is for all of the LDEVs in the LUSE volume. The table displays the following information:

- **LDEV**: shows an LDEV status icon, and the CU and LDEV number. If the selected LDEV is a LUSE volume, the LDEV number of the top LDEV in the LUSE volume is displayed.
- **Emulation**: shows the emulation type. If the selected LDEV is a LUSE volume, the emulation type is displayed together with an asterisk and the number of volumes in the LUSE volume (e.g., OPEN-E*5)
- **Capacity**: shows the LDEV capacity, displayed in either MB or GB, depending on which unit is selected in the **Capacity Unit** box.
- **RAID**: shows the RAID level.
- **PG**: shows a combination of the disk group, the parity group, and the CU number.
- **Paths**: shows the number of paths (n) that is set for the LDEV.
- **Selected LDEVs**: shows the number of LDEVs selected in the LDEV table
- The **Capacity Unit** box allows you to select the capacity of the LDEV for display, in either **Gbyte** (default view) or **MByte**.

The **LDEV Operation** detail is on the lower right of the **LUSE** tab.

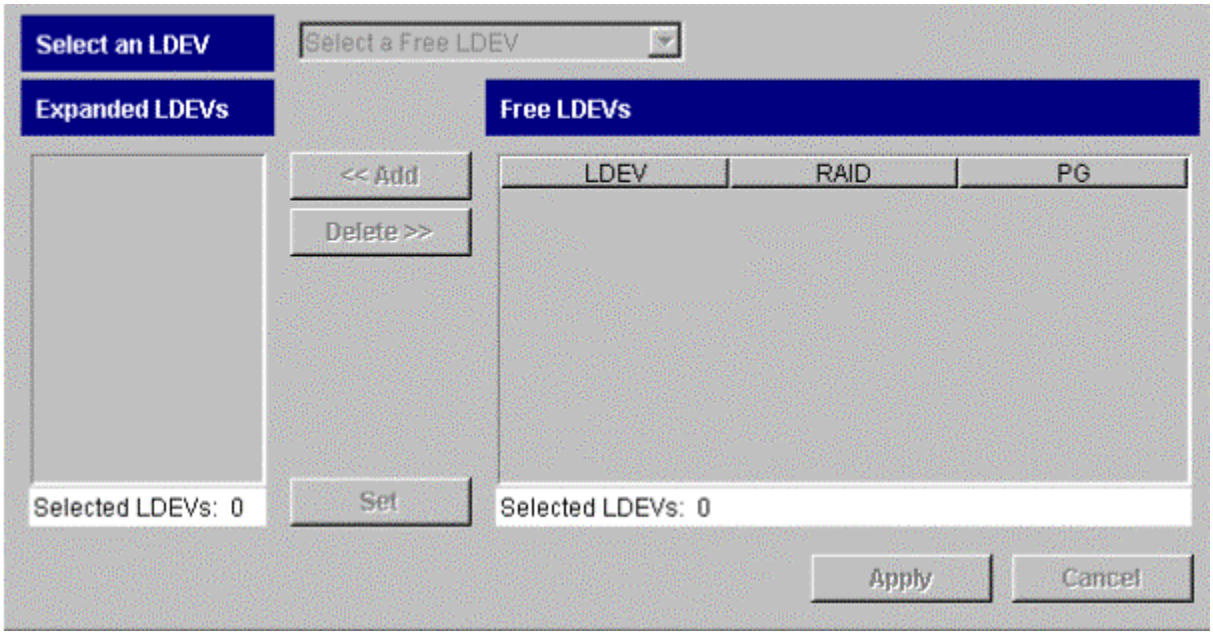


Figure 3.4 LDEV Operation Detail (From the LUSE/VLL Panel, LUSE Tab)

The LDEV Operation detail has the following features:

- The **Select a Free LDEV** drop-down box lists the free LDEVs of the selected CU.
- The **Expanded LDEVs** list displays LDEVs that are selected as LUSE volume components. An LDEV is added to this list when the **<<Add** button is selected (see below).
- The**<<Add** button is used to move an LDEV that has been selected on the **Free LDEVs** list to the **Expanded LDEVs** list.
- The **Delete>>** button is used to move an LDEV that has been selected on the **Expanded LDEVs** list to the **Free LDEVs** list.
- The **Free LDEVs** table displays the free LDEVs that are eligible to become part of a LUSE volume.
- The **Set** button is used to set a LUSE volume to be created out of the volumes currently in the **Expanded LDEVs** list. The new LUSE is displayed in blue on the LDEV table (on the upper right corner of the LUSE tab; refer to Figure 3.3), but is not actually created until you select the **Apply** button (see below).
- The **Apply** button implements the settings to the subsystem.
- The **Cancel** button cancels the setting on the LUSE operation panel.

3.2 LUSE Operations

LUSE operations include the following:

- Creating LUSE volumes (see section 3.2.1),
- Releasing LUSE volumes (see section 3.2.2), and
- Changing LUSE capacities (see section 3.2.3).

3.2.1 Creating a LUSE Volume

> ***WARNING:*** LUSE creation is a destructive operation. Move and/or back up your data before proceeding.

There are two ways to create a LUSE volume:

- Using the LDEV Operation detail (on the lower right of the panel; refer to Figure 3.4), or
- Using the LDEV table (on the upper right corner of the LUSE tab; refer to Figure 3.3).

3.2.1.1 Creating a LUSE Volume From the LDEV Operation Detail

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The LUSE tab is the default view (refer to Figure 3.1).
2. Select a CU number from the **LDEV Information** outline (on the upper left corner of the **LUSE** tab; refer to Figure 3.2).
3. Select the arrow button in the **Select an LDEV** drop-down box (on the lower right of the panel; refer to Figure 3.4). Select the first LDEV for the LUSE from the list. A free LDEV for a LUSE volume is displayed in the **Free LDEVs** list.
4. Select one or more LDEVs for the LUSE volume in the **Free LDEVs** list.
5. Select **<<Add** button to move the selected LDEVs from the **Free LDEVs** list to the **Expanded LDEVs** list.
6. If you want to delete an LDEV from the **Expanded LDEVs** list and move it back to the **Free LDEVs** list, select one or more volumes and then select the **Delete>>** button.
7. Select the **Set** button to display the Set LUSE Confirmation panel (see Figure 3.5). Select **OK** if you want to create the LUSE as indicated. Select **Cancel** if you want to cancel. ***Note***: The new settings will appear on the panel in blue but are not yet implemented.
8. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (see Figure 3.6).
9. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (see Figure 3.7).

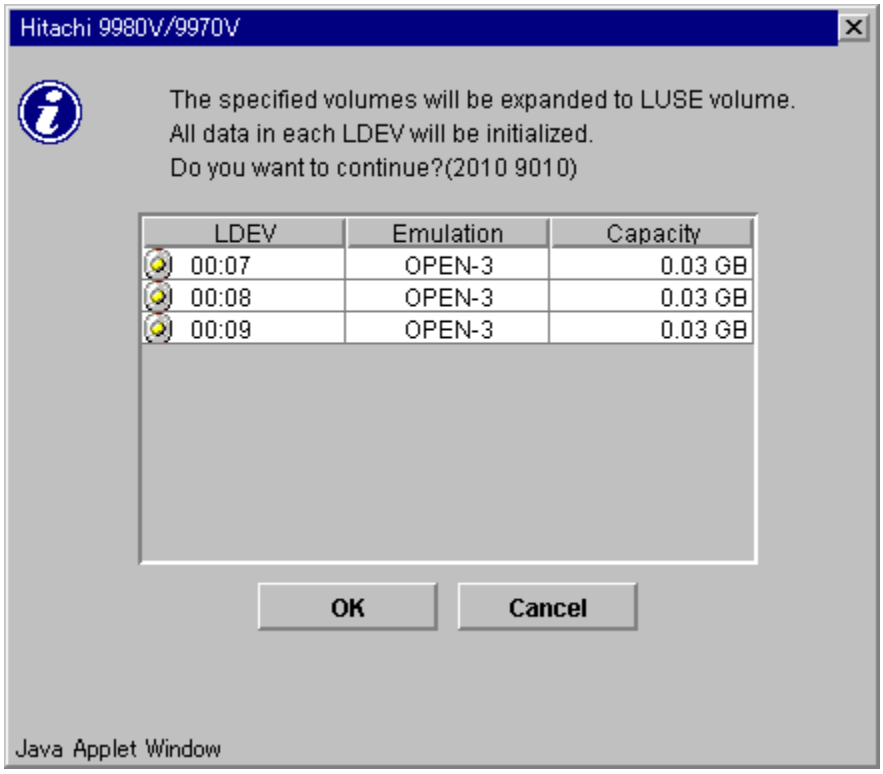


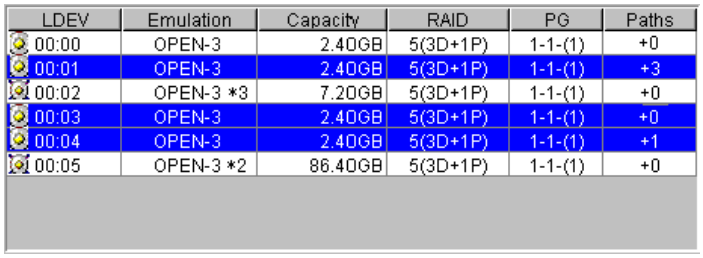
Figure 3.5 Set LUSE Confirmation Panel

Figure 3.6 Apply Confirmation Message

Figure 3.7 Cancel Confirmation Message

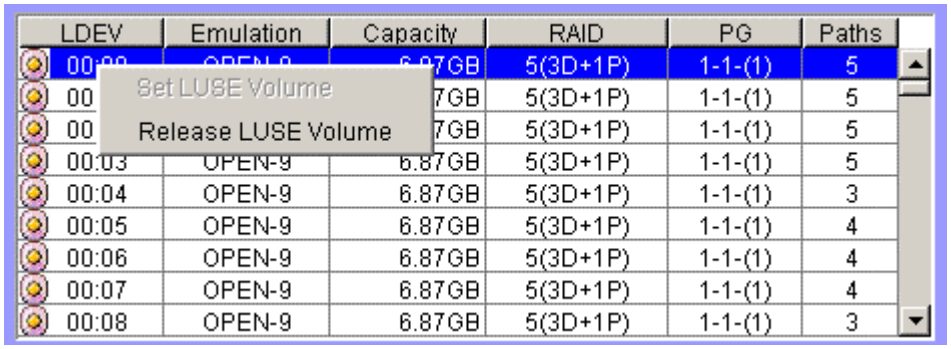
3.2.1.2 Creating a LUSE Volume From the LDEV Table

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The LUSE tab is the default view (refer to Figure 3.1).
2. Select a CU number from the **LDEV Information** outline (on the upper left corner of the **LUSE** tab; refer to Figure 3.2). The LDEV table (on the upper right corner of the LUSE tab; refer to Figure 3.3) shows all LDEVs in the selected CU.
3. In the LDEV table, select and then right click the free LDEVs that you want to for the LUSE volume. This will to display the **Set LUSE Volume** pop-up menu.
4. Select **Set LUSE Volume** to display the Set LUSE Confirmation panel (refer to Figure 3.5).
5. Select the **OK** button to create the LUSE volume, or select **Cancel** to cancel. ***Note***: The settings appear on the panel in blue but are not yet implemented.
6. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (refer to Figure 3.6).
7. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (refer to Figure 3.7).



LDEV	Emulation	Capacity	RAID	PG	Paths
00:00	OPEN-3	2.40GB	5(3D+1P)	1-1-(1)	+0
00:01	OPEN-3	2.40GB	5(3D+1P)	1-1-(1)	+3
00:02	OPEN-3 *3	7.20GB	5(3D+1P)	1-1-(1)	+0
00:03	OPEN-3	2.40GB	5(3D+1P)	1-1-(1)	+0
00:04	OPEN-3	2.40GB	5(3D+1P)	1-1-(1)	+1
00:05	OPEN-3 *2	86.40GB	5(3D+1P)	1-1-(1)	+0

Figure 3.8 Selecting Free LDEVs for LUSE Volume



LDEV	Emulation	Capacity	RAID	PG	Paths
00:00	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	5
00		7GB	5(3D+1P)	1-1-(1)	5
00		7GB	5(3D+1P)	1-1-(1)	5
00:03	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	5
00:04	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	3
00:05	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	4
00:06	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	4
00:07	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	4
00:08	OPEN-9	6.87GB	5(3D+1P)	1-1-(1)	3

Figure 3.9 Set LUSE Volume Pop-Up Menu

3.2.2 Releasing a LUSE Volume

> ***WARNING:*** Releasing LUSE volumes is a destructive operation. Move and/or back up your data before proceeding.

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The LUSE tab is the default view (refer to Figure 3.1).
2. Select a CU number from the **LDEV Information** outline (on the upper left corner of the **LUSE** tab; refer to Figure 3.2). The LDEV table (on the upper right corner of the LUSE tab; refer to Figure 3.3) shows all LDEVs in the selected CU.
3. Select a LUSE volume in the LDEV table (on the upper right corner of the LUSE tab; refer to Figure 3.3). Right-click the LUSE volume to display the **Release LUSE Volume** pop-up menu.
4. Select **Release LUSE Volume**. The Release LUSE volume confirmation panel will display.
5. Verify that the LUSE volumes(s) listed in the confirmation panel are the one(s) that you want to release. ***Note***: The settings appear on the panel in blue but are not yet implemented.
6. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (refer to Figure 3.6).
7. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (refer to Figure 3.7).

LDEV	Emulation	Capacity	RAID	PG	Paths
00:00	OPEN-3	2.29GB	1(2D+2D)	1-1-(1)	
00:01	OPEN-3 *3	6.87GB	1(2D+2D)	1-1-(1)	
00:02	OPEN-3	2.29GB	1(2D+2D)	1-1-(1)	
00:05	OPEN-3 *3	6.87GB	1(2D+2D)	1-1-(1)	
00:08	OPEN-9	6.87GB	5(3D+1P)	1-2-(1)	
00:09	OPEN-9	6.87GB	5(3D+1P)	1-2-(1)	
00:0A	OPEN-9	6.87GB	5(3D+1P)	1-2-(1)	
00:0B	OPEN-9	6.87GB	5(3D+1P)	1-2-(1)	
00:0C	OPEN-9	6.87GB	5(3D+1P)	1-2-(1)	

Figure 3.10 Selecting LUSE Volume(s) To Be Released

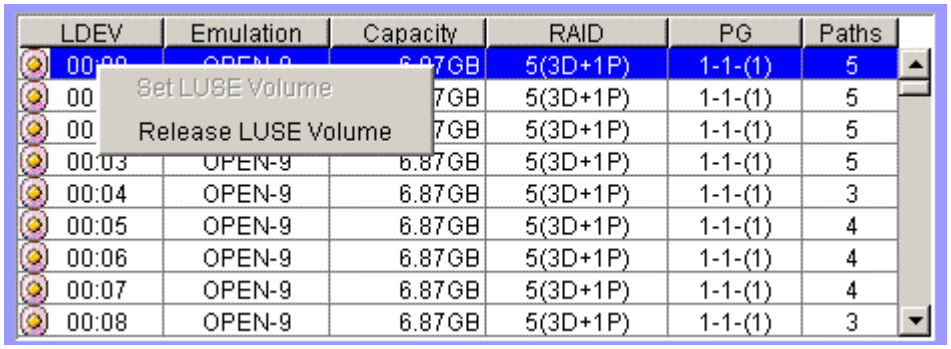


Figure 3.11 Release LUSE Volume Pop-Up Menu

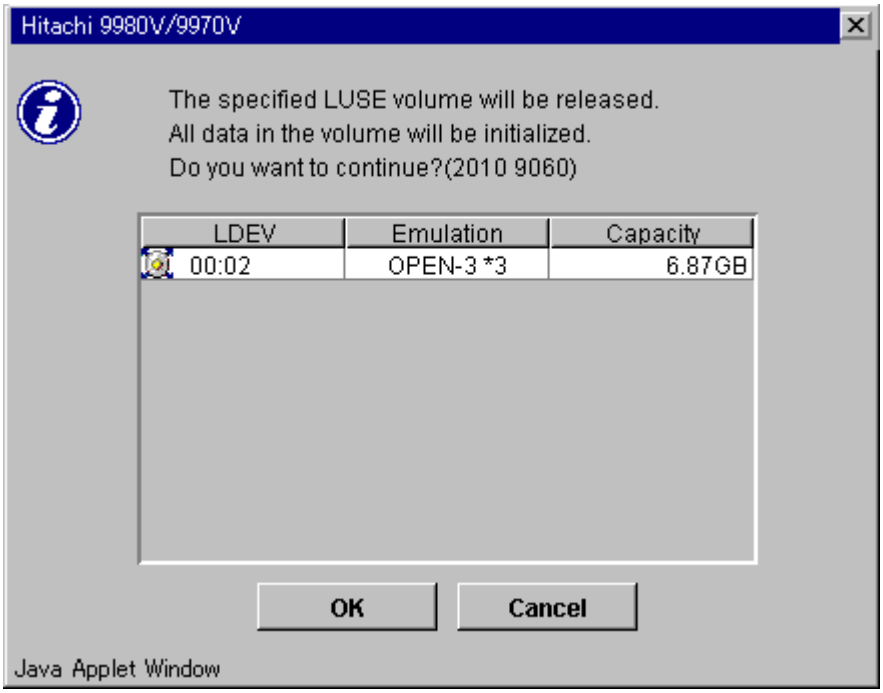


Figure 3.12 Release LUSE Confirmation Panel

3.2.3 Changing LUSE Capacities

You may not change the capacity of an existing LUSE volume. If you want a LUSE volume to have a different capacity, you must release the LUSE volume (refer to section 3.2.2) and then re-define the LUSE volume (refer to section 3.2.1).

Chapter 4 Virtual LVI/LUN (VLL) Operations

4.1 The Virtual LVI/LUN Panels

4.1.1 LUSE/VLL Panel, VLL Tab

The **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button ( ) opens the LUSE/VLL panel. The **LUSE** tab is the default view. Select the **VLL** tab (see Figure 4.1).

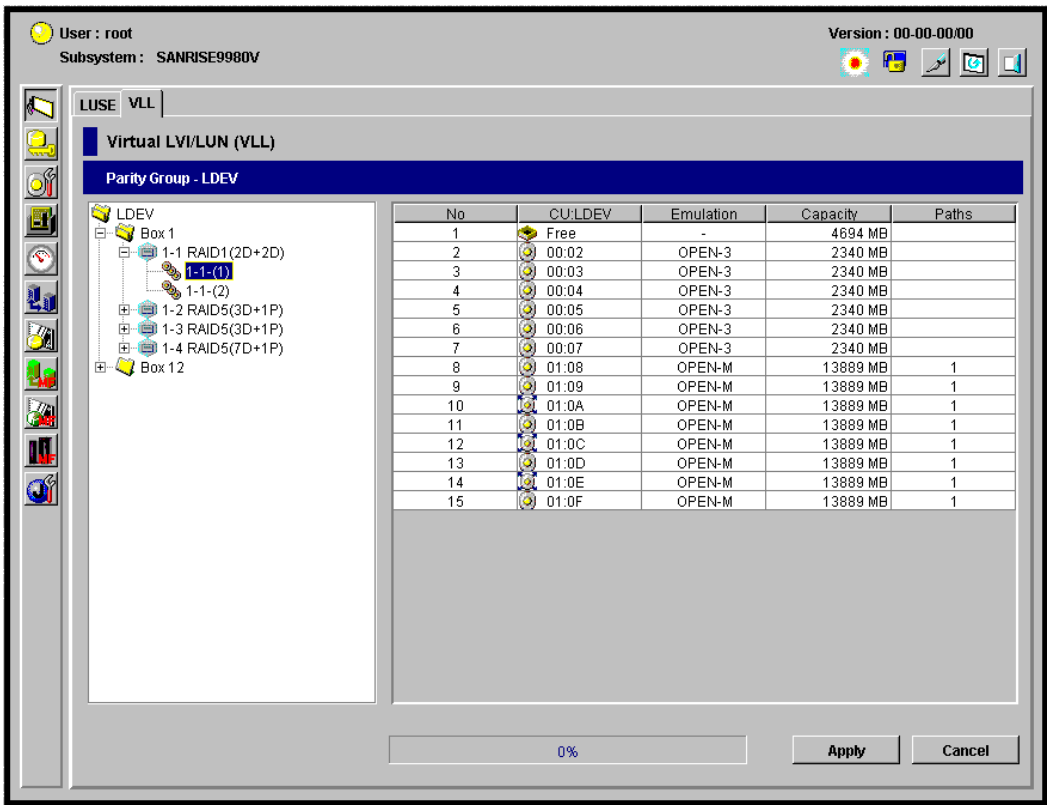


Figure 4.1 LUSE/VLL Panel, VLL Tab

The **Parity Group - LDEV** outline (on the upper left of the **VLL** tab; see Figure 4.2) shows the hierarchical structure of the subsystem, including a disk group number (e.g., Box 1), the parity group number (e.g., 1-1), the RAID level (e.g., 3D+1P), and the CU number (e.g., 1-1-(1).

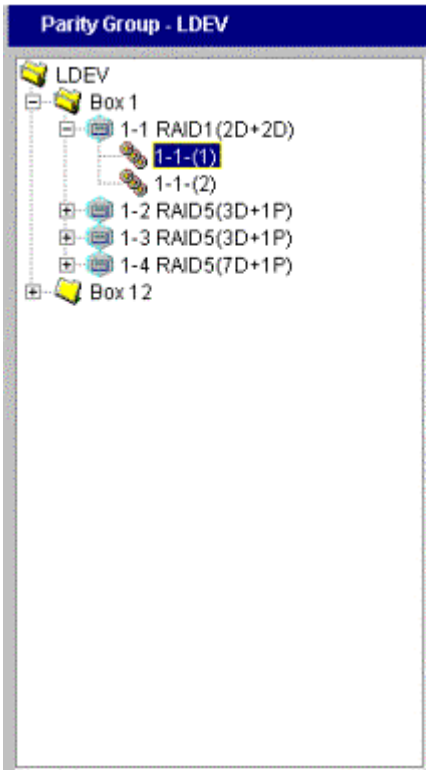


Figure 4.2 Parity Group - LDEV Outline (From the LUSE/VLL Panel, VLL Tab)

- The icon indicates that there are no pending VLL actions on that CU.
- The icon indicates that VLL actions have been stored, but not yet implemented on the subsystem.

When you select a Control Unit in the Parity Group – LDEV outline, the LDEV Information table (on the upper right of the VLL tab; see Figure 4.3) displays information about the logical volumes in that control unit.)

No	CU:LDEV	Emulation	Capacity	Paths
1	Free	-	4694 MB	
2	00:02	OPEN-3	2340 MB	
3	00:03	OPEN-3	2340 MB	
4	00:04	OPEN-3	2340 MB	
5	00:05	OPEN-3	2340 MB	
6	00:06	OPEN-3	2340 MB	
7	00:07	OPEN-3	2340 MB	
8	01:08	OPEN-M	13889 MB	1
9	01:09	OPEN-M	13889 MB	1
10	01:0A	OPEN-M	13889 MB	1
11	01:0B	OPEN-M	13889 MB	1
12	01:0C	OPEN-M	13889 MB	1
13	01:0D	OPEN-M	13889 MB	1
14	01:0E	OPEN-M	13889 MB	1
15	01:0F	OPEN-M	13889 MB	1

Figure 4.3 LDEV Information Table (From the LUSE/VLL Panel, VLL Tab)

- The **No** column shows the volume number. ***Note***: Only 24 volumes will fit on a page. The 25th and higher volumes can be displayed by scrolling.
- The **CU:LDEV** column shows an icon and the CU and LDEV number. **Free** indicates a free space. The icon will be one of the following:

  indicates a normal LDEV

  indicates a LUSE volume

  indicates an LDEV reserved for Hitachi CruiseControl

  indicates a VLL volume

  indicates a VLL volume that is reserved for Hitachi CruiseControl

  indicates free space
- The **Emulation** column shows the emulation type.
- The **Capacity** column shows the capacity of the volume, in MB for open-system volumes and in cylinders (Cyl) for mainframe volumes.
- The **Paths** column shows the number of LU paths. Blank indicates no LU paths.
- The **Apply** button implements the settings that have been made in this panel.
- The **Cancel** button cancels the settings that have been made in this panel.
- Table 4.1 shows how emulation types are grouped.

Table 4.1 Emulation Groups

Emulation Group	Emulation Type
Group 1	3390-3, 3A, 3B, 3C, -L
Group 2	3390-3R
Group 3	OPEN-3, 8, 9, E

4.1.2 Set SSID Panel

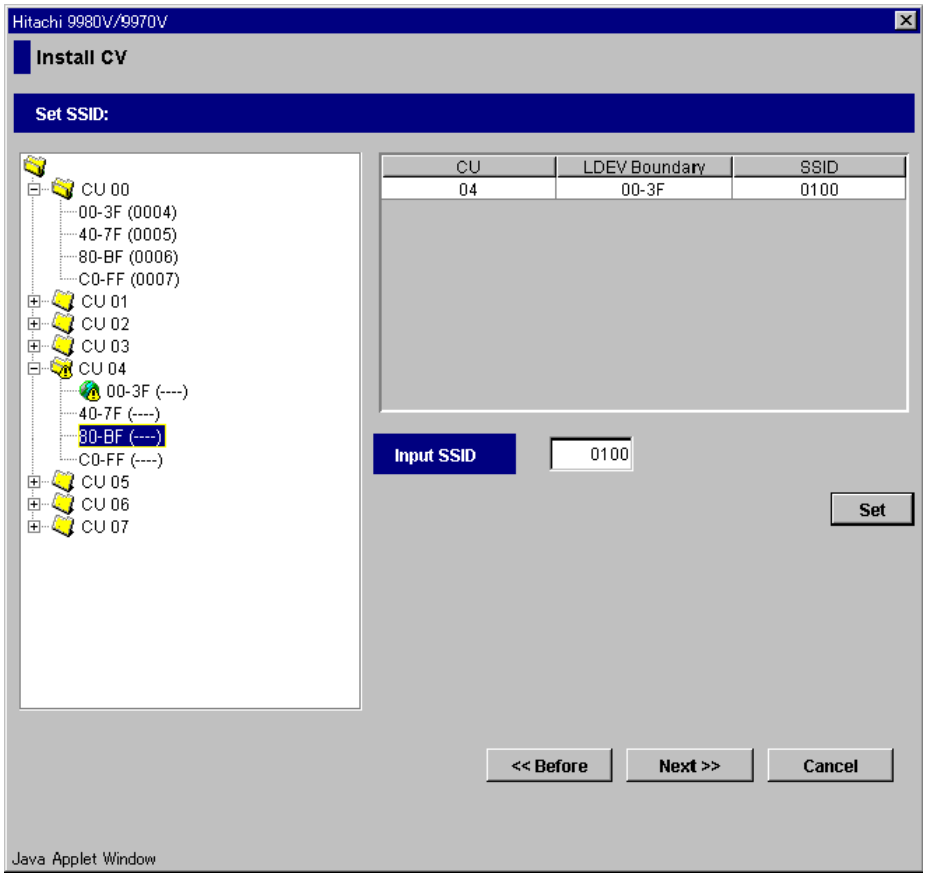


Figure 4.4 Set SSID Panel

The Set SSID panel has the following features:

- The **SSID outline** displays CU numbers (e.g., CU 00), SSID boundary areas (e.g., 00-3F), and SSID (e.g., 0004).

  ---- indicates a boundary area with no SSID

   indicates that the CU number is not extracted.

   indicates that the CU number is extracted.

   indicates the LDEV boundary area.

  The **SSID table** is used to set the SSID boundary area.

  - The **CU** column shows a CU number that contains an LDEV boundary with no SSID.
  - The **LDEV boundary** column shows the boundary area of the LDEV number with no SSID.
  - The **SSID** field shows the smallest available SSID.

- The **Input SSID** field is used to change the available SSID given in the SSID setting area.
- The **Set** button will input the selected SSID in the "Input SSID" entry box.
- The **<<Before** button will cancel the SSID setting and return you to one of the following:

  If you are installing CVs, the Install CV Panel (2) (see Figure 4.10) will display or

  if you are initializing VLL volumes, the Volume Initialize Panel (see Figure 4.14) will display.

- The **Next>>** button will take you to one of the following:

  If you are installing CVs, the Install CV Confirmation Panel (see Figure 4.12) will display, or

  If you are initializing VLL volumes, the Volume Initialize Confirmation Panel (see Figure 4.17) will display.

- The **Cancel** button will cancel the SSID setting and return you to the **VLL** tab.

4.2 Virtual LVI/LUN Operations

Before starting a VLL operation on a selected disk subsystem, be sure to disconnect the mainframe volumes from the host and/or remove the LU paths to the open volumes. For instructions on removing LU paths, see *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD104).

Virtual LVI/LUN operations include:

- Converting logical volumes to free space (see section 4.2.1),
- Creating VLL volumes (see section 4.2.2),
- Deleting VLL volumes (see section 4.2.3)
- Initializing VLL volumes (see section 4.2.4).

4.2.1 Converting Logical Volumes to Space

WARNING: The volume to space function is a destructive operation. The data on the logical volume(s) being converted will be lost when the operation is complete. The user is responsible for backing up the data as needed before performing this operation.

The **Volume to Space** function allows you to convert one or more logical volumes (LDEVs) to space, which deletes the selected LDEVs from that parity group. ***Note:*** The deleted LDEV(s) will remain as space in that parity group. Any normal or Virtual LVI/LUN volume can be deleted (made into space). To delete the last Virtual LVI/LUN volume, you must use the Volume Initialize function (see section 4.2.4). You cannot convert the last normal volume into space because this defines the emulation of the parity group.

The Volume to Space operation has the following restrictions:

- The LDEV should not have a path definition (including Hitachi TrueCopy-S/390®, Hitachi TrueCopy, ShadowImage-S/390®, and ShadowImage pair volumes).
- The LDEV should not be a component of a LUSE volume.
- The LDEV should not be reserved for Hitachi CruiseControl.

To convert a normal volume to free space:

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The **LUSE** tab is the default view (refer to Figure 3.1). Select the **VLL** tab (refer to Figure 4.1).
2. On the Parity Group – LDEV Outline (on the upper left corner of the panel; refer to Figure 4.2) Select the LDEV folder to open a list of Control Units. Select a Control Unit, and the LDEV information table (on the upper right of the panel; refer to Figure 4.3) displays detailed information about the LDEVs of the selected Control Unit.
3. Select one or more LDEVs from the CU:LDEV list. ***Note:*** You must leave at least one normal or VLL volume on each LDEV.
4. Right-click on the selected LDEV to display the Volume to Space pop-up menu (see Figure 4.5). Select **Volume to Space** in the pop-up menu to display the Volume to Space Confirmation panel (see Figure 4.6).
5. If the listed volumes are correct, Select **OK** on the confirmation panel.
6. The change is not yet implemented in the subsystem, but the following changes will appear in the VLL tab:
   a) The selected LDEVs will be listed as **Free**
   b) The figures in the **Capacity** column will not yet be updated.
   c) The color of the CU icon that you manipulated in the Parity Group - LDEV outline view changes from red to yellow. You cannot manipulate yellow CUs until you select the **Apply** button or the **Cancel** button (see below), but you can perform additional Volume to Space operations CUs with red icons.
7. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (refer to Figure 3.6). ***Note:*** When LDEV formatting is in progress, a panel appears and indicates the progress.
8. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (refer to Figure 3.7).

No	CU:LDEV	Emulation	Capacity	Paths
1	00:00	OPEN-3	2340 MB	
2	00:01	OPEN-3	2340 MB	
3	00:02	OPEN-3	2340 MB	
4	00:03	OPEN-3	2340 MB	
5	00:04	OPEN-3	2340 MB	
6	00:05	OPEN-3	2340 MB	
7	00:06	OPEN-3	2340 MB	
8	00:07	OPEN-3	2340 MB	
9	01:08	Volume to Space	13889 MB	1
10	01:09	OPEN-M	13889 MB	1
11	01:0A	OPEN-M	13889 MB	1
12	01:0B	OPEN-M	13889 MB	1
13	01:0C	OPEN-M	13889 MB	1
14	01:0D	OPEN-M	13889 MB	1
15	01:0E	OPEN-M	13889 MB	1
16	01:0F	OPEN-M	13889 MB	1

Figure 4.5 Volume to Space Pop-Up Menu

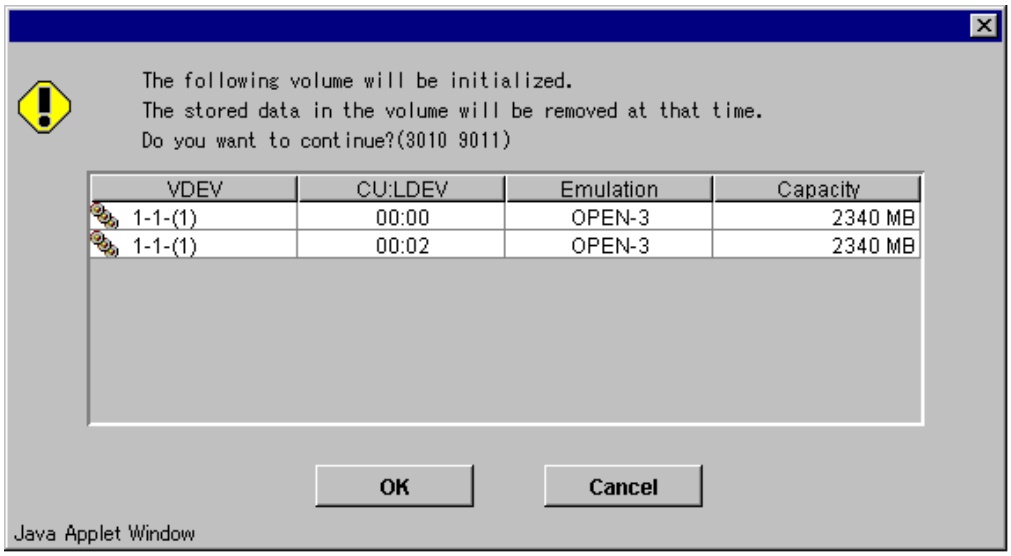


Figure 4.6 Volume to Space Confirmation Panel

4.2.2 Creating VLL volumes

The Install VLL volume function allows you to define and install one or more Virtual LVI/LUN volumes under an existing volume.

Note: The Install VLL volume Function allocates VLL volumes in the order in which the function finds sufficient free space for the VLL volumes, so for optimum space allocation you should allocate VLL volumes in descending order of capacity.

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The **LUSE** tab is the default view (refer to Figure 3.1). Select the **VLL** tab (refer to Figure 4.1)
2. On the Parity Group – LDEV Outline (on the upper left corner of the panel; refer to Figure 4.2) Select the LDEV folder to open a list of Control Units. Select a Control Unit, and the LDEV information table (on the upper right of the panel; refer to Figure 4.3) displays detailed information about the LDEVs of the selected Control Unit.
3. Double-click any part of the Parity Group - LDEV outline view to display the **Install CV** pop-up menu (see Figure 4.7).
4. Select **Install CV** to display the Install CV Panel (1) (see Figure 4.8). On this panel, do the following:
   a) In the **Emulation Type** drop-down box, select the emulation type.
   b) In the **Size** field enter the capacity of the VLL volume you want to create, either in MB for open systems or in cylinders (Cyl) for mainframe volumes. The available capacity range (minimum - maximum) is shown to the right of the **Size** field. The value can be incremented by one MB (open systems) or by one Cylinder (mainframe systems)
   c) Select the **Set** button, and the selected volume will be displayed
   d) Repeat the above steps to create more VLL volumes.
   e) If you make a mistake, right-click on the volume to display the **Clear** pop-up menu, and select **Clear**.
   f) To delete a VLL volume, select the DV in the setting list and select the **Delete** button.

Instructions continue on the following page.

5. After creating all of the VLL volumes you want to create, select the **Next** button to display the Install CV Panel (2) (see Figure 4.10), which will display the VLL volumes to be created in the table on the top. In this panel:
   a) Select one or more VLL volume numbers to which you want to assign a CU number and an LDEV number.
   b) Select a desired CU number from the **Select CU Number** pull-down menu.
   c) Select a desired LDEV number from the white LDEV numbers in the **Select LDEV Number:** table. Gray indicates LDEV numbers that are not selectable, white indicates unused LDEV numbers, and blue indicates available LDEV numbers. The CU and LDEV number appear in the **CU:LDEV** field of the VLL volume setting information table.
   d) If you want to change a CU:LDEV number that is already assigned, you must remove the CU:LDEV number and then assign a new CU:LDEV number. Select one or more VLL volume numbers corresponding to the CU:LDEV numbers that you want to remove, then Right-click the mouse button and then select **Clear** from the pop-up menu (see Figure 4.9).
   e) To set two or more VLL volumes, repeat the above steps.
6. After setting all CU numbers and LDEV numbers, select the **Next** button.
7. If the boundary area of the selected LDEV number does not have an SSID, the SSID setting panel appears (see Figure 4.11). In this panel:
   a) Select the CU number.
   b) Enter a new SSID in the **Input SSID** entry box.
   c) Select the **Set** button. The SSID is displayed in the **SSID** field of the SSID setting area.
   d) Repeat the above steps to set two or more SSIDs.
8. After setting all of the SSIDs, select the **Next** button to display the Install CV Confirmation panel (see Figure 4.12).
9. Select **OK**, and you will be returned to the VLL tab.
10. The change is not yet implemented in the subsystem, but the following changes will appear in the VLL tab:
    a) The figures in the **Capacity** column will not yet be updated.
    b) The color of the CU icon that you manipulated in the Parity Group - LDEV outline view changes from red to yellow. You cannot manipulate yellow CUs until you select the **Apply** button or the **Cancel** button (see below), but you can install additional CVs in CUs with red icons.
11. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (refer to Figure 3.6). ***Note:*** When LDEV formatting is in progress, a panel appears and indicates the progress.
12. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (refer to Figure 3.7).

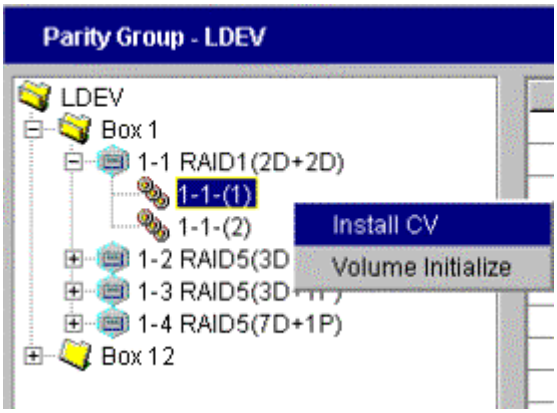


Figure 4.7 Install CV Pop-Up Menu

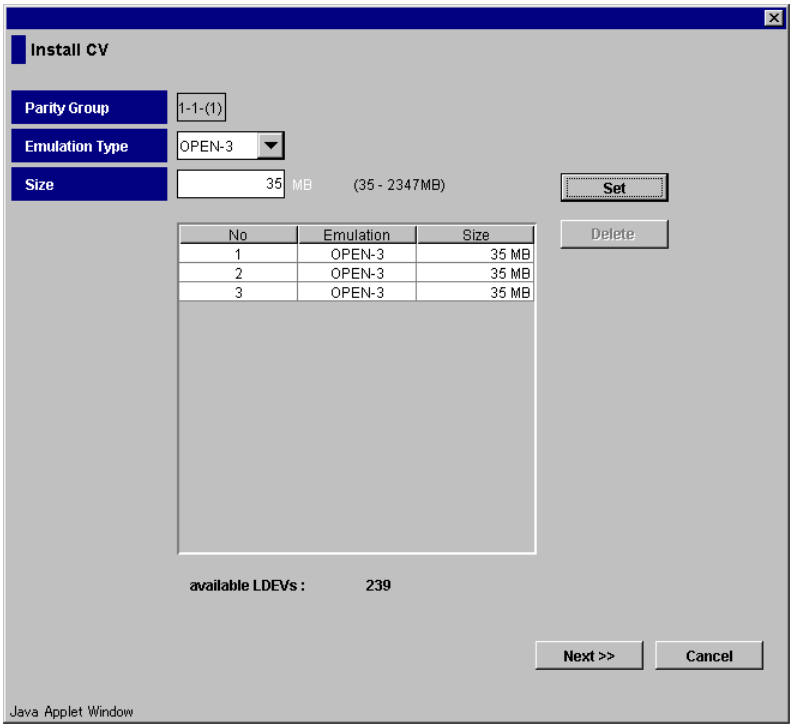


Figure 4.8 Install CV Panel (1)

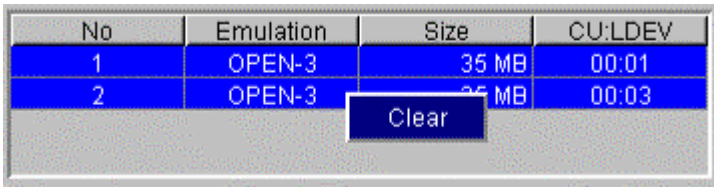


Figure 4.9 Clear Pop-Up Menu

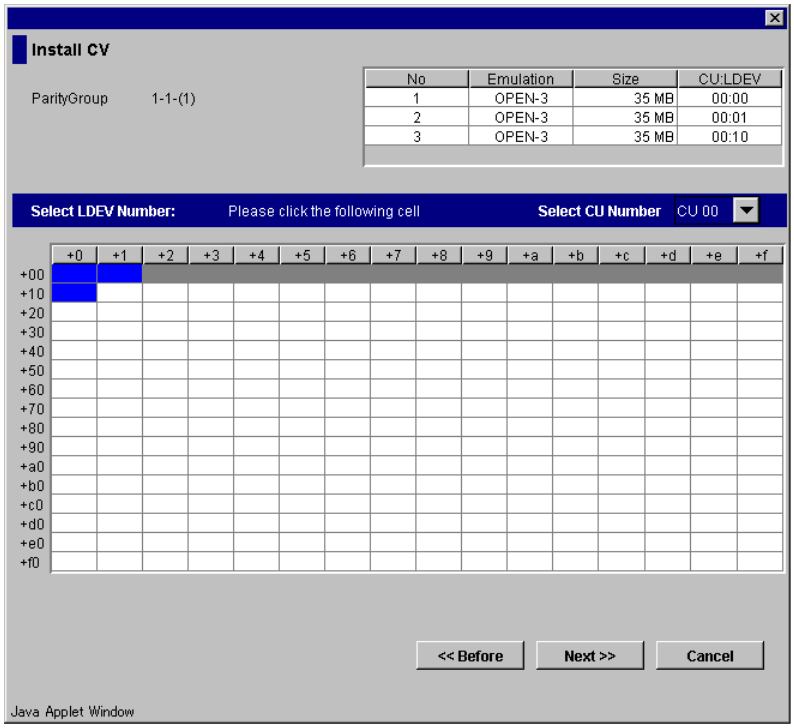


Figure 4.10 Install CV Panel (2)

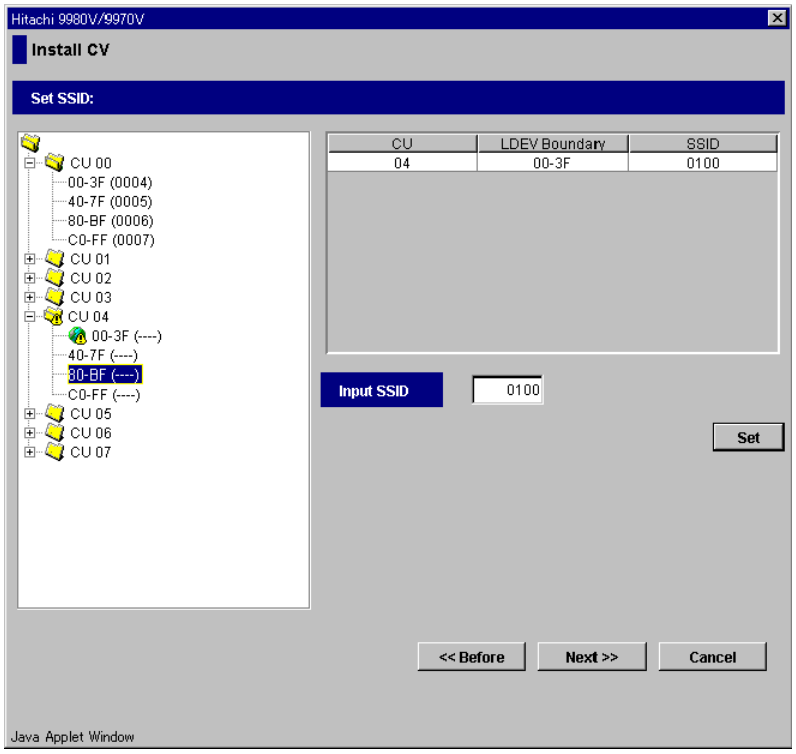


Figure 4.11 Set SSID Panel (Installing VLL Volumes)

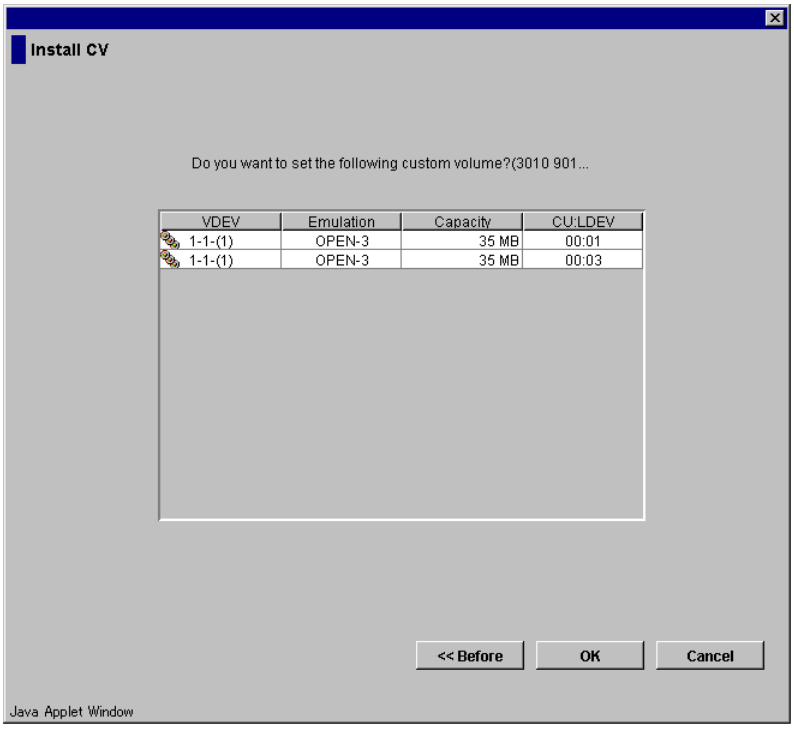


Figure 4.12 Install CV Confirmation Panel

4.2.3 Deleting a VLL volume

To delete an individual Virtual LVI/LUN volume within an LDEV or parity group, use the volume to space operation (refer to section 4.2.1).

To convert a Virtual LVI/LUN volume to a normal volume, you must initialize the volume (see section 4.2.4).

4.2.4 Initializing a Virtual LVI/LUN Volume

> ***WARNING:*** The Volume Initialize function is a destructive operation. The data on the Virtual LVI/LUN volume being converted will be lost when the operation is complete. The user is responsible for backing up the data as needed before performing this operation.

The **Volume Initialize** function allows you to convert a Virtual LVI/LUN volume back to a normal volume. This operation de-installs all variable sized volumes under a Virtual LVI/LUN volume and then reformats the Virtual LVI/LUN volume as a normal volume (e.g., 3390-3).

The Volume Initialize operation has the following restrictions:

- The LDEV should not have a path definition (including Hitachi TrueCopy-S/390®, Hitachi TrueCopy, ShadowImage-s/390®, and ShadowImage pair volumes).
- The LDEV should not be a component of a LUSE volume.
- The LDEV should not be reserved for Hitachi CruiseControl.

- **To initialize a VLL volume:**

1. Change to **Modify** mode (refer to section 2.3 if you need instructions). Select the **LUN Expansion (LUSE)/Virtual LVI/LUN (VLL)** button () to open the LUSE/VLL panel. The **LUSE** tab is the default view (refer to Figure 3.1). Select the **VLL** tab (refer to Figure 4.1)
2. On the Parity Group – LDEV Outline (on the upper left corner of the panel; refer to Figure 4.2), select the LDEV folder to open a list of Control Units. Select a Control Unit, and the LDEV information table (on the upper right of the panel; refer to Figure 4.3) displays detailed information about the LDEVs of the selected Control Unit.
3. Right-click any part of the Parity Group - LDEV outline view to display the Volume Initialize pop-up menu (see Figure 4.13).
4. Select **Volume Initialize** to display the **Volume Initialize** panel (see Figure 4.14). On this panel:
   c) Select one or more VLL volume numbers.
   d) Select a desired CU number from the **Select CU Number** drop-down list.
   e) Select a desired LDEV number from white LDEV numbers in the **Select LDEV Number:** table. The CU and LDEV number appear in the **CU:LDEV** field.
   f) If you want to change a CU:LDEV number that is already assigned, select one or more volume numbers corresponding to the CU:LDEV numbers that you want to remove, then right-click the mouse button to display the **Clear** Pop-Up Menu (see Figure 4.15). Select **Clear**.
5. After setting all CU numbers and LDEV numbers, select the **Next** button.
6. If the boundary area of the selected LDEV number does not have a SSID, the SSID setting panel (see Figure 4.16). On that panel:
   a) Select the CU number.
   b) Enter a new SSID in the **Input SSID** entry box.
   c) Select the **Set** button.
7. After setting all SSIDs, select the **Next** button.
8. The Volume Initialize Confirmation Panel (see Figure 4.17) displays. Verify that the information is correct, then select **OK**.

Instructions continue on the next page.

9. You will be returned to the VLL tab. The change is not yet implemented in the subsystem, but the following changes will appear in the VLL tab:
   a) The figures in the **Capacity** column will not yet be updated.
   b) The color of the CU icon that you manipulated in the Parity Group - LDEV outline view changes from red to yellow. You cannot manipulate yellow CUs until you select the **Apply** button or the **Cancel** button (see below), but you can initialize additional VLL volumes in CUs with red icons.
10. If you want to apply the changes to the subsystem, select **Apply** and then select **OK** on the confirmation message (refer to Figure 3.6). ***Note:*** When LDEV formatting is in progress, a panel appears and indicates the progress.
11. If you want to cancel the changes and not apply them to the subsystem, select **Cancel** and then select **OK** on the confirmation message (refer to Figure 3.7).

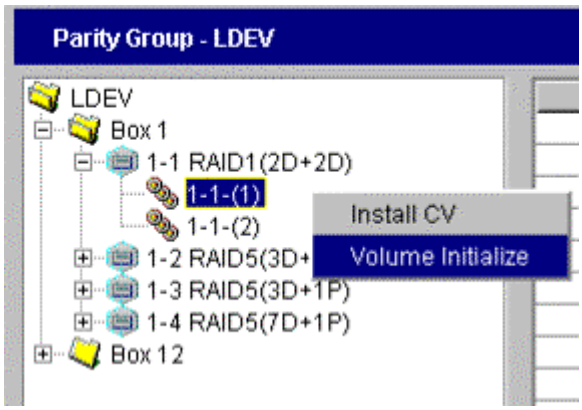


Figure 4.13 Volume Initialize Pop-Up Menu

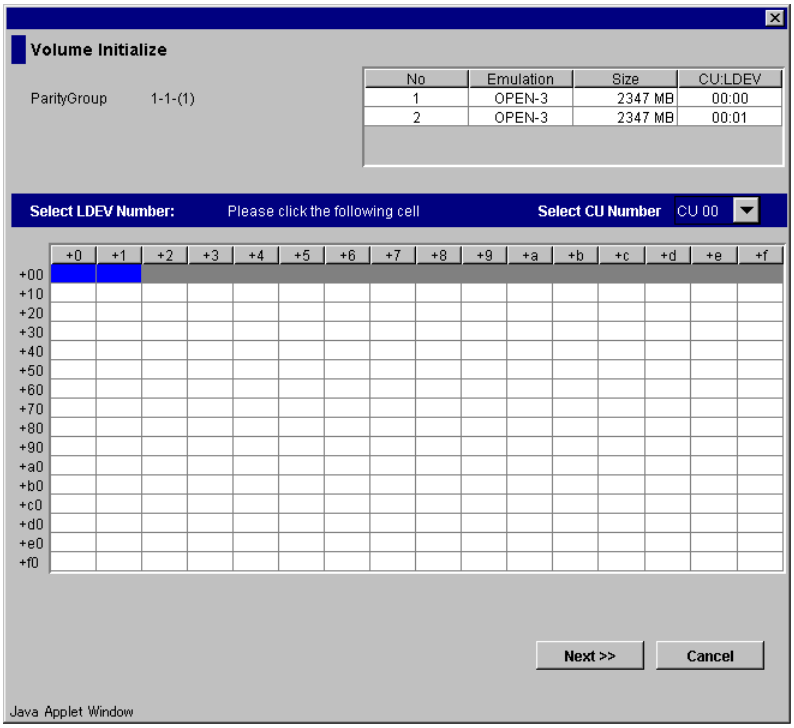


Figure 4.14 Volume Initialize Panel

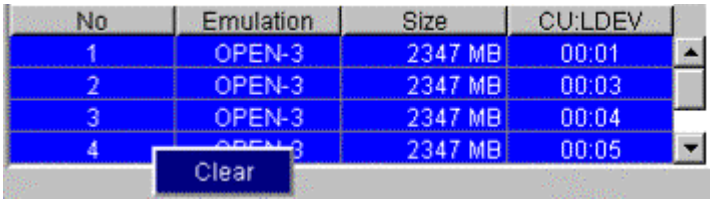


Figure 4.15 Clear Pop-Up Menu

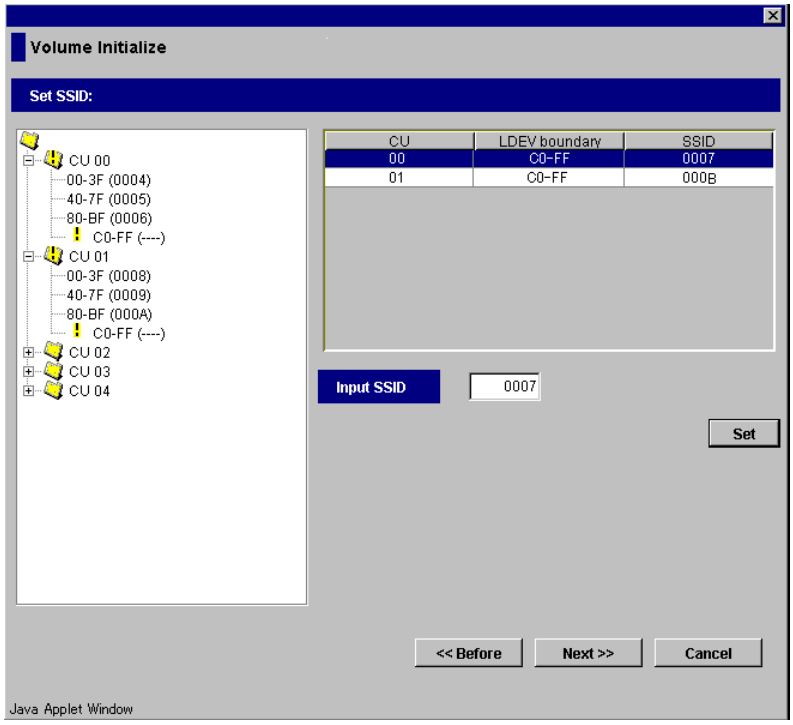


Figure 4.16 Set SSID Panel (Volume Initialize)

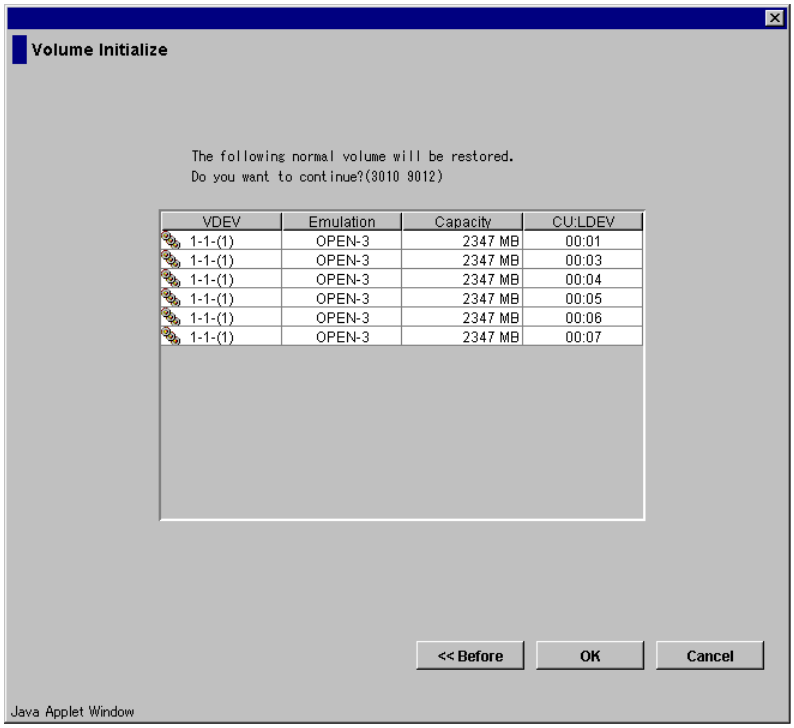


Figure 4.17 Volume Initialize Confirmation Panel

Chapter 5 Troubleshooting

5.1 Troubleshooting

For troubleshooting information on the 9900V subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100).

For information on the 9900V Remote Console software error codes, please refer to the Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console – Storage Navigator Error Codes (MK-92RD132).

The user is responsible for the operation and normal maintenance of the PC(s), which host the 9900V Remote Console software. Here are some guidelines for troubleshooting 9900V Remote Console software operations:

- **Check the cabling and the LAN.** Verify that both the computer and LAN cabling are firmly attached, and that the LAN is operating properly.
- **Reboot the PC.** Close any programs that are not responding. If necessary, reboot the PC and restart the 9900V Remote Console – Storage Navigator Java™ applet program.
- **Check for any General Error Conditions.** Check the troubleshooting information in the *Hitachi Lightning 9900V Hitachi Remote Console – Storage Navigator User's Guide*. The document lists general error conditions and provides recommended resolution for each condition. If you are still unable to resolve an error condition, please call the Hitachi Data Systems Support Center for assistance (see section 5.2 for contact information).
- **Check the status lamp on the Remote Console Main Panel (Status tab).** If the lamp becomes yellow () or red (), confirm the severity level of the error. If you are unable to resolve an error condition, please contact the Hitachi Data Systems Support Center (see section 5.2).
- **Download the Remote Console trace files using the FD Dump Tool.** If you are unable to resolve an error condition, copy the 9900V Remote Console configuration information onto diskette using the FD Dump Tool. See *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console – Storage Navigator User's Guide* (MK92RD101) for instructions on using the FD Dump tool. Contact the Hitachi Data Systems Support Center (see section 5.2), and give this information to the Hitachi Data Systems service personnel.

Table 5.1 General Error Conditions

Error Condition	Probable Cause / Recommended Action
The Remote Console experiences an error.	Save the Java™ log file on the Remote Console, and report to the Hitachi Data Systems Technical Support Center. For Windows® 2000, the Java™ log file is in the following place: c:\Documents and Settings\login user ID\plugin131.trace Restart the Remote Console.
Only the Exit and Refresh buttons are effective when accessing the SVP from the Remote Console.	The SVP might not be ready or perform some write processes from the other system. Wait for a while, and then select the Refresh button.
Abnormal End / No Response	
An internal error occurs, or a browser ends abnormally (forcibly).	Close all panels including the Storage Device List panel, and then log on to the Remote Console again. If the same error occurs, restart the Remote Console.
A network error occurred. There is no response to an operation even after 30 minutes passed.	Restart the Remote Console.
Incorrect Display/ Disoperation	
After dragging and dropping objects to another location or area, the scroll bar on that location becomes unusable.	Close all panels including the Storage Device List panel, and then log on to the Remote Console again.
A focus disappears from the edit box.	Close all panels including the Storage Device List panel, and then log on to the Remote Console again.
The display of the browser becomes incorrect, because some GUI items such as labels and icons cannot be downloaded properly.	Log off from the Remote Console and then re-log in.
A Remote Console panel is closed by: – Selecting the ☒ button on the panel, – Using the commands such as **File** and **Exit** on the browser, or – Pressing the **Alt** and **F4** keys.	Wait for an RMI™ time-out (default is 1 min.), and then restart the Remote Console.
Maintenance / Others	
The program on the SVP is updated.	Exit all browsers on the Remote Console, and then restart the viewers. If in doubt, you should exit and restart the viewers.
The time of the clock on the Remote Console is reset.	Clear cache (the existing temporary Internet files) of the browser before logging on to the Remote Console.
Remote Console processing is temporarily delayed.	An internal processing (e.g., configuration change, Program Product. check, operational information acquisition, etc.) might be being executed on the SVP (web server).
If you are unable to resolve an error condition.	Copy the 9900V Remote Console configuration information onto floppy disk(s) using the **FD Dump Tool** and contact the Hitachi Data Systems Technical Support Center (see section 5.2).

5.2 Calling the Hitachi Data Systems Technical Support Center

If you need to call the Hitachi Data Systems Technical Support Center, be sure to provide as much information about the problem as possible. Include the circumstances surrounding the error or failure, the 9900V Remote Console configuration information saved in the floppy diskette(s) by the **FD Dump Tool**, the exact content of any messages displayed on the Remote Console, and the severity levels and reference codes displayed on the **Status** tab of the Remote Console Main panel. The worldwide Hitachi Data Systems Technical Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-348-4357
- Hitachi Data Systems Europe
  Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
  North Ryde, Australia
  011-61-2-9325-3300

Glossary, Acronyms, and Abbreviations

Command Control Interface (CCI)	System administrators can enter Command Control Interface (CCI) commands from open-system hosts to perform Hitachi TrueCopy and ShadowImage operations on logical devices.
CruiseControl	CruiseControl performs automatic relocation of volumes to optimize performance.
CU	Control Unit. The 9900V subsystem supports a maximum of 16 logical control unit (CU) images, numbered sequentially from 0 to F. Each CU image controls up to 256 LDEVs.
Custom Access	A feature that allows a non-administrator to be assigned write access to one or more of the restricted Remote Console functions.
DASD	Direct-Access Storage Device
DKC	Disk Controller. The 9900V disk controller provides up to sixteen logical control unit (CU) images and supports 3990-6, 3990-6E, and 2105-F20 disk controller emulation.
DKU	Disk Array Unit. The 9900V subsystem has up to six disk array frames containing the storage components (disk drive arrays) of the subsystem.
ESCON®	Enterprise System Connection
Export File	The Export File function allows you to export data (e.g., monitoring data used by Performance Monitor or Hitachi TrueCopy) to data files.
FD	floppy disk
FD Dump Tool	This function downloads the 9900V Remote Console configuration information onto a floppy diskette or a hard disk drive, and is generally used for troubleshooting purposes.
FICON™	Fibre Connection
FlashAccess	FlashAccess (Dynamic Cache Residence) enables you to store specific high-usage data directly in cache memory to provide virtually immediate data availability.
GB	gigabyte(s)
Hi-Star™	Hierarchical Star Network architecture improves the total performance of internal data transfer by using high-speed crossbar changes.
HMBR	Hitachi Multiplatform Backup/Restore
Java™ applet program	The web client Java™ applet program runs on a browser on the Remote Console. When a Remote Console user accesses and logs on to the desired SVP, the web client Java™ applet is downloaded from the SVP to the Remote Console. The web client Java™ applet program runs on a browser on the Remote Console.
JVM™	Java Virtual Machine™ is the web client Java™ applet program that is installed in each SVP and runs using a browser to provide a user-friendly interface for the 9900V Remote Console functions.

kB	kilobyte(s)
LAN	local-area network
LBA	logical block address
LDEV	logical device. An LDEV used by mainframe hosts can be called a device, logical volume image (LVI) or a volume. An LDEV used by open-system hosts is called a logical unit (LU).
LU	An LDEV used by open-system hosts is called a logical unit (LU). Open-system fibre interfaces access LUs that are mapped to one or more LDEVs.
LUN	logical unit number is an identifying number for an LU.
LUN Manager	Remote Console software option that enables you to configure the 9900V fibre-channel ports for operational environments, and restrict host access to LUs.
LUSE	LUN Expansion. This function allows you to concatenate two or more volumes into a larger volume.
LVI	Logical Volume Image (also called device emulation)
MB	megabyte(s)
MIB	message information block
Open Volume Management	A suite of options that includes Virtual LVI/LUN and LUSE (LUN Expansion). Virtual LVI/LUN divides a logical volume for open-system into two or more volumes. LUN Expansion allows you to concatenate two or more volumes into a larger volume.
Parity group	A set of hard disk drives that have the same capacity and are treated as one group. A parity group contains both user data and parity information, which allows the user data to be accessed in the event that one or more of the drives within the group are not available.
RMI™	Remote Method Invocation. RMI™ is a remote procedure call, which allows Java™ objects stored in the network to be run remotely.
R-SIM	remote service information message (generated by the 9900Vwhen it detects an error or service requirement).
SIM	service information message (generated by a subsystem when it detects an error or service requirement).
ShadowImage	An option that allows you to maintain subsystem-internal copies of all user data for purposes such as data backup and duplication.
SNMP	simple network management protocol (part of the TCP/IP protocol suite)
SSID	storage subsystem ID. The 9900Vis configured with one SSID for each 64 devices, and up to four SSIDs for each CU image.
SVP	Service Processor (this is the noteb**ok** computer that is inside the RAID450).
TCP/IP	transmission control protocol/internet protocol
TID	target ID
Trap	An SNMP agent initiates trap operations when R-SIMs occur, in order to send the R-SIMs to the SNMP manager (see Figure 4.1). An SNMP agent can be configured to deliver traps to more than one SNMP manager.
TrueCopy	TrueCopy is an option product that allows you to perform host-free remote

	copy operations between 9900V subsystems in different locations for data backup and disaster recovery purposes.
UCB	unit control block
User account list	The user account list includes user information such as user ID, password, and write permission for each 9900V option.
VLL	Virtual LVI/ LUN is an option that enables you to configure custom-size logical device images and logical units, which are smaller than standard-size devices.
Volser	volume serial number (mainframe volume identifier, not related to the LDEV ID)
Remote Console	The Remote Console communicates directly with the service processor (SVP) of each attached subsystem to obtain subsystem configuration and status information and send user-requested commands to the subsystem.
WWN	Worldwide Name is a unique identifier for a particular open-system host bus adapter, consisting of a 64-bit physical address (the IEEE 48-bit format with 12-bit extension and 4-bit prefix).