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Performance Guide

Hitachi Performance Guide for Gx00 and Fx00 Models

Hitachi Performance Monitor
Hitachi Server Priority Manager
Hitachi Virtual Partition Manager

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Product Version

Getting Help

Contents

Hitachi Data Systems

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Glossary

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Preface

This document describes and provides instructions for monitoring and managing the performance of the Hitachi Virtual Storage Platform G200, G400, G600, G800 (VSP G200, G400, G600, G800) and Hitachi Virtual Storage Platform F400, F600, F800 (VSP F400, F600, F800) storage systems using the following licensed software products: Hitachi Performance Monitor, Hitachi Server Priority Manager, Hitachi Virtual Partition Manager.

Please read this document carefully to understand how to use these products, and maintain a copy for reference purposes.

- Intended audience
- Product version
- Release notes
- Changes in this revision
- Referenced documents
- Document conventions
- Convention for storage capacity values
- Accessing product documentation
- Getting help
- Comments

Intended audience

This document is intended for system administrators and Hitachi Data Systems representatives and authorized service providers who install, configure, and operate storage systems of VSP Gx00 models and VSP Fx00 models.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- VSP Gx00 models or VSP Fx00 models and the *Hardware Reference Guide* for your storage system model.
- The Hitachi Command Suite software and the *Hitachi Command Suite User Guide* or the Hitachi Device Manager - Storage Navigator software and the *System Administrator Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.

Product version

This document revision applies to:

- VSP Gx00 models, VSP Fx00 models firmware 83-04-0*x* or later
- SVOS 7.0 or later

Release notes

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

Changes in this revision

- Added the PhyMPU operand for tables in section group on page 4-22.

Referenced documents

- *Hitachi Virtual Storage Platform G200 Hardware Reference Guide*, MK-94HM8020
- *Hitachi Virtual Storage Platform G400, G600 Hardware Reference Guide*, MK-94HM8022
- *Hitachi Virtual Storage Platform G800 Hardware Reference Guide*, MK-94HM8026
- *Hitachi Virtual Storage Platform F400, F600 Hardware Reference Guide*
- *Hitachi Virtual Storage Platform F800 Hardware Reference Guide*

- *Hitachi Universal Replicator User Guide*, MK-94HM8023
- *Hitachi Universal Volume Manager User Guide*, MK-92RD8024
- *Global-Active Device User Guide*, MK-92RD8072
- *Hitachi Command Suite User Guide*, MK-90HC172
- *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*, MK-94HM8014
- *System Administrator Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*, MK-94HM8016
- *Hitachi Device Manager - Storage Navigator Messages*, MK-94HM8017
- *Hitachi TrueCopy® User Guide*, MK-94HM8019
- *Hitachi ShadowImage® User Guide*, MK-94HM8021

Document conventions

This document uses the following terminology conventions:

Convention	Description
Hitachi Virtual Storage Platform G200, G400, G600, G800 (VSP G200, G400, G600, G800) VSP Gx00 models	Refers to all models of the Hitachi Virtual Storage Platform G200, G400, G600, G800 storage systems, unless otherwise noted.
Hitachi Virtual Storage Platform F400, F600, F800 (VSP F400, F600, F800) VSP Fx00 models VSP F series	Refers to all models of the Hitachi Virtual Storage Platform F400, F600, F800 storage systems, unless otherwise noted.

This document uses the following typographic conventions:

Convention	Description
Bold	• Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click **OK**. • Indicates emphasized words in list items.
Italic	• Indicates a document title or emphasized words in text. • Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: `pairdisplay -g` *`group`* (For exceptions to this convention for variables, see the entry for angle brackets.)
`Monospace`	Indicates text that is displayed on screen or entered by the user. Example: `pairdisplay - g oradb`

Convention	Description
< > (angle brackets)	Indicates variables in the following scenarios: • Variables are not clearly separated from the surrounding text or from other variables. Example: `Status-<report-name><file-version>.csv` • Variables in headings.
[ ] (square brackets)	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } (braces)	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| (vertical bar)	Indicates that you have a choice between two or more options or arguments. Examples: [a | b] indicates that you can choose a, b, or nothing. { a | b } indicates that you must choose either a or b.
↓*value*↓ floor floor(*value*)	Floor function (round down value to the next integer)
↑*value*↑ ceiling ceiling(*value*)	Ceiling function (round up *value* to the next integer)
_ (underlined text)	Default value

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

Icon	Label	Description
	Note	Calls attention to important or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Important	Provides information that is essential to the completion of a task.
	Caution	Warns the user of adverse conditions or consequences (for example, disruptive operations).
	WARNING	Warns the user of severe conditions or consequences (for example, destructive operations).

Convention for storage capacity values

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

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

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

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

Accessing product documentation

Product documentation is available on Hitachi Data Systems Support Connect: https://support.hds.com/en_us/documents.html. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

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

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connections. **Join the conversation today!** Go to community.hds.com, register, and complete your profile.

Comments

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

Thank you!

1

Performance management

This chapter provides an overview of performance management of the Hitachi Virtual Storage Platform G200, G400, G600, G800 and the Hitachi Virtual Storage Platform F400, F600, F800 storage systems and describes the system requirements.

- Overview of performance management
- System requirements

Overview of performance management

The Virtual Storage Platform G200, G400, G600, G800 and Hitachi Virtual Storage Platform F400, F600, F800 storage systems include a suite of performance management software products that allow you to monitor and tune storage system performance to improve and optimize storage utilization and storage system performance.

- **Hitachi Performance Monitor.** Performance Monitor allows you to collect and analyze detailed performance and usage statistics for VSP Gx00 models and VSP Fx00 models as well as statistics about workloads on drives and traffic between the hosts and the storage system. You can view the data in lists and on graphs, and you can export the data for analysis in spreadsheet and other applications.
- **Hitachi Server Priority Manager.** Server Priority Manager enables you to control port activity to provide high-priority hosts with relatively higher throughput and prevent production servers from experiencing degraded performance. Server Priority Manager monitors the data being collected by Performance Monitor and applies upper-limit control and threshold control according to user-specified settings.
- **Hitachi Virtual Partition Manager (VSP Gx00 models only).** Virtual Partition Manager enables you to configure logical cache partitions on your storage system. These cache partitions help to maintain performance for high-priority activities by acting as dedicated storage resources that are independently managed and reserved for specific applications.

Performance management operations can be performed using the Hitachi Command Suite software and the Command Control Interface software. For details about Command Control Interface, see the *Command Control Interface User and Reference Guide*.

System requirements

- **Performance management products.** The following software is required for performance management operations:
  - Hitachi Performance Monitor
  - Hitachi Server Priority Manager
  - Hitachi Virtual Partition Manager (VSP Gx00 models only)
- **Administrator or write access:** Administrator access for Hitachi Command Suite or write access for the performance management software products is required to perform operations. Users without Administrator or write access can only view the performance management information and settings.
- **License keys:** The license keys for the performance management software products must be installed. For details about installing license keys, see the *System Administrator Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.

- **Hitachi Device Manager - Storage Navigator secondary window:** You must enable the Hitachi Device Manager - Storage Navigator secondary window before you use Server Priority Manager. For details and instructions, see the *System Administrator Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.
- **Cache memory for Virtual Partition Manager:** Use of Virtual Partition Manager may require installation of additional cache memory in the storage system.

2

Hitachi Performance Monitor operations

This chapter describes performance monitoring and provides instructions for performing performance monitoring operations using Hitachi Performance Monitor.

- ☐ Overview of Hitachi Performance Monitor
- ☐ Cautions and restrictions for Performance Monitor
- ☐ Performance monitoring workflow
- ☐ Setting the storing period for the monitoring data
- ☐ Starting monitoring
- ☐ Monitoring WWNs
- ☐ Monitoring CUs
- ☐ Changing the sampling interval
- ☐ Stopping monitoring
- ☐ Using the Performance Monitor data graphs

Overview of Hitachi Performance Monitor

Hitachi Performance Monitor enables you to monitor Hitachi storage systems and collect detailed usage and performance statistics. You can view the data in lists and on graphs to identify changes in usage rates and workloads, analyze trends in disk I/O, and detect peak I/O times. For example, if there is a decrease in performance, such as delayed host response times, you can use Performance Monitor to discover the reason for the decrease and determine the actions to take to improve performance.

Performance Monitor collects data about storage system resources such as drives, volumes, and microprocessors as well as statistics about front-end (host I/O) and back-end (drive I/O) workloads. Data is collected when the Monitoring Switch is set to **Enable**, and you specify when and how often the data is collected. Using the Performance Monitor data you can manage and fine-tune the performance of your storage system using the performance management software products.

- Data collected by Performance Monitor on page 2-2
- Sampling interval for monitoring on page 2-2
- Performance Monitor data graphs on page 2-3
- Export Tool for Performance Monitor on page 2-3

Data collected by Performance Monitor

Performance Monitor allows you to collect the performance and usage statistics for your storage systems. All statistics are available for monitoring.

When you monitor the storage system, you control when the statistics are collected (in real time or during a specified period of time) and how often the statistics are collected (from once per minute to once every 15 minutes).

- Monitoring data on page 3-3
- Sampling interval for monitoring on page 2-2
- Maximum storing period for monitoring on page 2-3

Sampling interval for monitoring

The sampling interval is the length of time between data collection events for monitoring. The number of CUs to be monitored determines the options for setting the sampling interval:

- **Up to 32 CUs.** If there are 32 or fewer CUs to be monitored, you can set the sampling interval from 1 to 15 minutes in increments of 1 minute. For example, when the sampling interval is set to 3 minutes, Performance Monitor collects statistics once every 3 minutes.
    - Performance Monitor collects statistics for 1 day when data is collected at 1-minute intervals.
    - Performance Monitor collects statistics for up to 15 days when data is collected at 15-minute intervals.

Maximum storing period for monitoring

For a specified sampling interval, the SVP can store a maximum of 1440 data collection events. Based on this number and the sampling interval, you can calculate the maximum storing period for the statistics as the sampling interval multiplied by 1440. For example, if you set the sampling interval to 1 minute, the maximum storing period for the statistics is 1 day (24 hours):

```
1 minute x 1440 = 1440 minutes = 24 hours = 1 day
```

If you set the sampling interval to 15 minutes, the maximum storing period for the statistics is 15 days:

```
15 minutes x 1440 = 21600 minutes = 360 hours = 15 days
```

This maximum storing period is the maximum range of display in the Monitor Performance windows. When you specify 1 minute for the sampling interval as in the example above, Performance Monitor displays the statistics for a maximum of 1 day (24 hours) in the lists and graphs. When you specify 15 minutes for the sampling interval, Performance Monitor displays the statistics for a maximum of 15 days in the lists and graphs.

Performance Monitor data graphs

You can view statistics on data graphs. All statistics can be viewed (for the storing period corresponding to the sampling interval setting). Usage statistics about storage system resources, which are monitored, can be viewed. When viewing usage statistics about resources, you can specify the range to view and which part of the storing period to display on lists and graphics.

For details about the Performance Monitor data graphs, see About the data graphs on page 2-19.

Export Tool for Performance Monitor

The Export Tool software that comes with Performance Monitor allows you to export the monitoring data for analysis, for example using spreadsheet or database software. You can also use Export Tool to save and accumulate data over extended periods of time for long-term analysis and future reference.

For details about Export Tool, see Chapter 4, Exporting Performance Monitor data on page 4-1.

Cautions and restrictions for Performance Monitor

- Cautions and restrictions for monitoring on page 2-3
- Cautions and restrictions for usage statistics on page 2-5

Cautions and restrictions for monitoring

- **Performance monitoring switch**

When the monitoring switch is set to disabled, monitoring data is not collected.

- **Changing the SVP time setting**
  If the SVP time setting is changed while the monitoring switch is enabled, the following monitoring errors can occur:
  - Invalid monitoring data appears.
  - No monitoring data is collected.

  If you have changed the SVP time setting, disable the monitoring switch, and then re-enable the monitoring switch. After that, obtain the monitoring data. For details about the monitoring switch, see Starting monitoring on page 2-7.
- **WWN monitoring**
  Traffic monitoring between host bus adapters and storage system ports in Performance Monitor
  You must configure some settings before the traffic between host bus adapters and storage system ports can be monitored. For details, see Adding new WWNs to monitor on page 2-8, Adding WWNs to ports on page 2-10, and Connecting WWNs to ports on page 2-12.
- **Caution in using Command Control Interface**
  When you are using Server Priority Manager in Command Control Interface, you cannot perform the setting required for WWN monitoring.
- **Parity group monitoring**
  To correctly display the performance statistics of a parity group, all volumes belonging to the parity group must be specified as monitoring targets.
- **Storage system maintenance**
  If the storage system is undergoing the following maintenance operations during monitoring, the monitoring data might not be valid:
  - Adding, replacing, or removing cache memory
  - Adding, replacing, or removing data drives
  - Changing the storage system configuration
  - Replacing the firmware
  - Formatting or quick formatting logical devices
  - Adding, replacing, or removing MP units
- **Storage system power-off**
  If the storage system is powered off during monitoring, monitoring stops while the storage system is powered off. When the storage system is powered up again, monitoring continues. However, Performance Monitor cannot display information about the period while the storage system is powered off. Therefore, the monitoring data immediately after powering on again might contain extremely large values.
- **Firmware replacement**

After the firmware is replaced, monitoring data is not stored until the service engineer releases the SVP from Modify mode. Therefore, inaccurate data might be temporarily displayed.

Cautions and restrictions for usage statistics

- **Retention of usage statistics**

  Usage statistics for up to the last 15 days are displayed in monitoring. Usage statistics outside of these ranges are deleted from the SVP.
- **Statistics for periods of high I/O workload**

  If the host I/O workload is high, the storage system gives higher priority to I/O processing than to monitoring. If this occurs, some monitoring data might be missing. If monitoring data is missing frequently, use the Edit Monitoring Switch window to lengthen the sampling interval. For details, see Starting monitoring on page 2-7.
- **Reverse resync operations**

  When you run the CCI horctakeover or pairresync-swaps command for a UR pair, the primary and secondary volumes are swapped. You can collect the before-swapped information immediately after you run any of the commands. Incorrect monitoring data will be generated for a short time but will be corrected automatically when the monitoring data gets updated. The incorrect data will temporarily be generated when the volume used for a secondary volume is used as a primary volume after a UR pair is deleted.
- **Display of monitoring data immediately after monitoring starts or immediately after the sampling interval is changed**

  Monitoring data cannot be displayed immediately after monitoring starts or immediately after the sampling interval is changed, because no monitoring data has accumulated. "Immediately after" here means the time within the first two sampling intervals after the monitoring starts or the interval is changed. For instance, if the sampling interval is set or changed to 15 minutes, monitoring data is not accumulated for up to 29 minutes after this setting is made.
- **Display of monitoring data during high SVP workload**

  If the SVP is overloaded, the system might require more time than the sampling interval allows to update the display of monitoring data. If this occurs, some portion of monitoring data is not displayed. For example, suppose that the sampling interval is 1 minute, and the display in the Performance Management window is updated at 9:00 and the next update occurs at 9:02. In this case, the window (including the graph) does not display the monitoring result for the period of 9:00 to 9:01. This situation can occur when the following maintenance operations are performed on the storage system or on the Device Manager - Storage Navigator PC:

  - Adding, replacing, or removing cache memory.
  - Adding, replacing, or removing data drives.
  - Changing the storage system configuration.
  - Replacing the firmware.

- **Pool-VOLs**
  Pool-VOLs of Thin Image and Dynamic Provisioning are not monitored.
- **Margin of error**
  The monitoring data may have a margin of error.

Performance monitoring workflow

1. Determine the resources to be monitored and the data to be collected, and write down the required information, including control unit (CU) numbers and WWNs of host bus adapters.
2. Set the storing period for the monitoring statistics. For instructions, see Setting the storing period for the monitoring data on page 2-6.
3. Start performance monitoring. For instructions, see Starting monitoring on page 2-7.
4. Add the WWNs to monitor. For instructions, see Monitoring WWNs on page 2-8.
5. Add the CUs to monitor. For instructions, see Monitoring CUs on page 2-14.
6. Adjust the sampling interval as needed to increase or decrease the maximum storing period of statistics. For instructions, see Changing the sampling interval on page 2-17.
7. View the monitoring data on graphs. For details, see Using the Performance Monitor data graphs on page 2-19.
8. Export the monitoring data as needed for analysis and for retention of long-term data. For details, see Chapter 4, Exporting Performance Monitor data on page 4-1.
9. When you want to stop collecting monitor data, stop monitoring by disabling the monitoring switch. For details, see Stopping monitoring on page 2-18.

Setting the storing period for the monitoring data

Before you start the monitoring function, you need to set the storing period for the monitoring data. Data can be collected for up to 15 days.

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.

b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window.

In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.

b. Right-click the target storage system and then select **Performance Monitor**.

c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window

2. Select **Set Range** or **Use Real Time** in the **Time Range** as the periods (ranges) for displaying statistics.

   You can select **Set Range** or **Use Real Time**.

3. Click **Apply** to apply the settings to the storage system.

Related topics

- Performance Monitor main window on page A-3
- Monitor Performance window on page A-7

Starting monitoring

Caution: When you start monitoring a storage system, all of its previous monitoring statistics are deleted. If you want to keep the previous monitoring statistics, first export the desired data using Export Tool and then restart monitoring.

After you have set the storing period for the monitoring data, you can start the monitoring function. While the statistics information is being collected, the server workload increases and the client process might slow down.

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.

   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**.

   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:

   a. Select the **Resources** tab, and expand the **Storage Systems** tree.

b. Right-click the target storage system and then select **Performance Monitor**.

2. In the **Performance Monitor** window click **Edit Monitoring Switch** to open the **Edit Monitoring Switch** window.
3. Click **Enable** in the **Monitoring Switch** field.
4. Select the sampling interval in the **Sample Interval**. This option is activated when you specify **Enable** for Current Status.
5. Click **Finish**.
6. In the **Confirm** window enter your task name in **Task Name**, and click **Apply** to start monitoring.

Note: Monitoring data cannot be displayed for the time within the first two sampling intervals after the monitoring starts because no monitoring data has accumulated. For instance, if the sampling interval is set to 15 minutes, monitoring data is not accumulated for up to 29 minutes after the start of monitoring.

Related topics

- Edit Monitoring Switch window on page A-5

Monitoring WWNs

This section provides instructions for monitoring WWNs using Hitachi Performance Monitor:

- Adding new WWNs to monitor on page 2-8
- Viewing the WWNs that are being monitored on page 2-9
- Removing WWNs to monitor on page 2-10
- Adding WWNs to ports on page 2-10
- Editing the WWN nickname on page 2-11
- Connecting WWNs to ports on page 2-12
- Deleting unused WWNs from monitoring targets on page 2-13

Adding new WWNs to monitor

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.

b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.

b. Right-click the target storage system and then select **Performance Monitor**.

2. In the **Performance Monitor** window select the **Monitored WWNs** tab.
3. On the **Monitored WWNs** tab click **Edit WWN Monitor Mode** to open the **Edit WWN Monitor Mode** window.
4. In the **Edit WWN Monitor Mode** window select the WWNs in the **Unmonitored WWNs** list, and click **Add**.
5. Enter your task name in **Task Name**, and click **Finish**.
6. In the **Confirm** window click **Apply** to apply the settings to the storage system.

   If **Go to tasks window for status** was checked, the **Task** window appears.

Related topics

- Edit WWN Monitor Mode wizard on page A-33

Viewing the WWNs that are being monitored

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.

   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**.

   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:

   a. Select the **Resources** tab, and expand the **Storage Systems** tree.

   b. Right-click the target storage system and then select **Performance Monitor**.

2. In the **Performance Monitor** window select the **Monitored WWNs** tab to see the WWNs that are currently being monitored.

Related topics

- Performance Monitor main window on page A-3

Removing WWNs to monitor

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. Click the **Monitored WWNs** tab.
3. On the **Monitored WWNs** tab click **Edit WWN Monitor Mode** to open the **Edit WWN Monitor Mode** window.
4. Select the WWNs in the **Monitored WWNs** list that you want to remove, and click **Remove**.
5. Enter your task name in **Task Name**, and click **Finish**.
6. In the **Confirm** window click **Apply**.
7. When the warning message appears, click **OK** to close the message. The settings are applied to the storage system.

Related topics

- Edit WWN Monitor Mode wizard on page A-33

Adding WWNs to ports

If you want to monitor WWNs that are not connected to the storage system, you can add them to ports and set them up for monitoring with Performance Monitor.

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.

b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.

b. Right-click the target storage system and then select **Performance Monitor**.

2. In the **Performance Monitor** window click the **Monitored WWNs** tab.
3. On the **Monitored WWNs** tab click **Add New Monitored WWNs** to open the **Add New Monitored WWNs** window.
4. Specify the following information for each new WWN:

Item	Description
HBA WWN (required)	Enter the 16-digit hexadecimal number.
WWN Name (optional)	Enter the unique name to distinguish the host bus adapter from others. The **WWN Name** must be less than 64 characters and must consist of alphanumeric characters and at least one symbol.
Port (in **Available Ports**)	In the **Available Ports** list select the port connected to the WWN.

5. Click **Add**. The added WWN is displayed in **Selected WWNs**.
6. If you need to remove a WWN from the **Selected WWNs** list, select the WWN and click **Remove**.
7. When you are done adding WWNs, click **Finish**.
8. In the **Confirm** window click **Apply** to apply the settings to the storage system.

Related topics

- Add New Monitored WWNs wizard on page A-38

Editing the WWN nickname

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.

   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**.

   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.

2. Click the **Monitored WWNs** tab to see the list of WWNs being monitored.
3. Select the WWN to edit. You can edit only one WWN at a time. If you select multiple WWNs, an error will occur.
4. On the **Monitored WWNs** tab click **Edit WWN** to open the **Edit WWN** window.
5. On the **Edit WWN** window edit the **HBA WWN** and **WWN Name** fields as needed.
   - **HBA WWN**
     A 16-digit hexadecimal number. The value of **HBA WWN** must be unique in the storage system.
   - **WWN Name**
     The nickname distinguishes the host bus adapter from others. The **WWN Name** must be less than 64 digits and must consist of alphanumeric characters and at least one symbol.
6. When you are done editing WWNs, click **Finish**.
7. In the **Confirm** window click **Apply** to apply the settings to the storage system.

Related topics

- Edit WWN wizard on page A-31

Connecting WWNs to ports

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window click the **Monitored WWNs** tab.
3. On the **Monitored WWNs** tab select the WWN to connect to the port.

Select only one WWN at a time. If you select multiple WWNs, an error occurs.

4. On the **Monitored WWNs** tab click **Add to Ports** to open the **Add to Ports** window.
5. Select the port to connect in **Available Ports**, and then click **Add**.
   The selected WWN and port are added to the **Selected WWNs** list.
6. If you need to delete a WWN from the **Selected WWNs** list, select the WWN, and then click **Remove**.
7. When you are done selecting the WWNs to connect, click **Finish**.
8. In the **Confirm** window click **Apply** to apply the settings to the storage system.

Related topics

- Add to Ports wizard on page A-42

Deleting unused WWNs from monitoring targets

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. Click the **Monitored WWNs** tab.
3. On the **Monitored WWNs** tab click **Delete Unused WWNs** to open the **Delete Unused WWNs** window.
4. In the **Confirm** window enter your task name in **Task Name**, and click **Apply**.

Related topics

- Delete Unused WWNs window on page A-37

Monitoring CUs

This section provides instructions for monitoring control units (CUs) using Hitachi Performance Monitor.

- Displaying CUs to monitor on page 2-14
- Adding and removing CUs to monitor on page 2-14
- Selecting CUs to monitor on page 2-15
- Confirming the status of CUs to monitor on page 2-16

Displaying CUs to monitor

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. Open the **Monitored CUs** tab to view the list of CUs.

Related topics

- Performance Monitor main window on page A-3

Adding and removing CUs to monitor

Use the Performance Monitor window to add or remove CUs to monitor. If this operation is performed, the monitoring result will be deleted.

Caution: Stored monitoring data is deleted when you perform this operation.

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. Open the **Monitored CUs** tab.
3. On the **Monitored CUs** tab click **Edit CU Monitor Mode** to open the **Edit CU Monitor Mode** window.
4. Add or remove CUs to monitor.
   To add CUs to monitoring target objects, select CUs from the **Unmonitored CUs** field and click **Add**. To remove CUs from monitoring target objects, select CUs from the **Monitored CUs** field and click **Remove**.
5. Click **Finish**.
6. In the **Confirm** window enter your task name in **Task Name**, and click **Apply**.

Note: To monitor a parity group, specify the CU numbers of all LDEVs belonging to the parity group. Otherwise the parity group is not subjected to monitoring.

Related topics

- Edit CU Monitor Mode wizard on page A-22

Selecting CUs to monitor

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.

2. Open the **Monitored CUs** tab.
3. On the **Monitored CUs** tab click **Edit CU Monitor Mode** to open the **Edit CU Monitor Mode** window.
4. Click **Select by Parity Groups** in the **Unmonitored CUs** field.
   The **Select by Parity Groups** window opens. The available parity group IDs and number of CUs are displayed.
5. Select the parity group ID from the list and click **Detail**.
   The **Parity Group Properties** window opens. The CUs and the number of LDEVs are displayed.
6. Confirm the properties of the parity group and click **Close**.
   The **Select by Parity Groups** window opens.
7. Select the parity group to be the monitoring target in the **Select by Parity Groups** window and click **OK**.
   CUs in the parity group are selected in the **Unmonitored CUs** field. For information about monitoring these CUs, see Adding and removing CUs to monitor on page 2-14.

Related topics

- Select by Parity Groups window on page A-28
- Parity Group Properties window on page A-30
- Adding and removing CUs to monitor on page 2-14

Confirming the status of CUs to monitor

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. Open the **Monitored CUs** tab.

3. Open the **View CU Matrix** window using one of the following methods:
   - On the **Monitored CUs** tab click **View CU Matrix**.
   - In the **Reports** menu click **Performance Monitor** then **View CU Matrix**.
   - On the **Monitored CUs** tab click **Edit CU Monitor Mode** then **View CU Matrix**.

   The following CUs are displayed in the **Monitored CUs** window:
   - Monitored CUs
   - Set monitored CUs
   - Release monitored CUs
4. Click **Close**.
   The **Edit CU Monitor Mode** window opens.

Related topics

- View CU Matrix window on page A-26

Changing the sampling interval

You can change the sampling interval for monitoring. For example, if you want to collect statistics over a longer period of time, you can lengthen the sampling interval to increase the storing period (for details see Maximum storing period for monitoring on page 2-3).

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window click **Edit Monitoring Switch** to open the **Edit Monitoring Switch** window.
3. Select the desired sampling interval in the **Sample Interval**. This option is available only when the current monitoring status is **Enable**.
4. Click **Finish**.

5. In the **Confirm** window enter your task name in **Task Name**, and click **Apply** to change the sampling interval.

Note: Monitoring data cannot be displayed immediately after the sampling interval is changed, because no monitoring data with the new sampling interval has accumulated. "Immediately after" here means the time within the first two sampling intervals after the interval was changed. For instance, if the sampling interval is changed to 15 minutes, monitoring data is not accumulated for up to 29 minutes after the interval was changed.

Related topics

- Edit Monitoring Switch window on page A-5

Stopping monitoring

When you no longer need to collect monitoring statistics, you can stop the monitoring function. After you stop monitoring, you should consider exporting the monitoring statistics using the Export Tool, because the existing statistics are deleted each time monitoring is restarted.

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window click **Edit Monitoring Switch** to open the **Edit Monitoring Switch** window.
3. Click **Disable** in the **Monitoring Switch** field.
   The **Sample Interval** list is grayed out and becomes ineffective.
4. Click **Finish**.
5. In the **Confirm** window enter your task name in **Task Name**, and click **Apply** to stop monitoring.

Related topics

- Edit Monitoring Switch wizard on page A-5

Using the Performance Monitor data graphs

- About the data graphs on page 2-19
- Displaying the monitor data on graphs on page 2-19
- Adding a new graph on page 2-20
- Changing the data displayed on a graph on page 2-21
- Changing the time period displayed on the graph panel on page 2-22
- Deleting a graph on page 2-23

About the data graphs

The Hitachi Performance Monitor data graphs are displayed on panels with the graph on the left and the legend for the graph on the right. Hitachi Performance Monitor can display up to eight monitoring objects per graph panel. You can set a maximum of four graph panels with up to 16 monitoring objects.

- You can change the size of each graph panel by clicking the icon in the upper right of the panel.
- You can display the value of each data point by placing the mouse cursor on the data point on the graph.
- You can adjust the unit of scale on the vertical axis using the vertical scale selector on the upper left of the graph. For example, you may need to increase the vertical scale to see data with high values.

  In some cases you may need to adjust the vertical scale to display the data properly. For example, if the scale is too small a single data line may be so thick that the entire graph is painted in a single color.
- You can display or hide data points on the graph panel by clicking the legend on the right of the graph. Each graph must display at least one set of data, so you cannot hide all of the data.
- When you are viewing data for the MP units in real time (**Time Range** is set to **Use Real Time**), the MP unit names are displayed as text links.

Displaying the monitor data on graphs

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:

a. Select **Analytics** in **Explorer**.
b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.

2. Specify the data range and time period to be displayed on the graphs:
   a. In the **Data Range** field, select the data range.
   b. In the **Time Range** field, select **Set Range** to display data from a specific period of time, or select **Use Real Time** to display real-time data as it is being collected.
   c. If you selected **Set Range**, specify the starting date/time and ending date/time for the range of data in the **From** and **To** fields.
3. Specify the monitor data to be displayed on the graphs:
   a. In the **Performance Objects** area select items in the **Object** field.
      Select items in the left field and then select detailed items in the right field. Detailed item changes by the items selected in the left field.
   b. Select items in the **Monitor Data** field.
      Select items in the left field and then select detailed items in the right field.
   c. Select the monitor data to be graphed in the **Available Objects** list.
   d. Click **Add** to add the monitor data to the **Selected Objects** list.
   e. If you need to remove monitor data from the **Selected Objects** list, select the object and click **Remove**.
4. Click **Apply** to display the selected monitor data on graphs in the **Monitor Performance** window.

Related topics

- Performance Monitor main window on page A-3
- Monitor Performance window on page A-7

Adding a new graph

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.

b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window.

In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.

b. Right-click the target storage system and then select **Performance Monitor**.

c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window

2. Display the graph panel in the **Monitor Performance** window.
   For details, see Displaying the monitor data on graphs on page 2-19.
3. Click **Add Graph** to open the **Add Graph** window.
   If a warning message is displayed when you click the **Add Graph** button, you are already displaying the maximum number of graphs. To add another graph you need to first delete an existing graph. For details, see Deleting a graph on page 2-23.
4. Specify the monitor data to be graphed by selecting the objects on the left and adding them to the **Selected Objects** list on the right.
   For details, see Displaying the monitor data on graphs on page 2-19.
5. Click **OK** to add the specified graph.

Related topics

- Monitor Performance window on page A-7
- Add Graph window on page A-63
- Displaying the monitor data on graphs on page 2-19

Changing the data displayed on a graph

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**, and select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   b. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window.

   c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window

   In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.
c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window

2. Display the graph panel in the **Monitor Performance** window.
   For details, see Displaying the monitor data on graphs on page 2-19.
3. Click **Edit Performance Objects** to open the **Edit Performance Objects** window.
4. Edit the monitor data being displayed on the graph by adding objects to and deleting objects from the **Selected Objects** list on the right.
   For details, see Displaying the monitor data on graphs on page 2-19.
5. Click **OK** to display the graph with the newly specified monitor data.

Related topics

- Monitor Performance window on page A-7
- Edit Performance Objects window on page A-49
- Displaying the monitor data on graphs on page 2-19

Changing the time period displayed on the graph panel

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**, and select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   b. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
   c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window
2. Display the graph panel in the **Monitor Performance** window.
   For details, see Displaying the monitor data on graphs on page 2-19.
3. Click **Edit Time Range** to open the **Edit Time Range** window.

4. Enter the desired starting date and time in the **From** field. Enter the desired end date and time in the **To** field.
5. Click **OK** to display the graph panel with the newly selected time period.

Related topics

- Monitor Performance window on page A-7
- Edit Time Range window on page A-48
- Displaying the monitor data on graphs on page 2-19

Deleting a graph

Prerequisites

- Required role: Storage Administrator (Performance Management)

Procedure

1. Display the **Monitor Performance** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
   c. On the **Performance Monitor** window, click **Monitor Performance** to open the **Monitor Performance** window
2. Display the graph panel in the **Monitor Performance** window.
   For details, see Displaying the monitor data on graphs on page 2-19.
3. Click **Delete Graph** in the lower right, or click the close icon in the upper right corner.
4. When the confirmation message appears, click **OK** to delete the graph.

Related topics

- Monitor Performance window on page A-7
- Displaying the monitor data on graphs on page 2-19

3

Hitachi Performance Monitor data

This chapter provides detailed descriptions of the monitoring data collected and displayed by Hitachi Performance Monitor.

- Monitoring data
- Usage rates of MPs
- Usage rate of cache memory
- Write pending rates
- Storage system throughput
- Data transfer rate
- Response times
- Cache hit rates
- Back-end performance
- Drive usage rates
- Data drive access rates
- ShadowImage usage statistics
- Remote I/O (RIO)
- Pair Synchronized

- Differential Track
- Number of Journals
- Data Usage Rate
- Meta Data Usage Rate

Monitoring data

The following table lists the objects that can be monitored and specifies the data that is collected for each monitoring object. You can specify the objects that are displayed in the graphs in the **Performance Objects** in the **Monitor Performance** window. When the resource group feature is installed, you can specify the objects to be displayed in the graphs only when the necessary resources specified in the following table are allocated.

The monitoring data for each sampling interval is the average value of the data over the data sampling interval. The sampling interval is 1 to 15 minutes. The monitoring data shows the information by each resource ID even when the volume is in a virtual storage machine (not by virtual ID). For instructions on viewing the monitoring data, see Using the Performance Monitor data graphs on page 2-19.

Object of monitoring	Monitoring data	Necessary resources
Controller	Usage rates of MPs (%)	None
Cache	Usage rates of cache (%)	None
	Write pending rates (%)	
Fibre port (target)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
Fibre port (initiator)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
iSCSI port (target)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
iSCSI port (initiator)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
NAS platform (User LU)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
NAS platform (System LU)	Throughput (IOPS)	Port
	Data transfer (MB/s)	
	Response time (ms)	
WWN	Throughput of WWN (IOPS)	Port
	Data transfer of WWN (MB/s)	

Object of monitoring	Monitoring data	Necessary resources
	Response time of WWN (ms)	
	Throughput of port (IOPS)	
	Data transfer of port (MB/s)	
	Response time of port (ms)	
LDEV (base)	Total throughput (IOPS)	LDEV
	Read throughput (IOPS)	
	Write throughput (IOPS)	
	Cache hit (%)	
	Data transfer (MB/s)	
	Response time (ms)	
	Back transfer (count/sec)	
	Drive usage rate (%)[1]	
	Drive access rate (%)[1]	
	ShadowImage usage rates (%)[1]	
LDEV (TC/ GAD)	RIO (count)	LDEV
	Pair Synchronized (%)	
	Differential track (count)	
	Initial copy throughput (count)	
	Initial copy data transfer (MB/s)	
	Initial copy response time (ms)	
	Update copy throughput (count)	
	Update copy data transfer (MB/s)	
	Update copy response time (ms)	
LDEV (UR)	Write host I/O throughput (IOPS)	LDEV
	Write host I/O data transfer (MB/s)	
	Initial copy cache hit (%)	
	Initial copy data transfer (MB/s)	
Parity group	Total throughput (IOPS)	Parity group
	Read throughput (IOPS)	
	Write throughput (IOPS)	
	Cache hit (%)	
	Data transfer (MB/s)	
	Response time (ms)	

Object of monitoring	Monitoring data	Necessary resources
	Back transfer (count/sec)	
	Drive usage rate (%)[1]	
LUN (base)	Total throughput (IOPS)	• Host group • LDEV
	Read throughput (IOPS)	
	Write throughput (IOPS)	
	Cache hit (%)	
	Data transfer (MB/s)	
	Response time (ms)	
	Back transfer (count/sec)	
LUN (TC/ GAD)[2]	RIO (count)	• Host group • LDEV
	Pair Synchronized (%)	
	Differential track (count)	
	Initial copy throughput (count)	
	Initial copy data transfer (MB/s)	
	Initial copy response time (ms)	
	Update copy throughput (count)	
	Update copy data transfer (MB/s)	
	Update copy response time (ms)	
LUN (UR)[2]	Write host I/O throughput (IOPS)	• Host group • LDEV
	Write host I/O data transfer (MB/s)	
	Initial copy cache hit (%)	
	Initial copy data transfer (MB/s)	
External storage	Data transfer between the VSP Gx00 model or VSP Fx00 model and external storage per logical device (MB/s)	LDEV
	Response time between the VSP Gx00 model or VSP Fx00 model and external storage per logical device (ms)	
	Data transfer between the VSP Gx00 model or VSP Fx00 model and external storage per external volume group (MB/s)	Parity group
	Response time between the VSP Gx00 model or VSP Fx00 model and external storage per external volume group (ms)	
Journal	Write host I/O throughput (IOPS)	None
	Write host I/O data transfer (MB/s)	

Object of monitoring	Monitoring data	Necessary resources
	Initial copy cache hit (%)	
	Initial copy data transfer (MB/s)	
	Master journal throughput (IOPS)	
	Master journal journal (count/sec)	
	Master journal data transfer (MB/s)	
	Master journal response time (ms)	
	Master journal usage data (%)	
	Master journal meta data usage rate (%)	
	Restore journal throughput (IOPS)	
	Restore journal journal (count/sec)	
	Restore journal data transfer (MB/s)	
	Restore journal response time (ms)	
	Restore journal usage data (%)	
	Restore journal meta data usage rate (%)	
Entire storage system (TC/ GAD)	RIO (count)	None
	Pair Synchronized (%)	
	Differential track (count)	
	Initial copy throughput (count)	
	Initial copy data transfer (MB/s)	
	Initial copy response time (ms)	
	Update copy throughput (count)	
	Update copy data transfer (MB/s)	
	Update copy response time (ms)	
Entire storage system (UR)	Write host I/O throughput (IOPS)	None
	Write host I/O data transfer (MB/s)	
	Initial copy cache hit (%)	
	Initial copy data transfer (MB/s)	
	Master journal throughput (IOPS)	
	Master journal journal (count/sec)	
	Master journal data transfer (MB/s)	
	Master journal response time (ms)	
	Restore journal throughput (IOPS)	
	Restore journal journal (count/sec)	

Object of monitoring	Monitoring data	Necessary resources
	Restore journal data transfer (MB/s)	
	Restore journal response time (ms)	

Notes:

1. Only information on internal volumes is displayed. Information on external volumes is not displayed.
2. The same value is output to all LUNs mapped to the LDEV.

Usage rates of MPs

Function

The usage rate of the MP shows the usage rate of an MP assigned to a logical device. If a usage rate of an MP is high, I/Os concentrate to an MP. Examine the distribution of I/Os to other MP units.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Controller	MP	Usage Rate (%)	None

Usage rate of cache memory

Function

When you display monitoring results in a sampling interval, the window displays the usage rates about the cache memory for the specified period of time.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Cache	None	Usage Rate (%)	None

Write pending rates

Function

The write pending rate indicates the ratio of write pending data to the cache memory capacity. The Monitor Performance window displays the average and the maximum write pending rate for the specified period of time.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Cache	None	Write Pending Rate (%)	None

Storage system throughput

Function

Total throughput is the sum of I/Os per second. The read throughput is I/Os to the disk per second when the file read processing is performed. The write throughput is I/Os to the disk per second when the file write processing is performed.

Throughput in the following modes can be displayed:

- Sequential access mode
- Random access mode
- Total value in the above-mentioned modes

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Fibre Port[1]	Target	Throughput (IOPS)	None
	Initiator	Throughput (IOPS)	None
iSCSI Port[1]	Target	Throughput (IOPS)	None
	Initiator	Throughput (IOPS)	None
NAS Platform (User LU)[1]	Target	Throughput (IOPS)	None
NAS Platform (System LU)[1]	Target	Throughput (IOPS)	None
WWN[1]	WWN	Throughput (IOPS)	None
	Port	Throughput (IOPS)	None
Logical Device[1]	Base	Total Throughput (IOPS)	Total
			Sequential
			Random
		Read Throughput (IOPS)	Total
			Sequential
			Random
		Write Throughput (IOPS)	Total
			Sequential
			Random
	TC/GAD	Initial copy	Throughput (count)[2]
		Update copy	Throughput (count)[2]
	UR	Write Host I/O	Throughput (IOPS)
Parity Group[1]	None	Total Throughput (IOPS)	Total
			Sequential
			Random
		Read Throughput (IOPS)	Total
			Sequential
			Random
		Write Throughput (IOPS)	Total
			Sequential
			Random

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
LUN[3]	Base	Total Throughput (IOPS)	Total
			Sequential
			Random
		Read Throughput (IOPS)	Total
			Sequential
			Random
		Write Throughput (IOPS)	Total
			Sequential
			Random
	TC/GAD	Initial copy	Throughput (count)[2]
		Update copy	Throughput (count)[2]
	UR	Write host I/O	Throughput (IOPS)
Journal	UR	Write host I/O	Throughput (IOPS)
		Master journal	Throughput (IOPS)
		Restore journal	Throughput (IOPS)
Entire Storage System	TC/GAD	Initial copy	Throughput (count)[2]
		Update copy	Throughput (count)[2]
	UR	Write host I/O	Throughput (IOPS)
		Master journal	Throughput (IOPS)
		Restore journal	Throughput (IOPS)

Notes:

1. Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.
2. The total number of accesses is displayed.
3. The same value is output to all LUNs mapped to the LDEV.

Data transfer rate

Function

The amount of data transferred from the host server per second. The data transfer rate for both read data and write data can be monitored.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Fibre Port*	Target	Data Trans. (MB/s)	None
	Initiator	Data Trans. (MB/s)	None
iSCSI Port*	Target	Data Trans. (MB/s)	None
	Initiator	Data Trans. (MB/s)	None
NAS Platform (User LU)*	Target	Data Trans. (MB/s)	None
NAS Platform (System LU)*	Target	Data Trans. (MB/s)	None
WWN*	WWN	Data Trans. (MB/s)	None
	Port	Data Trans. (MB/s)	None
Logical Device*	Base	Data Trans. (MB/s)	Total
			Read
			Write
	TC/GAD	Initial Copy	Data Trans. (MB/s)
		Update Copy	Data Trans. (MB/s)
	UR	Write Host I/O	Data Trans. (MB/s)
		Initial Copy	Data Trans. (MB/s)
Parity Group*	None	Data Trans. (MB/s)	Total
			Read
			Write
LUN*	Base	Data Trans. (MB/s)	Total
			Read
			Write
	TC/GAD	Initial Copy	Data Trans. (MB/s)
		Update Copy	Data Trans. (MB/s)
	UR	Write Host I/O	Data Trans. (MB/s)
		Initial Copy	Data Trans. (MB/s)
External Storage	Logical Device	Data Trans. (MB/s)	Total
			Read
			Write
	Parity Group	Data Trans. (MB/s)	Total

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
			Read
			Write
Journal	UR	Write host I/O	Data Trans. (MB/s)
		Initial copy	Data Trans. (MB/s)
		Master journal	Data Trans. (MB/s)
		Restore journal	Data Trans. (MB/s)
Entire Storage System	TC/GAD	Initial copy	Data Trans. (MB/s)
		Update copy	Data Trans. (MB/s)
	UR	Write host I/O	Data Trans. (MB/s)
		Initial copy	Data Trans. (MB/s)
		Master journal	Data Trans. (MB/s)
		Restore journal	Data Trans. (MB/s)
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Response times

Function

Time (in milliseconds) for replying from an external volume group when I/O accesses are made from the VSP Gx00 models or VSP Fx00 models to the external volume group. The average response time in the period specified at Monitoring Term is displayed.

Items whose response times can be monitored are ports, WWNs, LDEVs, parity groups, LUNs, and external storages (parity groups and LDEVs).

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Fibre Port*	Target	Response Time (ms)	None
	Initiator	Response Time (ms)	None

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
iSCSI Port*	Target	Response Time (ms)	None
	Initiator	Response Time (ms)	None
NAS Platform (User LU)*	Target	Response Time (ms)	None
NAS Platform (System LU)*	Target	Response Time (ms)	None
WWN*	WWN	Response Time (ms)	None
	Port	Response Time (ms)	None
Logical Device*	Base	Response Time (ms)	Total
			Read
			Write
	TC/GAD	Initial Copy	Response Time (ms)
		Update Copy	Response Time (ms)
Parity Group*	None	Response Time (ms)	Total
			Read
			Write
LUN*	Base	Response Time (ms)	Total
			Read
			Write
	TC/GAD	Initial Copy	Response Time (ms)
		Update Copy	Response Time (ms)
External Storage	Logical Device	Response Time (ms)	Total
			Read
			Write
	Parity Group	Response Time (ms)	Total
			Read
			Write
Journal	UR	Master Journal	Response Time (ms)
		Restore Journal	Response Time (ms)
Entire Storage System	TC/GAD	Initial Copy	Response Time (ms)
		Update Copy	Response Time (ms)
	UR	Master Journal	Response Time (ms)
		Restore Journal	Response Time (ms)

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Cache hit rates

Function

The cache hit rate is a rate that the input or output data of the disk exists in the cache. The cache hit rate is displayed for sequential access mode, random access mode, and both of these modes.

- Read hit ratio

  For a read I/O, when the requested data is already in cache, the operation is classified as a read hit. For example, if ten read requests have been made from hosts to devices in a given time period and the read data was already on the cache memory three times out of ten, the read hit ratio for that time period is 30 percent. A higher read hit ratio implies higher processing speed because fewer data transfers are made between devices and the cache memory.
- Write hit ratio

  For a write I/O, when the requested data is already in cache, the operation is classified as a write hit. For example, if ten write requests were made from hosts to devices in a given time period and the write data was already on the cache memory three cases out of ten, the write hit ratio for that time period is 30 percent. A higher write hit ratio implies higher processing speed because fewer data transfers are made between devices and the cache memory.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Objecc field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	Base	Cache Hit (%)	Read (Total)
			Read (Sequential)
			Read (Random)
			Write (Total)

Item on left side of Object field	Item on right side of Objecc field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
			Write (Sequential)
			Write (Random)
	UR	Initial Copy	Cache Hit (%)
Parity Group*	None	Cache Hit (%)	Read (Total)
			Read (Sequential)
			Read (Random)
			Write (Total)
			Write (Sequential)
			Write (Random)
LUN*	Base	Cache Hit (%)	Read (Total)
			Read (Sequential)
			Read (Random)
			Write (Total)
			Write (Sequential)
			Write (Random)
	UR	Initial Copy	Cache Hit (%)
Journal	UR	Initial Copy	Cache Hit (%)
Entire Storage System	UR	Initial Copy	Cache Hit (%)
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Back-end performance

Function

The back-end transfer can be monitored. The back-end transfer is the number of data transfers between the cache memory and the data drive. The graph contains following information.

- **Cache to Drive**
  The number of data transfers from the cache memory to data drives.
- **Drive to Cache (Sequential)**
  The number of data transfers from data drives to the cache memory in sequential access mode
- **Drive to Cache (Random)**
  The number of data transfers from data drives to the cache memory in random access mode

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	Base	Back Trans. (count/sec)	Total
			Cache to Drive
			Drive to Cache (Sequential)
			Drive to Cache (Random)
Parity Group*	None	Back Trans. (count/sec)	Total
			Cache to Drive
			Drive to Cache (Sequential)
			Drive to Cache (Random)
LUN*	Base	Back Trans. (count/sec)	Total
			Cache to Drive
			Drive to Cache (Sequential)
			Drive to Cache (Random)
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Drive usage rates

Function

The usage rates of the data drive of each LDEV or parity group can be displayed.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	Base	Drive Usage Rate (%)	None
Parity Group*	None	Drive Usage Rate (%)	None
*Only information on internal volumes is displayed. Information about external volumes is not displayed.			

Data drive access rates

Function

The data drive access rate shows the access rate of each data drive.

The rate of the file reading **Read (Sequential)** or the file writing **Write (Sequential)** processing of the data drive in the sequential access mode is displayed.

The rate of file reading **Read (Random)** or file writing **Write (Random)** processing of the data drive in the random access mode is displayed.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	Base	Drive Access Rate (%)	Read (Sequential) Read (Random) Write (Sequential) Write (Random)
*Only information on internal volumes is displayed. Information about external volumes is not displayed.			

ShadowImage usage statistics

Function

The access rate of volume by ShadowImage can be displayed the percentage of the processing of the program to all processing of the physical drives, for each volume. This value is found by dividing access time to physical drives by the program by all access time to physical drives.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	Base	ShadowImage (%)	None
*Only information on internal volumes is displayed. Information about external volumes is not displayed.			

Remote I/O (RIO)

Function

Information about LDEV performance is shown through the total number of remote I/Os from the P-VOL to the S-VOL of a TrueCopy or global-active device pair.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	TC/GAD	RIO (count)	Total
			Write
			Error

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
LUN*	TC/GAD	RIO (count)	Total
			Write
			Error
Entire Storage System	TC/GAD	RIO (count)	Total
			Write
			Error
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Pair Synchronized

Function

The synchronization rate between the P-VOL and S-VOL of a TrueCopy or global-active device pair is shown as the pair synchronization rate (%).

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	TC/GAD	Pair Synchronized (%)	None
LUN*	TC/GAD	Pair Synchronized (%)	None
Entire Storage System	TC/GAD	Pair Synchronized (%)	None
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Differential Track

Function

The synchronization rate between the P-VOL and the S-VOL of a TrueCopy or global-active device pair is shown through the number of differential tracks (the number of tracks not transmitted from the P-VOL to the S-VOL).

Storing period

Sample Interval can be specified.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Logical Device*	TC/GAD	Differential track (count)	None
LUN*	TC/GAD	Differential track (count)	None
Entire Storage System	TC/GAD	Differential track (count)	None
* Volumes that do not accept I/O from the host, such as pool-VOLs, are not monitored.			

Number of Journals

Function

The total number of journals transferred from the master journal volume to the restore journal volume is shown.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Journal	UR	Master Journal	Journal (count/sec)
		Restore Journal	Journal (count/sec)
Entire Storage System	UR	Master Journal	Journal (count/sec)
		Restore Journal	Journal (count/sec)

Data Usage Rate

Function

The current journal data usage rate (%) is shown, with the journal volume data space assumed to be 100%.

Storing period

Sample Interval can be specified.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Journal	UR	Master Journal	Data Usage Rate (%)
		Restore Journal	Data Usage Rate (%)

Meta Data Usage Rate

Function

The meta data usage rate of the current journal is shown, with journal volume meta data space assumed to be 100%.

Storing period

Sample Interval can be specified from 1 to 15 minutes.

Selection of monitoring objects

Select the desired monitoring objects in the **Performance Objects** field.

Item on left side of Object field	Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field
Journal	UR	Master Journal	Meta Data Usage Rate (%)
		Restore Journal	Meta Data Usage Rate (%)

4

Exporting Performance Monitor data

This chapter describes Export Tool and how to export Hitachi Performance Monitor data for your Hitachi Virtual Storage Platform G200, G400, G600, G800 and Hitachi Virtual Storage Platform F400, F600, F800 storage systems. You can then further analyze this data by using spreadsheets and other applications.

- ☐ About Export Tool
- ☐ Preparing to use Export Tool
- ☐ Using Export Tool
- ☐ Export Tool command reference
- ☐ Exported files
- ☐ Parity group and external volume group statistics
- ☐ Statistics for volumes in parity/external volume groups
- ☐ Volumes in parity groups or external volume groups (volumes controlled by a particular CU)
- ☐ Port statistics
- ☐ Host bus adapters connected to ports statistics
- ☐ Volumes (LU) statistics
- ☐ All host bus adapters connected to ports
- ☐ Remote copy operations by TC or GAD (whole volumes)

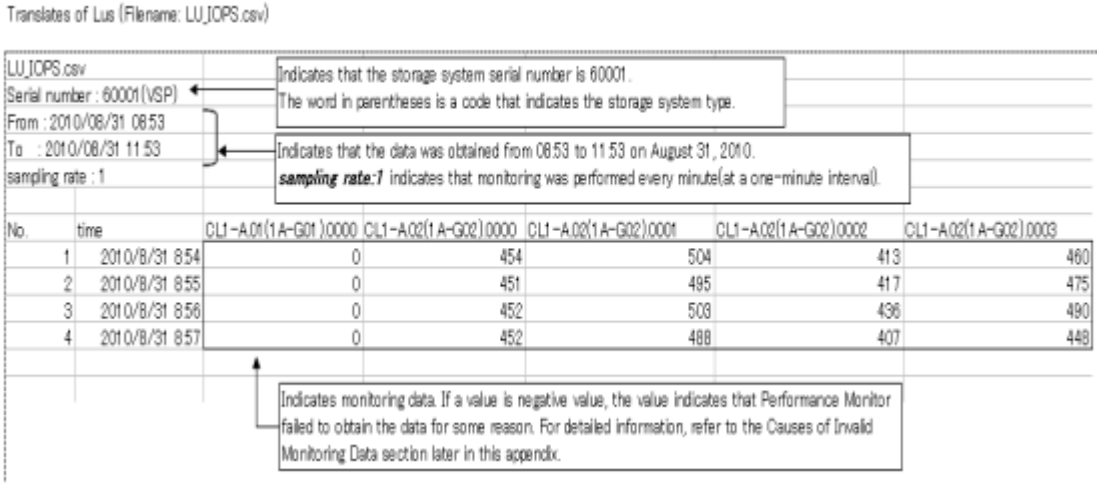
- Remote copy operations by TC or GAD (for each volume (LU))
- Remote copy by TC or GAD (volumes controlled by a particular CU)
- Remote copy by UR (whole volumes)
- Remote copy by UR (journals)
- Remote copy by UR (for each volume (LU))
- Remote copy by UR (volumes controlled by a particular CU)
- Causes of Invalid Monitoring Data

About Export Tool

Use Export Tool to export the monitoring data (statistics) shown in the Monitor Performance window to text files. You can also use Export Tool to export monitoring data on remote copy operations performed by TrueCopy, Universal Replicator, and global-active device. After exporting monitoring data to text files, you can import that data into desktop publishing applications, such as Microsoft Word, or into spreadsheet or database applications for analysis.

Example of a text file

The following example is of a text file imported into spreadsheet software.



Note: In this `LU_IOPS.csv` file, the last four digits of a table column heading (such as 0001 and 0002) indicate a LUN. For example, the heading CL1-A.00(1A-G00).0001 indicates the port CL1-A, the host group ID 00, the host group name 1A-G00, and the LUN 0001.
If you export monitoring data about concatenated parity groups, the resulting CSV file does not contain column headings for the concatenated parity groups. For example, if you export monitoring data about a concatenated parity group named 1-3[1-4], you will not be able to find 1-3[1-4] in column headings. To locate monitoring data about 1-3[1-4], find the 1-3 column or the 1-4 column. Either of these columns contains monitoring data about 1-3[1-4].

Preparing to use Export Tool

Requirements for Export Tool

The following components are required to use Export Tool. For details, see the *Hitachi Command Suite User Guide*.

- **Windows computer or a UNIX computer**

Export Tool runs on Windows computers and UNIX computers that can run the Hitachi Command Suite software. If your Windows or UNIX computer is unable to run Hitachi Command Suite, your computer is unable to run Export Tool.

Note: If a firewall exists between the Hitachi Command Suite computer and the SVP, see the *Hitachi Command Suite User Guide*. In the topic about setting up TCP/IP for a firewall, the RMI port numbers listed are the only direct communication settings required for Export Tool.

- **Java Runtime Environment (JRE) software**

  To use Export Tool, you must have the JRE software on your Windows or UNIX computer. If your computer runs Hitachi Command Suite, the required version of JRE is already installed (Export Tool uses the same JRE version as Hitachi Command Suite), and you can install Export Tool. If your computer does not run Hitachi Command Suite but contains the required version of JRE, you can install Export Tool on your computer. If your computer does not have the required JRE version, you need to install JRE before installing Export Tool. See the *Hitachi Command Suite User Guide* for the required JRE version.
- **User ID for exclusive use of Export Tool**

  Before you can use Export Tool, you must create a user ID for exclusive use of Export Tool. Assign only the Storage Administrator (Performance Management) role to the user ID for Export Tool. Do not assign any roles other than the Storage Administrator (Performance Management) role to this user ID. Users who have the Storage Administrator (Performance Management) role can perform the following operations:

  - Saving the monitoring data into files
  - Changing the sampling interval
  - Starting and stopping monitoring by using the **`set`** subcommand

  For details about creating user IDs, see *Hitachi Command Suite User Guide*.
- **The Export Tool program**

  Media for the software products contains Export Tool. For information about how to install Export Tool, see Installing Export Tool on page 4-5.
- Reinstallation of Export Tool is not mandatory if the Device Manager - Storage Navigator program and Export Tool version are:

  - VSP G200: 83-02-00-20/XX or later
  - VSP G400, G600: 83-02-00-40/XX or later
  - VSP G800: 83-02-00-60/XX or later

  For the Export Tool version, see the Readme.txt file stored in the software product media.

Caution:

- If the installed Export Tool version is earlier than 83-02-00-20/XX (for VSP G200), 83-02-00-40/XX (for VSP G400, G600), or 83-02-00-60/XX

(for VSP G800), remove Export Tool first. To remove it, delete the directory which was created when Export Tool was installed. When you delete the directory, monitoring data and log data acquired by Export Tool, and the file you edited will be deleted. If you need the monitoring data, log data, and the files you edited, save them in a separate directory before removing Export Tool.

- Running multiple instances of Export Tool simultaneously is not supported. If you run multiple instances, the SVP can become overloaded and a timeout error can occur.

Installing Export Tool

- On Windows on page 4-5
- On UNIX on page 4-5

On Windows

The Export Tool program is a Java class file and is located in the `export\lib` folder.

Caution: The files edited by the user are overwritten if Export Tool is reinstalled. Save these files in a separate directory in advance.

1. Log on with administrator privileges.
2. Create a new folder for the Export Tool application (for example, `C:\Program Files\monitor`). If this folder already exists, skip this step.
3. Insert the software media into the computer.
4. Locate the `\program\monitor\win` folder on the media, and copy the self-extracting file `export.exe` from the media into the new folder you just created.
5. Double-click `export.exe` to start the installation. Export Tool is installed, and a new folder named "export" is created.

Note: You should delete `runUnix.bat` and `delUnix.bat` from the export folder because these files are no longer needed.

On UNIX

The Export Tool program is a Java class file and is located in the `lib` directory.

Caution: The files edited by the user are overwritten if Export Tool is reinstalled. Save these files in a separate directory in advance.

1. Log on as a superuser.

   You do not need to remove a previous installation of Export Tool. The new installation overwrites the older program.

2. Create a new directory for the Export Tool program (for example, `/monitor`).
3. Mount the media for the software products.
4. Go to the `/program/monitor/UNIX` directory on the media, and copy the `export.tar` file to the new directory you just created.
5. Decompress the `export.tar` file on your computer. Export Tool is installed into the installation directory.

Note: You should delete `runWin.bat` and `delWin.bat` from the export folder because these files are no longer needed.

Using Export Tool

After installing Export Tool, you must prepare a command file and a batch file before you can export any monitoring data. This section explains how to prepare a command file and a batch file, and then how to run Export Tool.

Preparing a command file

To run Export Tool, you must write scripts for exporting monitoring data. When writing scripts, you must write several subcommands in a command file. When you run Export Tool, the subcommands in the command file are run sequentially, and then the monitoring data is saved in files.

When you install Export Tool, the `command.txt` file is stored in the installation directory. This file contains sample scripts for your command file. Customize the scripts in `command.txt` according to your needs. For details about subcommand syntax, see Export Tool command reference on page 4-16.

In the following example of a command file, a semicolon (;) indicates the beginning of a comment, so the characters from a semicolon to the end of the line are comments. The scripts in this sample command file are described in the following example.

Example of a command file

```
ip 158.214.135.57:1099          ; Specifies the IP address of
                                 ; the SVP and the connection port
number
dkcsn 123456                     ; Specifies the target DKC serial
                                 ; number.
login expusr                     ; Logs the user into the storage
system
show                             ; Outputs the storing period in
                                 ; the storage system to standard
output
group PhyPG                      ; Specifies the type of data to
                                 ; be exported and the storing
                                 ; period
group RemoteCopy                 ; Specifies the type of data to
                                 ; be exported
```

```
range 200610010850:200610010910  ; Specifies the range in
                                 ; which files will be saved
outpath out                      ; Specifies the directory in
                                 ; which files will be saved
option compress                  ; Specifies whether to
                                 ; compress files
apply                            ; Executes processing for
                                 ; saving monitoring data in
                                 ; files
```

Scripts in this sample command file

- `ip 158.214.135.57:1099`

  This script specifies that you are logging into the SVP whose IP address is `158.214.135.57` and that 1099 is the port number to connect to the SVP. You must log on to the storage system with the connecting SVP when using Export Tool.

  The **`ip`** subcommand specifies the SVP to which the storage system connects. You must include the **`ip`** subcommand in your command file.

  For detailed information about the **`ip`** subcommand, see ip on page 4-18.

  For Export Tool, a directory is created with a value name specified by the **`ip`** subcommand under the following directory:

  - For Windows: `export\lib`
  - For UNIX: `export\lib`

  When the value specified by the **`ip`** subcommand is an IP address, a hexadecimal value is specified as the directory name. Periods (.) and colons (:) are not included. When it is a host name, the IP address of the specified server is specified as the directory name.

  The following table provides examples of the directory names.

Value specified by the `ip` subcommand	Directory name
`ip` subcommand value is `ip 158.214.135.57` (for IPv4)	`9ED68739`
`ip` subcommand value is `ip 0000:0000:0020:00B4:0000:0000:9ED6:874` (for IPv6)	`000000000020:00B40000:00009ED6874`
`ip` subcommand value is `ip host01` (when the IP address of host01 is `158.214.135.57`)	`9ED68739`

- `dkcsn 123456`

  This script specifies the serial number of the system from which monitored data will be acquired. This subcommand specifies the system to provide the monitored data. Make sure to notate the **`dkcsn`** subcommand in the command file.

  For detailed information about the **`dkcsn`** subcommand, see dkcsn in dkcsn on page 4-19.

- `login expusr passwd`

  This script specifies that you use the user ID **`expusr`** and the password **`passwd`** to log on to the storage system.

  The **`login`** subcommand logs the specified user into the storage system. You must include the **`login`** subcommand in your command file.

  For detailed information about the **`login`** subcommand, see login on page 4-21.

Caution: When you write the **`login`** subcommand in your command file, you must specify a user ID that should be used exclusively for running Export Tool. See Requirements for Export Tool on page 4-3 for reference.

- `show`

  The **`show`** subcommand checks the SVP to find the period of monitoring data stored in the SVP and the data collection interval (called sampling interval in Performance Monitor), and then outputs them to the standard output (for example, the command prompt) and the log file.

  The **`show`** subcommand displays the storing period of monitoring data.

  The following is an example of information that the **`show`** subcommand outputs:

  ```
  Range From: 2006/10/01 01:00  -  To: 2006/10/01 15:00
   Interval: 1min.
  ```

  In this example, the monitoring data is stored every 1 minute in the term of 1:00 - 15:00 on October 1, 2006. When you run Export Tool, you can export monitoring data into the file.

  The use of the **`show`** subcommand is not required, but it is recommended that you include the **`show`** subcommand in your command file. If an error occurs when you run Export Tool, you might be able to find the error cause by checking the log file for information issued by the **`show`** subcommand.

  For detailed information about the **`show`** subcommand, see show on page 4-21.

- `group PhyPG` and `group RemoteCopy`

  The **`group`** subcommand specifies the type of data that you want to export. Specify an operand following **`group`** to define the type of data to be exported.

  The example script `group PhyPG` in Preparing a command file on page 4-6 specifies to export usage statistics about parity groups. Also, the script `group RemoteCopy` specifies to export statistics about remote copy operations by TrueCopy and global-active device. You can describe multiple lines of the **`group`** subcommand to export multiple monitoring items at the same time.

  For detailed information about the **`group`** subcommand, see group on page 4-22.

- `range 200610010850:200610010910`

  The **`range`** subcommand specifies the term of monitoring data to be exported. Use these subcommands when you want to narrow the export-target term within the stored data.

You can use this subcommand to narrow the export-target term for all of the monitoring items you can specify by the **group** subcommand.

Specify a term within "`Range From` XXX `To` XXX" which is output by the **show** subcommand.

In the sample file in Preparing a command file on page 4-6, the script range 200610010850:200610010910 specifies the term 8:50-9:10 on October 1, 2006. This script is applied to the **group RemoteCopy** subcommand in this example. When you run Export Tool, it will export the statistics about remote copy operations by TrueCopy and global-active device in the term specified by the **range** subcommand.

If you run Export Tool without specifying the **range** subcommand, the monitoring data in the whole storing period (data in the period displayed by the **show** subcommand) will be exported.

For detailed information about the **range** subcommand, see range on page 4-34

- **outpath out**

  This script specifies that files should be saved in the directory named **out** in the current directory.

  The **outpath** subcommand specifies the directory in which files should be saved. For detailed information about the **outpath** subcommand, see outpath on page 4-36.

- `option compress`

  This script specifies that Export Tool should compress monitoring data in ZIP files.

  The **option** subcommand specifies whether to save files in ZIP format or in CSV format. For detailed information about the **option** subcommand, see option on page 4-37.

- `apply`

  The **apply** subcommand saves monitoring data in files. For detailed information about the **apply** command, see apply on page 4-38.

Related topics

- Preparing to use Export Tool on page 4-3
- ip on page 4-18
- show on page 4-21
- group on page 4-22
- range on page 4-34
- outpath on page 4-36
- option on page 4-37
- apply on page 4-38

Preparing the batch file

Use a batch file to run Export Tool. Export Tool starts and saves monitoring data in files when you run the batch file.

The installation directory for Export Tool contains four default batch files: `runWin.bat`, `runUnix.bat`, `delWin.bat`, and `delUnix.bat`. If your computer runs Windows, use `runWin.bat` and `delWin.bat`. If your computer runs UNIX, use `runUnix.bat` and `delUnix.bat`.

The following examples illustrate scripts in `runWin.bat` and `runUnix.bat` batch files. These batch files include a command line that runs a Java command. When you run the batch file, the Java command runs the subcommands specified in the command file and then saves monitoring data in files.

Example batch file for Windows computers (`runWin.bat`):

```
java -classpath "./lib/JSanExportLoader.jar"
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Del.logpath=log -Dmd.rmitimeout=20
sanproject.getexptool.RJElMain<CR+LF>
pause<CR+LF>
```

Example batch file for UNIX computers (`runUnix.bat`):

```
#! /bin/sh<LF>
java -classpath "./lib/JSanExportLoader.jar"
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Del.logpath=log -Dmd.rmitimeout=20
sanproject.getexptool.RJElMain<LF>
```

In the previous scripts, <CR+LF> and <LF> indicate the end of a command line.

If the computer running Export Tool communicates directly with the SVP, you usually do not need to change scripts in `runWin.bat` and `runUnix.bat`. However, you might need to edit the Java command script in a text editor in some cases, for example:

- If the name of your command file is not `command.txt`
- If you moved your command file to a different directory
- If you do not want to save in the log directory
- If you want to name log files as you like

If the computer that runs Export Tool communicates with the SVP through a proxy host, edit the Java command script in a text editor to specify the host name (or IP address) and the port number of the proxy host. For example, if the host name is Jupiter and the port number is 8080, the resulting command script would be as shown in the following examples.

Example of specifying a proxy host on Windows (`runWin.bat`):

```
java -classpath "./lib/JSanExportLoader.jar"
-Dhttp.proxyHost=Jupiter -Dhttp.proxyPort=8080
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Dmd.logpath=log -Dmd.rmitimeout=20 sanproject.getexptool.RJElMain<CR
```

```
+LF>
pause<CR+LF>
```

Example of specifying a proxy host on UNIX (`runUnix.bat`):

```
#! /bin/sh<LF>
java -classpath "./lib/JSanExportLoader.jar"
-Dhttp.proxyHost=Jupiter -Dhttp.proxyPort=8080
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Dmd.logpath=log -Dmd.rmitimeout=20
sanproject.getexptool.RJElMain<LF>
```

In the preceding scripts, <CR+LF> and <LF> indicates the end of a command line.

If the IP address of the proxy host is 158.211.122.124 and the port number is 8080, the resulting command script is as follows:

Example batch file for Windows computers (`runWin.bat`):

```
java -classpath "./lib/JSanExportLoader.jar"
-Dhttp.proxyHost=Jupiter -Dhttp.proxyPort=8080
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Dmd.logpath=log -Dmd.rmitimeout=20 sanproject.getexptool.RJElMain<CR
+LF>
pause<CR+LF>
```

Example batch file for UNIX computers (`runUnix.bat`):

```
#! /bin/sh<LF>
java -classpath "./lib/JSanExportLoader.jar"
-Dhttp.proxyHost=Jupiter -Dhttp.proxyPort=8080
-Del.tool.Xmx=536870912-Dmd.command=command.txt
-Dmd.logpath=log -Dmd.rmitimeout=20
sanproject.getexptool.RJElMain<LF>
```

In these scripts, <CR+LF> and <LF> indicates the end of a command line.

For detailed information about syntax of the Java command, see Java on page 4-40.

The following examples show scripts in `delWin.bat` and `delUnix.bat`. These batch files include one java command. When you run the batch file, this java command is run, and the directories created by Export Tool and files in the directories are deleted.

Example batch file for Windows computers (`delWin.bat`):

```
java -classpath "./lib/JSanExportLoader.jar"
-Dmd.command=command.txt
-Dmd.logpath=log
-Del.mode=delete sanproject.getexptool.RJElMain<CR+LF>
```

Example batch file for UNIX computers (`delUnix.bat`):

```
#! /bin/sh<LF>
java -classpath "./lib/JSanExportLoader.jar"
-Dmd.command=command.txt
-Dmd.logpath=log
-Del.mode=delete sanproject.getexptool.RJElMain<LF>
```

Using Export Tool

Running the batch file

To save monitoring data in files, launch Export Tool by running the batch file.

```
c:\WINDOWS> cd c:\export
c:\export> runWin.bat
```

Dots (...) appear on the screen until the system finishes exporting data. If an internal error occurs, an exclamation mark (!) appears, and then Export Tool restarts automatically.

Example of command prompt outputs from Export Tool:

```
Loading ExportTool...
Export tool start [Version 80-xx-xx/xx]
command file = c:\export\command.txt
[ 2] ip 158.214.135.57:1099
[ 3] dkcsn 123456
[ 4] login User = expusr, Passwd = [****************]
   :
   :
[ 6] group Port
   :
   :
[20] apply
Start gathering port data
Target = 16, Total = 16
+----+----+----+----+----+----+----+----+----+----+
.............................!
.................................
End gathering port data
```

It might take time after "`Loading Export Tool`" is displayed before "`Export tool start [Version 80-xx-xx/xx]`" is displayed in the command prompt. The time depends on the connection environment between the computer executing Export Tool and the SVP. The following table shows the approximate time period.

Connection speed between the computer and the SVP	Line usage rate	Time
1 Gbps	0.1%	1 minute
	0.5%	12 seconds
100 Mbps	0.2%	5 minutes
	1%	1 minute

By default, the system compresses monitoring data files into a ZIP-format archive file. When you want to view the monitoring data, you can decompress and extract the CSV files from the ZIP archive. If the operating system on your computer does not include a way to extract files from a ZIP archive, you need to obtain software to view the data.

Note: You can change the default method of exporting files to an uncompressed format. However, the resulting files could be significantly larger and take longer to compile. For more information, see option on page 4-37.

For a complete list of files to be saved by Export Tool, see Using Export Tool on page 4-6.

File formats

If you specify the nocompress operand for the **option** subcommand, Export Tool saves files in CSV format instead of ZIP format (for details see option on page 4-37). When files are saved in CSV format instead of ZIP format, the file saving process could take longer and the resulting files could be larger.

Processing time

Files saved by Export Tool are often very large. The total file size for all files can be as large as approximately 2 GB. For this reason, the exporting process might take a lot of time. If you want to export statistics spanning a long period of time, run Export Tool multiple times for different periods, rather than running it one time to export the entire time span as a single large file. For example, if you want to export statistics spanning 24 hours, run the tool eight times to export statistics in three 3-hour increments.

The next table provides lists time estimates for exporting monitoring data files using different operands in the **group** subcommand:

Table 4-1 Estimate of time required for exporting files

Operand for the group subcommand	Estimated time	Remarks
Port	5 minutes	This estimate assumes that Export Tool should save statistics about 128 ports within a 24-hour period.*
PortWWN	5 minutes	This estimate assumes that Export Tool should save statistics about 128 ports within a 24-hour period.*
LDEV	60 minutes	This estimate assumes that: • Export Tool should save statistics about 8,192 volumes within a 24-hour period.* • Export Tool is used eight times. Each time Export Tool is used, the tool obtains statistics within a 3-hour period.
LU	60 minutes	This estimate assumes that: • Export Tool should save statistics about 12,288 LUs within a 24-hour period.* • Export Tool is used eight times. Each time Export Tool is used, the tool obtains statistics within a 3-hour period.
* For a 1-minute interval, the number of hours for the data that is stored is proportional to the interval. For example, for a 2-minute interval, data for 48 hours can be stored.		

Operand for the group subcommand	Estimated time	Remarks
Note: • The estimated time that includes the transfer time of the network might take a lot of time depending on the transmission speed of the network. • To shorten the acquisition time, specify the option of the **group** command to narrow acquisition objects. For details about the **group** command, see group on page 4-22.		

Termination code

If you want to use a reference to a termination code in your batch file, do the following:

- To use such a reference in a Windows batch file, write %**errorlevel**% in the batch file.
- To use such a reference in a UNIX Bourne shell script, write $**?** in the shell script.
- To use such a reference in a UNIX C shell script, write $**status** in the shell script.

A reference to a termination code is used in the following example of a Windows batch file. If this batch file runs and Export Tool returns the termination code 1 or 3, the command prompt displays a message that indicates the **set** subcommand fails.

```
java -classpath "./lib/JSanExportLoader.jar"
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Dmd.logpath=log sanproject.getexptool.RJElMain<CR+LF>
if %errorlevel%==1 echo THE SET SUBCOMMAND FAILED<CR+LF>
if %errorlevel%==3 echo THE SET SUBCOMMAND FAILED<CR+LF>
pause<CR+LF>
```

In the previous scripts, <CR+LF> indicates the end of a command line.

Log files

When Export Tool runs, Export Tool creates a new log file on your computer. Therefore, if you run Export Tool repeatedly, the size of free space on your computer will be reduced. To secure free space on your computer, you should delete the log files regularly. For information about the directory containing the log files, see Java on page 4-40.

When Export Tool processing is successful, the directories and files created by Export Tool are deleted automatically. If Export Tool processing is interrupted, the following directories and files are not deleted:

```
export/lib/ip-value

JSanExport.jar

JSanRmiApiSx.jar

JSanRmiServerUx.jar
```

SanRmiApi.jar

To delete the remaining directories and files, run the batch file. Run delWin.bat for Windows, and delUnix.bat for UNIX.

Caution: Do not run delWin.bat or delUnix.bat while running Export Tool to collect monitoring log data.

Note: If you change the ip value in command.txt before running delWin.bat or delUnix.bat, the remaining directories and files are not deleted automatically. In this case, manually delete the directories and files left in the lib directory.

Export Tool returns a termination code when it finishes.

Table 4-2 Termination codes returned by Export Tool

Termination code	Meaning
0	Export Tool finished successfully.
1	An error occurred when the set subcommand (see set on page 4-38) runs, because an attempt to switch to Modify mode failed. Some other user might have been logged on in Modify mode.
2	One of the following two errors occurred: • A command file has been corrupted or could not be read. • An error occurred when a command was parsed.
3	An error occurred due to more than one reason. One of the reasons is that an attempt to switch to Modify mode failed when the set subcommand (see set on page 4-38) runs. Some other user might have been logged on in Modify mode.
4	The Storage Administrator (Performance Management) role is not assigned to the user ID.
101	An error occurred during the preparation process for running Export Tool. See the displayed message and the table Messages issued by Export Tool on page 7-4 for error details.

Error handling

When an internal error occurs during export processing, an exclamation mark (!) appears to signal an error. By default, Export Tool makes up to three more attempts at processing. You can change the maximum number of retries by using the **retry** subcommand. For detailed information about the **retry** subcommand, see retry on page 4-20.

If export processing does not finish within three retries or if an internal error occurs other than those listed in the following table, Export Tool stops. If Export Tool stops, quit the command prompt, and then run the tool again.

For more information, see Troubleshooting Performance Monitor on page 7-2.

Errors for which export tool retries processing

Error message ID	Cause of error
0001 4001	An error occurred during SVP processing.
0001 5400	Because the SVP is busy, the monitoring data cannot be obtained.
0001 5508	An administrator is changing a system environment file.
0002 2016	Array is refreshing, or the settings by the user are registered.
0002 5510	The storage system is in internal process, or some other user is changing configuration.
0002 6502	Now processing.
0002 9000	Other user is accessing the storage system in Modify mode.
0003 2016	Service engineer is accessing the storage system in Modify mode.
0003 2033	The SVP is not ready yet, or an internal process is being run.
0003 3006	An error occurred during SVP processing.
0405 8003	The storage system status is invalid.
5205 2003	An SVP internal process is being run, or SVP maintenance is in progress.
5205 2033	The SVP is now updating the statistics data.
5305 2033	Updating the statistics data.
5305 8002	The storage system status is invalid.

Export Tool command reference

This section provides the syntax of the Export Tool subcommands that you can write in your command file and the command that should be used in your batch file. Subcommand list on page 4-18 lists and provides links to the subcommands explained in this section. The Java command is explained in Java on page 4-40.

- Export Tool command syntax on page 4-16
- Subcommand list on page 4-18

Export Tool command syntax

This section explains the syntax of the Export Tool subcommands that you can write in your command file. This section also explains the syntax of the Java command that should be used in your batch file.

- Conventions on page 4-17
- Syntax descriptions on page 4-17
- Writing a script in the command file on page 4-17
- Viewing the online Help for subcommands on page 4-18

Conventions

The following conventions are used to explain syntax:

Convention	Description
bold	Indicates characters that you must type exactly as they are shown.
italics	Indicates a type of an operand. You do not need to type characters in italics exactly as they are shown.
[ ]	Indicates one or more operands that can be omitted. If two or more operands are enclosed by these square brackets and are delimited by vertical bars (|), you can select one of the operands.
{ }	Indicates that you must select one operand from the operands enclosed by the braces. Two or more operands are enclosed by the braces and are delimited by vertical bars (|).
...	Indicates that a previously used operand can be repeated.
|	Vertical bar delimiter, indicating you can select one of the operands enclosed in square brackets.

Syntax descriptions

This syntax...	Indicates you can write this script...
connect *ip-address*	connect 123.01.22.33
destination [*directory*]	destination destination c:\temp
compress [yes|no]	compress compress yes compress no
answer {**yes**|**no**}	answer yes answer no
ports [*name*][...]	ports ports port-1 ports port-1 port-2

Writing a script in the command file

When you write a script in your command file, be aware of the following:

- Ensure that only one subcommand is used in one line.
- Empty lines in any command file will be ignored.
- Use a semicolon (;) if you want to insert a comment in your command file. If you enter a semicolon in one line, the remaining characters in that line will be regarded as a comment.
  Following are examples of comments in a command file:

```
;;;;;;; ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;;;    COMMAND FILE: command.txt    ;;;;
;;;;;;;;;; ;;;;;;;;;;;;;;;;;;;;;;;;;;;;
ip 158.214.135.57:51990      ; IP address of the SVP
dkcsn 123456                 ; Serial No of the DKC
login expusr "passwd"        ; Log into the SVP
```

Viewing the online Help for subcommands

You can display the online Help to view the syntax of subcommands when you are working at the command prompt. To be able to view the online Help, you must use the **help** subcommand of Export Tool. For more information about how to use the **help** subcommand, see help on page 4-39.

Subcommand list

Subcommand	Function
ip on page 4-18	Specifies the IP address of the SVP to log on to.
retry on page 4-20	Makes settings on retries of export processing.
login on page 4-21	Logs the specified user into the SVP.
show on page 4-21	Checks the SVP to find the period of monitoring data stored in the SVP and the data collection interval (sampling interval), and then outputs them to the standard output and the log file.
group on page 4-22	Specifies the type of data that you want to export.
range on page 4-34	Specifies the term of monitoring data to be exported.
outpath on page 4-36	Specifies the directory in which files should be saved.
option on page 4-37	Specifies whether to save files in ZIP format or in CSV format.
apply on page 4-38	Saves monitoring data in files.
set on page 4-38	Starts or ends monitoring of the storage system, and specifies the sampling interval.
help on page 4-39	Displays the online help for subcommands.
Java on page 4-40	Starts Export Tool and writes monitoring data into files.

ip

Description

This subcommand specifies the IP address or the host name of the SVP and the connection port number.

Syntax

ip {*ip-address*|*host-name*}[*:port-no*]

Operands

Operand	Description
ip-address	Specifies the IP address of the SVP. If the SVP is managed with IPv6 (Internet Protocol Version 6), you must specify the ip-address operand to match the format of IPv6.
host-name	Specifies the host name of the SVP. Alphanumeric characters, hyphen, and period can be specified. Underscore (_) cannot be specified. The host name can include a hyphen but must be enclosed by double quotation marks (").
port-no	Specifies the port number when connecting to the SVP. Only a number can be specified as a port number. Connect using 1099 when not specifying the port number.

Example

The following example specifies the IP address of the SVP in IPv4 as 158.214.127.170 and the port number as 1099.

```
ip 158.214.127.170:1099
```

The following example specifies the IP address of the SVP in IPv6 as 2001:0DB8:0:CD30:123:4567:89AB:CDEF and the port number as 1099.

```
ip [2001:0DB8:0:CD30:123:4567:89AB:CDEF]:1099
```

dkcsn

Description

This subcommand specifies the serial number of the system which you will take monitoring data.

Syntax

dkcsn *serial-no*

Operands

Operand	Description
serial-no	Specifies the serial number of the system from which to take monitoring data.

Example

The following example specifies the serial number of the system as 123456.

```
dkcsn 123456
```

retry

Description

This subcommand makes settings on retries of export processing.

When an internal error occurs during export processing, Export Tool stops processing and then retries export processing. By default, Export Tool can retry processing up to three times, but you can change the maximum number of retries by using the **retry** subcommand.

By default, the interval between one retry and the next retry is two minutes. You can change the interval by using the **retry** subcommand.

The **retry** subcommand must run before the **login** subcommand runs.

Syntax

retry [time=*m*] [count=*n*]

Operands

Operand	Description
time=*m*	Specifies the interval between retries in minutes, where m is a value within the range of 1 to 59. If this operand is omitted, the interval between retries is two minutes.
count=*n*	Specifies the maximum number of retries. If n is 0, the number of retries is unlimited. If this operand is omitted, the maximum number of retries is 3.

Example

If the following command file is used, the interval between retries is 5 minutes and the maximum number of retries is 10.

```
ip 158.214.135.57
dkcsn 123456
retry time=5 count=10
login expusr passwd
show
group Port
range 200604010850:200604010910
outpath out
option compress
apply
```

login

Description

This subcommand uses a user ID and a password to log the specified user into the storage system.

The **ip** subcommand must specify the SVP which manages the storage system to log into before the **login** subcommand runs.

The **login** subcommand fails if monitoring data does not exist in the SVP.

Syntax

login *userid password*

Operands

Operand	Description
userid	Specifies the exclusive user ID for Export Tool. If the user ID includes any non-alphanumeric character, the user ID must be enclosed by double quotation marks ("). For detailed information, see Requirements for Export Tool on page 4-3.
password	Specifies the exclusive password of the user for Export Tool. If the password includes any non-alphanumeric character, the password ID must be enclosed by double quotation marks (").

Example

This example logs the user **expusr** into the storage system with the connecting SVP whose IP address is 158.214.127.170. The password is **pswd**.

```
ip 158.214.127.170 login expuser pswd
```

show

Description

This subcommand outputs the following information to the standard output (for example, to the command prompt):

- The period during which monitoring data was collected on the SVP (storing period).
- The interval at which the monitoring data was collected (sampling interval).

Performance Monitor collects data between 1 and 15 days in the SVP. The **show** subcommand displays the storing period of monitoring data. Note the following example:

```
Range From : 2006/10/01 01:00 - To: 2006/10/01 15:00 Interval : 1min.
```

If using the **range** subcommand, you can narrow down the data which you want to save. **From** is the starting time and **To** is the ending time. **Interval** shows the sampling interval. For example, if it is **Interval 15min**, monitoring data is collected every 15 minutes.

Storing periods output by the **show** subcommand are the same as the information displayed in the **Monitoring Term** area of the Monitor Performance window.

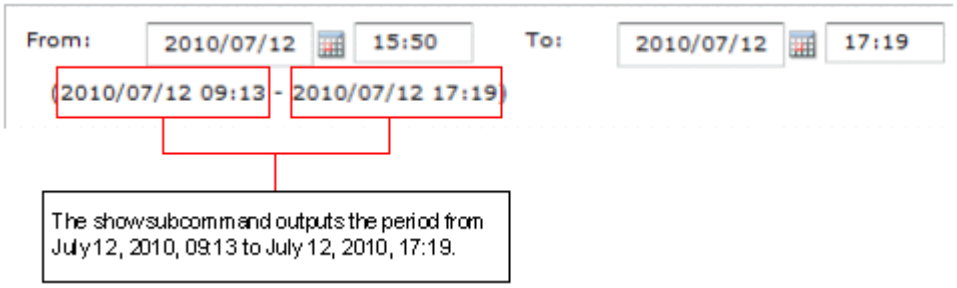


Figure 4-1 The monitoring term area

You must log into the storage system with the **login** subcommand before the **show** subcommand runs.

Syntax

show

Outputs

The **show** subcommand displays the storing period and the sampling interval for the monitoring data. For example, the **show** subcommand outputs the following information:

```
Range      From: 2006/10/01 01:00  -  To: 2006/10/01 15:00
 Interval: 1min.
```

`From` indicates the starting time for collecting monitoring data. `To` indicates the ending time for collecting monitoring data.

`Interval` indicates the interval at which the monitoring data was collected (sampling interval). For example, `Interval 15min.` indicates that monitoring data was collected at 15-minute intervals.

group

Description

The **group** subcommand specifies the type of monitoring data that you want to export. This command uses an operand (for example, PhyPG and PhyLDEV above) to specify a type of monitoring data.

Table 4-3 Operands of the **group** subcommand and saved monitoring data on page 4-23 shows the monitoring data that can be saved into files by each

operand, and the saved ZIP files. For details on the monitoring data saved in these files, see the tables listed in the **See** column.

Table 4-3 Operands of the `group` subcommand and saved monitoring data

Operand	Monitoring data saved in the file	Saved ZIP file	See
PhyPG	Usage statistics about parity groups	PhyPG_data.ZIP	Table 4-6 Files with resource usage and write pending rate statistics on page 4-44
PhyLDEV	Usage statistics about volumes	PhyLDEV_dat.ZIP	
PhyExG	Usage conditions about external volume groups	PhyExg_dat.ZIP	
PhyExLDEV	Usage conditions about external volumes	PhyExLDEV_dat/PHY_ExLDEB_xxxxx.ZIP[1]	
PhyProc	Usage statistics about MPs and data recovery and reconstruction processors	PhyProc_dat.ZIP	
PhyMPU	Write pending rate and cache usage statistics	PhyMPU_dat.ZIP	
PG	Statistics about parity groups, external volume groups	PG_dat.ZIP	Table 4-8 Files with parity group and external volume group statistics on page 4-46
LDEV	Statistics about volumes in parity groups, in external volume groups	LDEV_dat/LDEV_XXXXX.ZIP[1]	Table 4-9 Files with statistics about volumes in parity/external volume groups on page 4-47
LDEVEachOfCU	Statistics about volumes in parity groups or in external volume groups (for volumes controlled by a particular CU)	LDEVEachOfCU_dat/LDEV_XXXXX.ZIP[2]	Table 4-10 Files with statistics about volumes in parity groups or external volume groups (volumes controlled by a particular CU) on page 4-49
Port	Statistics about ports	Port_dat.ZIP	Table 4-11 Files with statistics about ports on page 4-51
PortWWN	Statistics about host bus adapters connected to ports	PortWWN_dat.ZIP	Table 4-12 Files with statistics about host bus adapters connected to ports on page 4-52
LU	Statistics about LUs	LU_dat.ZIP	Table 4-13 Files with statistics about volumes (LUs) on page 4-52

Operand	Monitoring data saved in the file	Saved ZIP file	See
PPCGWWN	All host bus adapters that are connected to ports	PPCGWWN_dat.ZIP	Table 4-14 Files with statistics about host bus adapters belonging to SPM groups on page 4-53
RemoteCopy	Statistics about remote copy operations by TrueCopy and GAD (in complete volumes)	RemoteCopy_dat.ZIP	Table 4-15 Files with statistics about remote copy operations by TC or GAD (whole volumes) on page 4-54
RCLU	Statistics about remote copy operations by TrueCopy and GAD (for each volume (LU))	RCLU_dat.ZIP	Table 4-16 Files with statistics about remote copy operations by TC or GAD (for each volume (LU)) on page 4-55
RCLDEV	Statistics about remote copy operations by TrueCopy and GAD (for volumes controlled by a particular CU)	RCLDEV_dat/RCLDEV_XXXXX.ZIP[3]	Table 4-17 Files with statistics about remote copy operations by TC or GAD (volumes controlled by a particular CU) on page 4-56
Universal Replicator	Statistics about remote copy operations by Universal Replicator (for entire volumes)	UniversalReplicator.ZIP	Table 4-18 Files with statistics about remote copy operations by UR (In the whole volumes) on page 4-57
URJNL	Statistics about remote copy operations by Universal Replicator (for journals)	URJNL_dat.ZIP	Table 4-19 Files with statistics about remote copy operations by UR (journals) on page 4-58
URLU	Statistics about remote copy operations by Universal Replicator (for each volume (LU))	URLU_dat.ZIP	Table 4-20 Files with statistics about remote copy operations by UR (for each volume (LU)) on page 4-59
URLDEV	Statistics about remote copy operations by Universal Replicator (for volumes controlled by a particular CU)	URLDEV_dat/URLDEV_XXXXX.ZIP[4]	Table 4-21 Files with statistics about remote copy operations by UR (volumes controlled by a particular CU) on page 4-59
PhyMPPK	MP usage rate of each resource	PhyMPPK_dat.ZIP	Table 4-14 Files with statistics about host bus adapters belonging to

Operand	Monitoring data saved in the file	Saved ZIP file	See
	allocated to MP units		SPM groups on page 4-53

Notes:

1. A ZIP file name beginning with `LDEV_dat/LDEV_`.
2. A ZIP file name beginning with `LDEVEachOfCU_dat/LDEV_`.
3. A ZIP file name beginning with `RCLDEV_dat/RCLDEV_`.
4. A ZIP file name beginning with `URLDEV_dat/URLDEV_`.

You can use the **group** subcommand more than one time in a command file. For example, you can write the following script:

```
group PortWWN CL1-A:CL1-B
group RemoteCopy
```

If you use an operand more than one time in a command file, the last operand takes effect. In the following example, the first **group** subcommand does not take effect, but the second **group** subcommand takes effect:

```
group PortWWN CL1-A:CL1-B
group PortWWN CL2-A:CL2-B
```

Syntax

```
group {PhyPG[parity-group-id]:[parity-group-id]][…]|
        PhyLDEV  [parity-group-id]:[parity-group-id]][…]|
        PhyExG [[exg-id]:[exg-id]][…]|
        PhyExLDEV [exg-id]:[exg-id]][…]|
        PhyProc |
             PG [[parity-group-id|exg-id]:
        [parity-group-id|exg-id]][…]|
        LDEV [[[parity-group-id|exg-id]:
        [parity-group-id|exg-id]][…]|
     LDEVEachOfCU[[[LDKC-CU-id]:[LDKC-CU-
id]][…]|internal|virtual]|
internal|virtual]|
     Port [[port-name]:[port-name]][…]|
     PortWWN [port-name]:[port-name]][…]|
     LU[[port-name.host-group-id]:
     [port-name.host-group-id]][…]|
     PPCGWWN[[monitor-target-name:monitor-target-name]][…]|
     RemoteCopy|
     RCLU [[port-name.host-group-id]:
     [port-name.host-group-id]][…]|
     RCLDEV[[LDKC-CU-id]:[LDKC-CU-id]][…]|
     UniversalReplicator |
     URJNL[[JNL-group-id]:[JNL-group-id]][…]|
     URLU [[port-name.host-group-id]:
     [port-name.host-group-id]][…]|
     URLDEV [[LDKC-CU-id]:[LDKC-CU-id]][…]|
        }
```

Operands

Operand	Description
PhyPG [[*parity-group-id*]:[*parity-group-id*]][…]	Use this operand to export statistics about parity group usage rates, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PhyPG_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. The exported file will contain statistics for up to 15 days. When you specify variables parity-group-id, you can narrow the range of parity groups whose monitoring data are to be exported. parity-group-id is a parity group ID. The colon (:) indicates a range. For example, `1-1:1-5` indicates parity groups from 1-1 to 1-5. Ensure that the parity-group-id value on the left of the colon is smaller than the parity-group-id value on the right of the colon. For example, you can specify `PhyPG 1-1:1-5`, but you cannot specify `PhyPG 1-5:1-1`. Also, you can specify `PhyPG 1-5:2-1`, but you cannot specify `PhyPG 2-1:1-5`. If parity-group-id is not specified, the monitoring data of all parity groups will be exported.
PhyLDEV [[*parity-group-id*]:[*parity-group-id*]][…]	Use this operand when you want to export statistics about volume usage rates, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PhyLDEV_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. The exported file will contain statistics for up to 15 days. When you specify variables parity-group-id, you can narrow the range of parity groups whose monitoring data are to be exported. parity-group-id is a parity group ID. The colon (:) indicates a range. For example, `1-1:1-5` indicates parity groups from 1-1 to 1-5. Ensure that the parity-group-id value on the left of the colon is smaller than the parity-group-id value on the right of the colon. For example, you can specify `PhyLDEV 1-1:1-5`, but you cannot specify `PhyLDEV 1-5:1-1`. Also, you can specify `PhyLDEV 1-5:2-1`, but you cannot specify `PhyLDEV 2-1:1-5`. If parity-group-id is not specified, the monitoring data of all volumes will be exported.
PhyExG [[*exg-id*]:[*exg-id*]] […]	Use this operand when you want to export statistics about external volume groups, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PhyExG_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. When you specify variables exg-id, you can narrow the range of external volume groups whose monitoring data are to be exported. exg-id is an ID of an external volume group. The colon (:) indicates a range. For example, `E1-1:E1-5` indicates external volume groups from E1-1 to E1-5. Ensure that the exg-id value on the left of the colon is smaller than the exg-id value on the right of the colon. For example, you can specify `PhyExG E1-1:E1-5`, but you cannot specify `PhyExG E1-5:E1-1`. Also,

Operand	Description
	you can specify `PhyExG E1-5:E2-1`, but you cannot specify `PhyExG E2-1:E1-5`. If exg-id is not specified, the monitoring data of all external volume groups will be exported.
PhyExLDEV[[*exg-id*]:[*exg-id*]][…]	Use this operand when you want to export statistics about volumes in external volume groups, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PhyExLDEV_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. When you specify variables exg-id, you can narrow the range of external volume groups whose monitoring data are to be exported. exg-id is an ID of an external volume group. The colon (:) indicates a range. For example, `E1-1:E1-5` indicates external volume groups from E1-1 to E1-5. Ensure that the exg-id value on the left of the colon is smaller than the exg-id value on the right of the colon. For example, you can specify `PhyExLDEV E1-1:E1-5`, but you cannot specify `PhyExLDEV E1-5:E1-1`. Also, you can specify `PhyExLDEV E1-5:E2-1`, but you cannot specify `PhyExLDEV E2-1:E1-5`. If exg-id is not specified, the monitoring data of all external volumes will be exported.
PhyProc	Use this operand when you want to export the usage rates of MPs, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PhyProc_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. The exported file will contain statistics for up to 15 days.
PhyMPU	Use this operand when you want to save the following information displayed in the Monitor Performance window to a file: • Cache memory usage statistics • Amount of allocated cache memory • Write pending rate When statistics are exported to a ZIP file, the file name will be `PhyMPU_dat.zip`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. The exported file will contain statistics for up to 15 days.
PG [[*parity-group-id*|*exg-id*]: [*parity-group-id*|*exg-id*][…]	Use this operand when you want to export statistics about parity groups or external volume groups which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, the file name will be `PG_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-6 Files with resource usage and write pending rate statistics on page 4-44. When you specify variables parity-group-id, or exg-id you can narrow the range of parity groups, or external volume groups whose monitoring data are to be exported. parity-group-id is a parity group ID. exg-id is an ID of an external volume group. You can check to which group each LDEV belongs in the Logical Devices window. The colon (:)

Operand	Description
	indicates a range. For example, `1-1:1-5` indicates parity groups from 1-1 to 1-5. `E1-1:E1-5` indicates external volume groups from E1-1 to E1-5. Ensure that the parity-group-id, or exg-id value on the left of the colon is smaller than the parity-group-id, or exg-id value on the right of the colon. For example, you can specify `PG 1-1:1-5`, but you cannot specify `PG 1-5:1-1`. Also, you can specify `PG 1-5:2-1`, but you cannot specify `PG 2-1:1-5`. If neither parity-group-id, nor exg-id is specified, the statistics of all parity groups and external volume groups will be exported.
LDEV [[[*parity-group-id*|*exg-id*]: [*parity-group-id*||*exg-id*]][…] | **internal**| **virtual**]|	Use this operand when you want to export statistics about volumes, which are displayed in the Monitor Performance window. When statistics are exported to a ZIP file, multiple ZIP files whose names are beginning with `LDEV_` will be output. For details on the statistics exported by this operand, see Table 4-11 Files with statistics about ports on page 4-51. When you specify variables parity-group-id, or exg-id, you can narrow the range of parity groups, or external volume groups whose monitoring data are to be exported. parity-group-id is a parity group ID. exg-id is an ID of an external volume group. You can check to which group each LDEV belongs in the Logical Devices window. The colon (:) indicates a range. For example, `1-1:1-5` indicates parity groups from 1-1 to 1-5. `E1-1:E1-5` indicates external volume groups from E1-1 to E1-5. Ensure that the parity-group-id, or exg-id value on the left of the colon is smaller than the parity-group-id, or exg-id value on the right of the colon. For example, you can specify `LDEV 1-1:1-5`, but you cannot specify `LDEV 1-5:1-1`. Also, you can specify `LDEV 1-5:2-1`, but you cannot specify `LDEV 2-1:1-5`. If internal is specified, you can export statistics about volumes in the parity group. If virtual is specified, you can export statistics about volumes in the external volume group. If neither parity-group-id, nor exg-id is specified, the statistics of all parity groups and external volumes will be exported. Either one of the following values can be specified: • parity-group-id or exg-id • internal • virtual
LDEVEachOfCU[[[*LDKC-CU-id*]:[*LDKC-CU-id*]][…]| **internal**| **virtual**]	Use this operand when you want to export statistics about volumes which are displayed in the Monitoring Performance window. By using this operand, you can export monitoring data at volumes controlled by a particular CU. When statistics are exported to a ZIP file, multiple ZIP files whose names are beginning with `LDEV_` will be output. For details on the statistics exported by this operand, see Table 4-10 Files with statistics about volumes in parity groups or external volume groups (volumes controlled by a particular CU) on page 4-49. When you specify variables LDKC-CU-id, you can narrow the range of LDKC:CUs that control the volumes whose monitoring data are to be exported. LDKC-CU-id is an ID of a LDKC:CU. The colon (:) indicates a range. For example, `000:105` indicates LDKC:CUs from 00:00 to 01:05. Ensure that the LDKC-CU-id value on the left of the colon is smaller than the LDKC-CU-id value on the right of the colon. For example, you

Operand	Description
	can specify `LDEVEachOfCU 000:105`, but you cannot specify `LDEVEachOfCU 105:000`. If internal is specified, you can export statistics about volumes in the parity group. If virtual is specified, you can export statistics about volumes in the external volume or V-VOL. If LDKC-CU-id, internal or virtual is not specified, the monitoring data of all volumes will be exported. Either one of LDKC-CU-id, internal, or virtual can be specified.
Port [[*port-name*]:[*port-name*]][…]	Use this operand when you want to export port statistics, which are displayed in the Monitor Performance window. When statistics are exported in a ZIP file, the file name will be `Port_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-11 Files with statistics about ports on page 4-51. When you specify variables port-name, you can narrow the range of ports whose monitoring data are to be exported, where port-name is a port name and the colon (:) indicates a range. For example, `CL3-a:CL3-c` indicates ports from CL3-a to CL3-c. Ensure that the port-name value on the left of the colon is smaller than the port-name value on the right of the colon. The smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which value is smaller than which value: CL1-A < CL1-B < … < CL2-A < CL2-B < … < CL3-a < CL3-b < … < CL4-a < … < CL4-r For example, you can specify `Port CL1-C:CL2-A`, but you cannot specify `Port CL2-A:CL1-C`. Also, you can specify `Port CL3-a:CL3-c`, but you cannot specify `Port CL3-c:CL3-a`. If port-name is not specified, the monitoring data of all ports will be exported.
PortWWN[[*port-name*]:[*port-name*]][…]	Use this operand when you want to export statistics about host bus adapters (WWNs) connected to ports, which are displayed in the Monitor Performance window. When statistics are exported in a ZIP file, the file name will be `PortWWN_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-11 Files with statistics about ports on page 4-51. When you specify variables port-name, you can narrow the range of ports whose monitoring data are to be exported. port-name is a port name. The colon (:) indicates a range. For example, `CL3-a:CL3-c` indicates ports from CL3-a to CL3-c. Ensure that the port-name value on the left of the colon is smaller than the port-name value on the right of the colon. The smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which value is smaller than which value: CL1-A < CL1-B < … < CL2-A < CL2-B < … < CL3-a < CL3-b < … < CL4-a < … < CL4-r For example, you can specify `PortWWN CL1-C:CL2-A`, but you cannot specify `PortWWN CL2-A:CL1-C`. Also, you can specify `PortWWN CL3-a:CL3-c`, but you cannot specify `PortWWN CL3-c:CL3-a`. If port-name is not specified, the monitoring data of all host bus adapters will be exported.

Operand	Description
LU[[*port-name.host-group-id]*:[*port-name.host-group-id*]][…]	Use this operand when you want to export statistics about LU paths, which are displayed in the Monitor Performance window. When statistics are exported in a ZIP file, the file name will be `LU_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-13 Files with statistics about volumes (LUs) on page 4-52. When you specify variables port-name**.**host-group-id, you can narrow the range of LU paths whose monitoring data are to be exported. port-name is a port name. host-group-id is the ID of a host group (that is, a host storage domain). The host group (host storage domain) ID must be a hexadecimal numeral. The colon (:) indicates a range. For example, `CL1-C.01:CL1-C.03` indicates the range from the host group #01 of the CL1-C port to the host group #03 of the CL1-C port. Ensure that the value on the left of the colon is smaller than the value on the right of the colon. The smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which port-name value is smaller than which port-name value: CL1-A < CL1-B < … < CL2-A < CL2-B < … < CL3-a < CL3-b < … < CL4-a < … < CL4-r For example, you can specify `LU CL1-C.01:CL2-A.01`, but you cannot specify `LU CL2-A.01:CL1-C.01`. Also, you can specify `LU CL1-C.01:CL1-C.03`, but you cannot specify `LU CL1-C.03:CL1-C.01`. If port-name**.**host-group-id is not specified, the monitoring data of all LU paths will be exported.
PPCGWWN[[*Monitor-target-name*]:[*Monitor-target-name*]][…]	Use this operand when you want to export statistics about all host bus adapters connected to ports, which are displayed in the Monitor Performance window. When statistics are exported in a ZIP file, the file name will be `PPCGWWN_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-14 Files with statistics about host bus adapters belonging to SPM groups on page 4-53. When you specify variables monitor-target-name, you can narrow the range of monitoring target groups whose monitoring data are to be exported. Monitor-target-name is the name of an monitoring target group. If the name includes any non-alphanumeric character, the name must be enclosed by double quotation marks ("). The colon (:) indicates a range. For example, `Grp01:Grp03` indicates a range of SPM groups from Grp01 to Grp03. Ensure that the monitor-target-name value on the left of the colon is smaller than the monitor-target-name value on the right of the colon. Numerals are smaller than letters and lowercase letters are smaller than uppercase letters. In the following formulas, values are arranged so that smaller values are on the left and larger values are on the right: • 0 < 1 < 2 < …< 9 < a < b < …< z < A < B < … < Z • cygnus < raid < Cancer < Pisces < RAID < RAID5 If monitor-target-name is not specified, the monitoring data of all host bus adapters will be exported.
RemoteCopy	Use this operand when you want to export statistics about remote copy operations of TrueCopy or global-active device. By using this operand, you can export monitoring data about remote copy operations performed by TC and GAD in the whole volumes. When statistics are exported to a ZIP file, the file name will be `RemoteCopy_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-15 Files

Operand	Description
	with statistics about remote copy operations by TC or GAD (whole volumes) on page 4-54.
RCLU[[*port-name.host-group-id*]:[*port-name.host-group-id*]][…]	Use this operand when you want to export statistics about remote copy operations of TrueCopy or global-active device. By using this operand, you can export monitoring data about remote copy operations performed by TC and GAD at each volume (LU). When statistics are exported to a ZIP file, the file name will be `RCLU_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-16 Files with statistics about remote copy operations by TC or GAD (for each volume (LU)) on page 4-55. When you specify variables port-name.host-group-id, you can narrow the range of LU paths whose monitoring data are to be exported, where port-name is a port name andhost-group-id is the ID of a host group. The host group ID must be a hexadecimal numeral. The colon (:) indicates a range. For example, `CL1-C.01:CL1-C.03` indicates the range from the host group #01 of the CL1-C port to the host group #03 of the CL1-C port. Ensure that the value on the left of the colon is smaller than the value on the right of the colon. The smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which port-name value is smaller than which port-name value: CL1-A < CL1-B < … < CL2-A < CL2-B < … < CL3-a < CL3-b < … < CL4-a < … < CL4-r For example, you can specify `RCLU CL1-C.01:CL2-A.01`, but you cannot specify `RCLU CL2-A.01:CL1-C.01`. Also, you can specify `RCLU CL1-C.01:CL1-C.03`, but you cannot specify `RCLU CL1-C.03:CL1-C.01`. If port-name**.**host-group-id is not specified, the monitoring data of all volumes (LUs) will be exported.
RCLDEV[[*LDKC-CU-id*]:[*LDKC-CU-id*]][…]|	Use this operand when you want to export statistics about remote copy operations of TrueCopy or global-active device. By using this operand, you can export monitoring data about remote copy operations performed by TC and GAD at volumes controlled by each CU. When statistics are exported to a ZIP file, multiple ZIP files whose names are beginning with `RCLDEV_` will be output. For details on the statistics exported by this operand, see Table 4-17 Files with statistics about remote copy operations by TC or GAD (volumes controlled by a particular CU) on page 4-56. When you specify variables LDKC-CU-id, you can narrow the range of LDKC:CUs that control the volumes whose monitoring data are to be exported. LDKC-CU-id is an ID of a LDKC:CU. The colon (:) indicates a range. For example, `000:105` indicates LDKC:CUs from 00:00 to 01:05. Ensure that the LDKC-CU-id value on the left of the colon is smaller than the LDKC-CU-id value on the right of the colon. For example, you can specify `RCLDEV 000:105`, but you cannot specify `RCLDEV 105:000`. If LDKC-CU-id is not specified, the monitoring data of all volumes will be exported.
UniversalReplicator	Use this operand when you want to export statistics about remote copy operations of UR. By using this operand, you can export monitoring data about remote copy operations performed by Universal Replicator in the whole volume. When statistics are exported to a ZIP file, the file name will be `UniversalReplicator.zip`. For details on the statistics

Operand	Description
	exported by this operand, see Table 4-18 Files with statistics about remote copy operations by UR (In the whole volumes) on page 4-57.
URJNL[[*JNL-group-id]*:[*JNL-group-id*]][…]	Use this operand when you want to export statistics about remote copy operations of UR. By using this operand, you can export monitoring data about remote copy operations performed by Universal Replicator at each journal. When statistics are exported to a ZIP file, the file name will be `URJNL_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-19 Files with statistics about remote copy operations by UR (journals) on page 4-58. When you specify variables JNL-group-id, you can narrow the range of journals whose monitoring data are to be exported. JNL-group-id is a journal number. The colon (:) indicates a range. For example, `00:05` indicates journals from 00 to 05. Ensure that the JNL-group-id value on the left of the colon is smaller than the JNL-group-id value on the right of the colon. For example, you can specify `URJNL 00:05`, but you cannot specify `URJNL 05:00`. If JNL-group-id is not specified, the monitoring data of all journal volumes will be exported.
URLU[[*port-name.host-group-id*]:[*port-name.host-group-id*]][…]	Use this operand when you want to export statistics about remote copy operations of UR. By using this operand, you can export monitoring data about remote copy operations performed by Universal Replicator at each volume (LU). When statistics are exported to a ZIP file, the file name will be `URLU_dat.ZIP`. For details on the statistics exported by this operand, see Table 4-20 Files with statistics about remote copy operations by UR (for each volume (LU)) on page 4-59. When you specify variables port-name.host-group-id, you can narrow the range of LU paths whose monitoring data are to be exported, where port-name is a port name and host-group-id is the ID of a host group. The host group ID must be a hexadecimal numeral. The colon (:) indicates a range. For example, `CL1-C.01:CL1-C.03` indicates the range from the host group #01 of the CL1-C port to the host group #03 of the CL1-C port. Ensure that the value on the left of the colon is smaller than the value on the right of the colon. The smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which port-name value is smaller than which port-name value: CL1-A < CL1-B < … < CL2-A < CL2-B < … < CL3-a < CL3-b < … < CL4-a < … < CL4-r For example, you can specify `URLU CL1-C.01:CL2-A.01`, but you cannot specify `URLU CL2-A.01:CL1-C.01`. Also, you can specify `URLU CL1-C.01:CL1-C.03`, but you cannot specify `URLU CL1-C.03:CL1-C.01`. If port-name**.**host-group-id is not specified, the monitoring data of all volumes (LUs) will be exported.
URLDEV [[*LDKC-CU-id*]:[*LDKC-CU-id*]] […]	Use this operand when you want to export statistics about remote copy operations which of UR. By using this operand, you can export monitoring data about remote copy operations performed by Universal Replicator at volumes controlled by each CU. When statistics are exported to a ZIP file, multiple ZIP files whose names are beginning with `URLDEV_` will be output. For details on the statistics exported by this operand, see Table 4-21 Files with statistics about remote copy

Operand	Description
	operations by UR (volumes controlled by a particular CU) on page 4-59. When you specify variables LDKC-CU-id, you can narrow the range of LDKC:CUs that control the volumes whose monitoring data are to be exported. LDKC-CU-id is an ID of a LDKC:CU. The colon (:) indicates a range. For example, `000:105` indicates LDKC:CUs from 00:00 to 01:05. Ensure that the LDKC-CU-id value on the left of the colon is smaller than the LDKC-CU-id value on the right of the colon. For example, you can specify `URLDEV 000:105`, but you cannot specify `URLDEV 105:000`. If LDKC-CU-id is not specified, the monitoring data of all volumes will be exported.
PhyMPPK	Use this operand when you want to export statistics about the MP usage rate of each resource allocated to MP units. When statistics are exported to a ZIP file, the filename is PHY_MPPK.ZIP. For details on the statistics exported by this operand, see Table 4-14 Files with statistics about host bus adapters belonging to SPM groups on page 4-53

Examples

The following example exports statistics about host bus adapters:

```
group PortWWN
```

The following example exports statistics about three ports (CL1-A, CL1-B, and CL1-C):

```
group Port CL1-A:CL1-C
```

The following example exports statistics about six ports (CL1-A to CL1-C, and CL2-A to CL2-C)

```
group Port CL1-A:CL1-C CL2-A:CL2-C
```

The following example exports statistics about the parity group 1-3:

```
group PG 1-3:1-3
```

The following example exports statistics about the parity group 1-3 and other parity groups whose ID is larger than 1-3 (for example, 1-4 and 1-5):

```
group PG 1-3:
```

The following example exports statistics about the external volume groups E1-1 to E1-5:

```
group PG E1-1:E1-5
```

The following example exports statistics about the parity group 1-3 and other parity groups whose ID is smaller than 1-3 (for example, 1-1 and 1-2):

```
group LDEV:1-3
```

The following example exports statistics about LU paths for the host group (host storage domain) ID 01 for the port CL1-A:

```
group LU CL1-A.01:CL1-A.01
```

range

Description

Use this subcommand to specify a term of monitoring data to be exported into files. Use this subcommand when you want to narrow the export-target term within the stored data.

You must log into the storage system with the **login** subcommand before the **range** subcommand runs.

Syntax

range [[*yyyyMMddhhmm*][{**+**|**-**}*hhmm*]**:**[*yyyyMMddhhmm*][{**+**|**-**}h*hmm*]]

Operands

The value on the left of the colon (:) specifies the starting time of the period. The value on the right of the colon specifies the ending time of the period. Specify the term within "`Range From` XXX `To` XXX" which is output by the **show** subcommand.

If no value is specified on the left of the colon, the starting time for collecting monitoring data is assumed. If no value is specified on the right of the colon, the ending time for collecting monitoring data is assumed. The starting and ending times for collecting monitoring data are displayed in the **Monitoring Term** area in the Monitor Performance window.

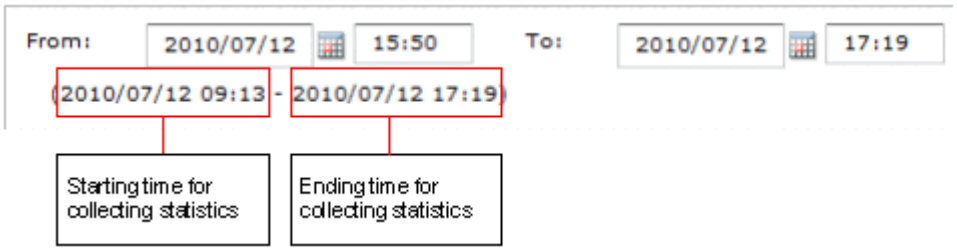


Figure 4-2 Starting and Ending Time for Collecting Monitoring Data

Operand	Description
yyyyMMddhhmm	*yyyyMMdd* indicates the year, the month, and the day. *hhmm* indicates the hour and the minute. If *yyyyMMddhhmm* is omitted on the left of the colon, the starting time for collecting monitoring data is assumed. If *yyyyMMddhhmm* is omitted on the right of the colon, the ending time for collecting monitoring data is assumed. To save monitoring data up to the sampling end time, omit *yyyyMMddhhmm* on the right of the colon. If you specify *yyyyMMddhhmm* on the right of the colon, specify date and time at least 30 minutes earlier than the current time. Otherwise, an Out of range error may occur.
+hhmm	Adds time (*hhmm*) to *yyyyMMddhhmm* if *yyyyMMddhhmm* is specified. For example, **201306230000+0130** indicates June 23, 2013. 01:30.

Operand	Description
	Adds time to the starting time for collecting monitoring data, if *yyyyMMddhhmm* is omitted.
-hhmm	Subtracts time (hhmm) from *yyyyMMddhhmm* if *yyyyMMddhhmm* is specified. For example, `201306230000-0130` indicates June 22, 2013. 22:30. Subtracts time from the ending time for collecting monitoring data, if *yyyyMMddhhmm* is omitted. If the last two digit of the time on the left or right of the colon (:) is not a multiple of the sampling interval, the time will automatically be changed so that the last two digits is a multiple of the sampling interval. If this change occurs to the time on the left of the colon, the time will be smaller than the original time. If this change occurs to the time on the right of the colon, the time will be larger than the original time. The following are the examples: • **If the time on the left is 10:15, the time on the right is 20:30, and the sampling interval is 10 minutes:** The time on the left will be changed to 10:10 because the last two digits of the time is not a multiple of 10 minutes. The time on the right will remain unchanged because the last two digits of the time is a multiple of 10 minutes. • **If the time on the left is 10:15, the time on the right is 20:30, and the sampling interval is 7 minutes:** The time on the left will be changed to 10:14 because the last two digits of the time is not a multiple of 7 minutes. The time on the right will be changed to 20:35 because of the same reason.

Examples

The following examples assume that:

- The starting time for collecting monitoring data is Jan. 1, 2013, 00:00.
- The ending time for collecting monitoring data is Jan. 2, 2013, 00:00.

`range 201301010930:201301011730`

Export Tool saves monitoring data within the range of Jan. 1, 9:30-17:30.

`range 201301010930:`

Export Tool saves monitoring data within the range of Jan. 1, 9:30 to Jan. 2, 00:00.

`range:201301011730`

Export Tool saves monitoring data within the range of Jan. 1, 0:00-17:30.

`range +0001:`

Export Tool saves monitoring data within the range of Jan. 1, 0:01 to Jan. 2, 00:00.

`range -0001:`

Export Tool saves monitoring data within the range of Jan. 1, 23:59 to Jan. 2, 00:00.

`range :+0001`

Export Tool saves monitoring data within the range of Jan. 1, 0:00-00:01.

`range :-0001`

Export Tool saves monitoring data within the range of Jan. 1, 0:00-23:59.

`range +0101:-0101`

Export Tool saves monitoring data within the range of Jan. 1, 1:01-22:59.

`range 201301010900+0130:201301011700-0130`

Export Tool saves monitoring data within the range of Jan. 1, 10:30-15:30.

`range 201301010900-0130:201301011700+0130`

Export Tool saves monitoring data within the range of Jan. 1, 7:30-18:30.

`range 201301010900-0130:`

Export Tool saves monitoring data within the range of Jan. 1, 7:30 to Jan. 2, 00:00.

outpath

Description

The **`outpath`** subcommand specifies the directory to which monitoring data will be exported.

Syntax

`outpath` [*path*]

Operands

Operand	Description
path	Specifies the directory in which files will be saved. If the directory includes any non-alphanumeric character, the directory must be enclosed by double quotation marks ("). If you want to specify a back slash (\) in the character string enclosed by double quotation marks, repeat the back slash twice for example, `\\`. If the specified directory does not exist, this subcommand creates a directory that has the specified name. If this operand is omitted, the current directory is assumed.

Examples

The following example saves files in the directory **C:\Project\out** on a Windows computer:

```
outpath "C:\\Project\\out"
```

The following example saves files in the **out** directory in the current directory:

```
outpath out
```

option

Description

This subcommand specifies the following:

- whether to compress monitoring data in ZIP files
- whether to overwrite or delete existing files and directories when saving monitoring data in files

Syntax

option [**compress**|**nocompress**] [**ask**|**clear**|**noclear**]

Operands

The two operands in the following table specify whether to compress CSV files into ZIP files. If none of these operands is specified, **compress** is assumed.

Operand	Description
compress	Compresses data in ZIP files. To extract CSV files out of a ZIP file, you will need to decompress the ZIP file.
nocompress	Does not compress data in ZIP files and saves data in CSV files.

The three operands in the following table specify whether to overwrite or delete an existing file or directory when Export Tool saves files. If none of these operands is specified, the **ask** operand is assumed.

Operand	Description
ask	Displays a message that asks whether to delete existing files or directories.
clear	Deletes existing files and directories and then saves monitoring data in files.
noclear	Overwrites existing files and directories.

Example

The following example saves monitoring data in CSV files, not in ZIP files:

```
option nocompress
```

apply

Description

The **apply** subcommand saves monitoring data specified by the **group** subcommand into files.

You must log into the storage system with the **login** subcommand before the **apply** subcommand runs.

The **apply** subcommand does nothing if the **group** subcommand runs.

The settings made by the **group** subcommand will be reset when the **apply** subcommand finishes.

Syntax

apply

set

Description

The **set** subcommand starts or ends monitoring the storage system (for example, starts or ends collecting performance statistics). The **set** subcommand also specifies the sampling interval (interval of collecting statistics).

If you want to use the **set** subcommand, you must use the **login** subcommand (see login on page 4-21 to log on to the storage system. Ensure that the **set** subcommand runs immediately before Export Tool finishes.

Executing the **set** subcommand generates an error in the following conditions:

- Some other user is logged into the SVP in Modify mode.
- Maintenance operations are being performed on the SVP.

If an error occurs, do the following:

- Check Device Manager - Storage Navigator and confirm that all users who are logged into the storage system are not in Modify mode. If any user is logged into the SVP in Modify mode, ask the user to switch to View mode.
- Wait until maintenance operations finish on the SVP, so that the **set** subcommand can run.



Note: Following are notes of the set command.

- Batch files can include script that should run when an error occurs. For information about writing such a script in your batch file, see **Notes** in Using Export Tool on page 4-12.
- When the set subcommand starts or ends the monitoring or changes the sampling interval after the Monitor Performance window is

started, the contents displayed in the Monitor Performance window does not change automatically in conjunction with the set subcommand operation. To display the current monitoring status in the Monitor Performance window, click **Refresh** on the menu bar of the Device Manager - Storage Navigator main window.

- If you change the specified sampling interval during a monitoring, the previously collected monitoring data will be deleted.

Syntax

set [**switch**={*m*|**off**}]

Operands

Operand	Description
switch={*m*|**off**}	To start monitoring, specify the sampling interval (interval of collecting statistics) of monitoring data at m. Specify a value between 1 and 15 in minutes. m is the sampling interval by Performance Monitor. To end monitoring, specify off. If this operand is omitted, the set subcommand does not make settings for starting or ending monitoring.

Examples

The following command file saves port statistics and then ends monitoring ports:

```
ip 158.214.135.57
dkcsn 123456
login expusr passwd
show
group Port
range 200604010850:200604010910
apply
set switch=off
```

The following command file starts monitoring remote copy operations. The sampling time interval is 10 minutes:

```
ip 158.214.135.57
dkcsn 123456
login expusr passwd
set switch=10
```

help

Description

The **help** subcommand displays the online help for subcommands.

If you want to view the online help, create a batch file and a command file that are used exclusively for displaying the online help. For details, see the following example.

Syntax

help

Example

In this example, a command file (`cmdHelp.txt`) and a batch file (`runHelp.bat`) are created in the C:\export directory on a Windows computer:

- Command file (c:\export\cmdHelp.txt):

```
help
```

- Batch file (c:\export\runHelp.bat):

```
java -classpath "./lib/JSanExportLoader.jar"
-Xmx536870912 -Dmd.command=cmdHelp.txt
-Dmd.logpath=log sanproject.getexptool.RJElMain<CR+LF>
pause<CR+LF>
```

In the preceding script, <CR+LF> indicates the end of a command line.

In this example, you must do one of the following to view the online Help:

- Double-click `runHelp.bat`.
- Go to the c:\export directory at the command prompt, enter `runHelp` or `runHelp.bat`, and then press **Enter**.

Java

Description

This command starts Export Tool and exports monitoring data into files. To start Export Tool, write this Java command in your batch file and then run the batch file.

Syntax

Java -classpath *class-path property-parameters*
sanproject.getexptool.RJElMain

Operands

Operand	Description
class-path	Specifies the path to the class file of Export Tool. The path must be enclosed in double quotation marks (").

Operand	Description
property-parameters	You can specify the following parameters. At minimum you must specify -Dmd.command. • **-Dhttp.proxyHost=***host-name-of-proxy-host*, or **-Dhttp.proxyHost=***IP-address-of-proxy-host* Specifies the host name or the IP address of a proxy host. You must specify this parameter if the computer that runs Export Tool communicates with the SVP through a proxy host. • **-Dhttp.proxyPort=***port-number-of-proxy-host* Specifies the port number of a proxy host. You must specify this parameter if the computer that runs Export Tool communicates with the SVP through a proxy host. • **-Del.tool.Xmx**=*VM-heap-size-when-ExportTool-starts* (bytes) Specifies the size of memory to be used by JRE when Export Tool is being run. You must specify this parameter. The memory size must be 536870912, as shown in the example later in this topic. If the installed memory size is smaller than the recommended size of the PC running Device Manager - Storage Navigator, you must install more memory before executing Export Tool. If the installed memory size is larger than the recommended memory size of the PC running Device Manager - Storage Navigator, you can specify a memory size larger than as shown in the example. However, to prevent lowering of execution speed, you do not set oversized memory size. • **-Dmd.command=***path-to-command-file* Specifies the path to the command file • **-Dmd.logpath=***path-to-log-file* Specifies the path to log files. A log file will be created whenever Export Tool runs. If this parameter is omitted, log files will be saved in the current directory. • **-Dmd.logfile=***name-of-log-file* Specifies the name of the log file. If this parameter is omitted, log files are named exportMMddHHmmss.log. MMddHHmmss indicates when Export Tool is run. For example, the log file export0101091010.log contains log information about Export Tool execution at Jan. 1, 09:10:10. • **-Dmd.rmitimeout=***timeout(min.)* Specifies the timeout value for communication between Export Tool and the SVP: ◦ Default: 20 minutes ◦ Minimum: 1 minute ◦ Maximum: 1,440 minutes (24 hours) If a request does not come from Export Tool within the timeout period, the SVP determines that execution has stopped and disconnects from the Export Tool session. Therefore, if the machine that Export Tool runs on is slow, the sessions may disconnect unexpectedly. To prevent this from occurring,

Operand	Description
	increase the timeout period by entering a larger value in this parameter. • **Del.logpath=***=log-output-destination-directory-name* Specifies the directory to store the log file which is created when Export Tool was downloaded. By default, the current directory is set. The initial value of the startup batch file is `log`. • **-Del.logfile=***=log-file-name* Specifies the name of the log file which is created when Export Tool was downloaded. By default, `loaderMMddHHmmss.log` is set. MM is the month, dd is the day, HH is the hour, mm is minutes, and ss is seconds. By default, a new log file is created every time you run Export Tool. Therefore, you need to delete logs regularly. The initial value of the startup batch file is not specified. • **-Del.mode=***=startup-mode-of-Export-Tool*(all/delete) Specifies the startup mode of Export Tool. Table 4-4 Behavior of Export Tool startup modes on page 4-42 shows the behavior of each operating mode.

Table 4-4 Behavior of Export Tool startup modes

Mode	Download Export Tool?	Run Export Tool?	Delete temporary directory in lib directory?
all	Yes	Yes	Yes
delete	No	No	Yes

Examples

The following example assumes that the computer running Export Tool communicates with the SVP through a proxy host. In the following example, the host name of the proxy host is **Jupiter**, and the port name of the proxy host is **8080**:

```
java -classpath "./lib/JSanExportLoader.jar"
-Dhttp.proxyHost=Jupiter -Dhttp.proxyPort=8080
-Del.tool.Xmx=536870912
-Dmd.command=command.txt
-Dmd.rmitimeout=20
-Dmd.logpath=log sanproject.getexptool.RJElMain<CR+LF>
```

In the following example, a log file named `export.log` will be created in the log directory below the current directory when Export Tool runs:

```
java -classpath "./lib/JSanExportLoader.jar"
-Del.tool.Xmx=536870912 -Dmd.command=command.txt
-Dmd.logfile=export.log
-Dmd.logpath=log sanproject.getexptool.RJElMain<CR+LF>
```

In this script, <CR+LF> indicates the end of a command line.

Exported files

Export Tool saves the exported monitoring data into text files in CSV (comma-separated value) format, in which values are delimited by commas. Many spreadsheet applications can be used to open CSV files.

Export Tool by default saves the CSV text files in compressed (ZIP) files. To use a text editor or spreadsheet software to view or edit the monitoring data, first decompress the ZIP files to extract the CSV files. You can also configure Export Tool to save monitoring data in CSV files instead of ZIP files.

Monitoring data exported by Export Tool

The following table shows the correspondence between the Performance Management windows and the monitoring data that can be exported by Export Tool. For details on the data contained in the corresponding ZIP files and CSV files, see the tables indicated in the links in the **Monitoring data** column.

The monitoring data shows the average value of sampling interval. The sampling intervals are 1 to 15 minutes that can be set in the **Edit Monitoring Switch** window.

Table 4-5 Performance management windows and monitoring data saved by Export Tool

GUI operation	Monitoring data
Select **Parity Groups** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Resource usage and write-pending rate statistics on page 4-44 Parity group and external volume group statistics on page 4-46
Select **Logical Devices (Base)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Resource usage and write-pending rate statistics on page 4-44 Statistics for volumes in parity/external volume groups on page 4-47 Volumes in parity groups or external volume groups (volumes controlled by a particular CU) on page 4-49
Select **Logical Devices (TC/GAD)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy by TC or GAD (volumes controlled by a particular CU) on page 4-55
Select **Logical Devices (UR)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy by UR (volumes controlled by a particular CU) on page 4-59
Select **Cache** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Resource usage and write-pending rate statistics on page 4-44
Select **Controller** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Resource usage and write-pending rate statistics on page 4-44

GUI operation	Monitoring data
Select **Fibre Port** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Port statistics on page 4-51
Select **iSCSI Port** from **Object list** in **Performance Objects** field in **Monitor Performance** window.	Port statistics on page 4-51
Select **LUN Base** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Volumes (LU) statistics on page 4-52
Select **LUN (TC/GAD)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy operations by TC or GAD (for each volume (LU)) on page 4-55
Select **LUN (UR)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy by UR (for each volume (LU)) on page 4-59
Select **WWN** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Host bus adapters connected to ports statistics on page 4-51 All host bus adapters connected to ports on page 4-53
Select **Journal** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy by UR (journals) on page 4-58
Select **Entire Storage System (TC/GAD)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy operations by TC or GAD (whole volumes) on page 4-54
Select **Entire Storage System (UR)** from **Object** list in **Performance Objects** field in **Monitor Performance** window.	Remote copy by UR (whole volumes) on page 4-57

Resource usage and write-pending rate statistics

The following table shows the file names and types of information in the Monitor Performance window that can be saved to files using Export Tool. These files contain statistics about resource usage and write pending rates.

Table 4-6 Files with resource usage and write pending rate statistics

ZIP file	CSV file	Data saved in the file
PhyPG_dat.ZIP	PHY_PG.csv	Usage rates for parity groups
PhyLDEV_dat.ZIP	PHY_LDEV_x-y.csv	Usage rates for volumes in a parity group
	PHY_LDEV_SI_xy.csv	Usage rates for ShadowImage volumes in a parity group
PhyProc_dat.ZIP	PHY_MP.csv	Usage rates for MPs

ZIP file	CSV file	Data saved in the file
PhyMPU_dat.ZIP	PHY_Cache_Usage_Rate.csv	Cache memory usage statistics of the entire system
	PHY_Write_Pending_Rate.csv	Write pending rate of the entire system
	PHY_Cache_Usage_Rate_z.csv	Cache memory usage statistics for each MP unit
	PHY_Write_Pending_Rate_z.csv	Write pending rate for each MP unit
	PHY_Cache_Allocate_z.csv	Amount (MB) of allocated cache memory for each MP unit. This amount is managed by the processor and therefore does not match the total amount of cache memory.

Notes:

- The letters "x-y" in CSV file names indicate a parity group or external volume group.
- The letter "z" in CSV file names indicate a name of MP unit.

If external storage volumes are mapped to the volume groups of your storage system, the following reports are output:

Table 4-7 Files with resource usage and write pending rate statistics

ZIP file	CSV file	Data saved in the file
PhyExG_dat.ZIP	PHY_ExG_Response.csv	This file includes the average response time for the volume groups including external storage volumes (milliseconds).
	PHY_ExG_Trans.csv	This file includes the amount of transferred data for volume groups including external storage volumes (Kbps).
	PHY_ExG_Read_Response.csv	This file includes the average read response time for the volume groups including external storage volumes (milliseconds).
	PHY_ExG_Write_Response.csv	This file includes the average write response time for the volume groups including external storage volumes (milliseconds).
	PHY_ExG_Read_Trans.csv	This file includes the amount of read transferred data for volume groups including external storage volumes (Kbps).
	PHY_ExG_Write_Trans.csv	This file includes the amount of write transferred data for volume groups including external storage volumes (Kbps).
PhyExLDEV_dat/ PHY_ExLDEV_Response.ZIP	PHY_ExLDEV_Response_x-y.csv	This file includes the average response time for external storage volumes in the volume group x-y (milliseconds).

ZIP file	CSV file	Data saved in the file
PhyExLDEV_dat/ PHY_ExLDEV_Trans.ZIP	PHY_ExLDEV_Trans_x-y.csv	This file includes the amount of data transferred for external storage volumes in the volume group x-y (Kbps).
PhyExLDEV_dat/ PHY_ExLDEV_Read_Response.ZIP	PHY_ExLDEV_Read_Response_x-y.csv	This file includes the average reading response time for external storage volumes in the volume group x-y (milliseconds).
PhyExLDEV_dat/ PHY_ExLDEV_Write_Response.ZIP	PHY_ExLDEV_Write_Response_x-y.csv	This file includes the average writing response time for external storage volumes in the volume group x-y (milliseconds).
PhyExLDEV_dat/ PHY_ExLDEV_Read_Trans.ZIP	PHY_ExLDEV_Read_Trans_x-y.csv	This file includes the amount of reading data transferred for external storage volumes in the volume group x-y (Kbps).
PhyExLDEV_dat/ PHY_ExLDEV_Write_Trans.ZIP	PHY_ExLDEV_Write_Trans_x-y.csv	This file includes the amount of writing data transferred for external storage volumes in the volume group x-y (Kbps).

Parity group and external volume group statistics

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about parity groups and external volume groups.

Table 4-8 Files with parity group and external volume group statistics

ZIP file	CSV file	Data saved in the file
PG_dat.ZIP	PG_IOPS.csv	Number of read and write operations per second
	PG_TransRate.csv	Size of data transferred per second (Kbps)
	PG_Read_TransRate.csv	Size of read data transferred per second (Kbps)
	PG_Write_TransRate.csv	Size of write data transferred per second (Kbps)
	PG_Read_IOPS.csv	Number of read operations per second
	PG_Rnd_Read_IOPS.csv	Number of random read operations per second
	PG_Write_IOPS.csv	Number of write operations per second
	PG_Seq_Write_IOPS.csv	Number of sequential write operations per second
	PG_Rnd_Write_IOPS.csv	Number of random write operations per second
	PG_Read_Hit.csv	Read hit ratio
	PG_Seq_Read_Hit.csv	Read hit ratio in sequential access mode
	PG_Rnd_Read_Hit.csv	Read hit ratio in random access mode

ZIP file	CSV file	Data saved in the file
	PG_Write_Hit.csv	Write hit ratio
	PG_Seq_Write_Hit.csv	Write hit ratio in sequential access mode
	PG_Rnd_Write_Hit.csv	Write hit ratio in random access mode
	PG_BackTrans.csv	Number of data transfer operations between cache memory and data drives (for example, parity groups or external volume groups) per second
	PG_C2D_Trans.csv	Number of data transfer operations from cache memory and data drives (for example, parity groups or external volume groups) per second
	PG_D2CS_Trans.csv	Number of data transfer operations from data drives (for example, parity groups or external volume groups) per second to cache memory in sequential access mode
	PG_D2CR_Trans.csv	Number of data transfer operations from data drives (for example, parity groups or external volume groups) per second to cache memory in random access mode
	PG_Response.csv	Average response time (microsecond) at parity groups or external volume groups
	PG_Read_Response.csv	Average read response time (microsecond) at parity groups or external volume groups
	PG_Write_Response.csv	Average write response time (microsecond) at parity groups or external volume groups

Note: The parity group number is output in the column header of each performance value in these files.

Statistics for volumes in parity/external volume groups

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about volumes in parity groups or in external volume groups.

Table 4-9 Files with statistics about volumes in parity/external volume groups

ZIP file	CSV file	Data saved in the file
LDEV_dat/ LDEV_IOPS.ZIP	LDEV_IOPS_x-y.csv	Number of read and write operations per second
LDEV_dat/ LDEV_TransRate.ZIP	LDEV_TransRate_x-y.csv	Size of data transferred per second (Kbps)

ZIP file	CSV file	Data saved in the file
LDEV_dat/ LDEV_Read_TransRate.ZIP	LDEV_Read_TransRate_x-y.csv	Size of read data transferred per second (Kbps)
LDEV_dat/ LDEV_Read_TransRate.ZIP	LDEV_Write_TransRate_x-y.csv	Size of write data transferred per second (Kbps)
LDEV_dat/ LDEV_Read_IOPS.ZIP	LDEV_Read_IOPS_x-y.csv	Number of read operations per second
LDEV_dat/ LDEV_Seq_Read_IOPS.ZIP	LDEV_Seq_Read_IOPS_x-y.csv	Number of sequential read operations per second
LDEV_dat/ LDEV_Rnd_Read_IOPS.ZIP	LDEV_Rnd_Read_IOPS_x-y.csv	Number of random read operations per second
LDEV_dat/ LDEV_Write_IOPS.ZIP	LDEV_Write_IOPS_x-y.csv	Number of write operations per second
LDEV_dat/ LDEV_Seq_Write_IOPS.ZIP	LDEV_Seq_Write_IOPS_x-y.csv	Number of sequential write operations per second
LDEV_dat/ LDEV_Rnd_Write_IOPS.ZIP	LDEV_Rnd_Write_IOPS_x-y.csv	Number of random write operations per second
LDEV_dat/ LDEV_Read_Hit.ZIP	LDEV_Read_Hit_x-y.csv	Read hit ratio
LDEV_dat/ LDEV_Seq_Read_Hit.ZIP	LDEV_Seq_Read_Hit_x-y.csv	Read hit ratio in sequential access mode
LDEV_dat/ LDEV_Rnd_Read_Hit.ZIP	LDEV_Rnd_Read_Hit_x-y.csv	Read hit ratio in random access mode
LDEV_dat/ LDEV_Write_Hit.ZIP	LDEV_Write_Hit_x-y.csv	Write hit ratio
LDEV_dat/ LDEV_Seq_Write_Hit.ZIP	LDEV_Seq_Write_Hit_x-y.csv	Write hit ratio in sequential access mode
LDEV_dat/ LDEV_Rnd_Write_Hit.ZIP	LDEV_Rnd_Write_Hit_x-y.csv	Write hit ratio in random access mode
LDEV_dat/ LDEV_BackTrans.ZIP	LDEV_BackTrans_x-y.csv	Number of data transfer operations between cache memory and data drives (for example, volumes) per second
LDEV_dat/ LDEV_C2D_Trans.ZIP	LDEV_C2D_Trans_x-y.csv	Number of data transfer operations from cache memory and data drives (for example, volumes) per second

ZIP file	CSV file	Data saved in the file
LDEV_dat/ LDEV_D2CS_Trans.ZIP	LDEV_D2CS_Trans_x-y.csv	Number of data transfer operations from data drives (for example, volumes) per second to cache memory in sequential access mode
LDEV_dat/ LDEV_D2CR_Trans.ZIP	LDEV_D2CR_Trans_x-y.csv	Number of data transfer operations from data drives (for example, volumes) per second to cache memory in random access mode
LDEV_dat/ LDEV_Response.ZIP	LDEV_Response_x-y.csv	Average response time (microseconds) at volumes
LDEV_dat/ LDEV_Read_Response. ZIP	LDEV_Read_Response_x-y.csv	Average read response time (microseconds) at volumes
LDEV_dat/ LDEV_Write_Response. ZIP	LDEV_Write_Response_x-y.csv	Average write response time (microseconds) at volumes
Note: The letters "x-y" in CSV filenames indicate a parity group. For example, if the filename is LDEV_IOPS_1-2.csv, the file contains the I/O rate for each volume in the parity group 1-2.		

Volumes in parity groups or external volume groups (volumes controlled by a particular CU)

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about volumes in parity groups or external volume groups (volumes controlled by a particular CU).

Table 4-10 Files with statistics about volumes in parity groups or external volume groups (volumes controlled by a particular CU)

ZIP file	CSV file	Data saved in the file
LDEVEachOfCU_dat/ LDEV_Read_TransRate.ZIP	LDEV_Read_TransRatexx.csv	The size of read data transferred per second (Kbps)
LDEVEachOfCU_dat/ LDEV_Write_TransRate.ZIP	LDEV_Write_TransRatexx.csv	The size of write data transferred per second (Kbps)
LDEVEachOfCU_dat/ LDEV_Read_Response.ZIP	LDEV_Read_Responsexx.csv	The average read response time (microseconds) at volumes
LDEVEachOfCU_dat/ LDEV_Write_Response.ZIP	LDEV_Write_Responsexx.csv	The average write response time (microseconds) at volumes

ZIP file	CSV file	Data saved in the file
LDEVEachOfCU_dat/ LDEV_IOPS.ZIP	LDEV_IOPSxx.csv	The number of read and write operations per second
LDEVEachOfCU_dat/ LDEV_TransRate.ZIP	LDEV_TransRatexx.csv	The size of data transferred per second (Kbps)
LDEVEachOfCU_dat/ LDEV_Read_IOPS.ZIP	LDEV_Read_IOPSxx.csv	The number of read operations per second
LDEVEachOfCU_dat/ LDEV_Seq_Read_IOPS.ZIP	LDEV_Seq_Read_IOPSxx.csv	The number of sequential read operations per second
LDEVEachOfCU_dat/ LDEV_Rnd_Read_IOPS.ZIP	LDEV_Rnd_Read_IOPSxx.csv	The number of random read operations per second
LDEVEachOfCU_dat/ LDEV_Write_IOPS.ZIP	LDEV_Write_IOPSxx.csv	The number of write operations per second
LDEVEachOfCU_dat/ LDEV_Seq_Write_IOPS.ZIP	LDEV_Seq_Write_IOPSxx.csv	The number of sequential write operations per second
LDEVEachOfCU_dat/ LDEV_Rnd_Write_IOPS.ZIP	LDEV_Rnd_Write_IOPSxx.csv	The number of random write operations per second
LDEVEachOfCU_dat/ LDEV_Read_Hit.ZIP	LDEV_Read_Hitxx.csv	The read hit ratio
LDEVEachOfCU_dat/ LDEV_Seq_Read_Hit.ZIP	LDEV_Seq_Read_Hitxx.csv	The read hit ratio in sequential access mode
LDEVEachOfCU_dat/ LDEV_Rnd_Read_Hit.ZIP	LDEV_Rnd_Read_Hitxx.csv	The read hit ratio in random access mode
LDEVEachOfCU_dat/ LDEV_Write_Hit.ZIP	LDEV_Write_Hitxx.csv	The write hit ratio
LDEVEachOfCU_dat/ LDEV_Seq_Write_Hit.ZIP	LDEV_Seq_Write_Hitxx.csv	The write hit ratio in sequential access mode
LDEVEachOfCU_dat/ LDEV_Rnd_Write_Hit.ZIP	LDEV_Rnd_Write_Hitxx.csv	The write hit ratio in random access mode
LDEVEachOfCU_dat/ LDEV_BackTrans.ZIP	LDEV_BackTransxx.csv	The number of data transfer operations per second between cache memories and data drives (for example, volumes)
LDEVEachOfCU_dat/ LDEV_C2D_Trans.ZIP	LDEV_C2D_Transxx.csv	The number of data transfer operations per second from cache memories and data drives (for example, volumes)
LDEVEachOfCU_dat/ LDEV_D2CS_Trans.ZIP	LDEV_D2CS_Transxx.csv	The number of data transfer operations per second from data drives (for example, volumes) to cache memories in sequential access mode

ZIP file	CSV file	Data saved in the file
LDEVEachOfCU_dat/ LDEV_D2CR_Trans.ZIP	LDEV_D2CR_Transxx.csv	The number of data transfer operations per second from data drives (for example, volumes) to cache memories in random access mode
LDEVEachOfCU_dat/ LDEV_Response.ZIP	LDEV_Responsexx.csv	The average response time (microseconds) at volumes
Note: The letters "xx" in CSV filenames indicate a CU image number. For example, if the filename is `LDEV_IOPS _10.csv`, the file contains the I/O rate (per second) of the volumes controlled by the CU whose image number is 10.		

Port statistics

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about ports.

Table 4-11 Files with statistics about ports

ZIP file	CSV file	Data saved in the file
Port_dat. ZIP	Port_IOPS.csv	The number of read and write operations per second at ports during Target connection
	Port_KBPS.csv	The size of data transferred per second at ports during Target connection (Kbps)
	Port_Response.csv	The average response time (microseconds) at ports during Target connection
	Port_Initiator_IOPS.csv	The number of read and write operations per second at ports during Initiator connection
	Port_Initiator_KBPS.csv	The size of data transferred per second at ports during Initiator connection (Kbps)
	Port_Initiator_Response.csv	The average response time (microseconds) at ports during Initiator connection

Host bus adapters connected to ports statistics

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about host bus adapters connected to ports.

Table 4-12 Files with statistics about host bus adapters connected to ports

ZIP file	CSV file	Data saved in the file
PortWWN_dat.ZIP	PortWWN_xx_IOPS.csv	The I/O rate (that is, the number of read and write operations per second) for HBAs that are connected to a port
	PortWWN_xx_KBPS.csv	The size of data transferred per second (Kbps) between a port and the HBAs connected to that port
	PortWWN_xx_Response.csv	The average response time (microseconds) between a port and the HBAs connected to that port

Notes:

- The letters "xx" in CSV filenames indicate a port name. For example, if the filename is PortWWN_1A_IOPS.csv, the file contains the I/O rate for each host bus adapter connected to the CL1-A port.
- If files are exported to a Windows computer, CSV filenames may end with numbers (for example, PortWWN_1A_IOPS-1.csv and PortWWN_1a_IOPS-2.csv).

Volumes (LU) statistics

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about volumes (LUs).

Table 4-13 Files with statistics about volumes (LUs)

ZIP file	CSV file	Data saved in the file
LU_dat.ZIP	LU_IOPS.csv	The number of read and write operations per second
	LU_TransRate.csv	The size of data transferred per second (Kbps)
	LU_Read_TransRate.csv	The size of read data transferred per second (Kbps)
	LU_Write_TransRate.csv	The size of write data transferred per second (Kbps)
	LU_Read_Response.csv	The average read response time (microseconds)
	LU_Write_Response.csv	The average write response time (microseconds)
	LU_Seq_Read_IOPS.csv	The number of sequential read operations per second
	LU_Rnd_Read_IOPS.csv	The number of random read operations per second
	LU_Seq_Write_IOPS.csv	The number of sequential write operations per second

ZIP file	CSV file	Data saved in the file
	LU_Rnd_Write_IOPS.csv	The number of random write operations per second
	LU_Seq_Read_Hit.csv	The read hit ratio in sequential access mode
	LU_Rnd_Read_Hit.csv	The read hit ratio in random access mode
	LU_Seq_Write_Hit.csv	The write hit ratio in sequential access mode
	LU_Rnd_Write_Hit.csv	The write hit ratio in random access mode
	LU_C2D_Trans.csv	The number of data transfer operations per second from cache memories to data drives (for example, LUs)
	LU_D2CS_Trans.csv	The number of data transfer operations per second from data drives (for example, LUs) to cache memories in sequential access mode
	LU_D2CR_Trans.csv	The number of data transfer operations per second from data drives (for example, LUs) to cache memories in random access mode
	LU_Response.csv	The average response time (microseconds) at volumes (LUs)

All host bus adapters connected to ports

The following table shows the file names and types of information in the Monitor Performance window that can be exported to files using Export Tool. These files contain statistics about all host bus adapters connected to ports.

Table 4-14 Files with statistics about host bus adapters belonging to SPM groups

ZIP file	CSV file	Data saved in the file
PPCGWWN_dat.ZIP	PPCGWWN_xx_IOPS.csv	I/O rate (that is, the number of read and write operations per second) for HBAs belonging to an SPM group
	PPCGWWN_xx_KBPS.csv	Transfer rate (Kbps) for HBAs belonging to an SPM group
	PPCGWWN_xx_Response.csv	Average response time (microseconds) for HBAs belonging to an SPM group
	PPCGWWN_NotGrouped_IOPS.csv	I/O rate (that is, the number of read and write operations per second) for HBAs that do not belong to any SPM group
	PPCGWWN_NotGrouped_KBPS.csv	Transfer rate (Kbps) for HBAs that do not belong to any SPM group

ZIP file	CSV file	Data saved in the file
	PPCGWWN_NotGrouped_Response.csv	Average response time (microseconds), for HBAs that do not belong to any SPM group

Notes:

- The letters "xx" in CSV filenames indicate the name of an SPM group.
- If files are exported to a Windows computer, CSV filenames may end with numbers (for example, PPCGWWN_mygroup_IOPS-1.csv and PPCGWWN_MyGroup_IOPS-2.csv).

Remote copy operations by TC or GAD (whole volumes)

The following table shows the file names and types of information on the Usage Monitor tab in the TC or GAD window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (whole volumes) by TrueCopy and global-active device.

Table 4-15 Files with statistics about remote copy operations by TC or GAD (whole volumes)

ZIP file	CSV file	Data saved in the file
RemoteCopy_dat.ZIP	RemoteCopy.csv	The following data in the whole volumes are saved: • The total number of remote I/Os (read and write operations). • The total number of remote write I/Os. • The number of errors that occur during remote I/O • The number of initial copy remote I/Os. • The average response time (milliseconds) for initial copy. • The average transfer rate (Kbps) for initial copy remote I/Os. • The number of update copy remote I/Os. • The average transfer rate (Kbps) for update copy remote I/Os. • The average response time (milliseconds) for update copy • The percentage of completion of copy operations (for example, number of synchronized pairs / total number of pairs) • The number of tracks that have not yet been copied by the initial copy or resync copy operation

Remote copy operations by TC or GAD (for each volume (LU))

The following table shows the file names and types of information on the Usage Monitor tab in the TC or GAD window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (for each volume (LU)) by TrueCopy and global-active device.

Table 4-16 Files with statistics about remote copy operations by TC or GAD (for each volume (LU))

ZIP file	CSV file	Data saved in the file
RCLU_dat.ZIP	RCLU_All_RIO.csv	The total number of remote I/Os (read and write operations)
	RCLU_All_Write.csv	The total number of remote write I/Os
	RCLU_RIO_Error.csv	The number of errors that occur during remote I/O
	RCLU_Initial_Copy_RIO.csv	The number of initial copy remote I/Os
	RCLU_Initial_Copy_Transfer.csv	The average transfer rate (Kbps) for initial copy remote I/Os
	RCLU_Initial_Copy_Response.csv	The average response time (milliseconds) for the initial copy of each volume (LU)
	RCLU_Update_Copy_RIO.csv	The number of update copy remote I/Os
	RCLU_Update_Copy_Transfer.csv	The average transfer rate (Kbps) for update copy remote I/Os
	RCLU_Update_Copy_Response.csv	The average response time (milliseconds) for the update copy of each volume (LU)
	RCLU_Pair_Synchronized.csv	The percentage of completion of copy operations (for example, number of synchronized pairs / total number of pairs)
	RCLU_Out_of_Tracks.csv	The number of tracks that have not yet been copied by the initial copy or resync copy operation

Remote copy by TC or GAD (volumes controlled by a particular CU)

The following table shows the file names and types of information on the Usage Monitor tab in the TC or GAD window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (volumes controlled by a particular CU) by TrueCopy and global-active device.

Table 4-17 Files with statistics about remote copy operations by TC or GAD (volumes controlled by a particular CU)

ZIP file	CSV file	Data saved in the file
RCLDEV_dat/ RCLDEV_All_RIO.ZIP	RCLDEV_All_RIO_xx.csv	The total number of remote I/Os (read and write operations)
RCLDEV_dat/ RCLDEV_All_Write.ZIP	RCLDEV_All_Write_xx.csv	The total number of remote write I/Os
RCLDEV_dat/ RCLDEV_RIO_Error.ZIP	RCLDEV_RIO_Error_xx.csv	The number of errors that occur during remote I/O
RCLDEV_dat/ RCLDEV_Initial_Copy_RIO.ZIP	RCLDEV_Initial_Copy_RIO_xx.csv	The number of initial copy remote I/Os
RCLDEV_dat/ RCLDEV_Initial_Copy_Transfer.ZIP	RCLDEV_Initial_Copy_Transfer_xx.csv	The average transfer rate (Kbps) for initial copy remote I/Os
RCLDEV_dat/ RCLDEV_Initial_Copy_Response.ZIP	RCLDEV_Initial_Copy_Response_xx.csv	The average response time (milliseconds) for initial copy at volumes
RCLDEV_dat/ RCLDEV_Update_Copy_RIO.ZIP	RCLDEV_Update_Copy_RIO_xx.csv	The number of update copy remote I/Os
RCLDEV_dat/ RCLDEV_Update_Copy_Transfer.ZIP	RCLDEV_Update_Copy_Transfer_xx.csv	The average transfer rate (Kbps) for update copy remote I/Os
RCLDEV_dat/ RCLDEV_Update_Copy_Response.ZIP	RCLDEV_Update_Copy_Response_xx.csv	The average response time (milliseconds) for the update copy at volumes
RCLDEV_dat/ RCLDEV_Pair_Synchronized.ZIP	RCLDEV_Pair_Synchronized_xx.csv	The percentage of completion of copy operations (for example, number of synchronized pairs / total number of pairs)
RCLDEV_dat/ RCLDEV_Out_of_Tracks.ZIP	RCLDEV_Out_of_Tracks_xx.csv	The number of tracks that have not yet been copied by the initial copy or Resync copy operation

ZIP file	CSV file	Data saved in the file
Note: • The letters "xx" in CSV filenames indicate a CU image number. For example, if the filename is `RCLDEV_All_RIO_10.csv`, the file contains the total number of remote I/Os of the volumes controlled by the CU whose image number is 10.		

Remote copy by UR (whole volumes)

The following table shows the file names and types of information on the Usage Monitor tab in the UR window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (whole volumes) by Universal Replicator.

Table 4-18 Files with statistics about remote copy operations by UR (In the whole volumes)

ZIP file	CSV file	Data saved in the file
UniversalReplicator_dat.zip	UniversalReplicator.csv	The following data in the whole volumes are saved: • The number of write I/Os per second • The amount of data that are written per second (Kbps) • The initial copy hit rate (percent) • The average transfer rate (Kbps) for initial copy operations • The number of asynchronous remote I/Os per second at the primary storage system • The number of journals at the primary storage system • The average transfer rate (Kbps) for journals in the primary storage system • The remote I/O average response time (milliseconds) on the primary storage system • The number of asynchronous remote I/Os per second at the secondary storage system • The number of journals at the secondary storage system • The average transfer rate (Kbps) for journals in the secondary storage system • The remote I/O average response time (milliseconds) on the secondary storage system

Remote copy by UR (journals)

The following table shows the file names and types of information on the Usage Monitor tab in the UR window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (journals) by Universal Replicator.

Table 4-19 Files with statistics about remote copy operations by UR (journals)

ZIP file	CSV file	Data saved in the file
URJNL_dat.ZIP	URJNL_Write_Record.csv	The number of write I/Os per second
	URJNL_Write_Transfer.csv	The amount of data that are written per second (Kbps)
	URJNL_Initial_Copy_Hit.csv	The initial copy hit rate (percent)
	URJNL_Initial_Copy_Transfer.csv	The average transfer rate (Kbps) for initial copy operations
	URJNL_M-JNL_Asynchronous_RIO.csv	The number of asynchronous remote I/Os per second at the primary storage system
	URJNL_M-JNL_Asynchronous_Journal.csv	The number of journals at the primary storage system
	URJNL_M-JNL_Asynchronous_Copy_Transfer.csv	The average transfer rate (Kbps) for journals in the primary storage system
	URJNL_M-JNL_Asynchronous_Copy_Response.csv	The remote I/O average response time (milliseconds) on the primary storage system
	URJNL_R-JNL_Asynchronous_RIO.csv	The number of asynchronous remote I/Os per second at the secondary storage system
	URJNL_R-JNL_Asynchronous_Journal.csv	The number of journals at the secondary storage system
	URJNL_R-JNL_Asynchronous_Copy_Transfer.csv	The average transfer rate (Kbps) for journals in the secondary storage system
URJNL_dat.ZIP (continued)	URJNL_R-JNL_Asynchronous_Copy_Response.csv	The remote I/O average response time (milliseconds) on the secondary storage system
	URJNL_M-JNL_Data_Used_Rate.csv	Data usage rate (percent) for master journals
	URJNL_M-JNL_Meta_Data_Used_Rate.csv	Metadata usage rate (percent) for master journals
	URJNL_R-JNL_Data_Used_Rate.csv	Data usage rate (percent) for restore journals

ZIP file	CSV file	Data saved in the file
	URJNL_R-JNL_Meta_Data_Used_Rate.csv	Metadata usage rate (percent) for restore journals

Remote copy by UR (for each volume (LU))

The following table shows the file names and types of information on the Usage Monitor tab in the UR window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (for each volume (LU)) by Universal Replicator.

Table 4-20 Files with statistics about remote copy operations by UR (for each volume (LU))

ZIP file	CSV file	Data saved in the file
URLU_dat.ZIP	URLU_Read_Record.csv	The number of read I/Os per second
	URLU_Read_Hit.csv	The number of read hit records per second
	URLU_Write_Record.csv	The number of write I/Os per second
	URLU_Write_Hit.csv	The number of write hit records per second
	URLU_Read_Transfer.csv	The amount of data that are read per second (Kbps)
	URLU_Write_Transfer.csv	The amount of data that are written per second (Kbps)
	URLU_Initial_Copy_Hit.csv	The initial copy hit rate (percent)
	URLU_Initial_Copy_Transfer.csv	The average transfer rate (Kbps) for initial copy operations

Remote copy by UR (volumes controlled by a particular CU)

The following table shows the file names and types of information on the Usage Monitor tab in the UR window that can be exported to files using Export Tool. These files contain statistics about remote copy operations (volumes controlled by a particular CU) by Universal Replicator.

Table 4-21 Files with statistics about remote copy operations by UR (volumes controlled by a particular CU)

ZIP file	CSV file	Data saved in the file
URLDEV_dat/ URLDEV_Read_Record.ZIP	URLDEV_Read_Record_xx.csv	The number of read I/Os per second
URLDEV_dat/ URLDEV_Read_Hit.ZIP	URLDEV_Read_Hit_xx.csv	The number of read hit records per second

ZIP file	CSV file	Data saved in the file
URLDEV_dat/ URLDEV_Write_Record.ZIP	URLDEV_Write_Record_xx.csv	The number of write I/Os per second
URLDEV_dat/ URLDEV_Write_Hit.ZIP	URLDEV_Write_Hit_xx.csv	The number of write hit records per second
URLDEV_dat/ URLDEV_Read_Transfer.ZIP	URLDEV_Read_Transfer_xx.csv	The amount of data that are read per second (Kbps)
URLDEV_dat/ URLDEV_Write_Transfer.ZIP	URLDEV_Write_Transfer_xx.csv	The amount of data that are written per second (Kbps)
URLDEV_dat/ URLDEV_Initial_Copy_Hit.ZIP	URLDEV_Initial_Copy_Hit_xx.csv	The initial copy hit rate (percent)
URLDEV_dat/ URLDEV_Initial_Copy_Transfer.ZIP	URLDEV_Initial_Copy_Transfer_xx.csv	The average transfer rate (Kbps) for initial copy operations
Note: The letters "xx" in CSV filenames indicate a CU image number. For example, if the filename is `URLDEV_Read_Record_10.csv`, the file contains the number of read I/Os (per second) of the volumes controlled by the CU whose image number is 10.		

Causes of Invalid Monitoring Data

If the value of monitoring data in CSV files is less than 0 (zero), consider the following causes:

Invalid values of monitoring data	Probable causes
The monitoring data in the CSV file includes (-1).	The value (-1) indicates that Performance Monitor failed to obtain monitoring data. Probable reasons are: • Performance Monitor attempted to obtain statistics when an operation for restarting the system is in progress. • Performance Monitor attempted to obtain statistics when a heavy workload is imposed on the system. • There is no volume in a parity group. • Just after the CUs to be monitored were added, Export Tool failed to save files that contain monitoring data for all volumes or journal volumes used by remote copy software (TC, UR, GAD). For details about the files, see Table 4-15 Files with statistics about remote copy operations by TC or GAD (whole volumes) on page 4-54, Table 4-18 Files with statistics about remote copy operations by UR (In the whole volumes) on page 4-57, and Table 4-19 Files with statistics about remote copy operations by UR (journals) on page 4-58. • If no CU is specified as a monitoring target, the value (-1) is displayed as the monitoring data.

Invalid values of monitoring data	Probable causes
The monitoring data in the CSV file includes (-3).	The value (-3) indicates that Performance Monitor failed to obtain monitoring data for the following reason: If IOPS is 0 (zero), the Response Time that is included in the monitoring data for LUs, LDEVs, ports, WWNs, or external volumes is (-3). Because IOPS is 0 (zero), the average response time becomes invalid.
The monitoring data in the CSV file includes (-4).	The value (-4) indicates that Performance Monitor failed to obtain monitoring data for the following reason: If the period for the monitoring data that is specified with Export Tool does not match the collecting period for monitoring data, Export Tool cannot collect the monitoring data. If the data of the SVP is updated while the monitoring data is being collected, the collected monitoring data near the collection start time is (-4).
The monitoring data in the CSV file includes (-5).	When the CU number is not the monitoring target object, Performance Monitor cannot obtain monitoring data from the CU. If the PG, LDEV, LU, RCLU, RCLDEV, URLU, or URLDEV operand is specified, the value of the monitoring data is (-5). To solve this problem, specify the CU as the monitoring target object by using the Monitoring Options window of Performance Monitor (not by using Export Tool). If the RemoteCopy, UniversalReplicator, or URJNL operand is specified, the value (-5) is not output in the monitoring data though the CU number is not the monitoring target object. In this case, data on monitored CUs are summed up and output into the CSV file.

5

Server Priority Manager operations

This chapter describes and provides instructions for managing host I/O activity using Hitachi Server Priority Manager.

- ☐ Overview of Server Priority Manager
- ☐ Use cases for Server Priority Manager
- ☐ Cautions and restrictions for Server Priority Manager
- ☐ Implementing Server Priority Manager: one-to-one connections
- ☐ Implementing Server Priority Manager: many-to-many connections
- ☐ Managing host bus adapters
- ☐ Working with SPM groups

Overview of Server Priority Manager

Server Priority Manager allows you to set upper limits of the number of accesses from the server to storage system as well as the amount of data transfer. The upper limits are automatically disabled when the traffic between the server and storage system drops to user-defined levels.

Using Server Priority Manager you can designate prioritized ports (for example, for production servers) and non-prioritized ports (for example, for development servers) and set upper limits and thresholds for the I/O activity of these ports to prioritize I/O operations to host servers requiring high-throughput I/O operations and prevent low-priority activities from negatively impacting high-priority activities.

- Performance of high-priority hosts on page 5-2
- Upper-limit control on page 5-2
- Threshold control on page 5-3
- About I/O rates and transfer rates (traffic) on page 5-3

Performance of high-priority hosts

In a SAN environment, the storage system is usually connected with many host servers. Some types of host servers often require higher performance than others. For example, production servers such as database and application servers that are used to perform daily tasks of business organizations usually require high performance. If production servers experience decreased performance, productivity in business activities can be negatively impacted. To prevent this from happening, the system administrator needs to maintain the performance of production servers at a relatively high level.

Computer systems in business organizations often include development servers, which are used for developing, testing, and debugging business applications, as well as production servers. If development servers experience decreased performance, development activities can be negatively impacted, but a drop in development server performance does not have as much negative impact to the entire organization as a drop in production server performance. In this case, you can use Server Priority Manager to give higher priority to I/O activity from production servers than I/O activity from development servers to manage and control the impact of development activities.

Related topics

- Overview of Server Priority Manager on page 5-2

Upper-limit control

Using Server Priority Manager you can limit the number of I/O requests from servers to the storage system as well as the amount of data that can be transferred between the servers and the storage system to maintain

production server performance at the required levels. This practice of limiting the performance of low-priority host servers is called upper-limit control. The upper-limit control is automatically disabled when traffic between the servers and the storage system drops to user-defined levels called thresholds.

Related topics

- Overview of Server Priority Manager on page 5-2

Threshold control

While upper-limit control can help production servers to perform at higher levels during periods of heavy use, it may not be desirable when production servers are not busy. For example, if the I/O activity on production servers is high between 09:00 and 15:00 hours and decreases significantly after 15:00, upper-limit control for development servers may not be required after 15:00.

To address this situation Server Priority Manager provides threshold control in which upper-limit control is automatically disabled when I/O traffic between production servers and the storage system decreases to a user-specified level. This user-specified level at which upper-limit control is disabled is called the threshold. You can specify the threshold as an I/O rate (number of I/Os per second) and a data transfer rate (amount of data transferred per second).

For example, if you set a threshold of 500 I/Os per second to the storage system, the upper-limit controls for development servers are disabled when the I/O rate of the production servers drops below 500 I/Os per second. If the I/O rate of the production servers goes up and exceeds 500 I/Os per second, upper-limit control is restored on the development servers.

If you also set a threshold of 20 MB per second to the storage system, the upper-limit controls for development servers are disabled when the amount of data transferred between the storage system and the production servers is less than 20 MB per second.

Related topics

- Overview of Server Priority Manager on page 5-2

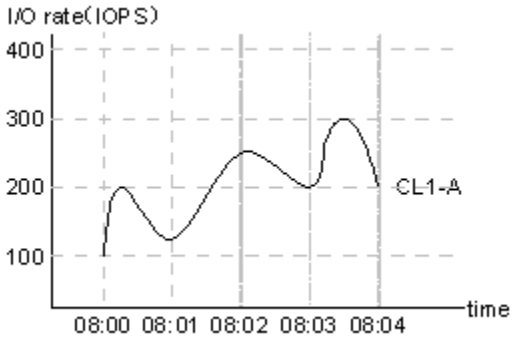
About I/O rates and transfer rates (traffic)

Server Priority Manager runs based on the I/O rates and data transfer rates, also called traffic, measured by Performance Monitor. Performance Monitor measures I/O rates and transfer rates every second, and calculates the average I/O rate and the average transfer rate for every sampling interval (specified between 1 and 15 minutes) regularly. These traffic statistics reveal the number of I/Os and amount of data being processed through the ports.

Suppose that 1 minute is specified as the sampling interval and the I/O rate at port 1-A changes as shown in Graph 1 below. When you use Performance Monitor to display the I/O rate graph for 1A, the line in the graph indicates changes in the average I/O rate calculated every minute (see Graph 2). If

you select the **Detail** check box in the Performance Monitor windows, the graph displays changes in the maximum, average, and minimum I/O rates in one minute (see **Graph 3**).

Using Server Priority Manager you can apply upper limits and thresholds to the average I/O rate or average transfer rate per sampling interval. For example, in the following figures, if you set an upper limit of 150 I/Os to port 1A, the highest data point in the line CL1-A in Graph 2 and in the line Ave. (1 min) in Graph 3 is approximately 150 I/Os. It is possible that the lines Max (1 min.) and Min (1 min.) in Graph 3 might exceed the upper limit.



Period	Minimum	Average	Maximum
08:00 - 08:01	100	160	200
08:01 - 08:02	130	180	250
08:02 - 08:03	200	225	250
08:03 - 08:04	200	250	300

Figure 5-1 Graph 1: actual I/O rate (measured every second)

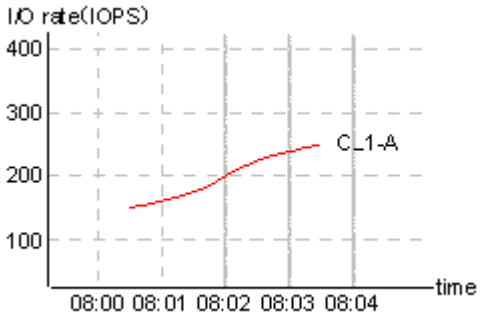


Figure 5-2 Graph 2: I/O rate displayed in Performance Monitor

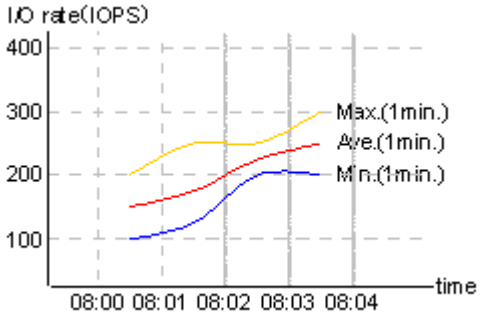


Figure 5-3 Graph 3: detailed I/O rate displayed in Performance Monitor

Related topics

- Overview of Server Priority Manager on page 5-2

Use cases for Server Priority Manager

This section describes the use cases for implementing Server Priority Manager on VSP Gx00 models:

- Use case for one-to-one connections on page 5-5
- Use case for many-to-many connections on page 5-7

Use case for one-to-one connections

The following figure shows an example of a network, called Network A, in which each adapter is connected to only one port on the storage system. The host bus adapters are connected directly to the storage system ports and are not connected via hubs or switches.

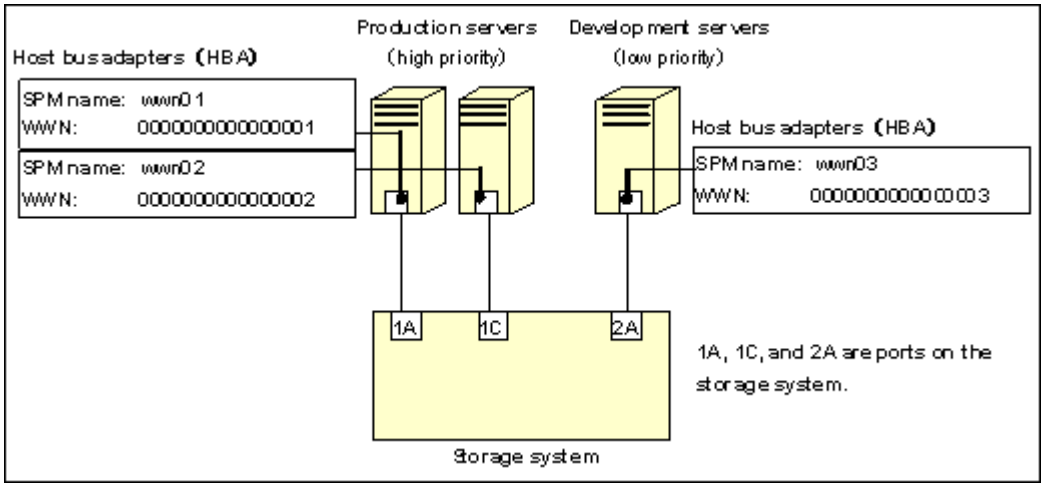
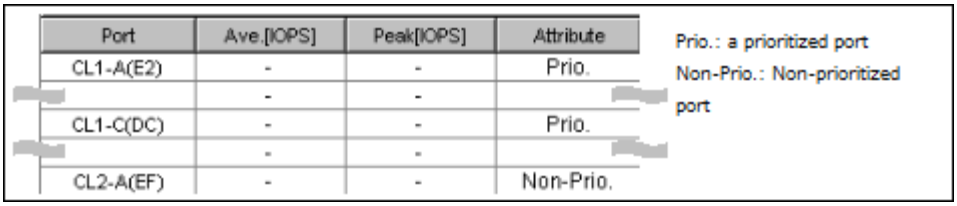


Figure 5-4 Network A: 1-to-1 connections between HBAs and ports

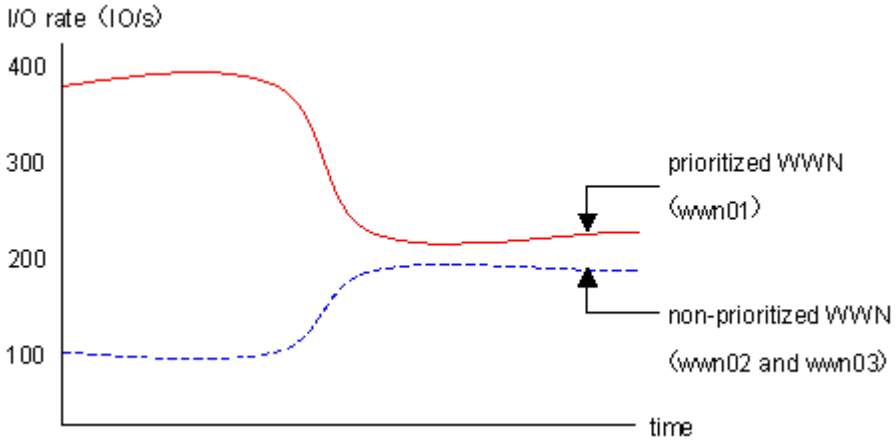
In Network A, ports 1A and 1C are connected to high-priority production servers. Port 2A is connected to a low-priority development server. Therefore, high priority (**Prio.**) is set to ports 1A and 1C, and low priority (**Non-Prio.**) is set to port 2A. The following figure shows the priority settings for these ports on the **Port** tab of the Server Priority Manager main window.



The I/O traffic at the ports is now monitored. When the desired amount of data has been collected, the traffic statistics are reviewed on graphs using the Performance Monitor window. The following figure shows the changes in the I/O rate for the three ports (1A, 1C, and 2A). According to the data, the I/O rate for ports 1A and 1C was approximately 400 IO/s at first, and the I/O rate for port 2A was approximately 100 IO/s at first. However, as the I/O rate for port 2A gradually increased from 100 IO/s to 200 IO/s, the I/O rate for ports 1A and 1C decreased from 400 IO/s to 200 IO/s, which indicates that the performance of the high-priority production servers decreased. If you

want to maintain the I/O rate for prioritized ports 1A and 1C at 400 IO/s, you can set an upper limit to the I/O rate for the non-prioritized port 2A.

When an upper limit is set for the first time, it is recommended that the upper limit be approximately 90 percent of the peak traffic. In Network A, the peak I/O rate for the non-prioritized port (2A) is 200 IO/s, so the recommended upper limit for port 2A is 180 IO/s. You can then adjust this value later as needed according to the results of your data analysis.



After upper limit values have been applied, the traffic at the ports is measured to check the result of the upper limits and see whether host performance has improved to a desirable level, in this case 400 IO/s for ports 1A and 1C. If production server performance is not improved to a desirable level, you can adjust the upper limit to a smaller value until the I/O rate for the high priority servers reaches the desirable level.

If you want to allow improved performance for non-prioritized ports when system activity is low, you can apply a threshold. For one-to-one connections threshold values can be set in either of the following two ways:

- Set a threshold to each prioritized port.

  In Network A, if you set a threshold of 200 IO/s to port 1A and a threshold of 100 IO/s to port 1C, the upper limit on the non-prioritized port (2A) is disabled when both of the following conditions occur:

  The I/O rate for port 1A is 200 IO/s or lower.

  The I/O rate for port 1C is 100 IO/s or lower.
- Set one threshold to the entire storage system.

  In Network A, if you set a threshold of 500 IO/s to the storage system, the upper limit on the non-prioritized port (2A) is disabled when the sum of the I/O rates for all prioritized ports (1A and 1C) falls below 500 IO/s.

The following table shows the relationship between the thresholds of prioritized ports and the upper limits of non-prioritized ports.

Table 5-1 Relationship between the thresholds of prioritized ports and the upper limits of non-prioritized ports

Threshold settings	Upper limit is set (non-zero) on the non-prioritized port	Upper limit of the non-prioritized port = 0
Threshold is set to the prioritized port	When thresholds are set on multiple prioritized ports, depending on the transfer rate, the following controls are executed: • When the I/O rate or transfer rate goes above the threshold in any prioritized port, the upper limits of all non-prioritized ports are in effect. • When the I/O rate or transfer rate goes below the threshold in all prioritized ports, the upper limits of all non-prioritized ports are not in effect.	The threshold control of the prioritized port is not executed.
Threshold is not set to the prioritized port	The specified upper limit is always in effect.	

Use case for many-to-many connections

The following figure shows an example of a network, called Network B, in which a production server and a development server are connected to the storage system in a many-to-many configuration. HBA wwn01 on the production server is connected to ports 1A, 2A, 1C, and 2C, and HBAs wwn02 and wwn03 on the development server are also connected to the same four ports.

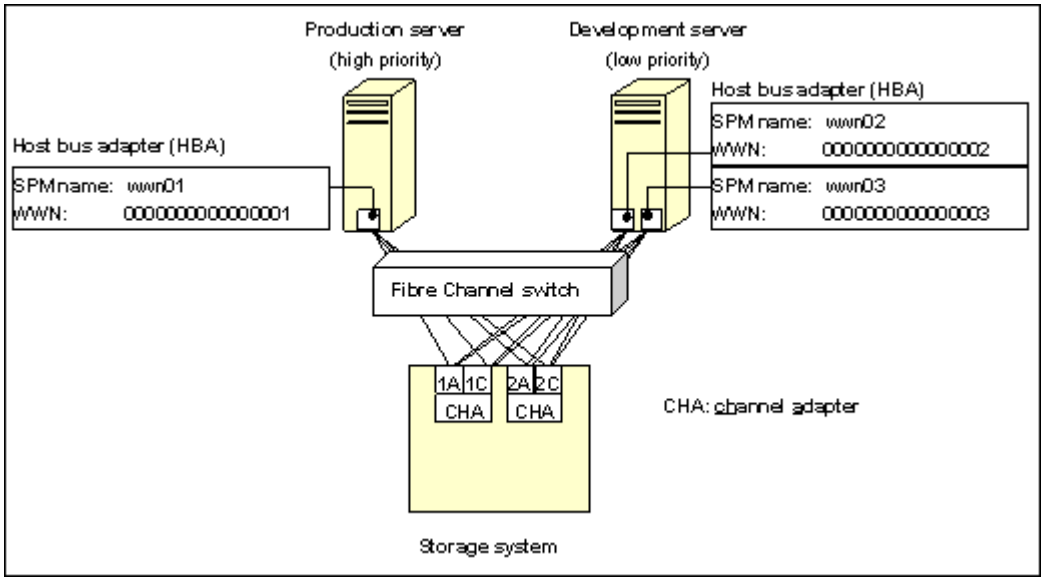


Figure 5-5 Network B: many-to-many connections between HBAs and ports

Before using Server Priority Manager, you must find the WWN (Worldwide Name) of each host bus adapter in host servers. WWNs are 16-digit hexadecimal numbers used to identify host bus adapters. For details on how to find WWNs, see the *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.

When using Server Priority Manager, ensure that all host bus adapters connected to ports in the storage system are monitored. Use the **WWN** tab of the Server Priority Manager main window to monitor host bus adapters. Place host bus adapters connected to each port below the **Monitor** icons.

In Network B, each of the four ports in the storage system is connected to three host bus adapters (wwn01, wwn02, and wwn03). Place the host bus adapter icons of wwn01, wwn02, and wwn03 below the **Monitor** icons for all four port icons.

Server Priority Manager is not able to monitor and control the performance of hosts whose host bus adapters are placed below the **Non-Monitor** icon. Therefore, make sure to place host bus adapters below the **Monitor** icons.

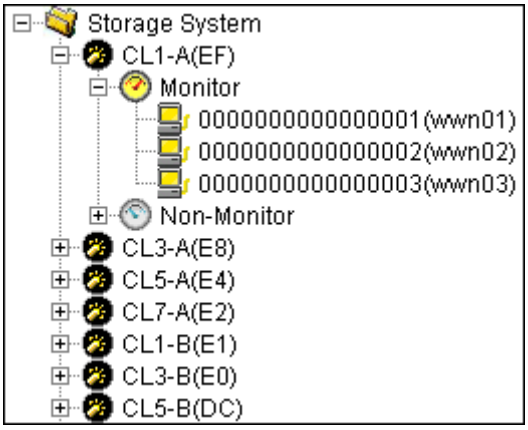


Figure 5-6 Host bus adapters being monitored

The priority for the host bus adapters is set using the WWN tab of the Server Priority Manager main window. In Network B, the production server is high priority (**Prio.**), and the development server is low priority (**Non-Prio.**). To give priority to the three host bus adapters, take the following steps:

- On the **WWN** tab of the Server Priority Manager main window, select one of the four ports that the HBAs are connected to (that is, ports 1A, 1C, 2A, and 2C).
- Set **Prio.** to wwn01. Also, set **Non-Prio.** to wwn02 and wwn03.

The following figure shows the priority settings for host bus adapters. When you select port 1A and set the priority for host bus adapters, the same settings are automatically applied to the other ports (ports 1C, 2A, and 2C).

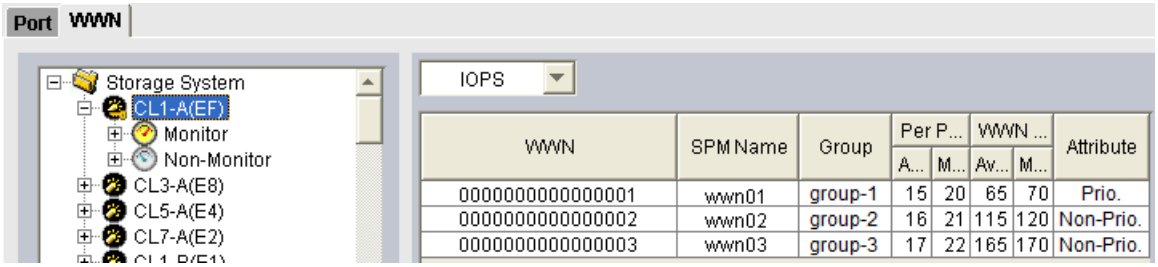


Figure 5-7 Priority specified in the Server Priority Manager main window

The term *prioritized WWN* to refers to a high-priority host bus adapter (for example, wwn01). The term *non-prioritized port* refers to a low-priority host bus adapter (for example, wwn02 and wwn03).

Monitor traffic between host bus adapter and ports. There are two types of traffic statistics: the I/O rate and the transfer rate. The I/O rate is the number of I/Os per second. The transfer rate is the size of data transferred between a host and the storage system per second. When you view traffic statistics in the window, you select either the I/O rate or the transfer rate. For Network B, you must do the following:

- Measure traffic between port 1A and the three host bus adapters (wwn01, wwn02, wwn03).
- Measure traffic between port 2A and the three host bus adapters (wwn01, wwn02, wwn03).
- Measure traffic between port 1C and the three host bus adapters (wwn01, wwn02, wwn03).
- Measure traffic between port 2C and the three host bus adapters (wwn01, wwn02, wwn03).

The following figure shows these settings on the **WWN** tab of the **Server Priority Manager** main window.

The I/O traffic between the ports and host bus adapters is now monitored. When the desired amount of data has been collected, the traffic statistics are reviewed on graphs using the Performance Monitor window. The following graph shows the measured I/O rate for the paths between each port and the host bus adapters. According to the data, the I/O rate for the path between port 1A and the prioritized WWN (wwn01) was approximately 400 IO/s at first, and the I/O rate for the path between port 1A and the non-prioritized WWNs (wwn02 and wwn03) was approximately 100 IO/s at first. However, as the I/O rate for the non-prioritized WWNs gradually increased from 100 IO/s to 200 IO/s, the I/O rate for the prioritized WWN decreased from 400 IO/s to 200 IO/s, which indicates a decrease in the performance of the prioritized WWN.

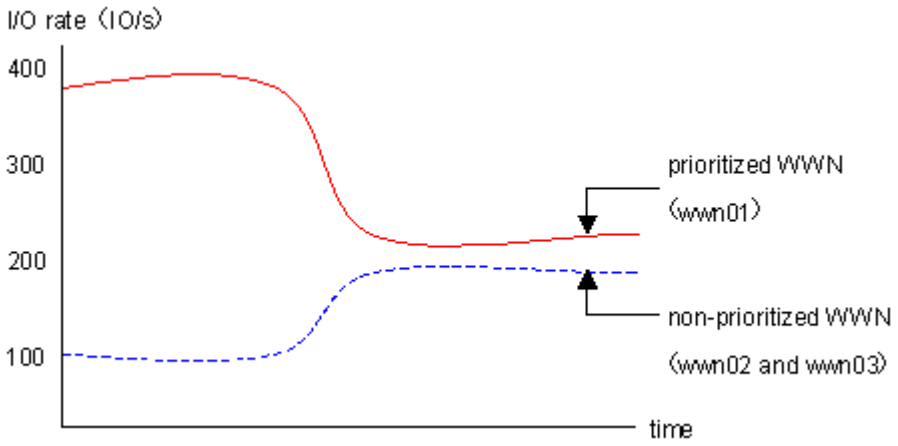


Figure 5-8 Traffic at ports

To maintain a higher I/O rate (400 IO/s) for the prioritized WWN, you can set upper limits on the I/O rate for the non-prioritized WWNs to minimize their effect on the performance of the high-priority production server. When an upper limit is set for the first time, it is recommended that the upper limit value be approximately 90 percent of the peak traffic level. In Network B, the peak I/O rate at the paths between each of the four ports and the non-prioritized WWNs (wwn02 and wwn03) is 200 IO/s, so the recommended upper limit for wwn02 and wwn03 is 720 IO/s (200 × 4 × 0.90). The following figure shows the result of setting the upper limit of 720 IO/s on the paths between port 1A and non-prioritized WWNs wwn02 and wwn03 on the **WWN** tab of the **Server Priority Manager** main window.

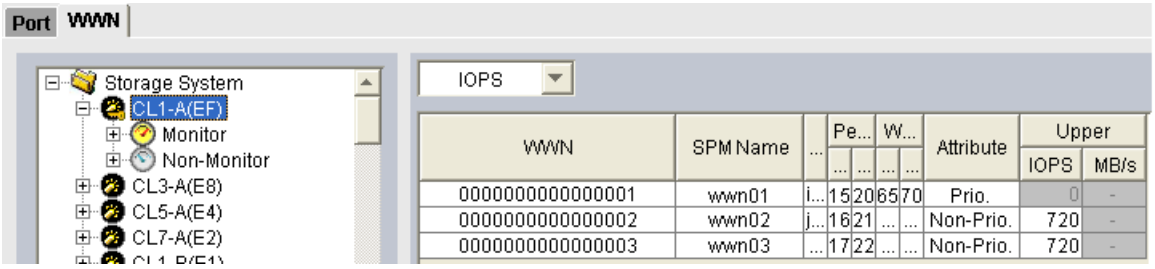


Figure 5-9 Upper limits for non-prioritized WWNs in Network B

After upper limits have been applied, the traffic is measured again to check the result of the upper limits and see whether host performance has improved to a desirable level, in this case 400 IO/s for wwn01. If not, you can adjust the upper limit to a smaller value until the I/O rate for wwn01 reaches the desirable level.

If you want to allow higher performance for non-prioritized WWNs when system activity is low, you can apply a threshold. For many-to-many connections you can specify one threshold for the entire storage system, regardless of the number of prioritized WWNs. For example, if there are three prioritized WWNs in the network and the threshold is 100 IO/s, the upper limit on the non-prioritized WWNs is disabled when the sum of the I/O rates for all three prioritized WWNs falls below 100 IO/s.

The following table shows the relationship between the thresholds of prioritized WWNs and the upper limits of non-prioritized WWNs.

Table 5-2 Relationship between the thresholds of prioritized WWNs and the upper limits of non-prioritized WWNs

Threshold settings	Upper limit is set (non-zero) to the non-prioritized WWN	Upper limit of the non-prioritized WWN = 0
Threshold is set to the prioritized WWN	When thresholds are set to prioritized WWNs, depending on the I/O rate or the transfer rate, the following controls are executed. • If the total value of I/O rate or transfer rate exceeds the threshold in all prioritized WWNs, upper limits of all non-prioritized WWNs are in effect. • If the total value of I/O rate or transfer rate goes below the threshold in all prioritized WWNs, upper limits of all non-prioritized WWNs are not in effect.	The threshold control of the prioritized WWN is not executed.
Threshold is not set to the prioritized WWN	The specified upper limit is always in effect.	

Cautions and restrictions for Server Priority Manager

- **Using Universal Volume Manager**

  Server Priority Manager monitors the I/O requests between the storage systems for Universal Volume Manager.

  I/O requests issued from a port on the local storage system are not subject to the upper limit control, therefore I/Os are not restricted.

  If you set the priority attribute to an external storage system port, all I/Os received on the port are controlled as the threshold control, and its performance data is added to the total number of I/Os of all prioritized ports. I/Os on the port will not be limited.

  If you set the non-priority attribute to an external storage system port, I/O requests from the local storage system port are controlled as the upper limit value control, and I/Os on the port will be limited. On the other hand, I/O requests from a host are controlled by upper limit control, and I/Os on the port will be limited.
- **Real-time monitoring mode**

  Server Priority Manager cannot be started when Performance Monitor is in real-time mode. Before starting Server Priority Manager, ensure that **Time Range** in the Monitor Performance window is not set to **Use Real Time**.
- **Remote copy functions or global-active device**

Server Priority Manager monitors the I/O requests between the storage systems for TrueCopy and Universal Replicator remote copy operations or global-active device.

I/O requests issued from a port on the primary storage system is not subject to the upper limit control, therefore I/Os are not restricted.

If you set the priority attribute to the storage system port at the secondary site, using the remote copy function (TrueCopy, Universal Replicator) or global-active device, all I/Os received on the port are controlled as the threshold control, and its performance data is added to the total number of I/Os (or the transfer rate) of all prioritized ports. I/Os on the port will not be limited.

If you set the non-priority attribute to the storage system port at the secondary site, using the remote copy function (TrueCopy, Universal Replicator) or global-active device, I/O requests from the storage system port at the primary site are not controlled by threshold control, and I/Os on the port will not be limited. On the other hand, I/O requests from a host are controlled by upper limit control, and I/Os on the port will be limited.

- **Statistics for storage system ports at the primary site**

  The I/O requests from the storage system ports at the primary site are not controlled by Server Priority Manager.

- **Settings on the Server Priority Manager main window**

  The Server Priority Manager main window has two tabs: the **Port** tab and the **WWN** tab. The settings on only one tab at a time can be applied to the storage system. If you make settings on both tabs, the settings cannot be applied at the same time. When you select **Apply**, the settings on the last tab on which you made settings are applied, and the settings on the other tab are discarded.

- **Using Command Control Interface**

  Server Priority Manager operations cannot be performed from the GUI and the CLI (HCS and CCI) at the same time. When you are using Server Priority Manager in Command Control Interface, you cannot perform the setting required for WWN monitoring. If you change some settings for Server Priority Manager from CCI, you cannot change Server Priority Manager and the monitoring WWN of Performance Monitor settings from the GUI. If you do, some settings might not appear. Before you change features that use Server Priority Manager, delete all Server Priority Manager settings from the currently used features.

  To delete all settings specified from Device Manager - Storage Navigator, open the Server Priority Manager main window, and click either the **Port** or **WWN** tab, and then click the **Initialize** button to initialize the settings.

- **Connecting one HBA to multiple ports**

  If one host bus adapter is connected to multiple ports and you specify an upper limit of the non-prioritized WWN for one port, the specified upper limit value will be applied to the host bus adapter settings for other connected ports automatically.

- **Setting the connection between host bus adapter and port**

To make setting for connecting the host bus adapter's WWN and the port, use the WWN tab of the Server Priority Manager main window. Alternatively you can use the Monitored WWNs tab of the **Performance Monitor** main window. Note that the monitored WWN name displayed in Performance Monitor is displayed as the SPM name in Server Priority Manager.

- **Differences of operations between Device Manager - Storage Navigator and CCI**

  There are differences in operations for SPM information between Device Manager - Storage Navigator and CCI. The table below describes the differences. For details, see the *Command Control Interface User and Reference Guide* and the *Command Control Interface Command Reference*.

Operation target	Operation for SPM information	Device Manager - Storage Navigator	CCI	
		Can be performed?	Can be performed?	Command Example
Port	Configure	Yes	No	-
	Delete	Yes	No	-
	Obtain	Yes	No	-
WWN	Configure	Yes*	Yes*	raidcom modify spm_wwn
	Delete	Yes*	Yes*	raidcom delete spm_wwn
	Obtain	Yes*	Yes*	raidcom get spm_wwn
LDEV	Configure	No	Yes	raidcom modify spm_ldev
	Delete	No	Yes	raidcom delete spm_ldev
	Obtain	No	Yes	raidcom get spm_ldev
* For Fibre Channel only.				

When you perform one or more of the following operations, the upper limit value control might be disabled for about two minutes:

- Adding, replacing, or removing cache memory
- Changing the system configuration
- Updating the firmware
- Replacing the controller (CTL)
- Adding, replacing, or removing CHB

- Powering on and off the storage system

Note: The upper limit value control might be disabled when an abnormal condition occurs, such as a network failure or damage to the HBA or Fibre cable, as these conditions can cause the login or logout of the host. Resolve the cause of the unexpected login/logout behavior and then enable the upper limit value control.

Implementing Server Priority Manager: one-to-one connections

This section describes and provides instructions for implementing Server Priority Manager for one-to-one connections.

- Server Priority Manager workflow: one-to-one connections on page 5-14
- Setting priority for ports: one-to-one connections on page 5-15
- Analyzing traffic statistics: one-to-one connections on page 5-16
- Setting upper-limit values for non-prioritized ports: one-to-one connections on page 5-17
- Setting a threshold: one-to-one connections on page 5-19

Server Priority Manager workflow: one-to-one connections

The workflow for Server Priority Manager depends on the connection between the host bus adapters and the ports. When one-to-one connections are established between host bus adapters and ports, you can manage the priority of I/O operations on each port. You can specify upper limit values on the non-prioritized ports. You can also specify threshold values on the prioritized ports or apply one threshold value to the entire storage system. When traffic drops below this threshold, the upper limits on non-prioritized ports are disabled to allow higher performance on non-prioritized ports during periods of low system activity.

The Port tab of the Server Priority Manager main window is used to manage Server Priority Manager operations for one-to-one connections.

Workflow for one-to-one connections:

1. If desired, assign names to the WWNs for ease of identification. For details, see Changing the SPM name of a host bus adapter on page 5-32.
2. Set the priority (**Prio** or **Non-Prio**) for the ports of the storage system. For details, see Setting priority for ports: one-to-one connections on page 5-15.
3. Monitor the I/O traffic at the prioritized and non-prioritized ports to collect data and statistics for analysis. For details, see Monitoring WWNs on page 2-8.

4. Analyze the traffic statistics that you have collected to determine the appropriate upper limits to set for the non-prioritized ports. For details, see Analyzing traffic statistics: one-to-one connections on page 5-16.
5. Set upper limits for I/O traffic at the non-prioritized ports to prevent these ports from affecting the prioritized ports. For details, see Setting upper-limit values for non-prioritized ports: one-to-one connections on page 5-17.
6. Monitor the I/O traffic at the ports again to check the results of applying the upper limits to the non-prioritized ports, and adjust the upper-limit values as needed.
7. If desired, apply a threshold to the ports or to the entire storage system to allow higher performance at non-prioritized ports when activity on the prioritized ports or storage system is low. For details, see Setting a threshold: one-to-one connections on page 5-19.

Setting priority for ports: one-to-one connections

Prioritized ports are ports on which processing has high priority, and non-prioritized ports are ports on which processing has lower priority. Specify a port that connects to a high-priority host bus adapter as a prioritized port. Specify a port that connects to a lower-priority host bus adapter as a non-prioritized port.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.

5. Select the **Port** tab.
6. Select **All** from the list at the top right corner of the window.
7. Right-click a high-priority port, and in the pop-up menu select **Non-Prio ->> Prio**. The **Attribute** column displays **Prio**. Repeat this action for each high-priority port.
8. Right-click a lower-priority port and in the pop-up menu select **Prio ->> Non-Prio**. The **Attribute** column displays **Non-Prio**. Repeat this action for each lower-priority port. You can set upper limit values only on the **Non-prio.** ports.
9. Click **Apply** to apply the settings to the storage system.

   Now that you have set the port priorities, you can start monitoring the traffic (I/O rates and transfer rates) to collect data for analysis.

Related topics

- Server Priority Manager workflow: one-to-one connections on page 5-14
- Port tab of the Server Priority Manager main window on page B-3

Analyzing traffic statistics: one-to-one connections

You must analyze the traffic statistics to determine the upper limit values that should be applied to I/O rates or transfer rates on non-prioritized ports.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.

   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**.

   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:

   a. Select the **Resources** tab, and expand the **Storage Systems** tree.

   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.

5. Select the **Port** tab.
6. Select **All** from the list at the top right corner of the window.
7. Display the desired traffic statistics as follows:
   - To view I/O rates, select **IOPS** from the list at the upper left corner of the list.
   - To view transfer rates, select **MB/s** from the list at the upper left corner of the list.

   The list displays the traffic statistics (average and peak I/O rates or transfer rates) of the ports.
8. Analyze the data in the list to determine the upper limit values that should be applied to non-prioritized ports and, if desired, the threshold values that should be applied to prioritized ports or the storage system.
9. To view the traffic statistics on data graphs, see Displaying the monitor data on graphs on page 2-19.

   To export the traffic statistics (as text in CSV format) for analysis in other applications, see Using Export Tool on page 4-6.

Related topics

- Server Priority Manager workflow: one-to-one connections on page 5-14
- Port tab of the Server Priority Manager main window on page B-3

Setting upper-limit values for non-prioritized ports: one-to-one connections

After you analyze traffic statistics, you can set upper limit values for I/O rates or data transfer rates on non-prioritized ports to provide better performance for high-priority host servers. For details about upper limit values, see Upper-limit control on page 5-2.

When you set an upper limit for the first time, it is recommended that the upper limit value be approximately 90 percent of the peak traffic.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.

   In Device Manager - Storage Navigator:

   a. Select **Analytics** in **Explorer**.

   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.

   In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.

2. Display the Device Manager - Storage Navigator main window.
3. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
4. Click  to change to Modify mode.
5. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
6. Select the **Port** tab.
7. Do one of the following:
   - To limit the I/O rate for the non-prioritized port, select **IOPS** from the list at the upper left corner of the list.
   - To limit the transfer rate for the non-prioritized port, select **MB/s** from the list at the upper left corner of the list.
8. Locate the non-prioritized port in the list.

Note: The **Attribute** column of the list indicates whether ports are prioritized or non prioritized. If you cannot find any non prioritized port in the list, check the list at the top right corner of the window. If the list displays **Prioritize**, select **All** or **Non Prioritize** from the list.

9. Do one of the following:
   - To limit the I/O rate for the non-prioritized port, double-click the desired cell in the **IOPS** column in **Upper**, and enter the upper limit value in the cell.
   - To limit the transfer rate for the non-prioritized port, double-click the desired cell in the **MB/s** column in **Upper**, and enter the upper limit value in the cell.

     In the list, either of **IOPS** or **MB/s** column is activated depending on the rate selected in step 3 above. You can use either of them to specify the upper limit value for one port. You can specify different types of rates (**IOPS** or **MB/s**) for the upper limit values of different non-prioritized ports.

     The upper limit value that you entered is displayed in blue.

Caution: If an upper limit of the non-prioritized WWN is set to zero or nearly zero, I/O performance might be lowered. If I/O performance is lowered, the host cannot be connected to the storage system in some cases.

10. Click **Apply** to apply the settings to the storage system. The upper limit value that you entered turns black.

Related topics

- Server Priority Manager workflow: one-to-one connections on page 5-14

- Server Priority Manager window on page B-2
- Port tab of the Server Priority Manager main window on page B-3

Setting a threshold: one-to-one connections

When one-to-one connections are established between HBAs and ports, you can set a threshold value for each prioritized port or one threshold value for the entire storage system. When traffic between high-priority servers and the ports or storage system falls below the specified threshold level, upper limit control is disabled to allow higher performance on non-prioritized ports during periods of low activity on prioritized ports. For details about threshold values, see Threshold control on page 5-3.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager** to open the **Server Priority Manager** main window.
5. Select the **Port** tab.
6. To set a threshold value for each prioritized port, select the type of rates for the threshold value from the list in the upper left corner of the list.
   - To use the I/O rates for the threshold value, select **IOPS**.
   - To use the transfer rates for the threshold value, select **MB/s**.

   If you want to set one threshold value for the entire storage system, this step is unnecessary.
7. Do one of the following:

- To set a threshold to each prioritized port, locate the desired prioritized port, which is indicated by **Prio.** in the **Attribute** column. Next, double-click the cell in the **IOPS** or **MB/s** column in **Threshold**, and then enter the threshold value. In the list, either of **IOPS** or **MB/s** column is activated depending on the rate selected at step 6 above. Repeat this operation to set the thresholds for all prioritized ports. You can use different types of rates (**IOPS** or **MB/s**) for thresholds of different prioritized ports.

Caution: If you enter zero (0) in a cell to disable the upper limit, the cell displays a hyphen (–) and the threshold for the prioritized port becomes ineffective. If the thresholds of all prioritized ports are ineffective, threshold control will not be performed but upper limit control will be performed. If you set thresholds for multiple prioritized ports and the I/O rate or transfer rate goes below the threshold at all prioritized ports, threshold control works in the entire storage system and the upper limits of the non-prioritized ports are disabled.

- To set one threshold to the entire storage system, select the **All Thresholds** check box. Next, select **IOPS** or **MB/s** from the list of right side in **All Thresholds** and enter the threshold value in the text box. Even if the types of rates for upper limit values and the threshold are different, the threshold control can work for all non-prioritized ports.

8. Click **Apply** to apply the settings to the storage system.

Related topics

- Server Priority Manager workflow: one-to-one connections on page 5-14
- Server Priority Manager window on page B-2
- Port tab of the Server Priority Manager main window on page B-3

Implementing Server Priority Manager: many-to-many connections

This section describes and provides instructions for implementing Server Priority Manager for many-to-many connections.

- Server Priority Manager workflow: many-to-many connections on page 5-21
- Setting priority for WWNs: many-to-many connections on page 5-22
- Monitoring all port-HBA traffic: many-to-many connections on page 5-23
- Analyzing traffic statistics: many-to-many connections on page 5-27
- Setting upper-limit values for non-prioritized WWNs: many-to-many connections on page 5-28
- Setting a threshold for the entire storage system: many-to-many connections on page 5-30

Server Priority Manager workflow: many-to-many connections

The workflow for using Server Priority Manager depends on the connection between the host bus adapters and the storage system ports. When many-to-many connections are established between HBAs and storage system ports, the server priority cannot be defined by the port, because one port can be connected to multiple adapters and multiple ports can be connected to one adapter. For many-to-many connections, you can specify the priority of I/O operations and the upper limit value for each host bus adapter, and you can specify one threshold value for the entire storage system.

The WWN tab of the Server Priority Manager main window is used to manage Server Priority Manager operations for many-to-many connections.

Workflow for many-to-many connections:

1. Find the WWNs of the host bus adapters. For details about finding WWNs, see the *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.
2. If desired, assign names to the WWNs for ease of identification. For details, see Changing the SPM name of a host bus adapter on page 5-32.
3. If you want to manage multiple host bus adapters as a single group, create SPM groups. For details, see Creating an SPM group on page 5-35.
4. Set the priority (**Prio** or **Non-Prio**) on the host bus adapters (WWNs). For details, see Setting priority for WWNs: many-to-many connections on page 5-22.
5. Monitor the I/O traffic for all prioritized and non-prioritized host bus adapters to collect data and statistics for analysis. For details, see Monitoring WWNs on page 2-8.
6. Analyze the traffic statistics that you have collected to determine the appropriate upper limits to set for the non-prioritized WWNs. For details, see Analyzing traffic statistics: many-to-many connections on page 5-27.
7. Set upper limits for traffic on non-prioritized WWNs to prevent these WWNs from affecting the prioritized WWNs. For details, see Setting upper-limit values for non-prioritized WWNs: many-to-many connections on page 5-28.
8. Monitor traffic at the ports again to check the results of applying the upper-limit values to the non-prioritized WWNs, and adjust the upper-limit values as needed.
9. If desired, apply a threshold to the entire storage system to allow higher performance for the non-prioritized WWNs when activity on the storage system is low. For details, see Setting a threshold for the entire storage system: many-to-many connections on page 5-30.

Setting priority for WWNs: many-to-many connections

If many-to-many connection is established between HBAs and ports, you need to define the priority of WWNs, measure the traffic between the HBAs and the ports that the HBAs are connected to, and analyze the traffic data.

The HBAs are divided into two types: prioritized WWNs and non-prioritized WWNs. Specify an HBA on which high-priority processing is performed as a prioritized WWN. Specify an HBA on which lower-priority processing is performed as a non-prioritized WWN.

Note: You cannot change the priority of a WWN that is contained in an SPM group. For details on how to change the attribute of a WWN contained in an SPM group, see Switching priority of an SPM group on page 5-37.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. Select **All** from the list at the top right corner of the window.
7. In the upper-left tree, double-click a port.
8. Double-click **Monitor**, which is displayed below the specified port.
9. Check to see if all WWNs of the host bus adapters to be controlled by using Server Priority Manager appear below **Monitor**.
   If some of the WWNs are missing, use the procedure in Monitoring all port-HBA traffic: many-to-many connections on page 5-23 to move all WWNs to below **Monitor**.

10. Click **Monitor** to display the information of the host bus adapters that are monitored in the list on the right of the tree.
11. Right-click a host bus adapter (WWN) in the list, and in the pop-up menu select **Non-Prio ->> Prio**.

    The **Attribute** column of the selected WWN in the list displays **Prio**. If you want to specify more than one prioritized WWN, repeat this operation.
12. Right-click a host bus adapter (WWN) in the list, and in the pop-up menu select **Prio ->> Non-Prio**.

    The **Attribute** column of the selected WWN in the list displays **Non-Prio**. If you want to specify more than one non-prioritized WWN, repeat this operation.



Note: You cannot change the priority of a WWN which is contained in an SPM group. For details on how to change the attribute of a WWN contained in an SPM group, see Switching priority of an SPM group on page 5-37.

    You must set upper limit values for the **Non-prio.** specified ports. For details, see Setting upper-limit values for non-prioritized WWNs: many-to-many connections on page 5-28.
13. Repeat steps 6 to 11 for ports (except for the port selected in step 6).

    If one host bus adapter is connected to multiple ports and you specify the priority of the host bus adapter for one port, the specified priority will be also applied to the host bus adapter settings for other connected ports automatically.
14. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

For instructions on measuring traffic (that is, I/O rates and transfer rates), see Starting monitoring on page 2-7.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- WWN tab of the Server Priority Manager main window on page B-6

Monitoring all port-HBA traffic: many-to-many connections

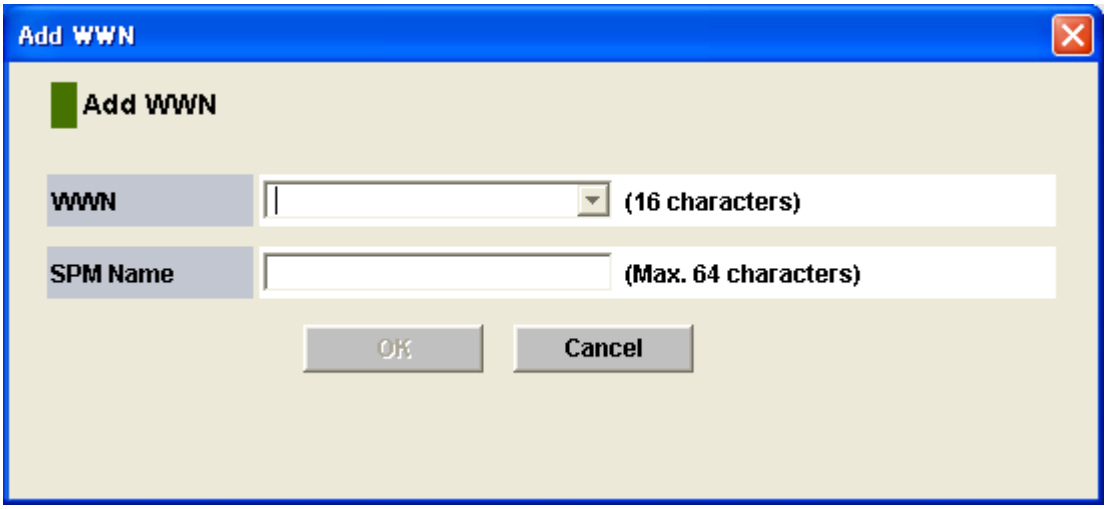
When many-to-many connections are established between HBAs and ports, you should make sure that all traffic between HBAs and ports is monitored.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Click the **WWN** tab.
   Two trees are displayed on the left side of the **WWN** tab. The upper-left tree lists ports in the storage system.
6. Select **All** from the list at the top right corner of the window.
7. In the upper-left tree, double-click a port.
8. Double-click **Non-Monitor** below the specified port.
   If there are any host bus adapters whose traffic with the specified port are not monitored, those host bus adapters are displayed below **Non-Monitor**.
9. Right-click **Monitor**, and then select **Add WWN** to open the **Add WWN** window.



10. In the **Add WWN** window, specify the WWN and the SPM name.
    Expand the **WWN** list to show the WWNs of the host bus adapters that are connected to the port but are not monitored. These host bus adapters

are the same as that displayed in step 8. From that list, select a WWN and specify the SPM name (up to 64 characters).

Note: It is recommended that you specify the same names for the SPM names and the host bus adapter nicknames defined in LUN Manager for convenience of host bus adapter management. In the **Performance Monitor** window, both the SPM names and the nicknames are displayed as the aliases of host bus adapters (WWNs), so if you use the same names, management of the host bus adapters is easier.

11. Click **OK**. The selected WWN (of the host bus adapter) is moved from **Non-Monitor** to **Monitor**.

    If the specified host bus adapter is connected to other ports, after clicking **OK**, a message appears asking whether to change the settings of that host bus adapter for other ports. Apply the same setting to all of the ports.

12. Repeat steps 9 to 11 to move all host bus adapters from below **Non-Monitor** to below **Monitor**.

    Up to 32 host bus adapters (WWNs) can be monitored for one port. If more than 32 host bus adapters are connected to one port, the traffic statistics for all host bus adapters cannot be monitored. Consider the intended use of each host, and place the host bus adapters that do not need to be monitored below **Non-Monitor**.

Note: When you disconnect a host that has been connected via a cable to your storage system or change the port to the another port of the host, the WWN for the host will remain in the WWN list on the WWN tab. To remove the WWN from the list, you need to delete the WWN using LUN Manager. For details, see the *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.

13. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.
14. If you add a port or a host bus adapter to the storage system after the settings above, the traffic for the new port or host bus adapter will not be monitored. In this case, follow this procedure again to make sure all traffic between host bus adapters and ports is being monitored.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- Add New Monitored WWNs wizard on page A-38

Excluding traffic between an HBA and a port from the monitoring target: many-to-many connections

Up to 32 host bus adapters (WWNs) can be monitored for one port. If more than 32 host bus adapters are connected to one port, the traffic statistics for all host bus adapters cannot be monitored. Consider the intended use of each host, and move the host bus adapters that do not need to be monitored to **Non-Monitor**.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Ensure that the **WWN** tab is displayed.
6. Select **All** from the list at the top right corner of the window.
7. In the upper-left tree, double-click a port to which more than 32 host bus adapters are connected.
8. Double-click **Monitor** below the specified port.
9. Right-click the WWN of a host bus adapter you want to exclude from the monitoring target and then select **Delete WWN** from the pop-up menu.
   If the selected host bus adapter is connected to multiple ports, when you select the host bus adapter and select the Delete WWN pop-up menu, a message will appear that asks you whether to move the host bus adapter from **Monitor** to **Non-Monitor** below all other ports, too.
   If the selected host bus adapter is contained in an SPM group, a message will appear that tells you to delete the host bus adapter from the SPM group on ahead. You cannot move a host bus adapter that is contained in an SPM group from **Monitor** to **Non-Monitor**. For details on how to delete a host bus adapter from an SPM group, see Deleting an HBA from an SPM group on page 5-36.
10. Click **OK** for the confirmation message that asks you whether to delete the host bus adapter.
    The deleted host bus adapter (WWN) is moved from **Monitor** to **Non-Monitor**.
11. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- Server Priority Manager window on page B-2
- WWN tab of the Server Priority Manager main window on page B-6

Analyzing traffic statistics: many-to-many connections

The traffic statistics indicate the number of I/Os via ports from HBAs and the amount of data that has been transferred between ports and HBAs. You must analyze the traffic statistics to determine the upper limit values that should be applied to I/O rates or transfer rates for low-priority HBAs.

The following procedure uses the **Server Priority Manager** main window to analyze traffic statistics. You can also use the **Performance Monitor** window to analyze traffic statistics and display a line graph that shows the changes in traffic.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. Select **All** from the list at the top right corner of the window.
7. Do one of the following:

- To analyze I/O rates, select **IOPS** from the list at the upper left corner.
- To analyze transfer rates, select **MB/s** from the list at the upper left corner of the list.

8. Below the **Storage System** folder in the upper-left tree, click the icon of the port whose traffic statistics you want to collect.

   The list displays traffic statistics (I/O rates or transfer rates) about the host bus adapters that connect to the selected port.

   The following two types of traffic are shown. The traffic has attributes including the average and maximum values.

   - Traffic between the host bus adapter and the selected port (shown in **Per Port**)
   - Sum of the traffic between the host bus adapter and all ports connected to the host bus adapter (shown in **WWN Total**)

   The traffic statistics only about the host bus adapters below Monitor appear in the list.

   The WWN Total traffic statistics will also be displayed in the list when you click an icon in the lower left tree. If you click the **Storage System** folder in the lower left tree, the sum of the traffic of the host bus adapters registered on each SPM group is displayed. For details on SPM groups, see Working with SPM groups on page 5-35.

9. Analyze the information in the list and then determine upper limit values that should be applied to non-prioritized WWNs. If necessary, determine threshold values that should be applied to prioritized WWNs. For details, see Server Priority Manager workflow: many-to-many connections on page 5-21.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- Add New Monitored WWNs wizard on page A-38
- Server Priority Manager window on page B-2
- WWN tab of the Server Priority Manager main window on page B-6

Setting upper-limit values for non-prioritized WWNs: many-to-many connections

After you analyze traffic statistics about prioritized WWNs and non-prioritized WWNs, you must set upper limit values to I/O rates or transfer rates for non-prioritized WWNs. Upper limit values for I/O rates are used to suppress the number of I/Os from the low priority host servers and thus provide better performance for high-priority host servers. Upper limit values for transfer rates are used to suppress the amount of data that should be transferred between the storage system and the low priority ports, thus providing better performance for high-priority host servers.

When you set an upper limit for the first time, it is recommended that the upper limit be approximately 90 percent of the peak traffic.

Tip: To set the same upper limit value to more than one non-prioritized WWN, use an SPM group. For details on SPM groups, see Working with SPM groups on page 5-35.

Note: You cannot set the upper-limit value of a host bus adapter that is contained in an SPM group. The upper limit value of a host bus adapter in an SPM group is defined by the SPM group settings. For details, see Setting an upper-limit value to HBAs in an SPM group on page 5-39.

Caution: If an upper limit of the non-prioritized WWN is set to zero or nearly zero, I/O performance might be lowered. If I/O performance is lowered, the host cannot be connected to the storage system in some cases.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Ensure that the **WWN** tab is displayed.
6. Do one of the following:
   - To limit the I/O rate of the non-prioritized WWN, select **IOPS** from the list at the upper left corner.
   - To limit the transfer rate of the non-prioritized WWN, select **MB/s** from the list at the upper left corner.

7. In the upper-left tree, click the icon of the port whose traffic you want to limit below the **Storage System** folder.

   The information about the host bus adapters which connect to the selected port is displayed in the list.

8. Locate the non-prioritized WWN in the list.

   - The **Attribute** column of the list indicates whether WWNs are prioritized or non-prioritized. The **Attribute** column of a non-prioritized WWN displays **Non-Prio**.
   - If you cannot find any non-prioritized WWN in the list, check the list at the top right corner of the window. If the list displays **Prioritize**, select **All** or **Non-Prioritize**.

9. Do one of the following:

   - To limit the I/O rate of the non-prioritized WWN, double-click the desired cell in the **IOPS** column in **Upper**. Next, enter the upper limit value in the cell.
   - To limit the transfer rate of the non-prioritized WWN, double-click the desired cell in the **MB/s** column in **Upper**. Next, enter the upper limit value in the cell.

     In the list, either of the **IOPS** cells or **MB/s** cells are activated depending on the rate you specified in step 6. You can specify the limit value by using either of the I/O rate or transfer rate for each host bus adapter. The upper limit value that you entered is displayed in blue. It is allowed that you specify upper limit values by using the I/O rate for some host bus adapters and specify them by using the transfer rate for the other host bus adapters.



Note: If one host bus adapter is connected to multiple ports and you specify an upper limit value of the host bus adapter for one port, the specified upper limit value will be applied to the host bus adapter settings for other connected ports automatically.

10. Click **Apply** to apply the settings to the storage system.

    The upper limit value that you entered turns black.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- Server Priority Manager window on page B-2

Setting a threshold for the entire storage system: many-to-many connections

If threshold control is used, upper limit control is automatically disabled when traffic between production servers and the storage system is reduced to a specified level. For details, see Upper-limit control on page 5-2 and Server Priority Manager workflow: many-to-many connections on page 5-21.

If many-to-many connections are established between host bus adapters and storage system ports, you can set one threshold value for the entire storage system. In this environment, you cannot set individual threshold values for each prioritized WWN.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. Select the **All Thresholds** check box.
7. Select **IOPS** or **MB/s** from the **All Thresholds** list, and do one of the following:
   - To specify the threshold value by using the I/O rate, select **IOPS** from the list below the check box.
   - To specify the threshold value by using the transfer rate, select **MB/s** from the list below the check box.
     Even if the types of rates differ between the upper limit values and the threshold value, the threshold control is effective for all non-prioritized WWNs.
8. Enter the threshold in the text box of **All Thresholds**.

Caution: If you enter zero (0) in a cell to disable the upper limit, the cell displays a hyphen (–) and the threshold for the prioritized port becomes ineffective. If the thresholds of all prioritized ports are ineffective, threshold control will not be performed but upper limit control will be performed.

9. Click **Apply** to apply the settings to the storage system.

Related topics

- Server Priority Manager workflow: many-to-many connections on page 5-21
- WWN tab of the Server Priority Manager main window on page B-6
- Upper-limit control on page 5-2

Managing host bus adapters

You can use Server Priority Manager to change the name assigned to a host bus adapter and replace an existing host bus adapter.

- Changing the SPM name of a host bus adapter on page 5-32
- Replacing a host bus adapter on page 5-33

Changing the SPM name of a host bus adapter

Use Server Priority Manager to assign an SPM name to a host bus adapter. Although you can identify host bus adapters by WWNs, you might be able to identify host bus adapters more easily if you assign SPM names. WWNs are 16-digit hexadecimal numbers that cannot be changed, whereas SPM names need not be 16-digit hexadecimal numbers and can be changed as needed.

For details about assigning SPM names, see Monitoring all port-HBA traffic: many-to-many connections on page 5-23.

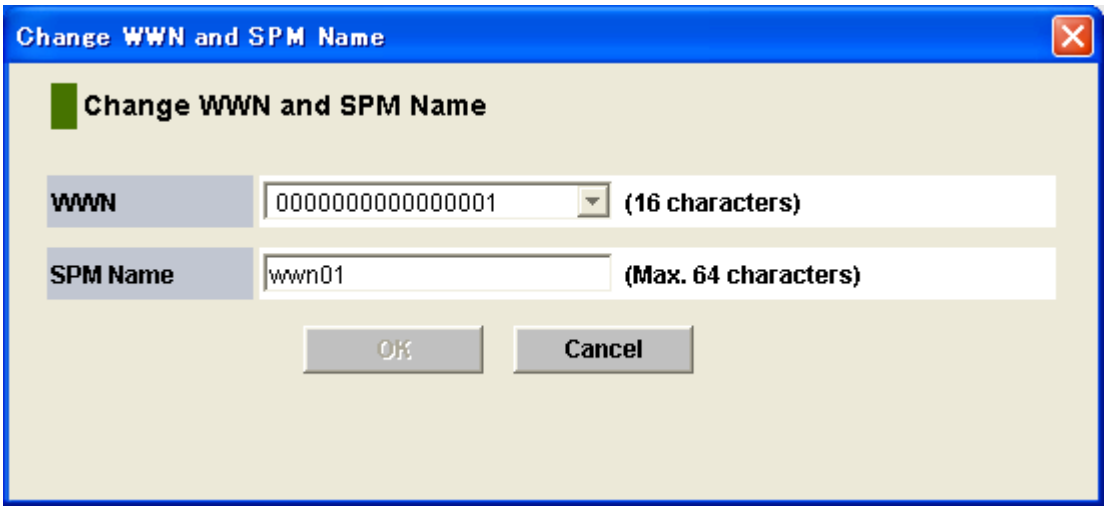
Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.

3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Ensure that the **WWN** tab is displayed.
6. In the upper-left tree, select a host bus adapter () from below **Monitor** and then right-click the selection.
7. From the pop-up menu, select **Change WWN and SPM Name**. The **Change WWN and SPM Name** window opens.



8. Enter a new SPM name in the **SPM Name** box and then select **OK**. You can use up to 64 characters for an SPM name.
9. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6
- Monitoring all port-HBA traffic: many-to-many connections on page 5-23

Replacing a host bus adapter

If you replace an existing host bus adapter, you need to use Server Priority Manager to delete the host bus adapter being removed and then add the host bus adapter being installed.

When you add a new host bus adapter rather than replacing one, the WWN of the new host bus adapter is automatically displayed below **Non-Monitor** for the connected port in the list.

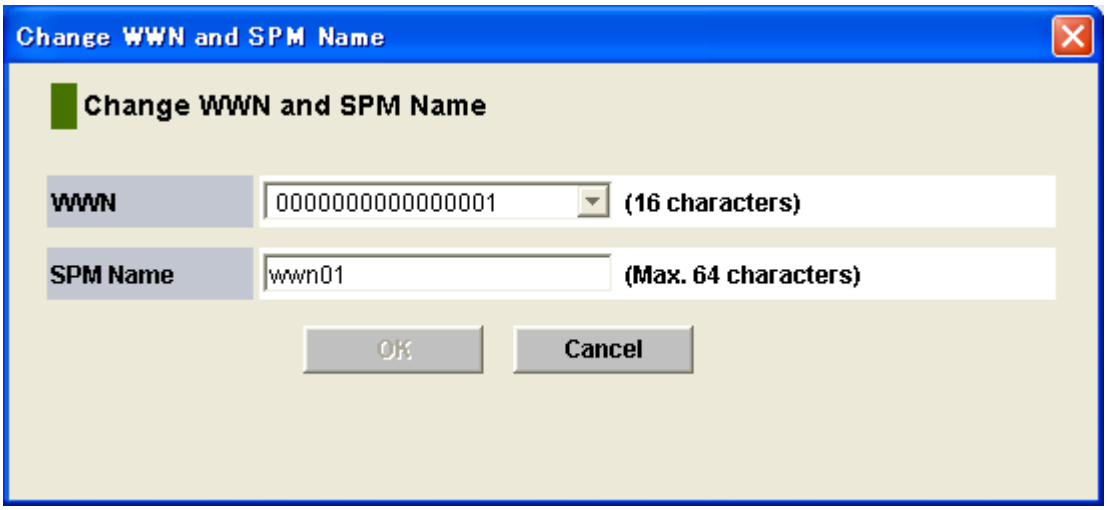
Prerequisites

- Required role: Storage Administrator (System Resource Management)

- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the upper-left tree, select the old host bus adapter ( ) from below **Monitor** and then right-click the selection.
7. From the pop-up menu, select **Change WWN and SPM Name**. The **Change WWN and SPM Name** window opens.



8. Enter the WWN of the new host bus adapter in the **WWN** combo box. For details on how to get the WWN the HBA WWN, see the *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.
   You can select the WWN of the newly connected host bus adapter in the **WWN** combo box.

9. If necessary, enter a new SPM name in the **SPM Name** box. You can use up to 64 characters for an SPM name.
10. Select **OK** to close the **Change WWN and SPM Name** window.
11. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Working with SPM groups

You can use Server Priority Manager to create SPM groups to manage multiple host bus adapters as a single group. Each SPM group can contain up to 32 HBAs, and you can create up to 255 SPM groups in the storage system. All HBAs in an SPM group have the same priority. Prioritized WWNs and non-prioritized WWNs cannot be mixed in the same group.

You can use an SPM group to switch priority of multiple HBAs from prioritized to non-prioritized, or vice versa. You can also use an SPM group to set the same upper limit value to all HBAs in the group.

- Creating an SPM group on page 5-35
- Deleting an HBA from an SPM group on page 5-36
- Switching priority of an SPM group on page 5-37
- Setting an upper-limit value to HBAs in an SPM group on page 5-39
- Renaming an SPM group on page 5-40
- Deleting an SPM group on page 5-42

Creating an SPM group

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

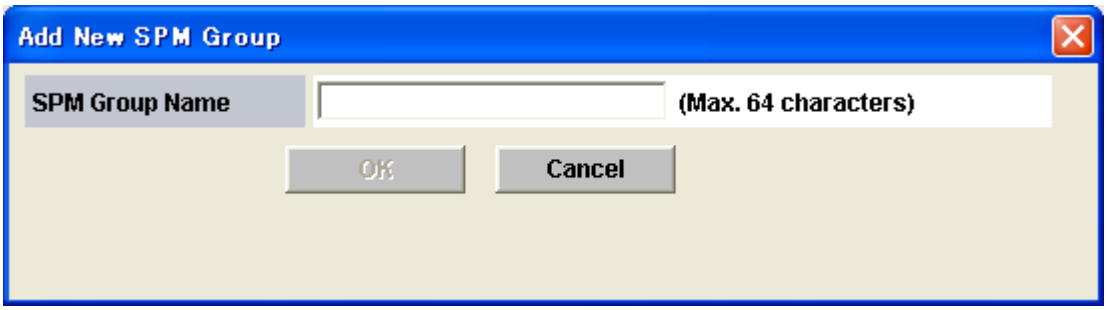
A host bus adapter can belong to only one SPM group.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:

a. Select the **Resources** tab, and expand the **Storage Systems** tree.
b. Right-click the target storage system and then select **Performance Monitor**.

2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the lower-left tree, select and right-click the **Storage System** folder.
7. From the pop-up menu, select **Add New SPM Group**.
8. In the **Add New SPM Group** window, enter the name of the SPM group and then select **OK**. An SPM group is created and an SPM group icon () is added to the lower-left tree.



9. Select an HBA  from the upper-left tree and select an SPM group from the lower-left tree. Next, click **Add WWN**.
   Repeat this operation until all desired HBAs are added to the SPM group.
   - Select a host bus adapter from below Monitor. You cannot add HBAs from below Non-Monitor to SPM groups.
   - When selecting a host bus adapter that is already contained in some SPM group from the upper-left tree, the Add WWN button is not activated. Select a host bus adapter that is not contained in any SPM groups.
10. Click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Deleting an HBA from an SPM group

Prerequisites

- Required role: Storage Administrator (System Resource Management)

- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the lower-left tree, double-click the SPM group () that contains the host bus adapter to be deleted.
7. Below the SPM icon, right-click the icon the host bus adapter () you want to delete.
8. Select **Delete WWN** from the pop-up menu.
   The selected host bus adapter icon is deleted from the tree.
9. Click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Switching priority of an SPM group

All host bus adapters in one SPM group must have the same priority. Prioritized WWNs and non-prioritized WWNs cannot be mixed in one SPM group.

You can use an SPM group to switch priority of multiple HBAs from prioritized to non-prioritized, or vice versa. You can perform the upper-limit value control for the SPM group by setting the upper-limit value on the SPM group.

Note: The upper-limit value of each HBA which belongs to the SPM group is the upper-limit value set for the SPM group divided by the number of HBAs

which belong to the SPM group and have I/O. The I/O existence in HBA is distinguished with one minute interval monitoring. The upper-limit value of HBAs which belong to the SPM group is updated in one minute intervals. Therefore, when the existence of I/O is alternated, the upper-limit value of the SPM group might be over or under the setting value.
For example, in the condition that the upper-limit value is set to 200 IOPS for an SPM group to which 2 HBAs belong and only 1 HBA has I/O, the upper-limit value allocated to each HBA is 200 (200÷1) IOPS. After that, if the number of HBAs that have I/O turns from 1 to 2, until the next detection (updating the HBA upper-limit value which belongs to the SPM group is in one minute interval), the upper-limit value might become 400 (200+200) IOPS because the upper-limit value is allocated to 200 IOPS to each HBA, which is over the setting value for the SPM group.
In the condition that the upper-limit value is set to 200 IOPS for an SPM group to which 2 HBAs belong and 2 HBAs have I/O, the upper-limit value allocated to each HBA is 100 (200÷2) IOPS. After that, if the number of HBAs which have I/O turns from 2 to 1, until the next detection (updating HBA upper-limit value which belongs to the SPM group is in one minute interval), the upper-limit value might become 100 IOPS because the upper-limit value is allocated 100 IOPS to each HBA, which is under the setting value for the SPM group.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the lower-left tree, select and right-click an SPM group ().

7. Do one of the following:
   - To switch priority from prioritized to non-prioritized, select **Prio ->> Non-Prio** from the pop-up menu.
   - To switch priority from non-prioritized to prioritized, select **Non-Prio ->> Prio** from the pop-up menu.
8. Click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Setting an upper-limit value to HBAs in an SPM group

If all host bus adapters in an SPM group are non-prioritized WWNs, you can set an upper limit value to HBA performance (such as I/O rate or transfer rate). You can assign one upper limit value for one SPM group.

For example, suppose that the upper limit value *100 IOPS* is assigned to an SPM group consisting of four host bus adapters. If the sum of the I/O rate of the four host bus adapters reaches 100 IOPS, Server Priority Manager controls the system so that the sum of the I/O rates will not exceed 100 IOPS.

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

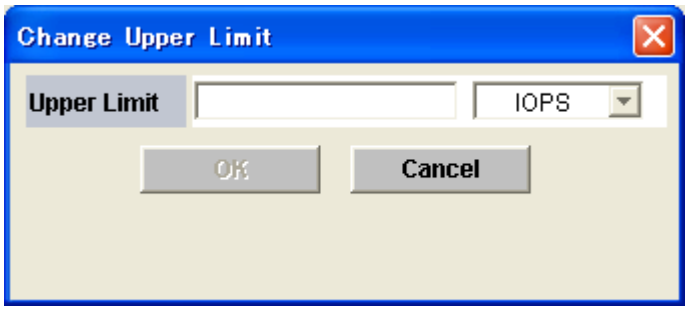
Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.

5. Select the **WWN** tab.
6. In the lower-left tree, select and right-click the **Storage System** folder or an SPM group ( ).
7. If you selected the **Storage System** folder, take the following steps:
   - Select **IOPS** or **MB/s** from the list at the upper-left corner of the list. Select **IOPS** if you want to assign an upper limit to the I/O rate. Select **MB/s** if you want to assign an upper limit to the transfer rate.
   - To assign an upper limit to the I/O rate, enter the upper limit value in the **IOPS** column of the list. To assign an upper limit to the transfer rate, enter the upper limit value in the **MB/s** column of the list.

   Tip: If you cannot see the IOPS or MB/s column, scroll the list to the left. The column is located at the right side of the list.

   If you selected an SPM group ( ), take the following steps:
   - Right-click the selected SPM group and then select **Change Upper Limit** from the pop-up menu. The **Change Upper Limit** dialog box opens.

   - To assign an upper limit to the I/O rate, enter the upper limit value and then select **IOPS** from the list. Next, select **OK**. To assign an upper limit to the transfer rate, enter the upper limit value and then select **MB/s** from the list. Next, select **OK**.
8. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

   To confirm an upper limit value specified for each SPM group, select the **Storage System** folder in the lower-left tree on the WWN tab. The SPM groups are displayed in the list and you can confirm each upper limit value.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Renaming an SPM group

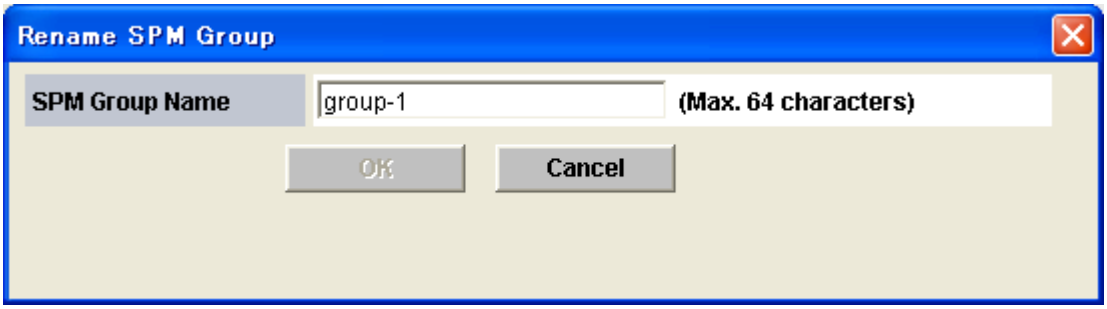
Prerequisites

- Required role: Storage Administrator (System Resource Management)

- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the lower-left tree, select and right-click an SPM group ().
7. Select **Rename SPM Group** from the pop-up menu. The **Rename SPM Group** dialog box opens.



8. Enter the new name and select **OK**.
9. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

Deleting an SPM group

Prerequisites

- Required role: Storage Administrator (System Resource Management)
- The Device Manager - Storage Navigator secondary window must be enabled.

Procedure

1. Display the **Performance Monitor** window.
   In Device Manager - Storage Navigator:
   a. Select **Analytics** in **Explorer**.
   b. Select **Performance Monitor** in the tree to open the **Performance Monitor** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Right-click the target storage system and then select **Performance Monitor**.
2. In the **Performance Monitor** window, click **Server Priority Manager** to open the **Server Priority Manager** window.
3. Click  to change to Modify mode.
4. In the **Server Priority Manager** window, click **Server Priority Manager**. The **Server Priority Manager** main window appears.
5. Select the **WWN** tab.
6. In the lower-left tree, select and right-click an SPM group ().
7. Select **Delete SPM Group** from the pop-up menu.
8. In the **Server Priority Manager** main window, click **Apply** to apply the settings to the storage system.

Related topics

- WWN tab of the Server Priority Manager main window on page B-6

6

Hitachi Virtual Partition Manager operations

This chapter describes and provides instructions for performing cache partitioning operations using Hitachi Virtual Partition Manager. Hitachi Virtual Partition Manager is available for VSP Gx00 models only.

- ☐ Overview of Virtual Partition Manager
- ☐ Use case for cache logical partitioning
- ☐ Cache partitioning workflow
- ☐ Cautions and restrictions for Virtual Partition Manager
- ☐ Calculating cache capacity
- ☐ Managing CLPRs

Overview of Virtual Partition Manager

Hitachi Virtual Storage Platform G200, G400, G600, G800 storage systems can connect to multiple hosts and can be shared by multiple users, which can result in conflicts among users. For example, if a host issues many I/O requests or reads or writes a large amount of data, the I/O performance of other hosts may be affected. Virtual Partition Manager allows you to create multiple virtual cache memories called *cache logical partitions* (CLPRs), each allocated to different hosts, to prevent contention for cache memory and improve I/O performance.

A cache logical partition is a pool of the cache and parity groups in the storage system. Partitioning cache into one or more CLPRs allows storage administrators to dedicate individual CLPRs to a different host, preventing I/O contention for cache memory. Partitioning cache dedicates cache resources for exclusive use by specific applications to maintain priority and quality of service for business-critical applications. Storage administrators can secure or restrict access to storage resources to ensure confidentiality for specific applications. By dedicating resources to each partition as needed, a high quality of service can be maintained for all users. Hitachi Virtual Partition Manager is available for VSP Gx00 models only.

CLPR names

CLPR0 is the default CLPR in the storage system. If you have not yet created any cache logical partitions, all cache belongs to CLPR0.

The following table lists the reserved CLPR names and corresponding CLPR IDs. These CLPR names are reserved with each CLPR ID. You cannot use another CLPR ID. For example, if the CLPR ID is 1, you cannot change the CLPR name to "CLPR2".

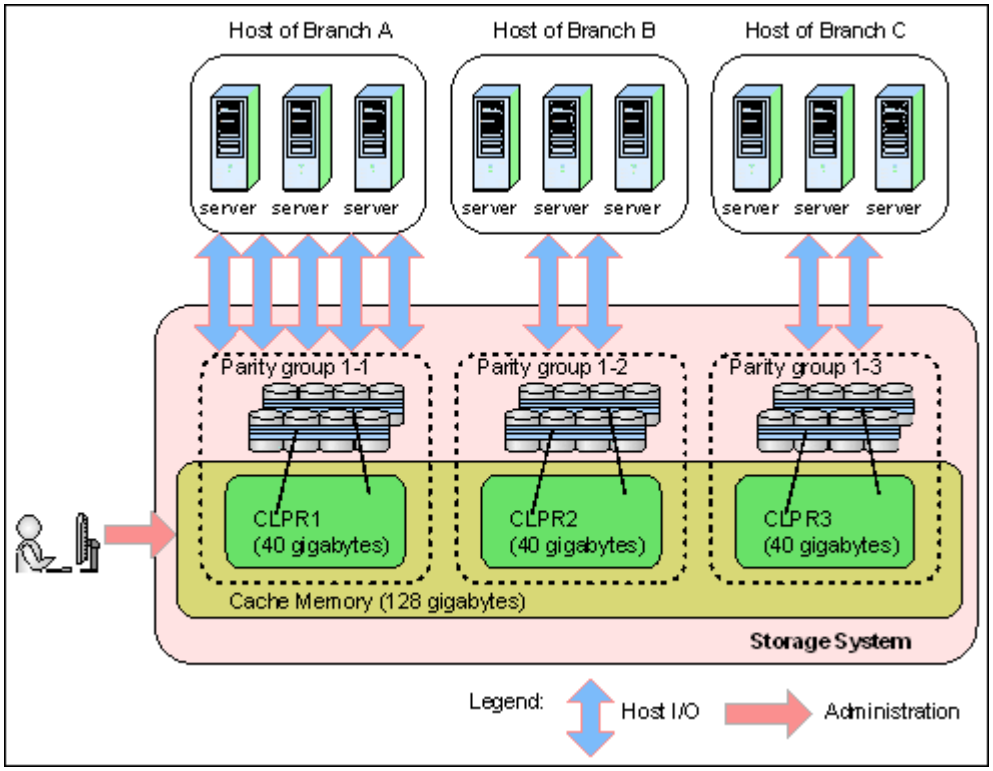
Note: You can create a maximum of 32 CLPRs including CLPR0, which is created by default.

CLPR ID	CLPR name	CLPR ID	CLPR name
0	CLPR0	16	CLPR16
1	CLPR1	17	CLPR17
2	CLPR2	18	CLPR18
3	CLPR3	19	CLPR19
4	CLPR4	20	CLPR20
5	CLPR5	21	CLPR21
6	CLPR6	22	CLPR22
7	CLPR7	23	CLPR23
8	CLPR8	24	CLPR24
9	CLPR9	25	CLPR25

CLPR ID	CLPR name	CLPR ID	CLPR name
10	CLPR10	26	CLPR26
11	CLPR11	27	CLPR27
12	CLPR12	28	CLPR28
13	CLPR13	29	CLPR29
14	CLPR14	30	CLPR30
15	CLPR15	31	CLPR31

Use case for cache logical partitioning

The following figure shows three branch offices and a total of 128 GB of cache memory partitioned into one 40 GB segment for each office. The host for branch A has a heavy I/O load. Because the cache memory is partitioned, that heavy I/O load cannot affect the cache memory for the other two branches.



Cache partitioning workflow

1. Calculate the cache capacity required for your needs taking into account other features and functions that also have cache capacity requirements. For details, see Calculating cache capacity on page 6-5.

2. If needed, work with your Hitachi Data Systems representative to have additional cache memory installed in your storage system.
3. Determine an appropriate time to create CLPRs and migrate resources to the new CLPRs. Creating CLPRs and migrating resources can significantly degrade host performance and should be performed during the initial installation and setup of the storage system or during a maintenance window.
4. Create the new CLPRs and migrate resources to the new CLPRs. For details, see Creating a CLPR on page 6-7 and Migrating resources to and from a CLPR on page 6-9.
5. Manage the CLPRs as needed.

   After a CLPR has been created, you can change the CLPR name and CLPR cache capacity. For details, see Editing the settings of an existing CLPR on page 6-10.

Cautions and restrictions for Virtual Partition Manager

- **Increased cache memory requirements**

  Install additional cache memory before partitioning cache. Adding cache memory after CLPRs have been created is difficult and can be problematic. For details, see Calculating cache capacity on page 6-5.
- **Impact on host performance**

  Creating and changing cache logical partitions can significantly degrade host performance and should only be performed during the initial installation and setup of the storage system or during a maintenance window. If you must perform these changes on a production machine, use Hitachi Performance Monitor to verify that the write pending rate of the CLPR and CLPR0 satisfy the following formulas on all MP units:

  - For CLPR with decreased cache capacity

    ```
    Write pending rate x cache capacity before operation /
    cache capacity after operation < 30%
    ```

    The CLPR settings will be suspended if the write pending rate of any one of the MP units allocated to the operation target CLPR or CLPR0 is 50 percent or higher.
- When you move resources in CLPRs, make sure that the writing pending rates of all the MP units for each CLPR are less than 50 percent at both the source and the destination. The process for changing the CLPR settings will be suspended until the write pending rates of all the MP units become less than 50 percent.
- **Duration of cache partition operations**

  Adding or changing CLPR definitions or configurations can take hours to complete. After a CLPR operation has been started, you cannot cancel or modify the process until the operation is complete.
- **Interoperability restrictions for cache partitioning**

Application	Behaviors
ShadowImage	You cannot use ShadowImage Quick Restore functions that affect multiple CLPRs.
Volume Migration	You cannot use Volume Migration when it affects multiple CLPRs.
Universal Replicator	Universal Replicator data volumes and journal volumes can belong to different CLPRs. All journal volumes in the same journal must belong to the same CLPR. If not, an error occurs.

Calculating cache capacity

Before you partition cache memory into one or more CLPRs, calculate the cache capacity that you need for the storage system. If necessary, install additional cache memory.

The recommended cache capacity is different for different system configurations. System differences include:

- Number of mounted MP units
- RAID level
- Number of installed drives
- Use of the following specialized applications: Dynamic Provisioning, Dynamic Tiering, active flash, or Universal Volume Manager

Recommended Cache capacity without Dynamic Provisioning, Dynamic Tiering, or active flash

The Dynamic Provisioning, Dynamic Tiering, and active flash products require more cache capacity to run. The recommended cache capacity for storage systems that do not use the products is lower.

The following table lists the recommended cache capacity for storage systems that do not use Dynamic Provisioning, Dynamic Tiering, and active flash.

Internal/external VOL for a CLPR (Total capacity)[1]	Recommended cache capacity for a CLPR
Less than 4 TB	12 GB
4 TB or more	16 GB
16 TB or more	24 GB
48 TB or more	32 GB
96 TB or more	40 GB
160 TB or more	48 GB[2]
240 TB or more	56 GB[2]

Internal/external VOL for a CLPR (Total capacity)[1]	Recommended cache capacity for a CLPR
360 TB or more	64 GB[2]
600 TB or more	72 GB[2]

Notes:

1. If you are calculating the total capacity of internal/external volumes, note the following for each volume capacity:
   - Internal volume: For RAID1, add the half of total parity group capacity. For RAID 5/6, subtract the parity disk capacity from the total parity group capacity and add that amount.
   - External volume: Add the total capacity of the parity group.
2. 40 GB for VSP G200

Recommended Cache capacity with Dynamic Provisioning, Dynamic Tiering, or active flash

You have to allocate more cache capacity for each CLPR when Dynamic Provisioning, Dynamic Tiering, or active flash is in use.

The following table lists the recommended cache capacity for storage systems that use Dynamic Provisioning, Dynamic Tiering, or active flash.

Internal/external/virtual VOL for a CLPR (Total capacity)[1]	Recommended cache capacity for a CLPR
Less than 4 TB	20 GB
4 TB or more	20 GB
16 TB or more	24 GB
48 TB or more	32 GB
96 TB or more	40 GB
160 TB or more	48 GB[2]
240 TB or more	56 GB[2]
360 TB or more	64 GB[2]
600 TB or more	72 GB[2]

Notes:

1. If you are calculating the total capacity of internal/external/virtual volumes, note the following for each volume capacity:
   - Internal volume: For RAID1, add the half of total parity group capacity. For RAID 5/6, subtract the parity disk capacity from the total parity group capacity and add that amount.
   - External volume: Add the total capacity of the parity group.
   - Virtual volume: Add the total capacity of LDEV. Check virtual volume LDEV capacity in Logical Device window. For details on Logical Device window, see *Provisioning Guide for Hitachi Virtual Storage Platform Gx00 and Fx00 Models*.

Internal/external/virtual VOL for a CLPR (Total capacity)[1]	Recommended cache capacity for a CLPR
2. 40 GB for VSP G200	

Recommended Cache capacity with Universal Volume Manager

If you are using Universal Volume Manager, sometimes you can allocate less cache capacity to a CLPR. To use less cache capacity, the CLPR that you want to create must meet the following conditions:

- The CLPR uses only external volumes.
- Transfer speed is not important.
- Cache mode of the mapped volume is **Disable**.
- The CLPR uses only volumes for open systems.

The following table lists the recommended cache when the total external volume capacity with Universal Volume Manager is equal to or more than or less than 128,000 GB.

Total capacity of external volume of CLPR with UVM	Number of MP units	Recommended cache capacity for a CLPR
Less than 128 TB	4	4 GB
128 TB or more	4	8 GB

When adding cache memory, use either the Standard Cache Access Model mode or the High Performance Cache Access Model mode. If the storage system has any additional printed circuit boards (PCBs), you must use the High Performance Cache Access Model mode. For more information about adding cache memory, contact the Hitachi Data Systems customer support.

Managing CLPRs

- Creating a CLPR on page 6-7
- Migrating resources to and from a CLPR on page 6-9
- Editing the settings of an existing CLPR on page 6-10
- Deleting a CLPR on page 6-11

Creating a CLPR

Caution: Creating CLPRs can significantly degrade host performance and should be performed during the initial installation and setup of the storage system or during a maintenance window.
Before creating a CLPR, read Cautions and restrictions for Virtual Partition Manager on page 6-4.

If no CLPRs have been created, the entire cache is displayed as CLPR0. When the first CLPR is created, CLPR1 is added. You can create up to CLPR9 for VSP G200, CLPR23 for VSP G400, and CLPR31 for VSP G600 and VSP G800.

The default cache capacity is 4 GB. CLPRs can be created by assigning the necessary capacity from CLPR0.

Prerequisites

- Required role: Storage Administrator (System Resource Management)

Procedure

1. Display the **Cache Partitions** window.
   In Device Manager - Storage Navigator:
   a. Select **Administration** in **Explorer**, and select **Cache Partitions** in the tree to open the **Cache Partitions** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Click **Cache Partitions** and open the **Cache Partitions** window.
2. Click **Create CLPRs** to open the **Create CLPRs** window. **CLPR ID** displays the first available CLPR ID or a blank if no CLPR ID is available.
3. In **CLPR Name**, enter the CLPR name (maximum 16 alphanumeric characters). Each CLPR name must be unique. You cannot use a CLPR name that is already reserved. If no CLPR ID is available, a blank is displayed.
4. In **Cache Size**, select the cache capacity. If no CLPR ID is available, a blank is displayed.
   The default size is 4 GB, and you can select 4 GB or higher value in increments of 2 GB. The maximum available capacity (subtracted the total usage capacity of other CLPRs from the total capacity of the storage system) is displayed as the upper limit value.
5. Click **Add**. The created CLPR is added to the **Selected CLPRs** table.
   To delete a CLPR from the **Selected CLPRs** table, select the CLPR and click **Remove**. To change the settings of an existing CLPR, select the CLPR and **Change Settings** to open the **Change Settings** window.
6. Click **Finish**.
7. Check the settings in the **Confirm** window, enter the task name in **Task Name**, and click **Apply**.
   If **Go to tasks window for status** is checked, the **Tasks** window opens.

After creation, a CLPR has no resources (parity groups). To migrate resources to the new CLPR, see Migrating resources to and from a CLPR on page 6-9.

Related topics

- Create CLPRs wizard on page C-6
- Change Settings window on page C-14

- Migrating resources to and from a CLPR on page 6-9
- Editing the settings of an existing CLPR on page 6-10

Migrating resources to and from a CLPR

Caution: Migrating resources to and from CLPRs can significantly degrade host performance and should be performed during the initial installation and setup of the storage system or during a maintenance window.

After creating a CLPR, you can migrate resources (parity groups) from existing CLPRs to the new CLPR.

When migrating resources to and from CLPRs, multiple parity groups that configure interleaved parity groups must be in the same CLPR.

Prerequisites

- Required role: Storage Administrator (System Resource Management)

Procedure

1. Display the **Cache Partitions** window.
   In Device Manager - Storage Navigator:
   a. Select **Administration** in **Explorer** and select **Cache Partitions** in the tree to open the **Cache Partitions** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Click **Cache Partitions** to open the **Cache Partitions** window.
2. On the **Cache Partitions** tab, click **Migrate CLPR Resources** to open the **Migrate CLPR Resources** window.
3. In the **Available Parity Groups** table or **Available Virtual Volumes** table, select the resource that you want to migrate.
4. Select the migration destination CLPR in the **CLPRs** table.
5. Click **Set**.
   The resource selected in the **Available Parity Groups** table or **Available Virtual Volumes** table is migrated to the CLPR selected in the **CLPRs** table. To check the information of the CLPR, select the CLPR and click **Detail** to open the **CLPR Properties** window.
6. When you are done adding resources to migrate, click **Finish**.
7. On the **Confirm** window, check the settings carefully.
8. When you are ready to start the resource migration, enter the task name in the **Confirm** window, and then click **Apply**.
   If **Go to tasks window for status** is checked, the **Tasks** window opens.

Related topics

- Create CLPRs wizard on page C-6

Editing the settings of an existing CLPR

You can change the following settings after creating a CLPR:

- CLPR name
- CLPR cache capacity (**Cache Size** on the GUI)

When you select the "CLPR0" to edit, you can edit only CLPR name, and the other items are inactive.

Prerequisites

- Required role: Storage Administrator (System Resource Management)

Procedure

1. Display the **Cache Partitions** window.
   In Device Manager - Storage Navigator:
   a. Select **Administration** in **Explorer**.
   b. Select **Cache Partitions** in the tree to open the **Cache Partitions** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Click **Cache Partitions** to open the **Cache Partitions** window.
2. Select the CLPR to be edited, and then click **Edit CLPR** to open the **Edit CLPR** window on the **Cache Partitions** tab.
3. Edit the CLPR settings as follows.
   a. In **CLPR Name**, edit the CLPR name as needed. You can use up to 16 alphanumeric characters but cannot specify CLPR names that are already reserved. The default is the name set at the time of the CLPR creation.
   b. In **Cache Size**, edit the CLPR cache capacity as needed. You can select 4 GB or a higher value for the cache capacity of the CLPR and the size can be changed in increments of 2 GB. The default is the value set at the time of the CLPR creation.
      The maximum available capacity (subtract the total usage capacity of other CLPRs from the total capacity of the storage system) is displayed as the upper limit value.
4. When you are done editing the CLPR settings, click **Finish**.
5. On the **Confirm** window, check the settings carefully.
6. When you are ready to change the settings, enter the task name in the **Confirm** window, and then click **Apply**.
   If **Go to tasks window for status** is checked, the **Tasks** window opens.

Deleting a CLPR

You can only delete CLPRs that you created. CLPR0 cannot be deleted. CLPRs to which parity groups or virtual volumes are allocated cannot be deleted.

Prerequisites

- Required role: Storage Administrator (System Resource Management)

Procedure

1. Display the **Cache Partitions** window.
   In Device Manager - Storage Navigator:
   a. Select **Administration** in **Explorer**, and select **Cache Partitions** in the tree to open the **Cache Partitions** window.
   In Hitachi Command Suite:
   a. Select the **Resources** tab, and expand the **Storage Systems** tree.
   b. Click **Cache Partitions** to open the **Cache Partitions** window.
2. Select the CLPR that you want to delete, and then click **Delete CLPRs** in the **More Actions** on the **Cache Partitions** tab to open the **Delete CLPRs** window.
3. In the **Selected CLPRs** table, check the CLPR that you want to delete, and then enter the task name in the **Task Name** field. If you want to cancel the deletion, click **Cancel** to go back to the **Cache Partitions** tab.
4. Click **Apply**.
   If **Go to tasks window for status** is checked, the **Tasks** window opens.

7

Troubleshooting

This chapter provides troubleshooting information and instructions for contacting Hitachi Data Systems customer support.

- ☐ General troubleshooting resources
- ☐ Troubleshooting Performance Monitor
- ☐ Troubleshooting Export Tool for Performance Monitor
- ☐ Troubleshooting Server Priority Manager
- ☐ Troubleshooting Virtual Partition Manager
- ☐ Calling Hitachi Data Systems customer support

General troubleshooting resources

For troubleshooting information on the Hitachi Virtual Storage Platform G200, G400, G600, G800 or Hitachi Virtual Storage Platform F400, F600, F800 storage system, see the hardware guide for your VSP storage system model.

For information on error messages, see the *Hitachi Device Manager - Storage Navigator Messages* guide.

Troubleshooting Performance Monitor

Error	Recommended action
Part of monitoring data is missing.	While displaying Performance Monitor, if I/O workloads between hosts and the storage system become heavy, the storage system gives higher priority to I/O processing than monitoring processing. If you notice that monitoring data is frequently missing, change to a longer collection interval.
The monitoring data is not updated, even though **Monitoring Switch** is set to **Enable**.	If the time setting of the SVP is changed, the monitoring data might not be updated. Set **Monitoring Switch** to **Disable**, and set **Monitoring Switch** to **Enable** again.
The WWN of a host bus adapter is displayed in red on the **WWN** tab.	The HBA for the WWN that is displayed in red is connected to two or more ports, but the traffic between the HBA and some of the ports is not monitored by Performance Monitor. When many-to-many connections are established between HBAs and ports, make sure that all traffic between HBAs and ports is monitored. For details, see Monitoring all port-HBA traffic: many-to-many connections on page 5-23.

Troubleshooting Export Tool for Performance Monitor

Error	Recommended action
You cannot run the batch file.	The path to the Java Virtual Machine (Java.exe) might not be defined in the PATH environment variable. If this is true, you must add that path to the PATH environment variable. For information about how to add a path to the environment variable, see the documentation for your operating system. An incorrect version of Java Runtime Environment (JRE) might be installed on your computer. To check the JRE version, enter the following command at the Windows command prompt or the UNIX console window: `Java -version`. If the version is incorrect, install the correct version of JRE.
Export Tool stops and the processing does not continue. The command prompt window was displaying progress of the export	• The command prompt window might be in pause mode. The command prompt window will be in pause mode if you click the command prompt window when Export Tool is running. To cancel pause mode, activate the command prompt window and then press the <ESC> key. If a timeout of RMI occurs during pause mode, the login will be canceled and an error will occur when you cancel pause

Error	Recommended action
processing, but the window stopped displaying progress before the processing stopped. The progress information does not seem to be updated anymore.	mode after the timeout. The error message ID will be (0001 4011). • If a memory size is not specified in a batch file, the Out Of Memory Error occurs in JRE, Export Tool might stop and the processing might not continue. Confirm whether the specified memory size is correct or not.
An error occurs and the processing stops.	If the error message ID is (0001 4011), the user is forcibly logged off and the processing stops because Export Tool did not issue any request to SVP within the timeout period specified by the **-Dmd.rmitimeout** parameter of the **Java** command (default: 20 minutes). The computer running Export Tool could be slow. Confirm whether you are using a computer that is not supported, or whether the computer is slow. To continue running Export Tool, first increase the value of the **-Dmd.rmitimeout** parameter (maximum: 1,440 minutes (24 hours), and then run Export Tool. For details about **-Dmd.rmitimeout**, see the **Operands** table for the **Java** command in Java on page 4-40. If the error persists, contact the Hitachi Data Systems customer support. If the error message ID is (0002 5510), probable error causes and solutions are: • An internal processing is being performed in the system. Alternatively, another user is changing configurations. Wait for a while and then run Export Tool again. • Maintenance operations are being performed on the system. Wait until the maintenance operations finish and then run Export Tool again. If the error message ID is none of the above, see Messages issued by Export Tool on page 7-4.
The monitoring data in the CSV file includes (-1).	For details on invalid monitoring data, see Causes of Invalid Monitoring Data on page 4-60.
• When Export Tool terminated abnormally due to error, the row of Check License is shown as Unmarshal Exception in the log file. • Export Tool terminated abnormally because the processing did not continue. version unmatched is shown in the log file.	The problem might have occurred due to an unsuitable combination of the DKCMAIN firmware/Device Manager - Storage Navigator software and Export Tool versions. Confirm whether the versions of these programs are correct.

Error	Recommended action
When a CSV file is opened, the parity group ID and volume ID appear as follows: • The parity group IDs appear as dates • The volume IDs appear with a decimal point	To display a CSV file correctly, you need to perform following operations: 1. Start Microsoft Excel. 2. On the menu bar, select **Data**, **Import External Data**, and **Import Text File**, and specify a CSV file to import. The Text Import.zip - Step 1 of 3 dialog box is displayed. 3. In the Text Import.zip - Step 1 of 3 dialog box, click **Next**. Text Import.zip - Step 2 of 3 dialog box is displayed. 4. In the Text Import.zip - Step 2 of 3 dialog box, check only Comma in the Delimiter area, and click **Next**. The Text Import.zip - Step 3 of 3 dialog box is displayed. 5. In the Text Import.zip - Step 3 of 3 dialog box, select all columns of **Date** preview, and check **Text** in the Column data format area on the upper right of this dialog box. 6. Click **Finish**. The imported CSV file is displayed.
When you executed Export Tool with many volumes specified, Export Tool terminated abnormally while collecting monitoring data.	Because too many volumes are specified, a timeout error might have occurred due to a heavy workload imposed on the computer where Export Tool was running. The error message ID is (0001 4011). Specify fewer volumes. It is recommended that the number of volumes to be specified is 16,384 or less.
"404 Not Found." or other errors appear when you run Export Tool.	This error occurred because the Export Tool execution has failed. Possible causes are as follows: - The svpip value is incorrect. - The SVP version you are using is old.
"Specified "ip" is wrong." appears when you run Export Tool.	This error occurred because the network connection with the SVP could not established. Possible causes are as follows: • The IP address or host name specified by the `ip` subcommand is incorrect. • The connection port number (default is 1099) specified by the `ip` subcommand is incorrect.[1] • The connection port number (default is 1099) for RMI connection used by the SVP is changed or used by other applications.[1] • The SVP is not working correctly or does not have a network connection.
Notes: 1. For the connection port number, see the hardware reference guide for your model.	

Messages issued by Export Tool

If an error occurs when Export Tool is running, error messages are issued to the standard output (for example, the command prompt) and the log file. The following table lists the Export Tool messages and recommended actions to resolve errors.

Export Tool messages	Probable causes	Recommended action
Connection to the server has not been established.	Connection to the server has not been established.	Specify the **login** subcommand first.
Execution stops.	Execution stops.	Remove errors.
Illegal character: *character*	An illegal character is used.	Use legal characters.
Invalid length: *token*	The length is invalid.	Specify a value that has a correct length.
Invalid mode: *startup-mode*	Operation has failed because the specified startup mode is incorrect.	Specify the correct startup mode.
Invalid range: *range*	The specified range is invalid.	Check if the correct start and end values are specified.
Invalid URL: *URL*	The specified URL is invalid.	Check the URL.
Invalid value: *value*	The specified value is invalid.	Specify a correct value.
Login failed	An attempt to log into the storage system failed. Probable causes are: 1. An incorrect operand is used for the **ip** subcommand. 2. An incorrect operand is used for the **dkcsn** subcommand. 3. An incorrect operand is used for the **login** subcommand. 4. The specified user ID is used by another person, and the person is being logged into the storage system. 5. Currently, the Server Priority Manager window is in use by another user. 6. Currently, another user is running Export Tool. 7. Versions of Device Manager - Storage Navigator and Export Tool do not match.	For 1, 2, and 3, specify the correct operand. For 4 and 5, take one of the following actions: • Determine the user logging in with same user ID and ask the user to log off. • Ask the other user to close the Server Priority Manager window. • Wait for the other user to quit Export Tool. For 6, take one of the following actions: • Wait for the other user to quit Export Tool. • Forcibly terminate running Export Tool. • Ask all users not to use Export Tool while someone else is using it. For 7, match the versions of Device Manager - Storage Navigator and Export Tool. If the error is not caused by the conditions listed on the left, see Troubleshooting Performance Monitor on page 7-2.

Export Tool messages	Probable causes	Recommended action
Missing command file	No command file is specified.	Specify the name of the command file correctly.
Missing group name	No operand is specified in the group subcommand.	Specify operands for the subcommand.
Missing host name	No host name is specified.	Specify a host name.
Missing output directory	No directory is specified for saving files.	Specify the directory for saving files.
Missing password	Export Tool cannot find the user password that is used to log into the storage system.	Specify the password.
Missing ip	The **ip** subcommand is not specified.	Specify the **ip** subcommand first.
Missing dkcsn	The **dkcsn** subcommand is not specified.	Specify the **dkcsn** subcommand first.
Missing time range	No time range is specified.	Specify the time range.
Missing user ID	Export Tool cannot find the user ID that is used to log into the storage system.	Specify the user ID.
Out of range: *range*	The value is outside the range.	If the **range** subcommand is used, specify a value within the range from the monitoring start time to the monitoring end time. If the **set** subcommand is used with the switch operand, specify a value within the range of 1 to 15.
Permission Denied.	The user ID does not have the required role.	Assign the storage administrator role (performance management) to the user ID.
RMI server error (*part-code*, *error-number*)	An error occurs at the RMI server.	For detailed information, see the *Hitachi Device Manager - Storage Navigator Messages*.
Serial-Not found	The serial number of the system in which to obtain monitoring data cannot be found.	Specify the serial number of the system connected to the SVP.
Unable to connect to the server: *host:port*	Access to the server failed.	Check the host name and the port number.
Unable to create temporary directory: *tmp*	Temporary directory creation failed.	Check the access permission of the directory or if another file exists.
Unable to display help messages	Export Tool cannot display the online help due to a system error.	Run Export Tool again. If the problem occurs again, contact

Export Tool messages	Probable causes	Recommended action
		Hitachi Data Systems customer support.
Unable to execute ExportTool	The Export Tool execution failed.	The downloaded file might be damaged, or an error might have occurred when running Export Tool. Run Export Tool again. If the error occurs again, contact Hitachi Data Systems customer support customer support.
Unable to get ExportTool from the server: URL=URL[, code=*error-code*]	Export Tool acquisition from the server failed.	File acquisition by HTTP might have failed. Check the URL and HTTP error codes. If this error occurred during data acquistion, no error code is displayed.
Unable to get serial number	Export Tool cannot obtain the serial number due to a system error.	Make sure the SVP is operating correctly, and ensure the SVP is connected to the network.
Unable to get time range for monitoring	SVP does not contain monitoring data.	Accumulate monitoring data, and then run Export Tool.
Unable to read command file: *file*	Export Tool cannot read the command file.	Specify the name of the command file correctly.
Unknown host: *host*	Export Tool cannot resolve the host name.	Specify the correct host name.
Unsupported command name: *command*	Export Tool does not support the specified subcommand.	Specify a correct subcommand.
Unsupported operand: *operand*	The specified operand is not supported.	Correct the specified operand.
Unsupported option: *option*	The specified option is not supported.	Correct the specified option.
Same log path: *path*	The same path is specified for the el.logpath and el.logfile parameters, or the md.logpath and md.logfile parameters.	Check the specifications.
Some file exists in path. What do you do? clear(c)/ update(u)/stop(p) You selected "action". Is it OK? (y/n)	Files exist in path.	If you want to clear the files, press the <c> key. If you want to overwrite the files, press the <u> key. If you want to stop the operation, press the <p> key. When you press a key, a message appears and asks whether to perform the specified action.

Export Tool messages	Probable causes	Recommended action
		To perform the specified action, press the <y> key. To cancel the specified action, press the <n> key.
Specified "ip" is wrong.	The IP address, the host name, or the connection port number is not correct.	Check the IP address, host name, or connection port number of the SVP. If you do not specify the connection port number, 1099 (default) is used. If the probable cause is not applicable, see Troubleshooting Export Tool for Performance Monitor on page 7-2.
Specify the following subcommand before login subcommand: *retry*	The **`retry`** subcommand is written in an incorrect position in the command file.	Write the **`retry`** subcommand before the **`login`** subcommand.
Syntax error: *line*	A syntax error is detected in a command line in your command file.	Check the command line for the syntax error, and then correct the script. Some operands must be enclosed by double quotation marks ("). Check the command line to find whether double quotation marks are missing.
[login]version unmatched	The Export Tool version does not correspond to the Device Manager - Storage Navigator software version.	Upgrade Export Tool to match the Export Tool and Device Manager - Storage Navigator software versions.

Troubleshooting Server Priority Manager

Error	Recommended action
The WWN of a host bus adapter is displayed in red on the **WWN** tab.	The HBA for the WWN that is displayed in red is connected to two or more ports, but the traffic between the HBA and some of the ports is not monitored by Performance Monitor. When many-to-many connections are established between HBAs and ports, make sure that all traffic between HBAs and ports is monitored. For details, see Monitoring all port-HBA traffic: many-to-many connections on page 5-23.

Troubleshooting Virtual Partition Manager

Error	Cause
The CLPR name cannot be changed.	You cannot assign the same name to more than one CLPR. The name you entered is already in use or is a reserved name. Enter another name. For more information, see CLPR names on page 6-2.
The parity group in a CLPR cannot be migrated to another CLPR.	• Make sure that all interleaved parity groups belong to the same CLPR. • Make sure to click **Apply** when creating a new CLPR.

Calling Hitachi Data Systems customer support

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the error as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any error messages displayed on the host systems.
- The exact content of any error messages displayed by Device Manager - Storage Navigator.
- The Device Manager - Storage Navigator configuration information (use the Dump Tool).
- The service information messages (SIMs), including reference codes and severity levels, displayed by Device Manager - Storage Navigator.

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to Hitachi Data Systems Support Connect for contact information: https://support.hds.com/en_us/contact-us.html

A

Performance Monitor GUI reference

This chapter provides detailed information about the Performance Monitor GUI.

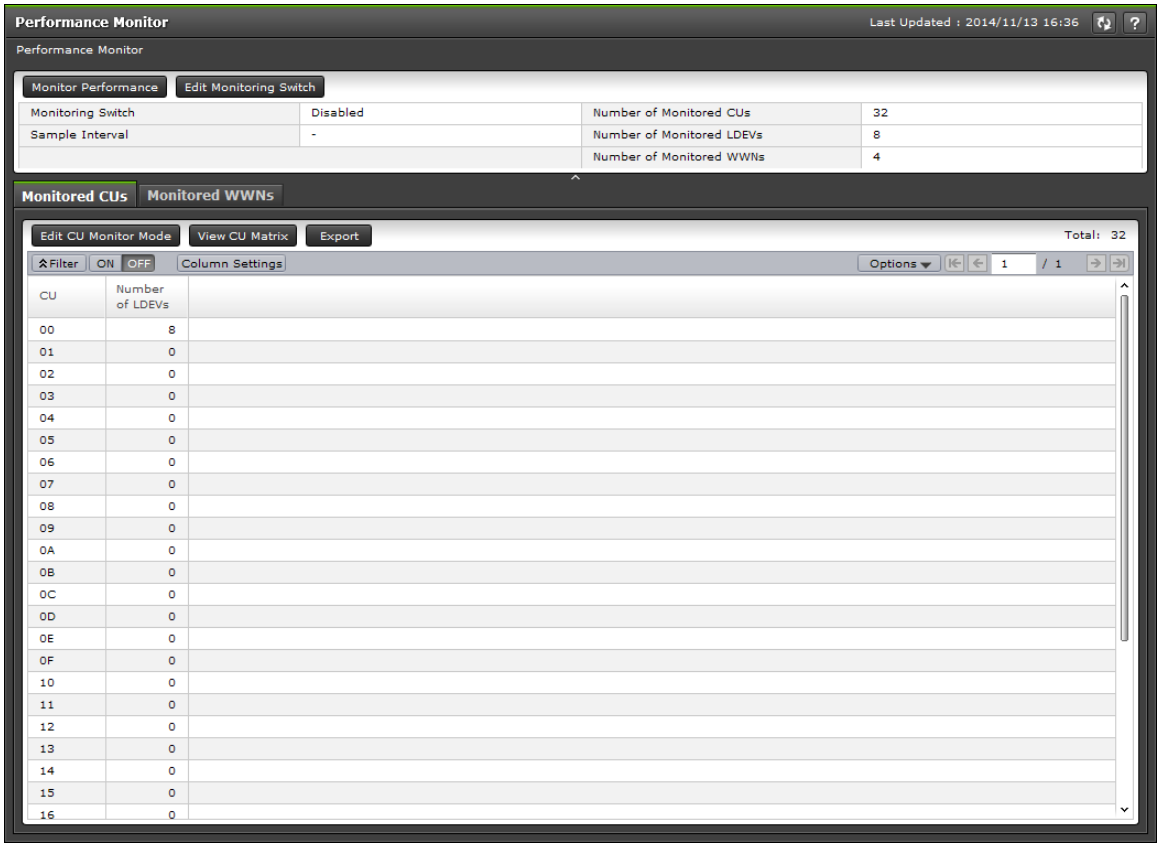
- Performance Monitor main window
- Edit Monitoring Switch wizard
- Monitor Performance window
- Edit CU Monitor Mode wizard
- View CU Matrix window
- Select by Parity Groups window
- Parity Group Properties window
- Edit WWN wizard
- Edit WWN Monitor Mode wizard
- Delete Unused WWNs window
- Add New Monitored WWNs wizard
- Add to Ports wizard
- Monitor window
- Edit Time Range window

- Edit Performance Objects window
- Add Graph window
- Wizard buttons
- Navigation buttons

Performance Monitor main window

This is the main window for monitoring performance on your storage system. From this window you can set up monitoring parameters, start and stop monitoring, and view performance graphs.

- Summary on page A-3
- Monitored CUs tab on page A-4
- Monitored WWNs tab on page A-4



Summary

The summary information of monitoring is displayed.

Buttons

Item	Description
Server Priority Manager*	Click to open the Server Priority Manager window.
Monitor Performance	Click to open the Monitor Performance window.
Edit Monitoring Switch	Click to open the Edit Monitoring Switch window.
* Appears when the secondary window is enabled in the Edit Information Display Settings window.	

Summary information

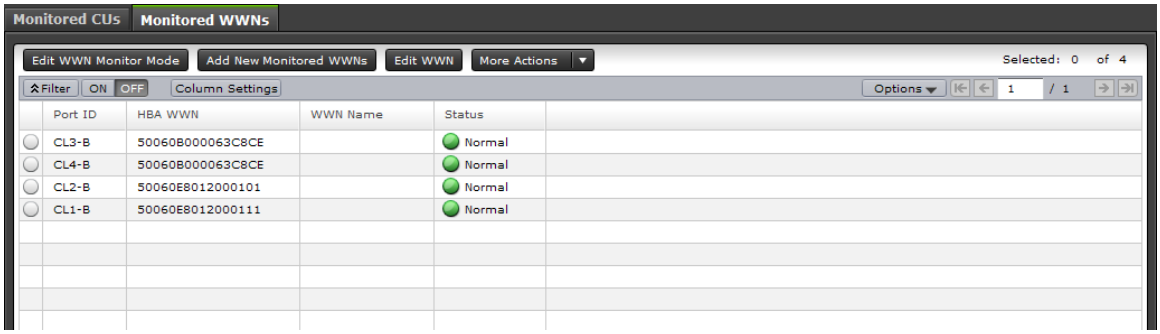
Item	Description
Monitoring Switch	Current monitoring status: **Enabled**: Performance Monitor is monitoring the storage system. **Disabled**: The storage system is not being monitored.
Sample Interval	Current sampling interval, from 1 to 15 minutes, for which statistics are collected during monitoring. This value is available when Enabled is selected in the Monitoring Switch field. If Disabled is selected, a hyphen appears.
Number of Monitored CUs*	Number, from 0 to 64, of CUs currently being monitored.
Number of Monitored LDEVs	Number of LDEVs currently being monitored: • VSP G200: 0 to 2,048 • VSP G400, VSP G600, VSP F400, F600: 0 to 4,096 • VSP G800, VSP F800: 0 to 16,384
Number of Monitored WWNs*	Number, from 0 to 2048, of WWNs currently being monitored.
*Appears only for VSP G800.	

Monitored CUs tab

Use this tab to view information about the CUs that are monitored. This tab displays only for VSP G800.

Item	Description
Edit CU Monitor Mode	Click to open the Edit CU Monitor Mode window.
View CU Matrix	Click to open the View CU Matrix window.
Export	Displays the window for outputting table information.
CU	Monitored CU number.
Number of LDEVs	Number of LDEVs included in the CU that are monitored.

Monitored WWNs tab



Use this tab to view information about the WWNs that are currently being monitored.

Item	Description
Port ID	Name of the port of the monitored WWN.
HBA WWN	Host bus adapter ID of the monitored WWN.
WWN Name	A WWN name is up to 64 alphanumeric characters and some signs.
Status	Following statuses of the port connected with WWN. **Normal**: All WWNs connected with the port are monitoring target objects. **Non-Integrity**: The WWN is not monitored for the corresponding port, but monitored for other ports.
Edit WWN Monitor Mode	Click to open the Edit WWN Monitor Mode window.
Add New Monitored WWNs	Click to open the Add New Monitored WWNs window.
Edit WWN	Click to open the Edit WWN window.
Delete Unused WWNs*	Click to open Delete Unused WWNs window.
Add to Ports*	Click to open the Add to Ports window.
Export*	Displays the window for outputting table information.
* Appears when you click **More Actions**.	

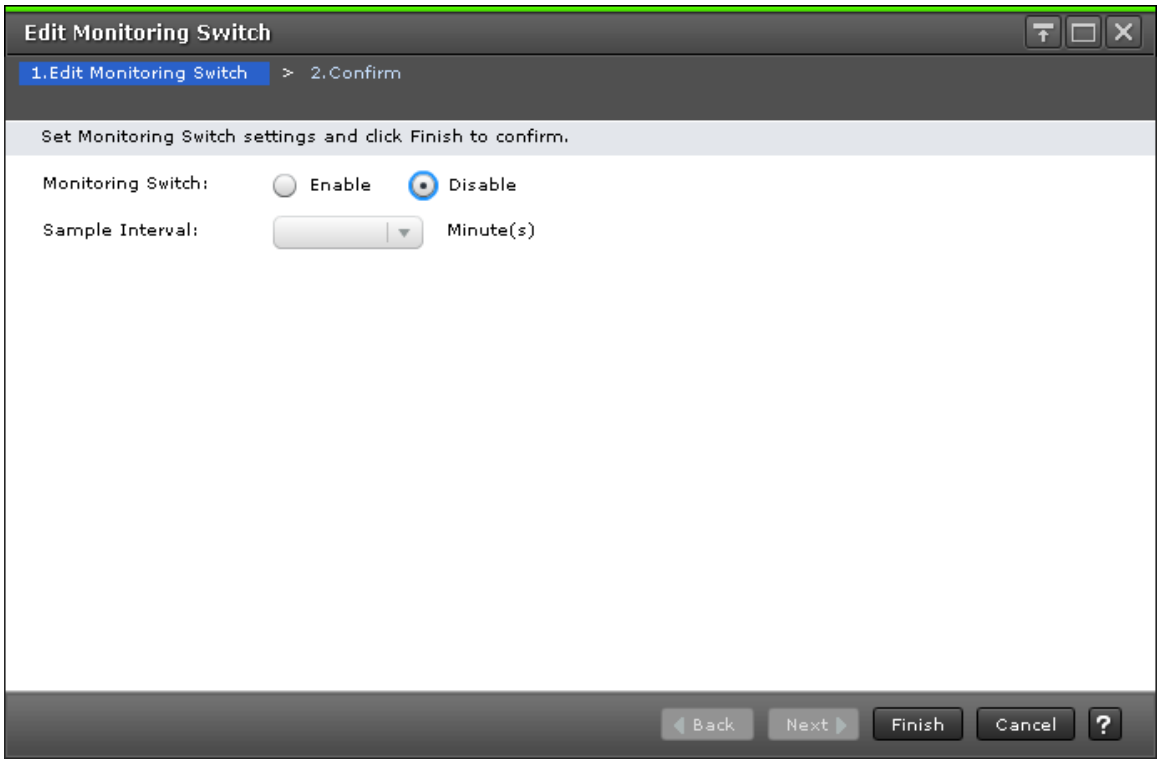
Edit Monitoring Switch wizard

Related topics

- Starting monitoring on page 2-7
- Stopping monitoring on page 2-18
- Edit Monitoring Switch window on page A-5
- Confirm window for Edit Monitoring Switch on page A-6

Edit Monitoring Switch window

Use this window to start and stop performance monitoring and to specify the sampling interval for how often to monitor statistics.

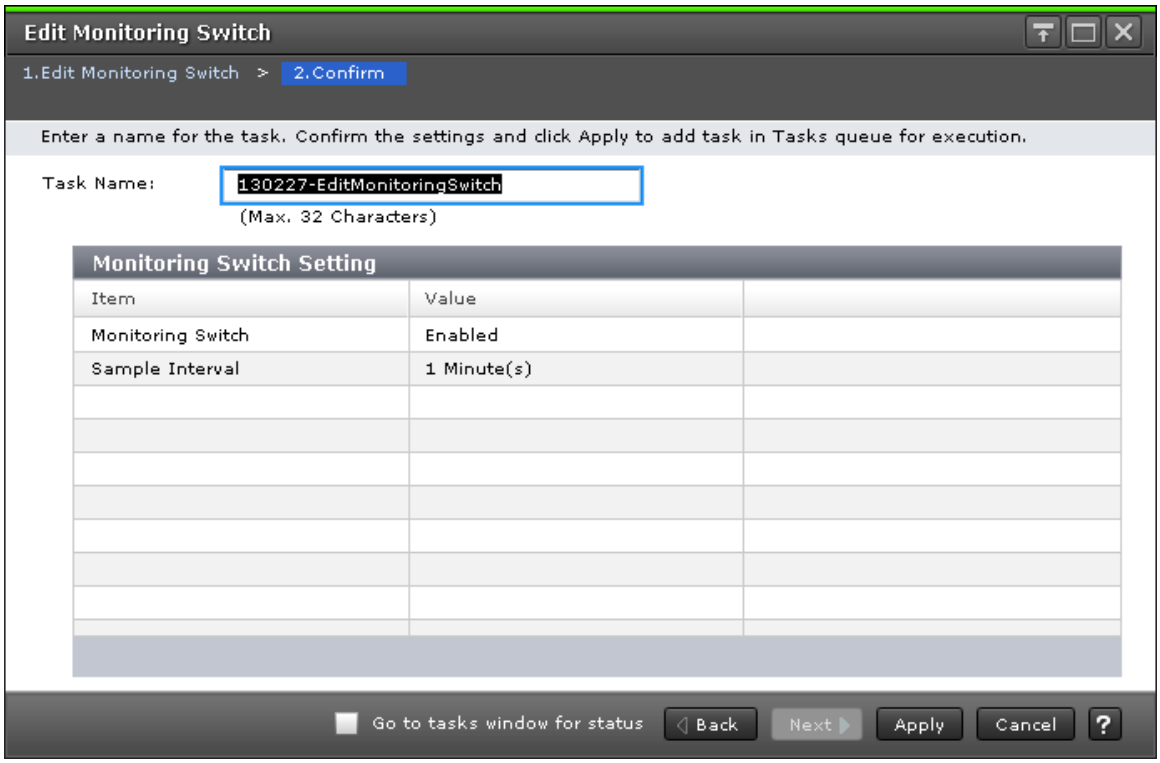


Setting fields

Item	Description
Monitoring Switch	Specify the monitoring status. **Enable**: Performance Monitor is monitoring the storage system. **Disable**: Performance Monitor is not monitoring the storage system.
Sample Interval	Specify the time interval of collecting statistics. You can specify from 1 to 15 minutes in intervals of 1 minute. The default is blank.

Confirm window for Edit Monitoring Switch

Use this window to confirm the specified monitoring information and to assign a task name to the editing task.



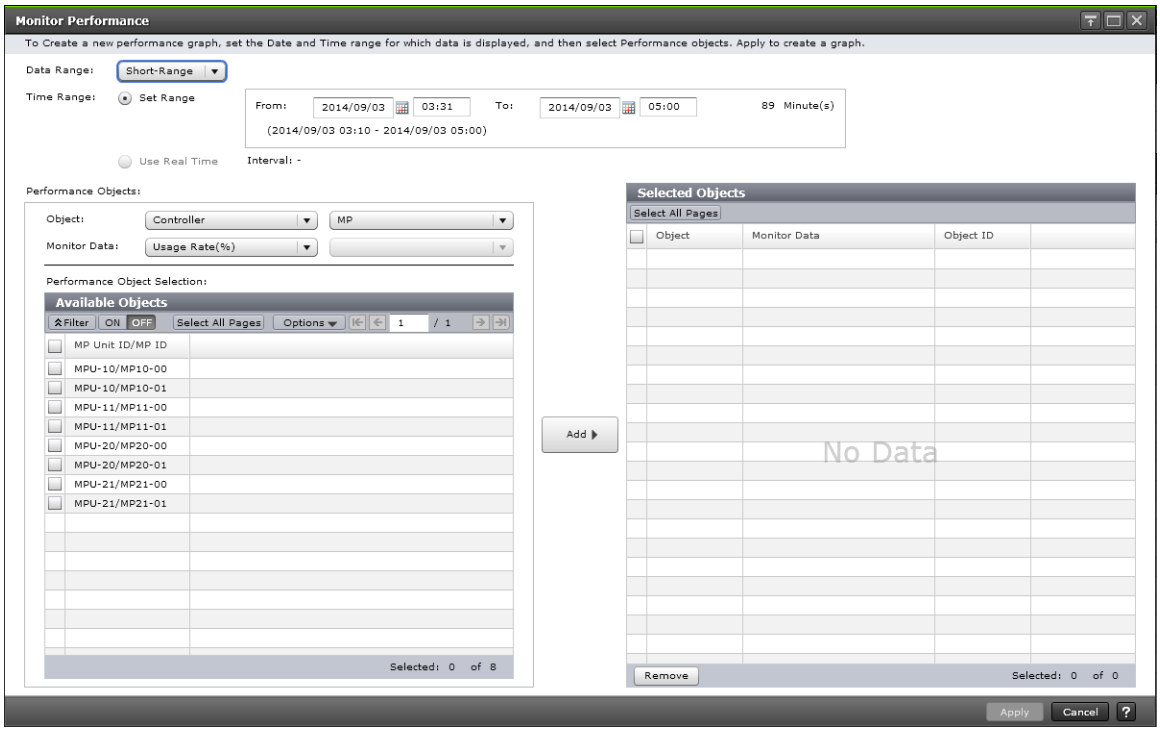
Monitoring Switch Setting table

Confirm the monitoring switch information to be changed.

Item	Description
Monitoring Switch	Following monitoring statuses of the storage system. **Enabled**: Performance Monitor is monitoring the storage system. **Disabled**: Performance Monitor is not monitoring the storage system.
Sample Interval	Time interval of collecting statistics.

Monitor Performance window

Use this window to specify the monitoring period and monitoring objects that will be displayed in graphs. You can set a maximum of eight monitoring objects per graph panel. You can set a maximum of four graph panels with up to 16 monitoring objects.



Data Range

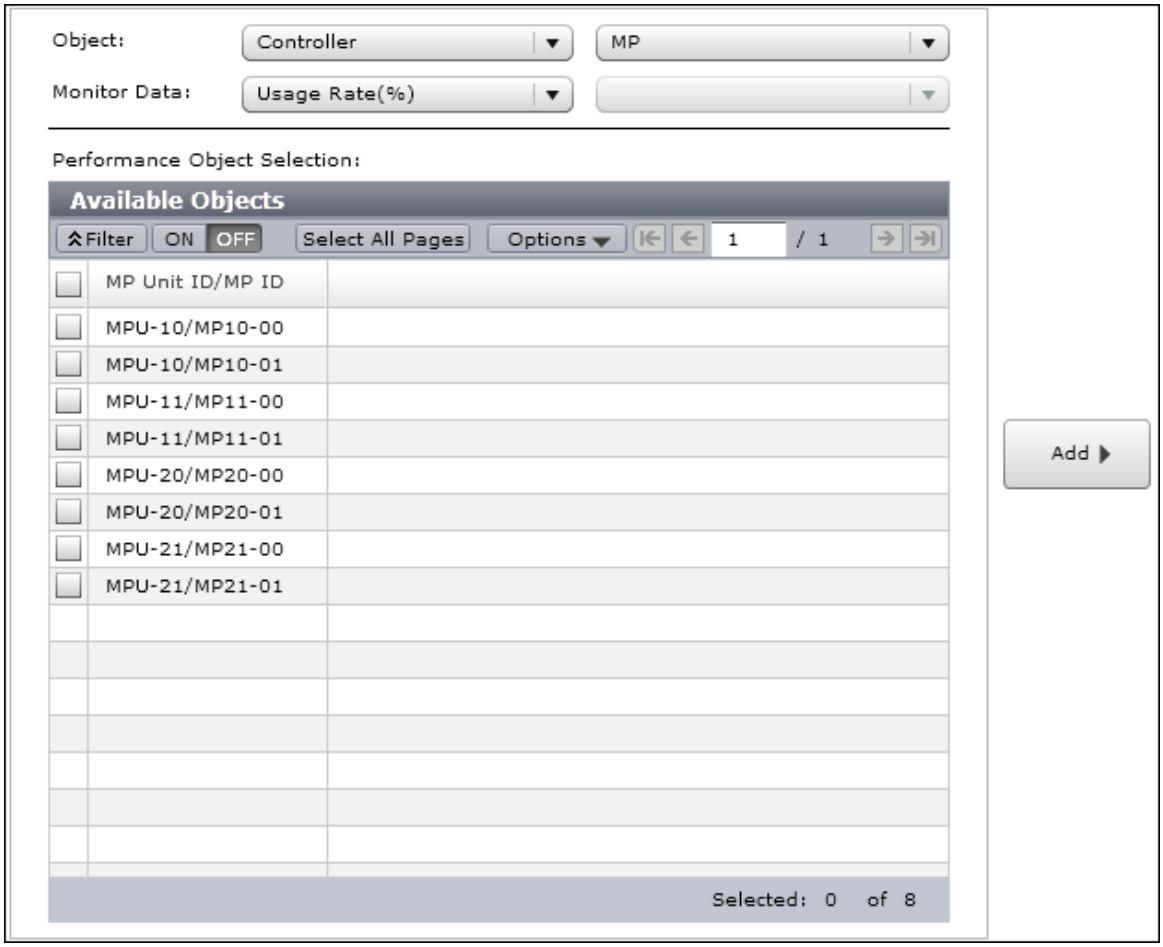
Graphs are displayed according to the value specified in the Sample Interval field in the Edit Monitoring Switch window. You can specify the sampling interval from 1 to 15 minutes. The interval for measuring or storing the information depends on the number of CUs to be monitored.

Time Range

Specify the storing period of statistics

- **Set Range**: Select this option to specify start and ending times to set a time range for which monitoring statistics will be collected.
- **Use Real Time**: Select this option to view statistics in real time mode, where statistics are updated at the value of the **Sample Interval** you specify on the **Edit Monitoring Switch** window. When this option is selected, you cannot change the date field in the Set Range option.

Performance Objects

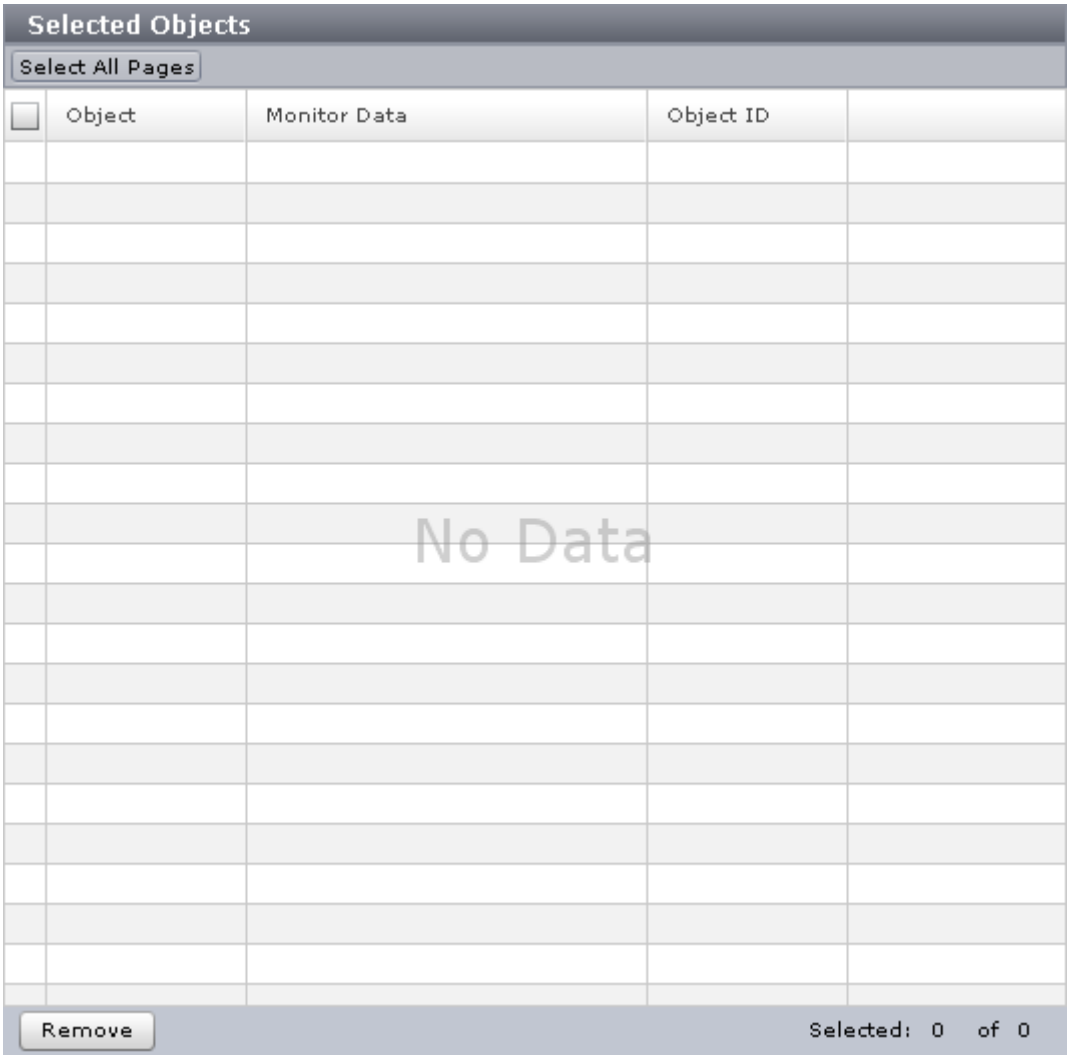


Item	Description
Object:	Types of objects to display on graphs. The list on the left specifies a large classification of monitoring objects. The list on the right specifies a small classification of monitoring objects.
Monitor Data:	Performance data specified in the Object field. The list on the left specifies a large classification of performance data. The list on the right specifies a small classification of performance data. For details, see Object and Monitor Data combinations on page A-10.
Performance Object Selection:	Objects that can be displayed in graphs. For details, see Available Objects table on page A-19.

Add

Adds objects to display the graph.

Selected Objects table



Item	Description
Object	Object types selected in the Performance Objects area.
Monitor Data	Monitor data types selected in the Performance Objects area.
Object ID	IDs of the selected objects.
Remove	Selected rows can be deleted from the table.

Object and Monitor Data combinations

The following table shows the possible Object and Monitor Data combinations that can be selected in the Performance Objects area of the Monitor Performance window.

- If Controller is selected on the left side of the Object field, the item on the right side of Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
MP	Usage Rate	%

- If Cache is selected on the left side of the Object field, items on the right side of the Object and Monitor Data is blank field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
None	Usage Rate	%
None	Write Pending Rate	%

- If Fibre Port is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If iSCSI Port is selected on the left side of the Object field, the item on right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If NAS Platform (User LU) or NAS Platform (System LU) is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If WWN is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
WWN	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Port	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if Base is selected on the right of the Object field, the following items can be selected.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate[1]	None	%
Drive Access Rate[1]	Read (Sequential)	%
	Read (Random)	
	Write (Sequential)	
	Write (Random)	
ShadowImage[1]	None	%

Notes:

1. Only information about internal volumes is displayed. Information about external volumes is not displayed.

- If Logical Device is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, the following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if UR is selected on the right side of the Object field, the following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- If Parity Group is selected on the left side of the Object field, the item on the right side of the Object field is blank. A parity group is displayed only when the CU number of each LDEV within the parity group is to be monitored.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate*	None	%
* Only information about internal volumes is displayed. Information about external volumes is not displayed.		

- If LUN is selected on the left side of the Object field and if Base is selected on the right of the Object field, the following items can be selected.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	

- If LUN is selected on the left side of the Object field and if TC or GAD is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If LUN is selected on the left side of the Object field and if UR is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- If Journal is selected on the left side of the Object field, UR is selected on the right side of the Object field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%

- If Entire Storage System is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Response Time	ms

- If Entire Storage System is selected on the left side of the Object field and if UR is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms

- If External Storage is selected on the left side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Logical Device	Data Trans.	Total	MB/s
		Read	
		Write	
	Response Time	Total	ms
		Read	
		Write	
Parity Group	Data Trans.	Total	MB/s
		Read	
		Write	
	Response Time	Total	ms

Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
		Read	
		Write	

Available Objects table

The items appearing in the Available Objects table depend on the objects selected in the Performance Objects fields.

Monitoring object	Item	Description
Fibre Port/Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
Fibre Port/Initiator		
iSCSI Port/Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
iSCSI Port/Initiator		
NAS Platform (User LU) / Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
NAS Platform (System LU) / Target		
WWN/WWN	HBA WWN	Worldwide name of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter. Only the WWNs that correspond to the ports assigned to the user are displayed.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.
WWN/Port	Port ID	Name of the port. Only the ports assigned to the user are displayed.
	HBA WWN	WWN of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.
Logical Device/Base	LDEV ID	ID of the volume, in the following format:

Monitoring object	Item	Description
		LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Logical Device/TC/GAD	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Logical Device/UR	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Parity Group	Parity Group ID	ID of the parity group. Only the parity groups assigned to the user are displayed.
LUN/Base	Port ID • Item: Type • Description: Type of port	Name of the port.
	Host Group Name/iSCSI Target Alias • Item: iSCSI target name • Description: Name of the iSCSI target	Name of the host group.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
LUN/TC/GAD	Port ID • Item: Type • Description: Type of port	Name of the port.
	Host Group Name/iSCSI Target Alias • Item: iSCSI target name	Name of the host group.

Monitoring object	Item	Description
	• Description: Name of the iSCSI target	
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
LUN/UR	Port ID • Item: Type • Description: Type of port	Name of the port.
	Host Group Name/iSCSI Target Alias • Item: iSCSI target name • Description: Name of the iSCSI target	Name of the host group.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
External Storage/Logical Device	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
External Storage/Parity Group	Parity Group ID	Parity group ID of the external volume. Only the parity groups assigned to the user are displayed.
Controller/MP	MP unit ID/MP ID	ID of an MP unit and processor.
Cache	MP unit ID	ID of an MP unit.
	Cache	Name of the cache.
Entire Storage System/ TC/GAD	Object	Item for entire storage system.
Entire Storage System/ UR	Object	Item for entire storage system.
Journal/UR	Journal ID	ID of the journal.

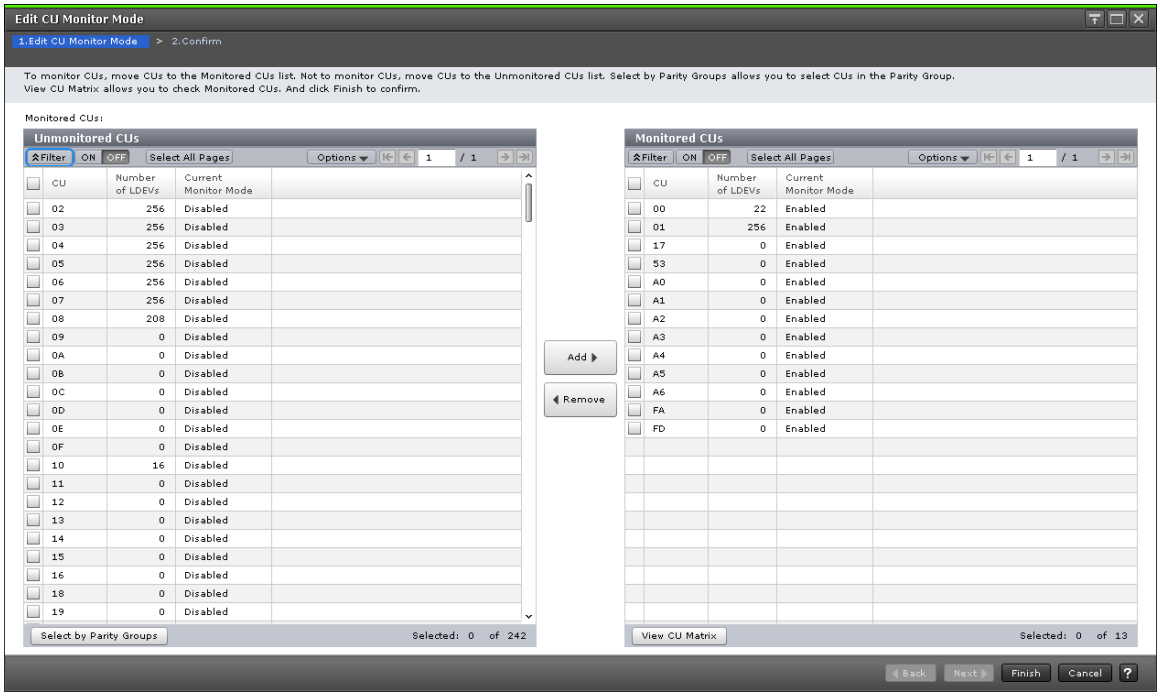
Edit CU Monitor Mode wizard

Related topics

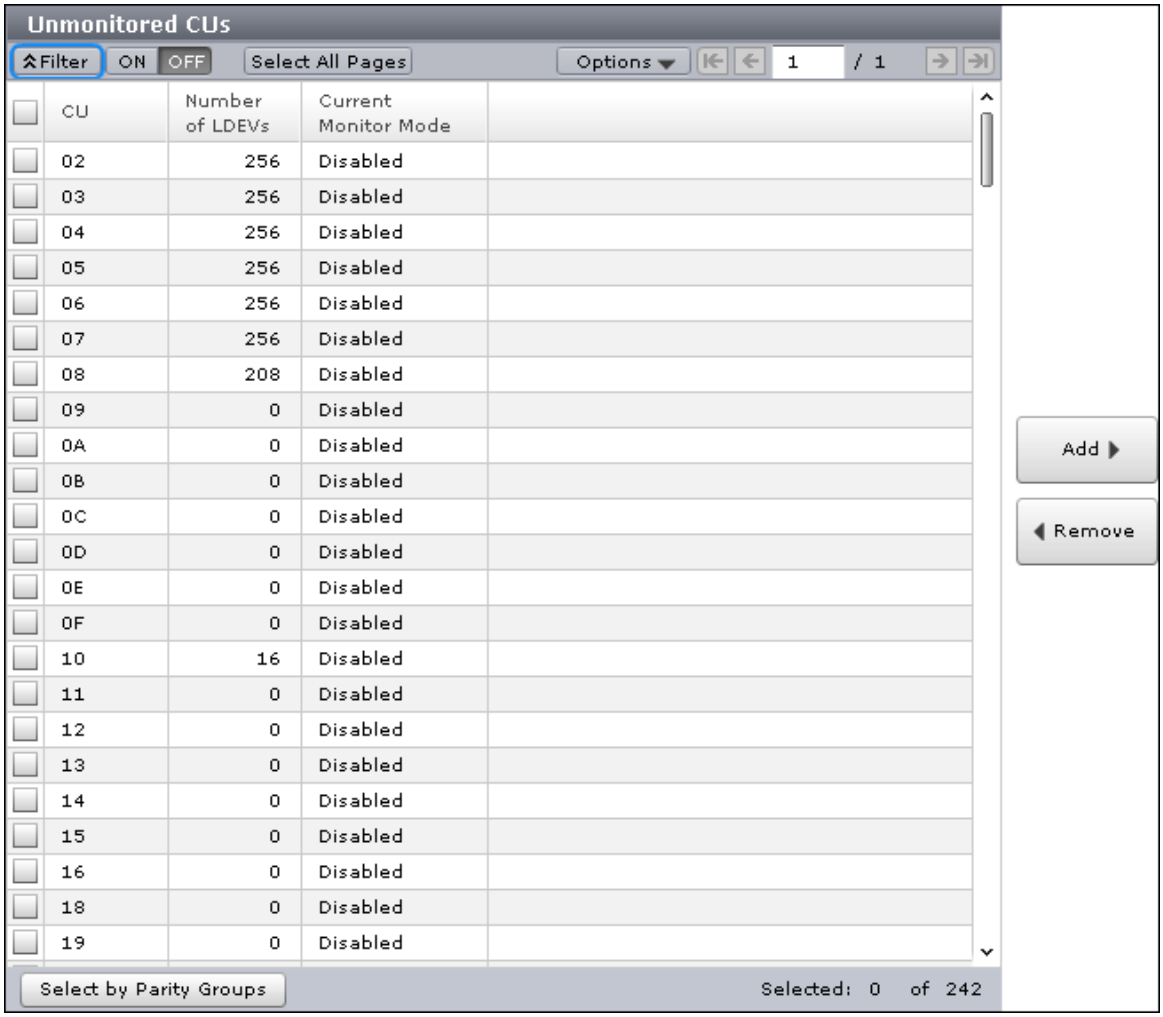
- Adding and removing CUs to monitor on page 2-14
- Edit CU Monitor Mode window on page A-22
- Confirm window for Edit CU Monitor Mode on page A-25

Edit CU Monitor Mode window

This window contains information about all CUs in the storage system, in table format, indicating which are monitored and which are unmonitored. Use this window to add and remove CUs as monitoring target objects. This window only displays for the VSP G800 and VSP F800 models.



Unmonitored CUs table



A table of the CUs that are going to be unmonitored.

Item	Description
CU	CUs not to be monitored.
Number of LDEVs	Number of LDEVs in the CU not to be monitored.
Current Monitor Mode	**Enabled**: The CU is a monitoring target object. **Disabled**: The CU is not a monitoring target object.
Select by Parity Groups	Click to open the Select by Parity Group window.

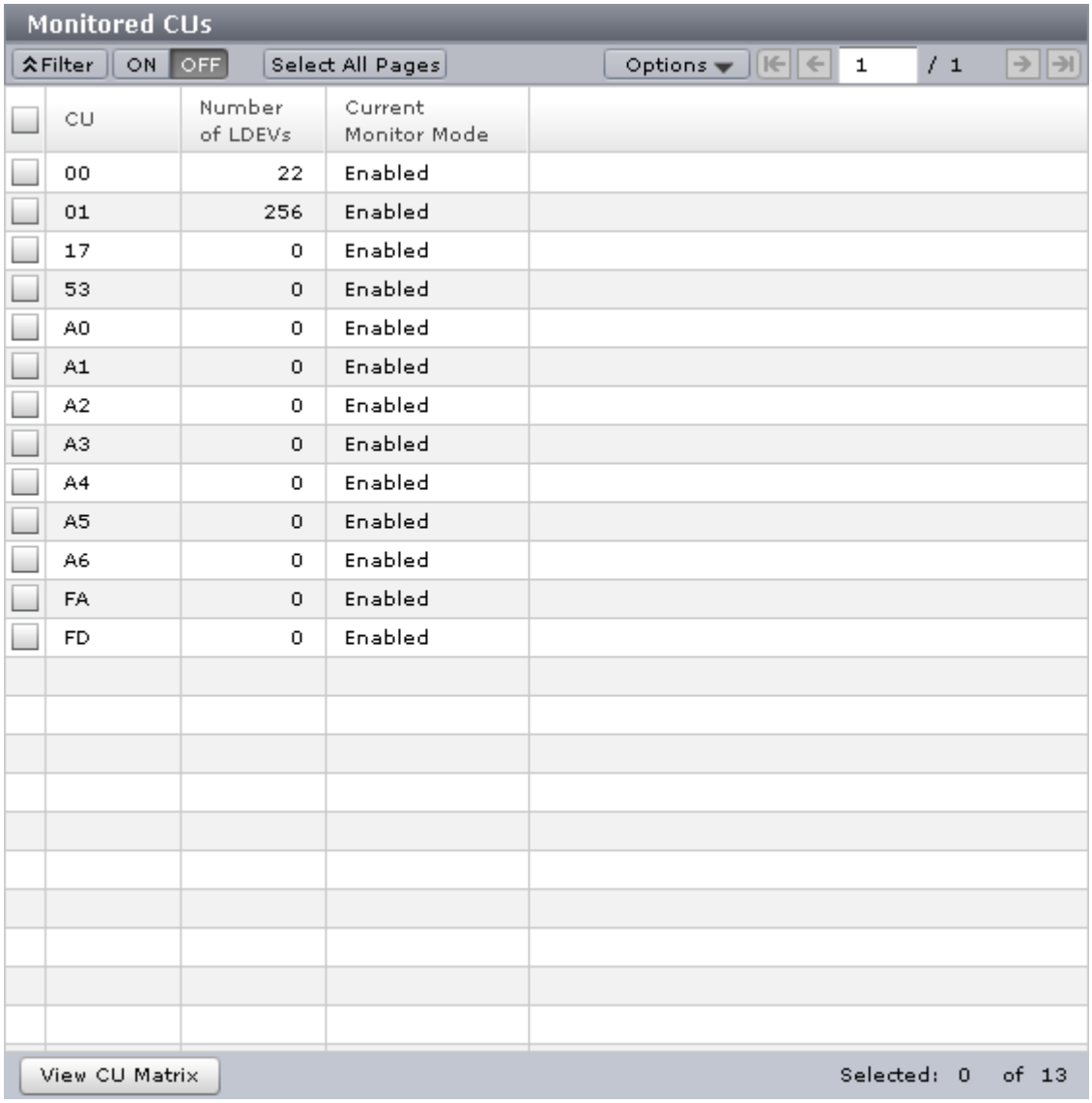
Add

Click to add CUs to Monitored CUs table.

Remove

Click to remove CUs from Monitored CUs table.

Monitored CUs table

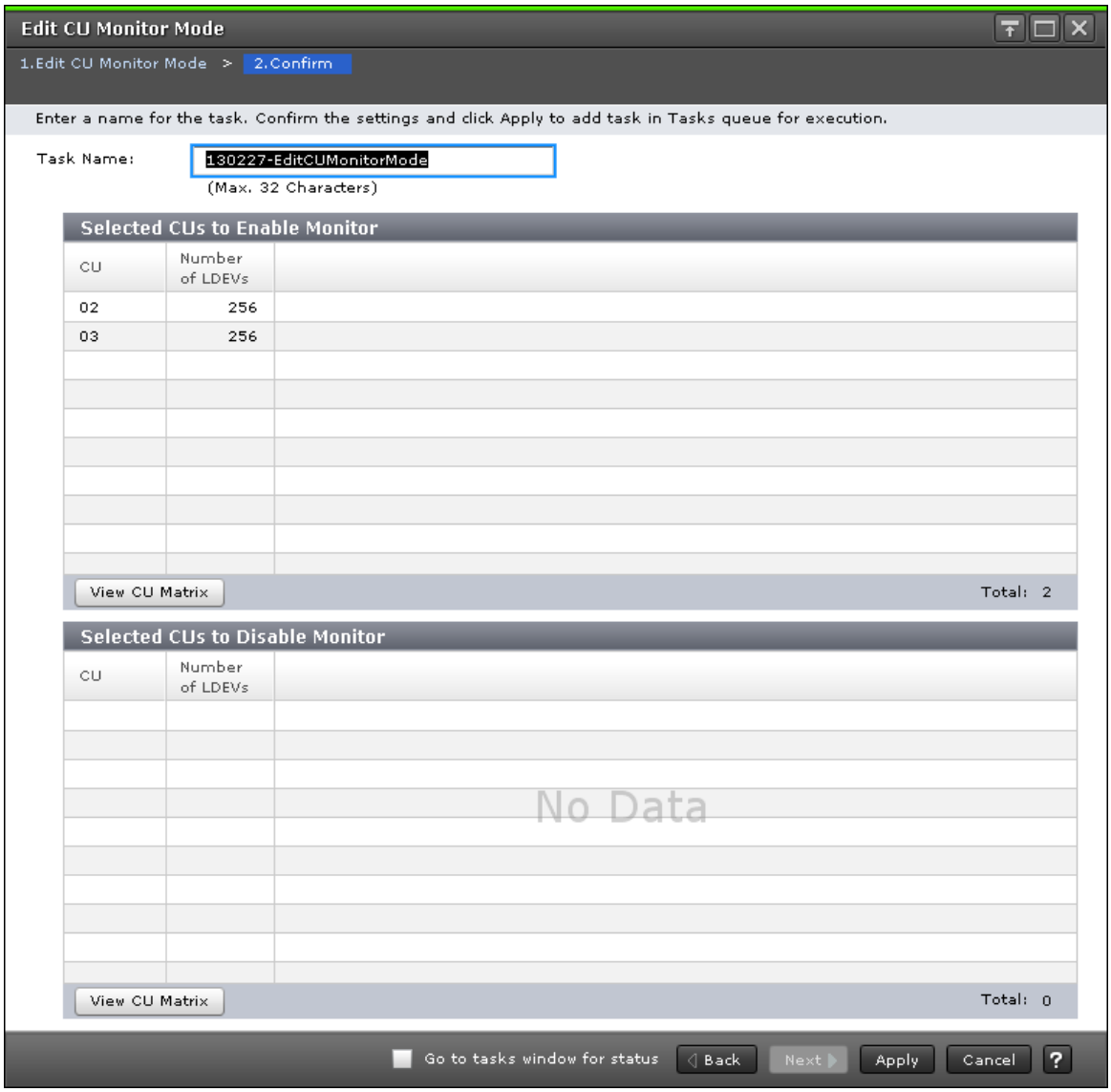


A table of the CUs that are going to be monitored.

Item	Description
CU	CUs to be monitored.
Number of LDEVs	Number of LDEVs in the CU to be monitored.
Current Monitor Mode	**Enabled**: The CU is a monitoring target object. **Disabled**: The CU is not a monitoring target object.
View CU Matrix	Click to open the View CU Matrix window.

Confirm window for Edit CU Monitor Mode

Use this window to confirm the edited CU monitoring mode information and to assign a task name to the editing task. This window only displays for the VSP G800 and VSP F800 models.



Selected CUs to Enable Monitor table

Confirm the information about the CUs to be monitored.

Item	Description
CU	CUs to be monitored.
Number of LDEVs	Number of LDEVs in the CU to be monitored.
View CU Matrix	Click to open the View CU Matrix window.

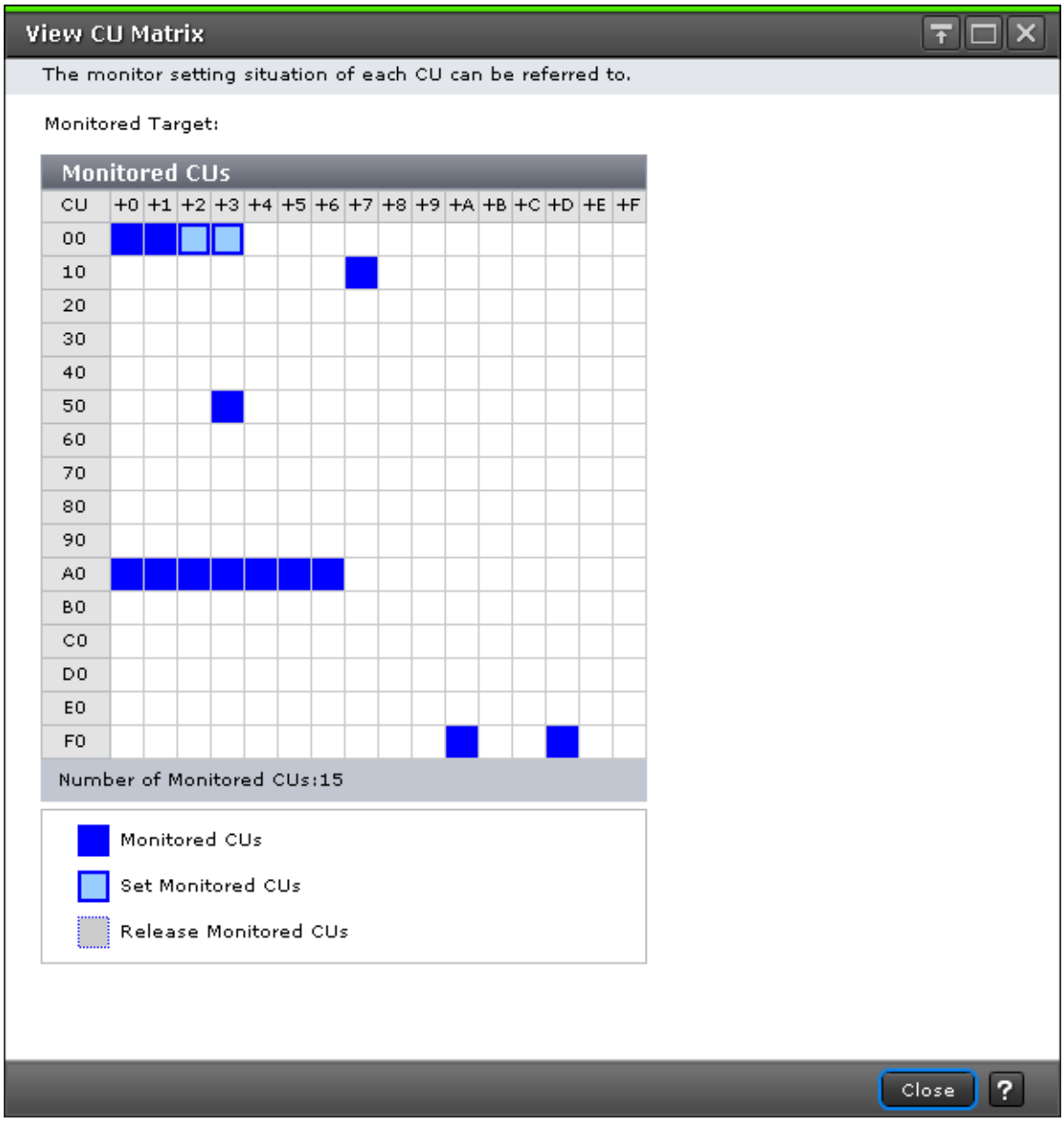
Selected CUs to Disable Monitor table

Information about the CUs not to be monitored.

Item	Description
CU	CUs not to be monitored.
Number of LDEVs	Number of LDEVs in the CU not to be monitored.
View CU Matrix	Click to open the View CU Matrix window. • CU which is being monitored • CU which is scheduled to be monitored • CU which is scheduled to be released from monitoring.

View CU Matrix window

Use this window to view a matrix of the monitoring status of all CUs in one LDKC. The cell markers indicate the monitoring status of the individual CUs. This window only displays for the VSP G800 and VSP F800 models.



Monitored CUs table

Item	Description
Monitored CUs	The table consists of cells representing CUs. One cell corresponds to one CU. Each row consists of 16 cells (CUs). A set of 16 rows represents CUs for one LDKC. The table header row shows the last digit of each CU number in the form of *+n* (where *n* is an integer from 0 to 9, or a letter from A to F).
Number of Monitored CUs:	Total count of monitored CUs.
Monitored CUs	Cell marker indicating that a CU is being monitored.

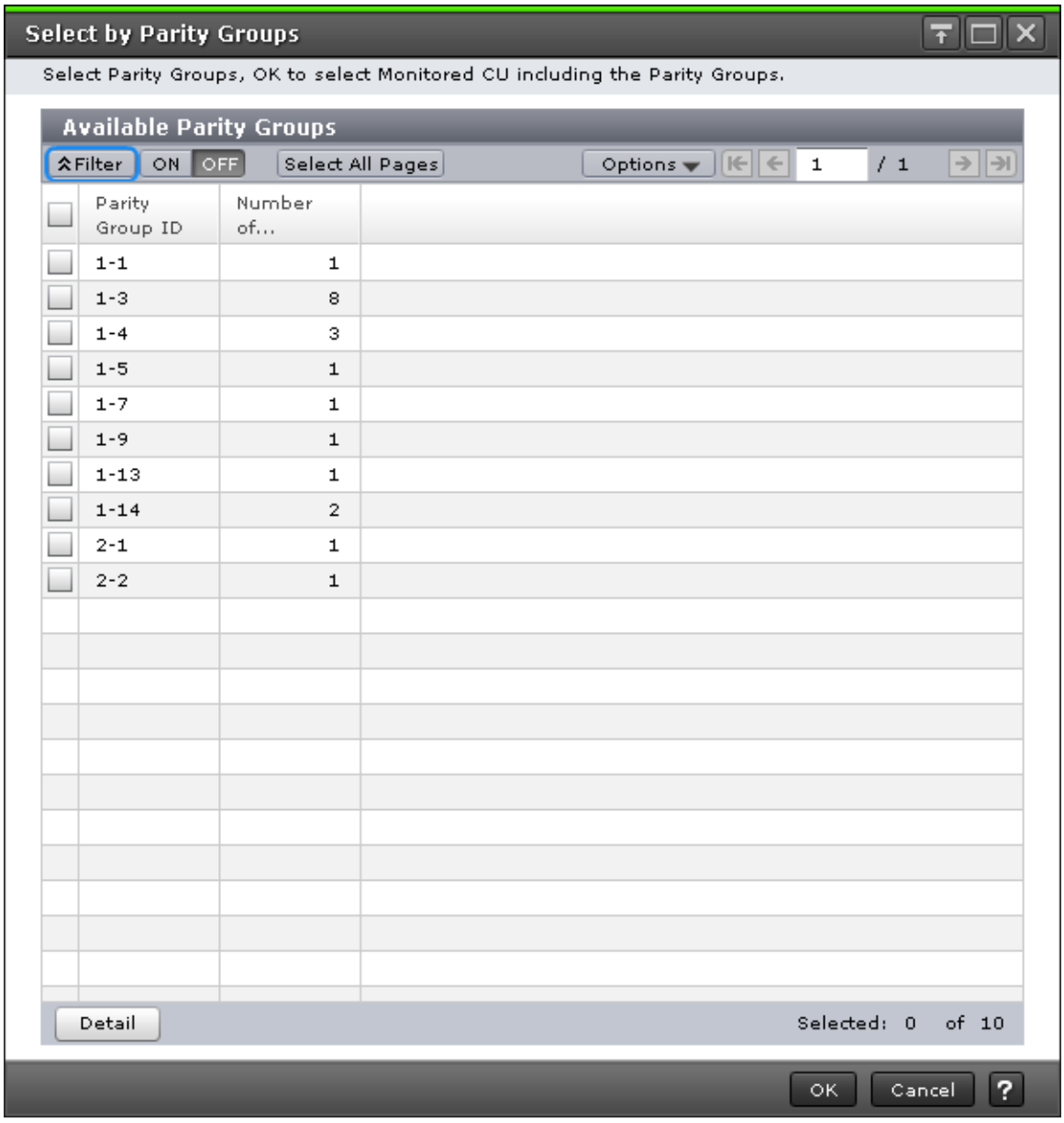
Item	Description
 Set Monitored CUs	Cell marker indicating that the CU is scheduled to be monitored.
 Release Monitored CUs	Cell marker indicating that the CU is scheduled to be released from monitoring.

Related topics

- Confirming the status of CUs to monitor on page 2-16

Select by Parity Groups window

When you select a parity group, all the CUs included in the parity group display in the **Edit CU Monitor Mode** window. This window only displays for the VSP G800 and VSP F800 models.

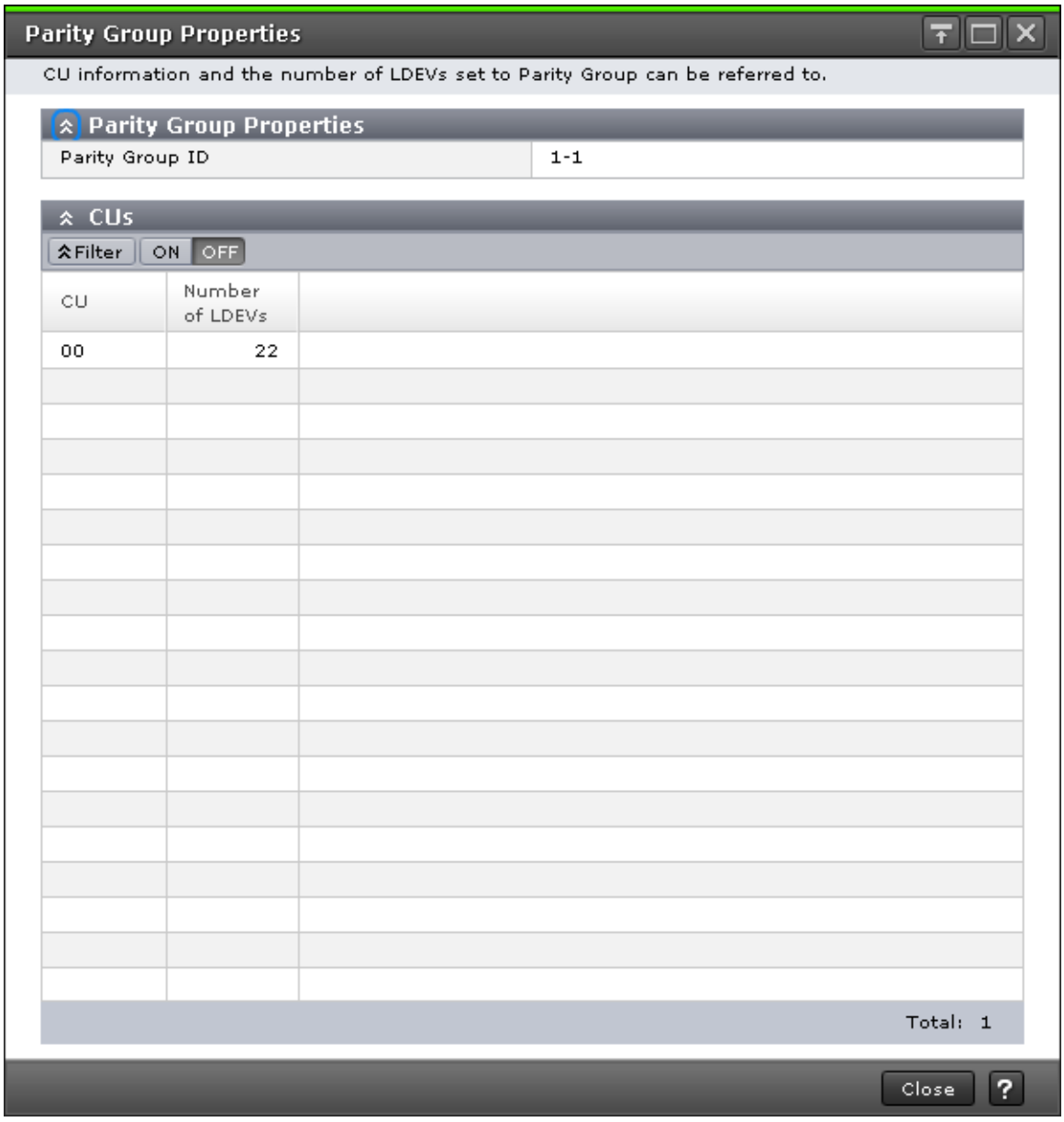


Available Parity Groups table

Item	Description
Parity Group ID	ID of the parity group.
Number of CUs	Number of CUs included in the parity group.
Detail	Click to display the Parity Group Properties window.

Parity Group Properties window

Use this window to view information about the CUs in the parity group selected in the previous window. This window only displays for the VSP G800 and VSP F800 models.



Parity Group Properties table

Item	Description
Parity Group ID	Identification number of the parity group.

CUs table

Item	Description
CU	Identification number of the CU in this parity group.
Number of LDEVs	Number of LDEVs included in the individual CUs.

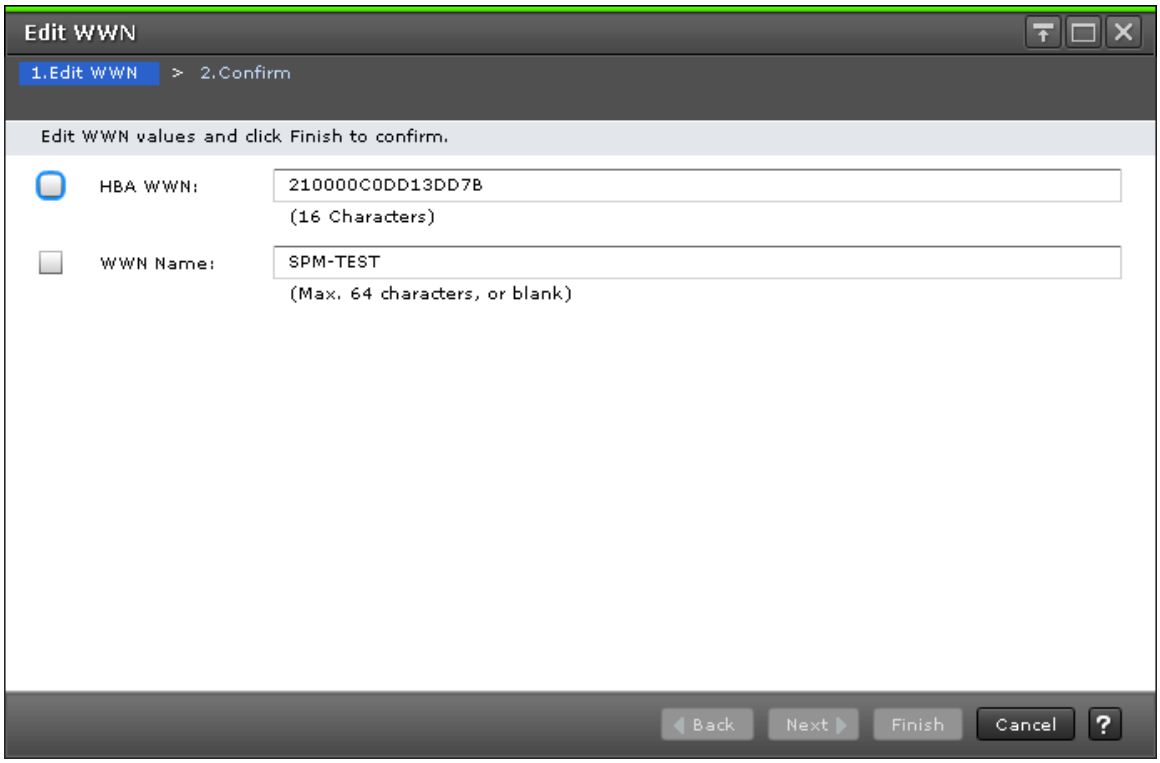
Edit WWN wizard

Related topics

- Editing the WWN nickname on page 2-11
- Edit WWN window on page A-31
- Confirm window for Edit WWN on page A-32

Edit WWN window

Use this window to edit the HBA WWN and WWN name of the WWN to be monitored.

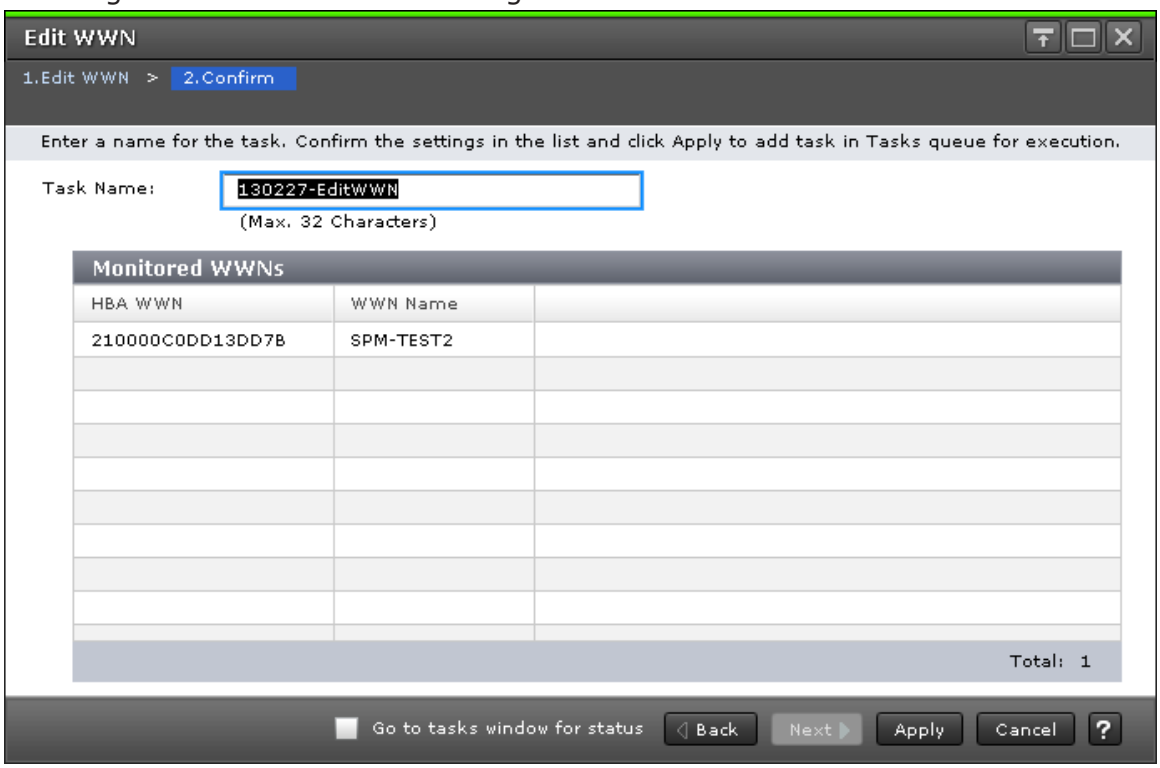


Setting fields

Item	Description
HBA WWN	Edit the worldwide name of the host bus adapter. WWNs are 16-digit hexadecimal numbers used to identify host bus adapters.
WWN Name	Edit a WWN name. Use up to 64 alphanumeric characters and some symbols for a WWN name.

Confirm window for Edit WWN

Use this window to confirm the edited HBA WWN and WWN Name and to assign a task name to the editing task.



Monitored WWNs table

Confirm the information about the WWNs to be monitored.

Item	Description
HBA WWN	HBA WWNs to be applied.
WWN Name	WWN Names to be applied.

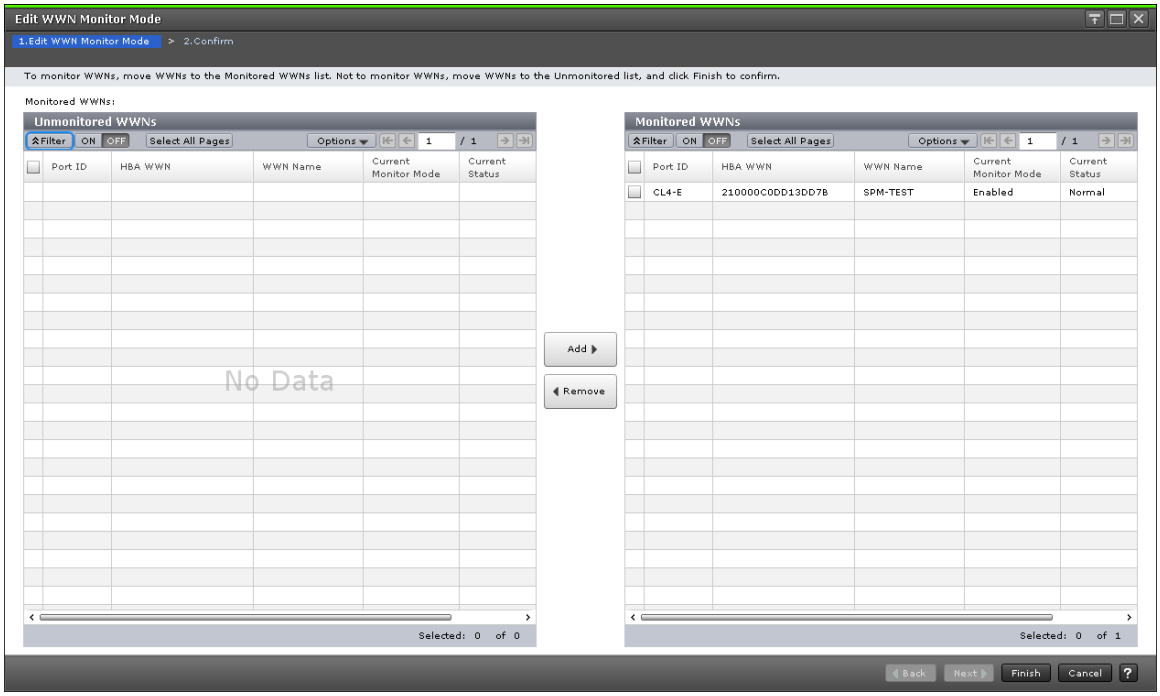
Edit WWN Monitor Mode wizard

Related topics

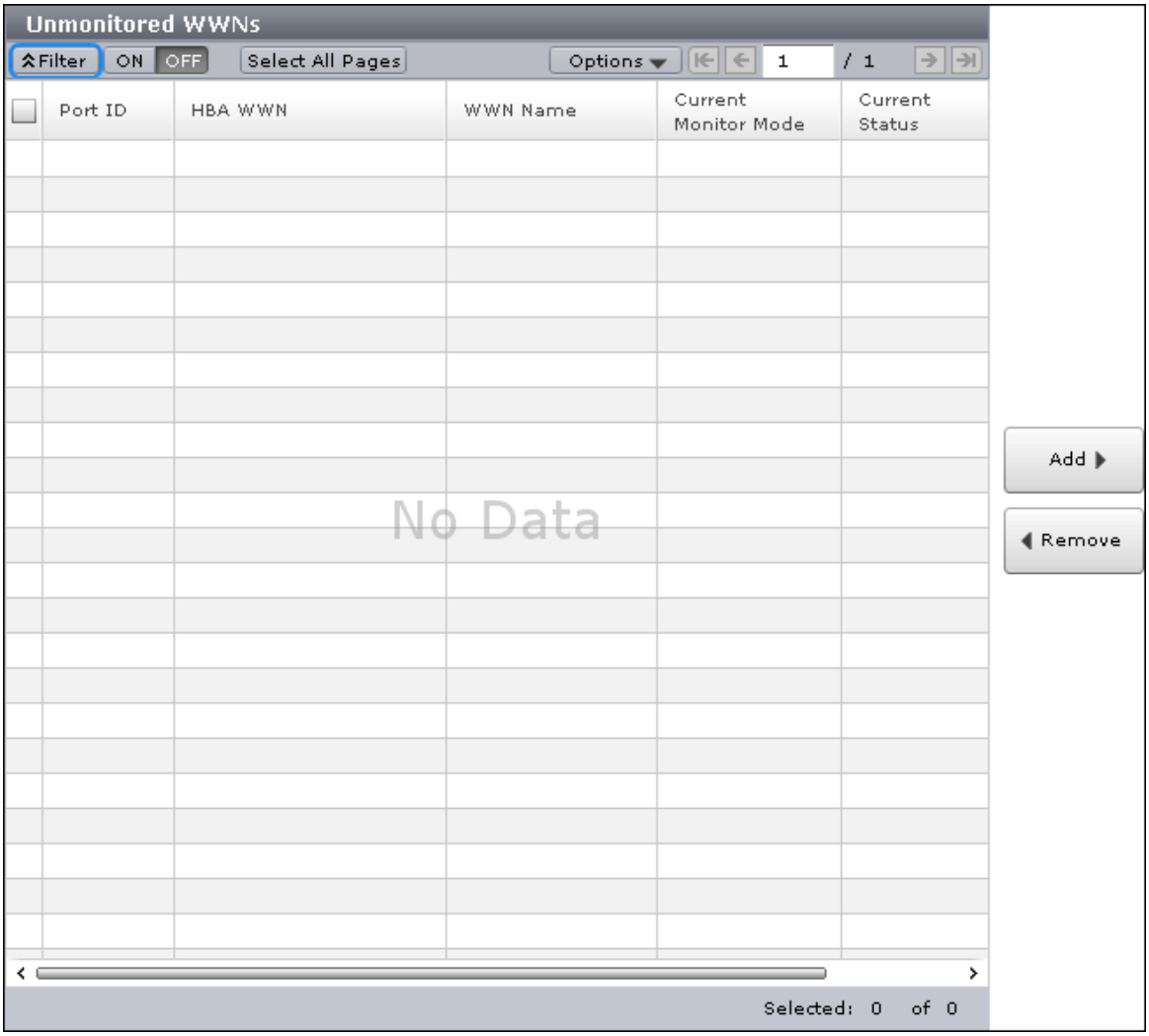
- Adding new WWNs to monitor on page 2-8
- Edit WWN Monitor Mode window on page A-33
- Confirm window for Edit WWN Monitor Mode on page A-36

Edit WWN Monitor Mode window

Use this window to specify WWNs to be monitored or not to be monitored.



Unmonitored WWNs table



A table of WWNs that are going to be unmonitored.

Item	Description
Port ID	Name of the port.
HBA WWN	Worldwide name of the host bus adapter
WWN Name	A WWN name is up to 64 alphanumeric characters and some signs.
Current Monitor Mode	Monitoring modes indicate whether WWNs are monitoring target objects or not. **Enabled**: The WWN is the monitoring target object. **Disabled**: The WWN is not the monitoring target object.
Current Status	Status of the port connected with WWN. **Normal**: All WWNs connected with the port are monitoring target objects. **Non-Integrity**: The WWN is not monitored for the corresponding port, but monitored for other ports.

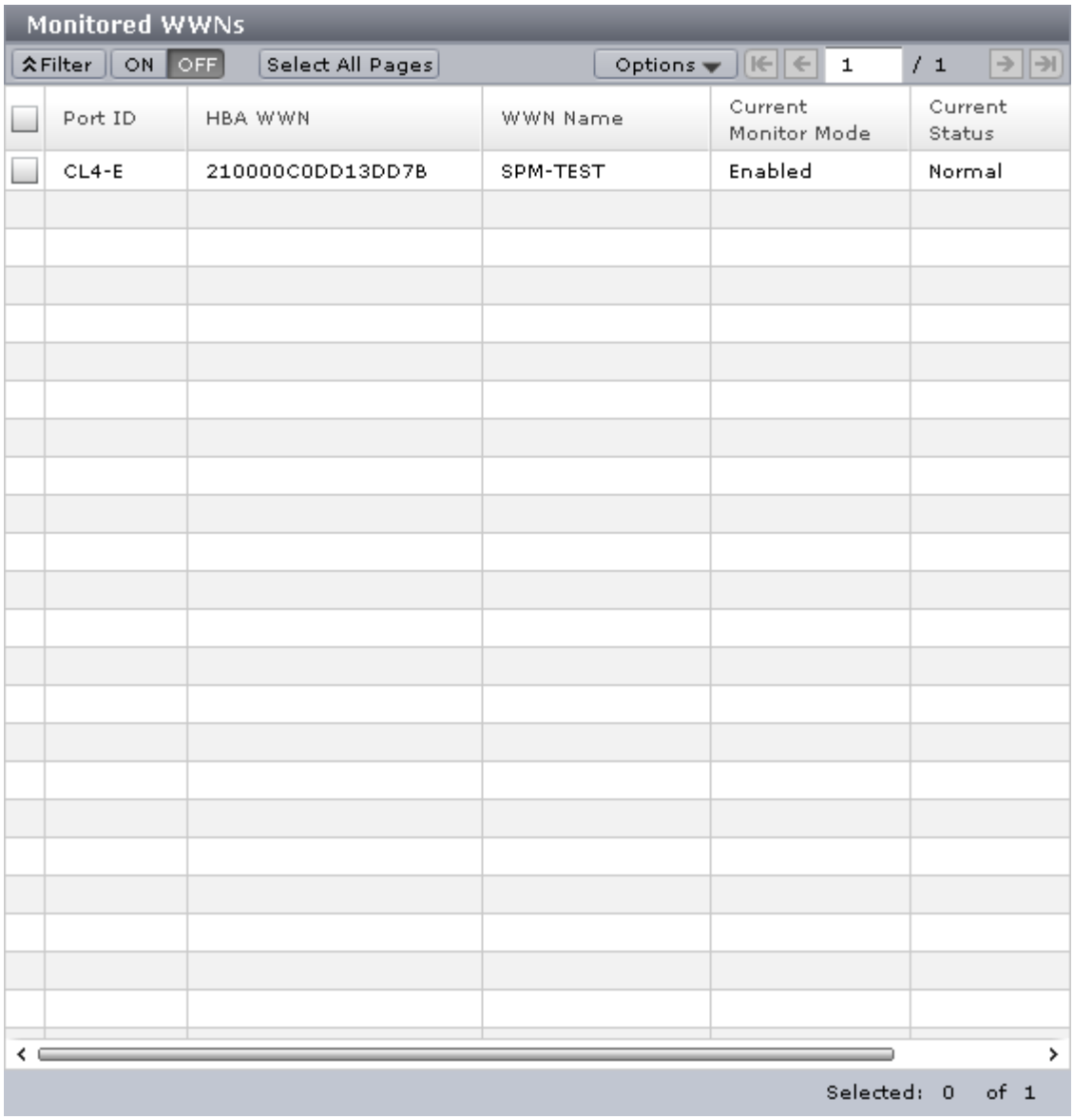
Add

Click to add WWNs to the Monitored WWNs table.

Remove

Click to remove WWNs from the Monitored WWNs table.

Monitored WWNs table



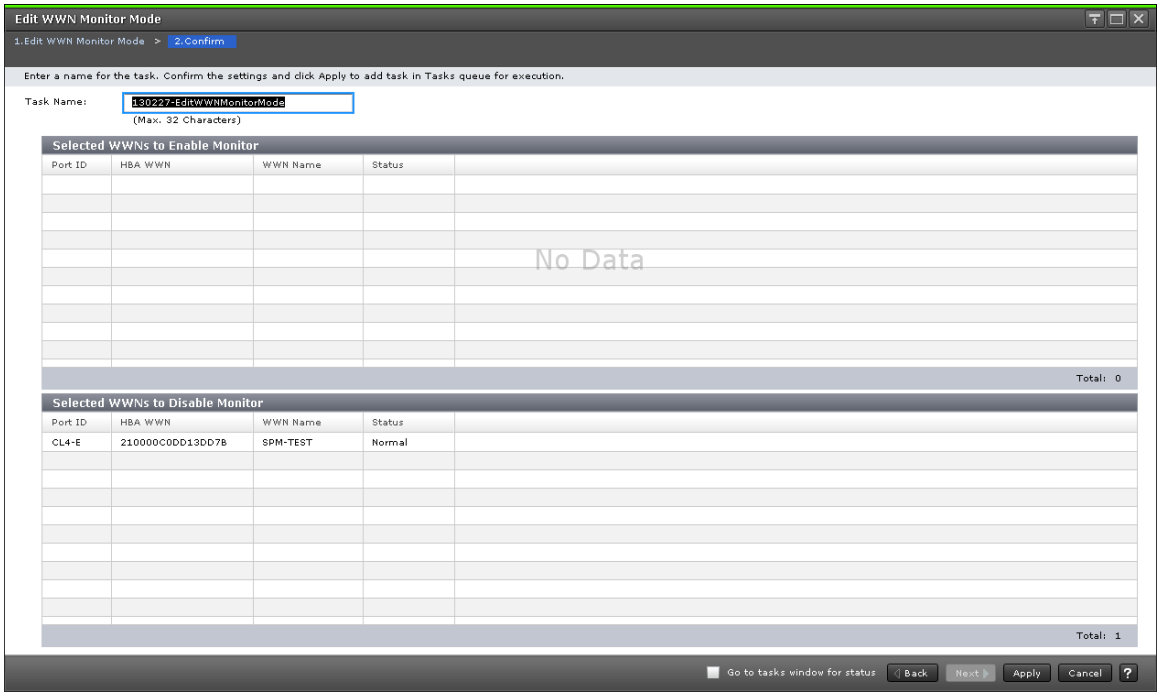
A table of WWNs that are going to be unmonitored.

Item	Description
Port ID	Name of the port.
HBA WWN	Worldwide name of the host bus adapter.

Item	Description
WWN Name	A WWN name is up to 64 alphanumeric characters and some signs.
Current Monitor Mode	Monitoring modes indicate whether WWNs are monitoring target objects or not. **Enabled**: The WWN is the monitoring target object. **Disabled**: The WWN is not the monitoring target object.
Current Status	Status of the port connected with WWN. **Normal**: All WWNs connected with the port are monitoring target objects. **Non-Integrity**: The WWN is not monitored for the corresponding port, but monitored for other ports.

Confirm window for Edit WWN Monitor Mode

Use this window to confirm the edited monitoring information and to assign a task name to the editing task.



Selected WWNs to Enable Monitor table

Confirm the information about the WWNs to be monitored.

Item	Description
Port ID	Port name to be added and monitored.
HBA WWN	Worldwide name of the host bus adapter to be added and monitored.

Item	Description
WWN Name	Nickname of WWN to be added and monitored. The name consists of up to 64 alphanumeric characters and some signs.
Status	Status of a WWN to be added and monitored. **Normal**: WWN connected with a port is the monitoring target object. **Non-Integrity**: The WWN is not monitored for the corresponding port, but monitored for other ports.

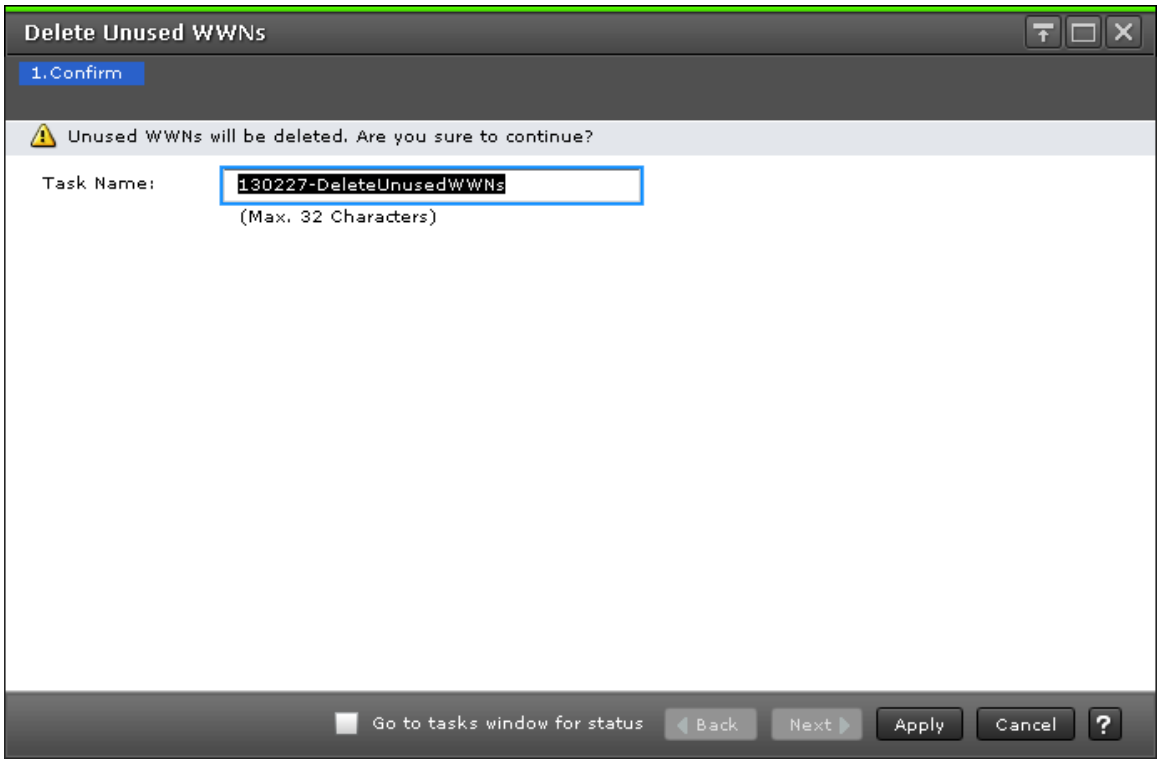
Selected WWNs to Disable Monitor table

Confirm the information about the WWNs not to be monitored.

Item	Description
Port ID	Port name not to be monitored.
HBA WWN	Worldwide name of the host bus adapter not to be monitored.
WWN Name	Nickname of WWN not to be monitored. The name consists of up to 64 alphanumeric characters and some signs.
Status	Status of a WWN not to be monitored. **Normal**: The WWN connected with a port is the monitoring target object. **Non-Integrity**: The WWN is not monitored for the corresponding port, but monitored for other ports.

Delete Unused WWNs window

Use this window to name the task to delete unused WWNs.



Item	Description
Task Name	Specify the task name. You can enter up to 32 alphanumeric characters and symbols in all, except for \ / : , ; * ? " < > |. The characters are case-sensitive. "date-window name" is entered as a default.

Related topics

- Removing WWNs to monitor on page 2-10

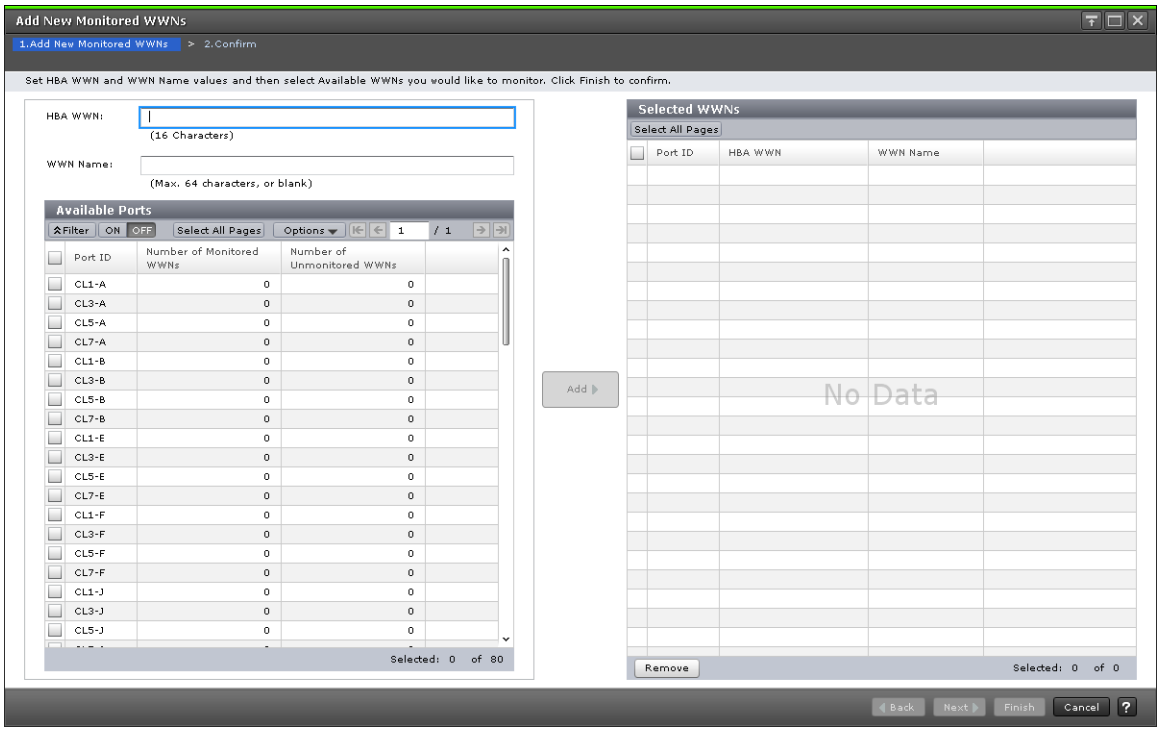
Add New Monitored WWNs wizard

Related topics

- Adding WWNs to ports on page 2-10
- Add New Monitored WWNs window on page A-38
- Confirm window for Add New Monitored WWNs on page A-42

Add New Monitored WWNs window

Use this window to add new WWNs to be monitored.



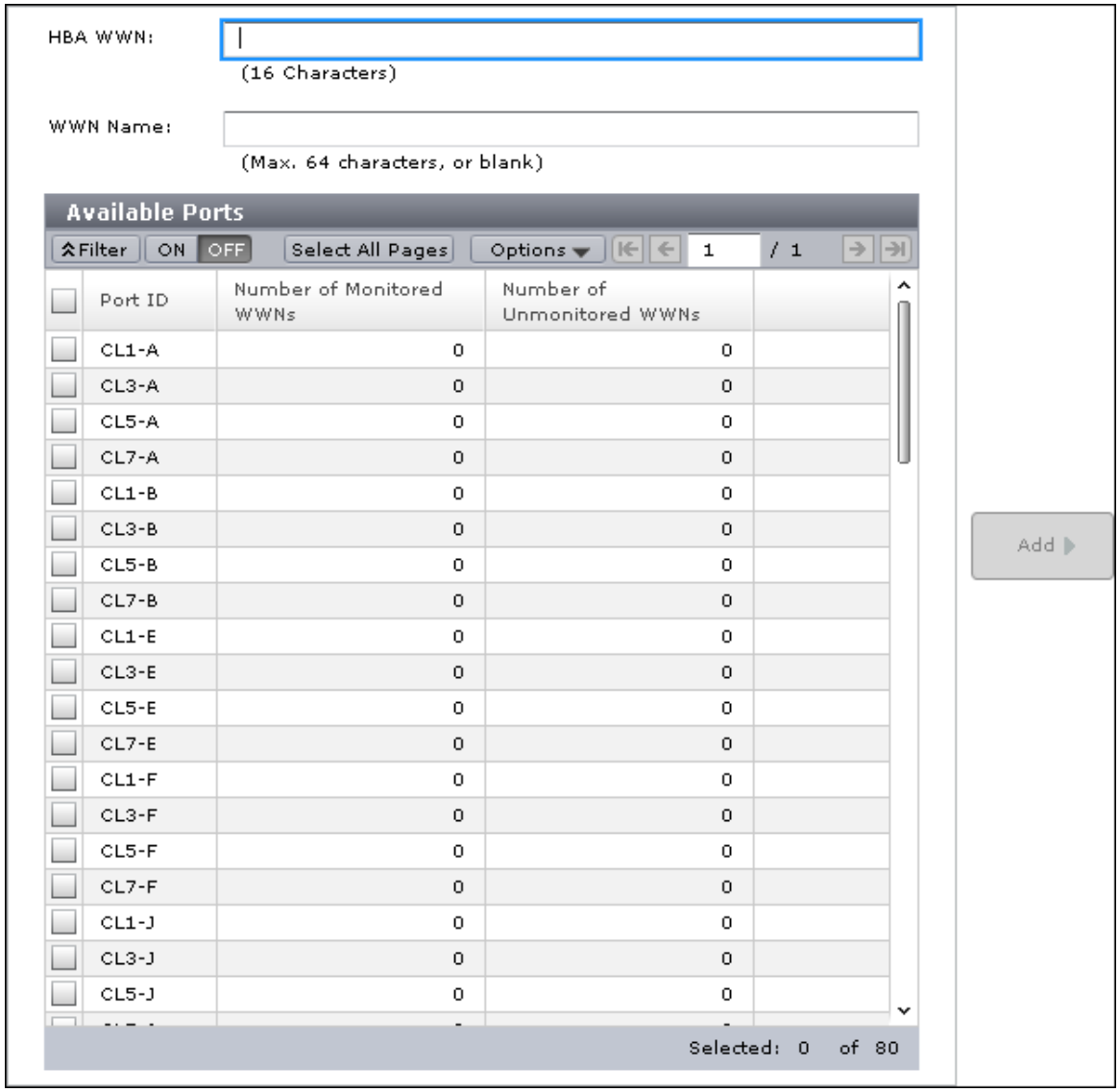
HBA WWN

Specify a worldwide name of the host bus adapter. WWNs are 16-digit hexadecimal numbers used to identify host bus adapters.

WWN Name

Specify a worldwide name using up to 64 characters for a WWN name.

Available Ports table

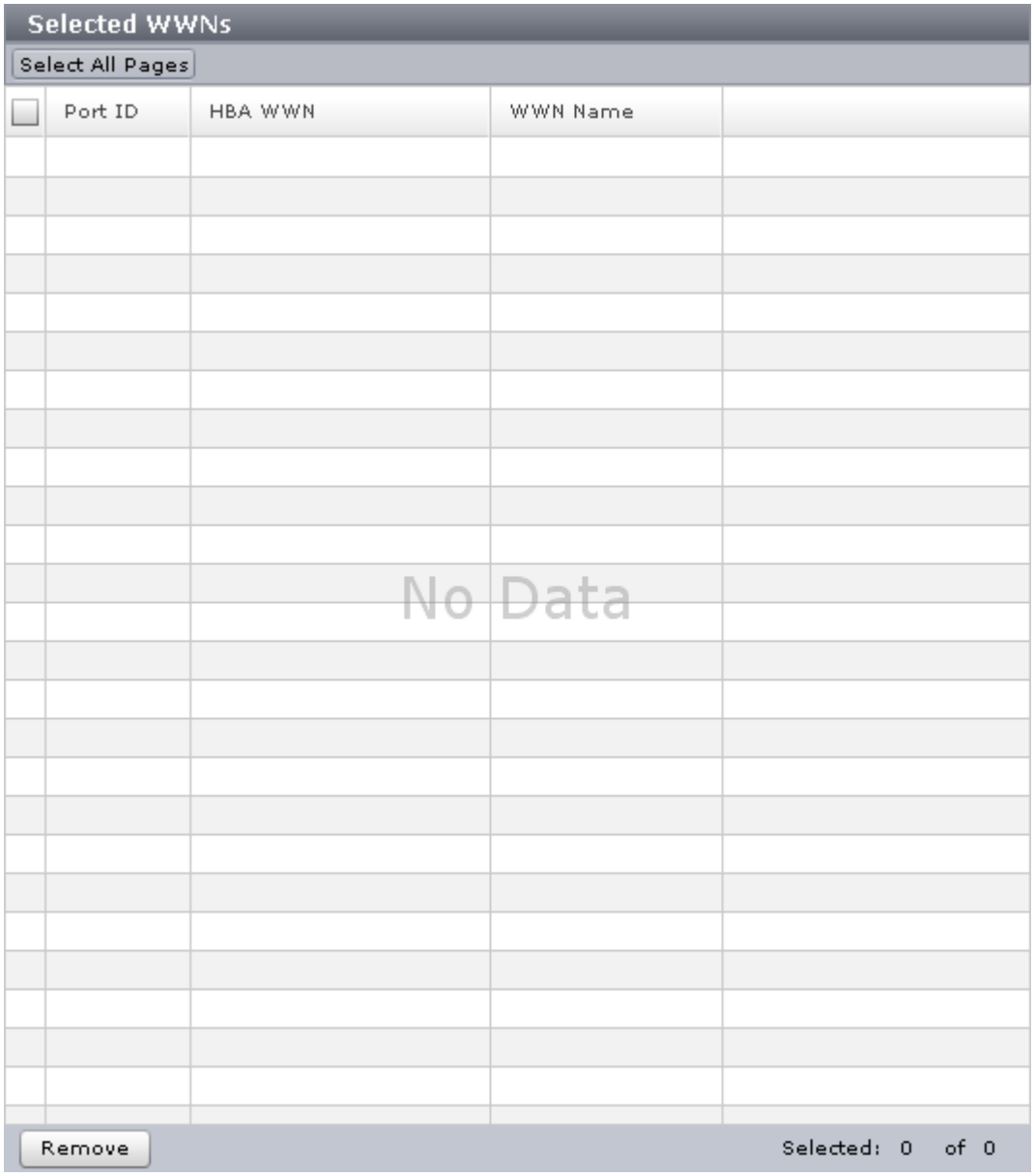


Item	Description
Port ID	Name of the port available in the storage system.
Number of Monitored WWNs	Number of monitored WWNs in the port.
Number of Unmonitored WWNs	Number of unmonitored WWNs in the port.

Add

Select ports, then click **Add** to add the combinations of HBA WWN and the selected ports into the Selected WWNs table.

Selected WWNs table

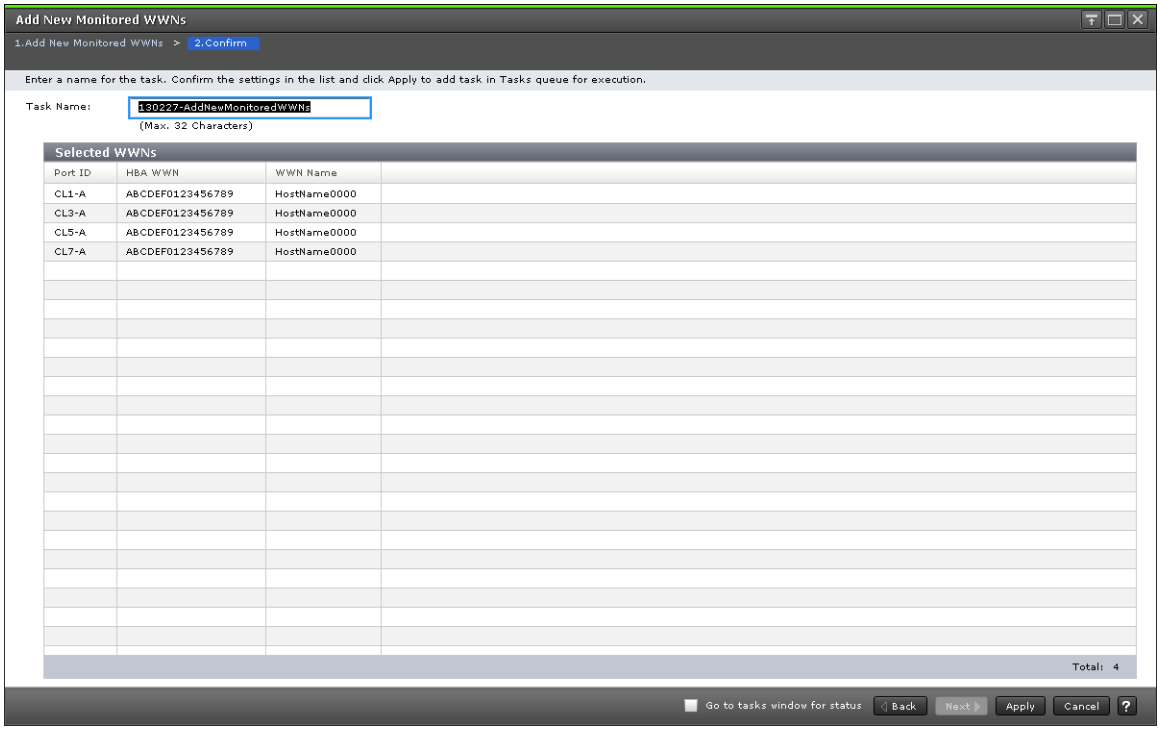


A list of WWNs to be monitored.

Item	Description
Port ID	Name of the port selected for monitoring.
HBA WWN	WWN selected for monitoring.
WWN Name	WWN name is up to 64 alphanumeric characters and some signs.
Remove	Select the row to be deleted. Click to remove a row from the table.

Confirm window for Add New Monitored WWNs

Use this window to confirm the new monitoring information and to assign a task name to the editing task.



Selected WWNs table

Confirm the list of combinations of ports and WWNs added as monitoring target objects.

Item	Description
Port ID	Name of the port selected for monitoring.
HBA WWN	WWN selected for monitoring.
WWN Name	WWN name is up to 64 alphanumeric characters and some signs.

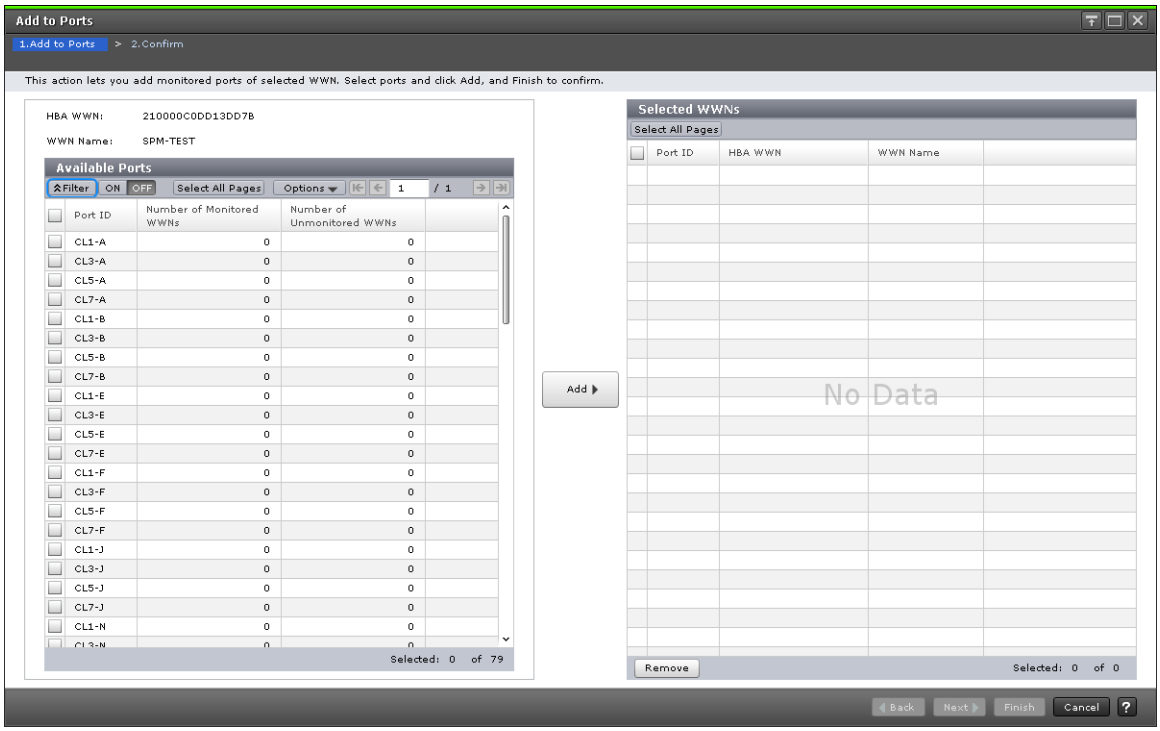
Add to Ports wizard

Related topics

- Connecting WWNs to ports on page 2-12
- Add to Ports window on page A-43
- Confirm window for Add to Ports on page A-46

Add to Ports window

Use this window to add a WWN to the port.



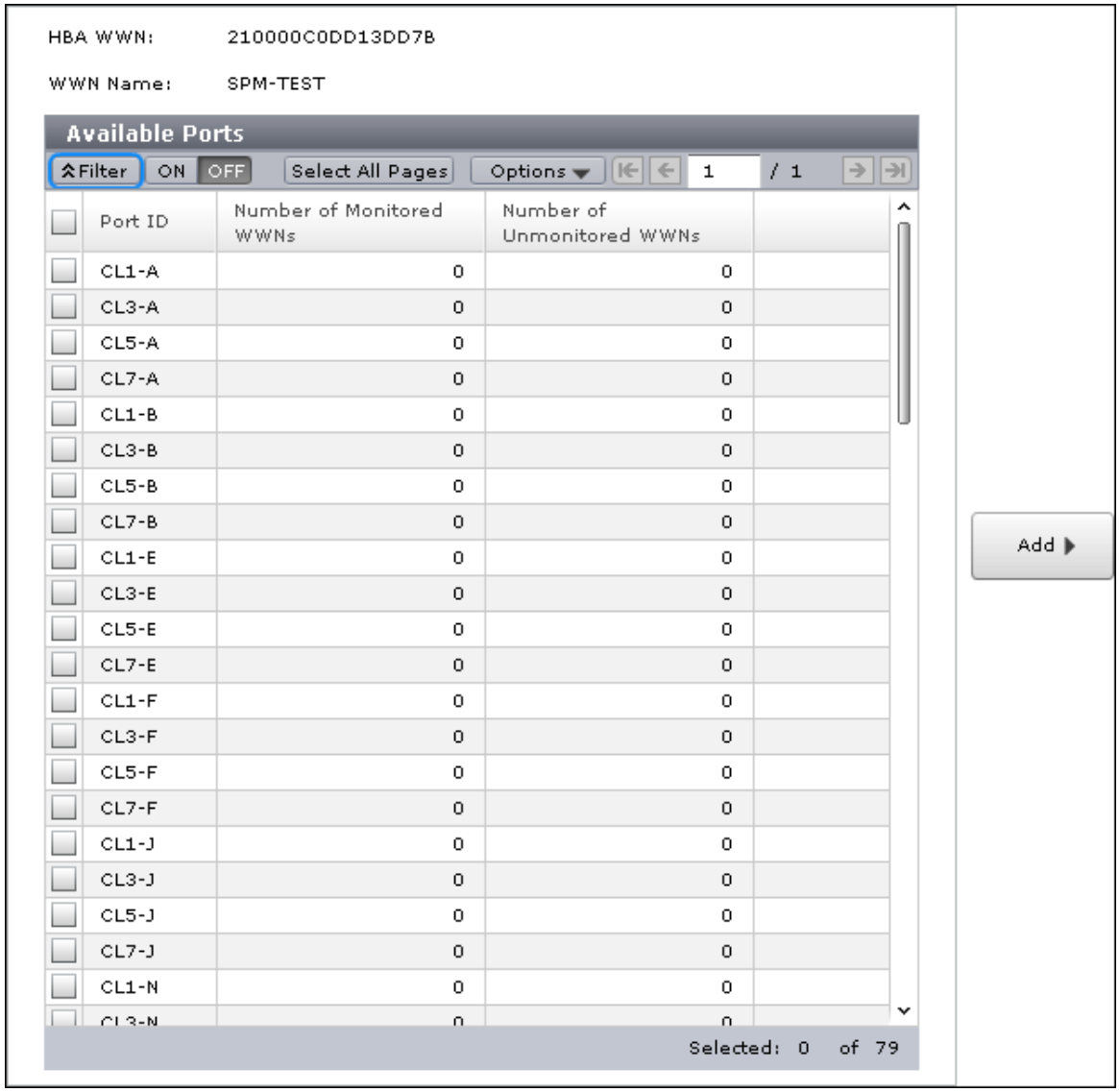
HBA WWN

Specify a worldwide name of the host bus adapter. WWNs are 16-digit hexadecimal numbers used to identify host bus adapters.

WWN Name

Specify a worldwide name using up to 64 characters for a WWN name.

Available Ports table



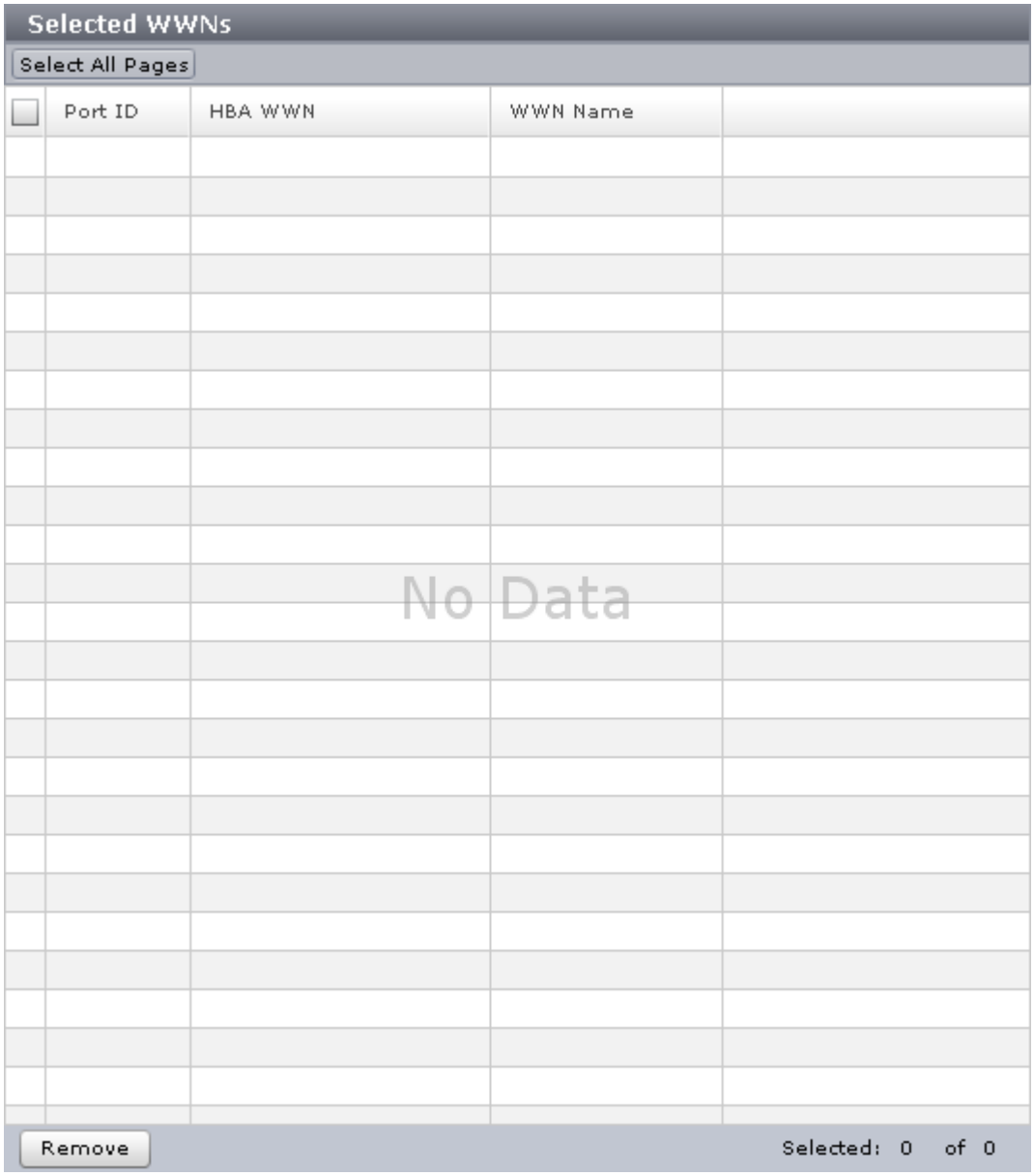
A list of available ports in the storage system.

Item	Description
Port ID	Name of the port available in the storage system.
Number of Monitored WWNs	Number of monitored WWNs in the port.
Number of Unmonitored WWNs	Number of unmonitored WWNs in the port.

Add

Select ports, then click Add to add the combinations of HBA WWN and the selected ports into the Selected WWNs table.

Selected WWNs table

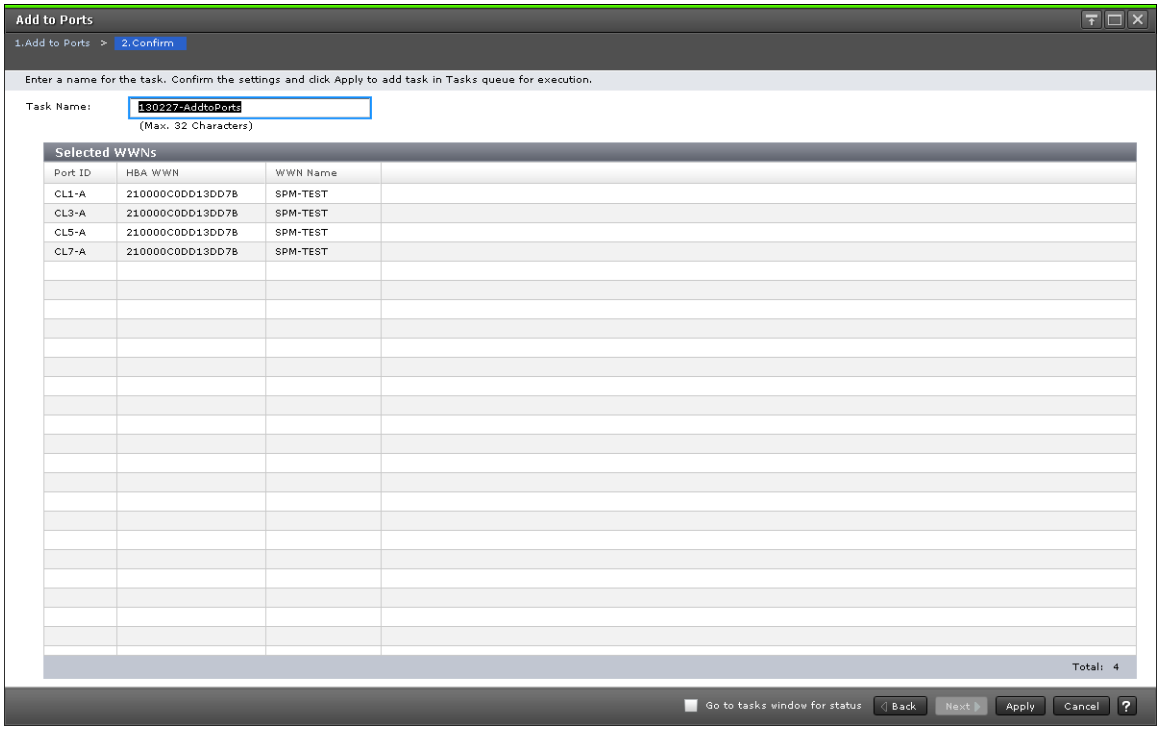


A list of WWNs to be monitored.

Item	Description
Port ID	Name of the port selected for monitoring
HBA WWN	The WWN selected for monitoring.
WWN Name	The WWN name is up to 64 alphanumeric characters and some signs.
Remove	Select the row to be deleted. Click to remove a row from the table.

Confirm window for Add to Ports

Use this window to confirm new WWNs related to ports and to assign a task name to the editing task.



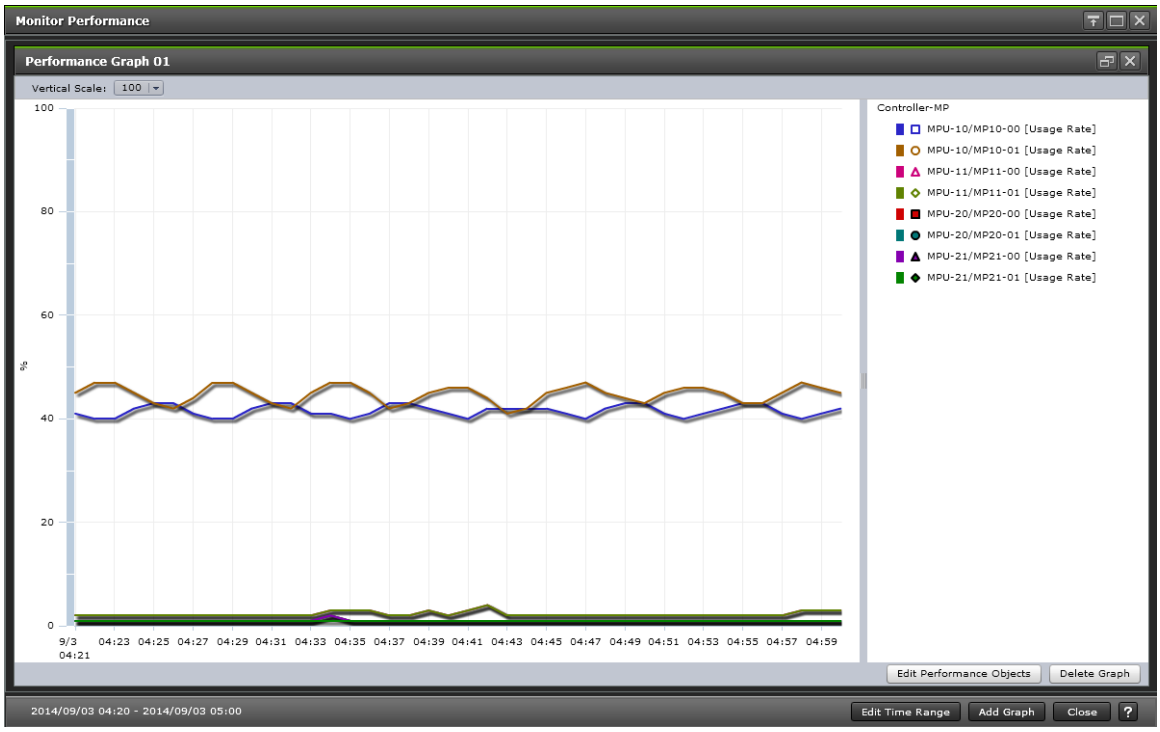
Selected WWNs table

Confirm the information of the WWNs to become the monitoring target objects.

Item	Description
Port ID	Name of the port selected for monitoring
HBA WWN	WWN selected for monitoring.
WWN Name	WWN name is up to 64 alphanumeric characters and some signs.

Monitor window

Use this window to view line graphs of monitored objects.



Item	Description
Graph panel	Shows line graphs. The line graph is displayed at the left of the graph panel, and explanatory notes are displayed at the right of the graph panel. Following operations can be performed. • If you put the mouse cursor over a point on the graph, a tool tip with more information appears. • When you click a note on the right of the graph panel, you can show or hide points on the graph panel. However, if the graph displays only one point on the X axis, the graph is always displayed on the screen. In this case, the graph cannot be displayed by clicking the icon that is displayed in the explanatory notes. • Up to eight graphs can be displayed in one graph panel. • You can view up to 16 graphs across a total of four panels.
Graph display area	Shows graph panels.

Graph panel

Shows line graphs of monitored objects.

Item	Description
Vertical Scale:	By using the list on the upper left of the graph screen, adjust the scale to display the maximum value of the graph. If the graph is too big, the display may not be

Item	Description
	able to displaying properly. For example, the line of the graph is too thick, or the graph panel is painted out in the color of the graph.
The button in the upper right of the graph panel	The graph panel can be maximized or minimized if you click the button in the upper right of the graph panel.
Edit Performance Objects	Opens the Edit Performance Objects window where you can change the objects to be monitored.
Delete Graph	Deletes the graph panel.

Graph display area

Shows graph panels.

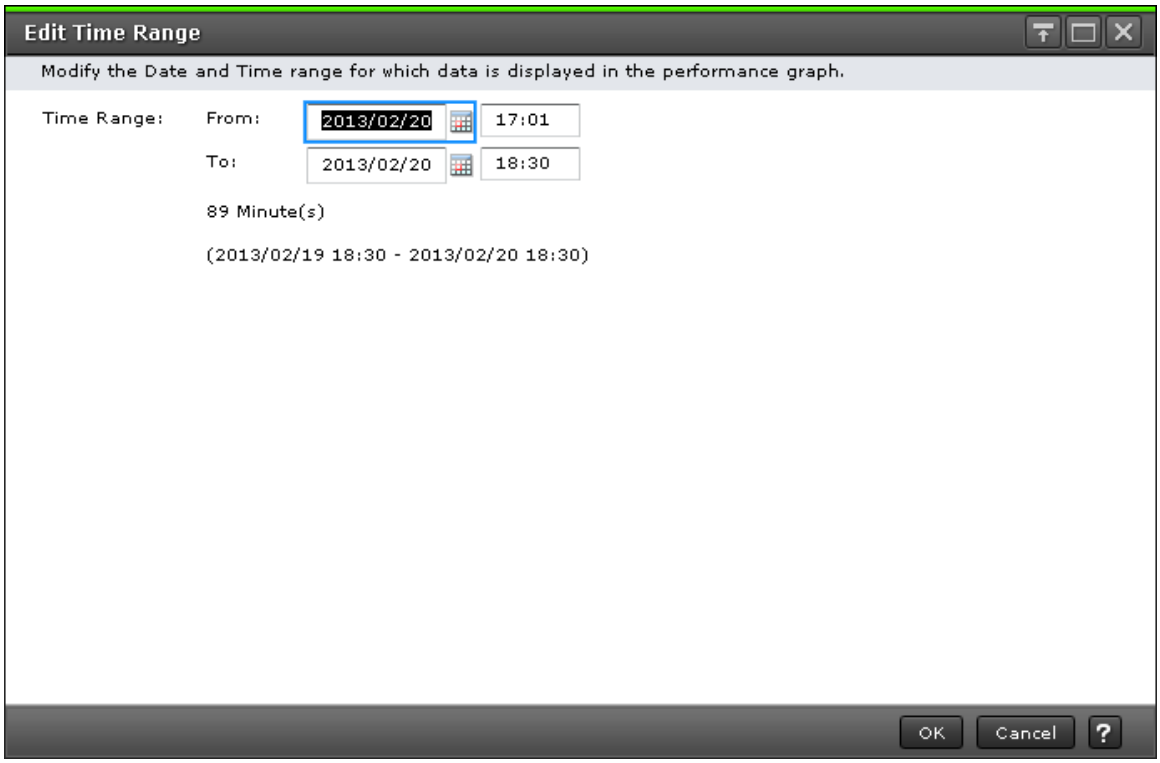
Item	Description
Monitoring Term	Shows the monitor period in the bottom left corner of this window. The first monitored time and the latest time are shown. If Use Real Time is selected, the interval and the date of last update are also shown. The following icon and the message are displayed while changing the configuration:  Graphs cannot be updated due to the configuration changing. Wait for a while.
Edit Time Range	Opens the Edit Time Range window where you can edit the time range for monitoring statistics.
Add Graph	Opens the Add Graph window to add a new graph.

Related topics

- Deleting a graph on page 2-23

Edit Time Range window

Use this window to select a date and time range for displaying monitoring data in a performance graph.



Setting fields

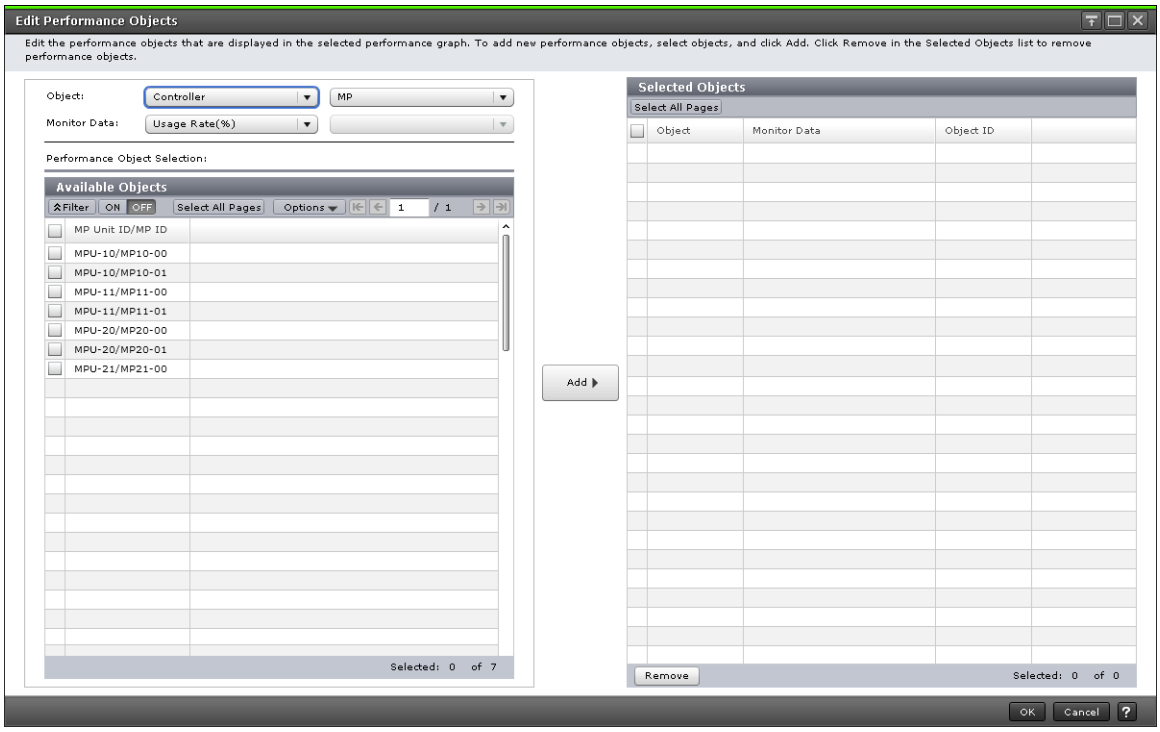
Item	Description
Time Range	Specify dates in the From and To fields to define a time range for displaying monitoring data in a performance graph. You can input directly or select from the calendar. When you specify a time range, Performance Monitor calculates the length of the specified period and displays the total time in hours and minutes.
From:	Specify the date and time to start monitoring performance.
To:	Specify the date and time to stop monitoring performance.

Related topics

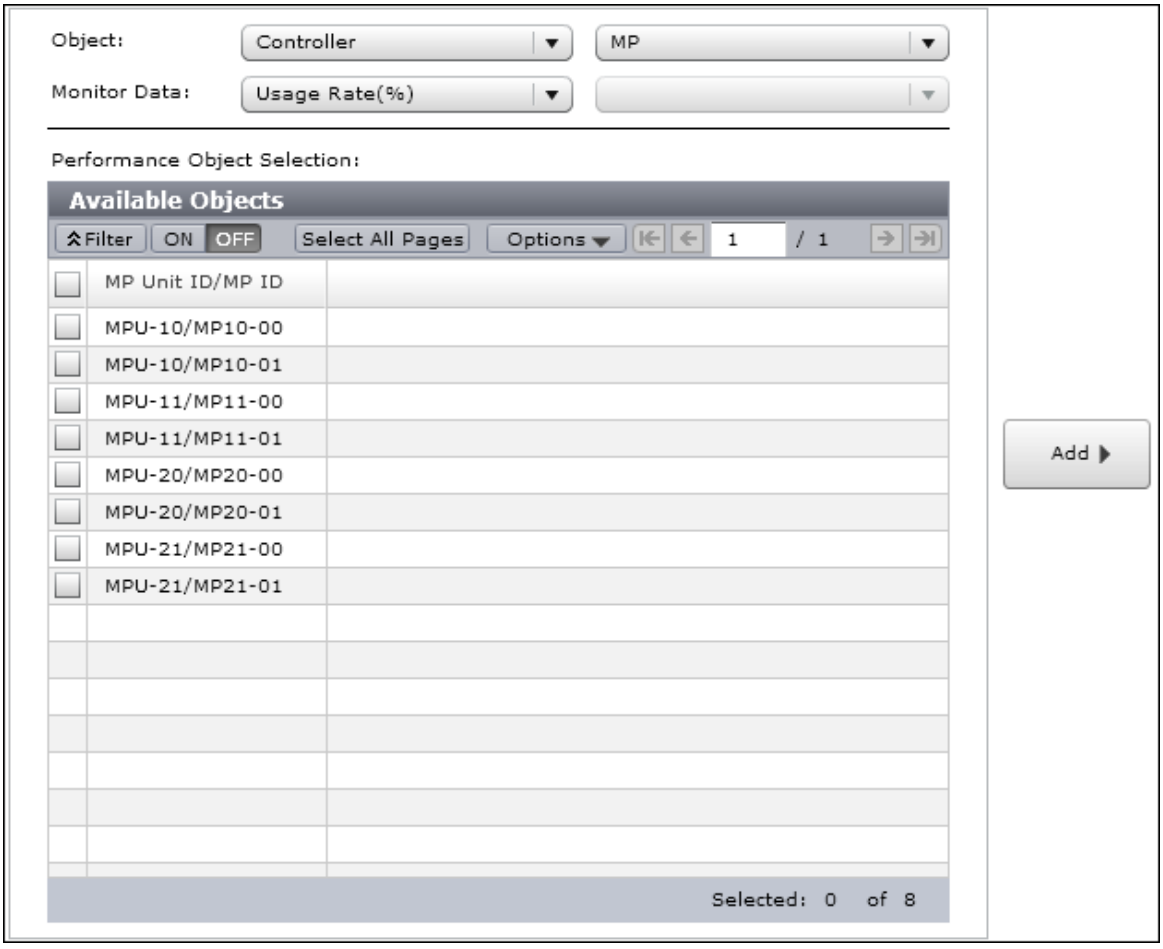
- Changing the time period displayed on the graph panel on page 2-22

Edit Performance Objects window

Use this window to select the monitoring object for displaying in a performance graph.


Edit Performance Objects
Edit the performance objects that are displayed in the selected performance graph. To add new performance objects, select objects, and click Add. Click Remove in the Selected Objects list to remove performance objects.
Object:
Controller
MP
Monitor Data:
Usage Rate(%)
Performance Object Selection:
Available Objects
Filter
ON
OFF
Select All Pages
Options
1
/ 1
MP Unit ID/MP ID
MPU-10/MP10-00
MPU-10/MP10-01
MPU-11/MP11-00
MPU-11/MP11-01
MPU-20/MP20-00
MPU-20/MP20-01
MPU-21/MP21-00
Selected: 0 of 7
Add
Selected Objects
Select All Pages
Object
Monitor Data
Object ID
Remove
Selected: 0 of 0
OK
Cancel

Object


Object:
Controller
MP
Monitor Data:
Usage Rate(%)
Performance Object Selection:
Available Objects
Filter
ON
OFF
Select All Pages
Options
1
/ 1
MP Unit ID/MP ID
MPU-10/MP10-00
MPU-10/MP10-01
MPU-11/MP11-00
MPU-11/MP11-01
MPU-20/MP20-00
MPU-20/MP20-01
MPU-21/MP21-00
MPU-21/MP21-01
Selected: 0 of 8
Add

Object types to display graphs. The list on the left specifies a large classification of monitoring objects. The list on the right specifies a small classification of monitoring objects.

Monitor Data

Performance data specified in the Object field. The list on the left specifies a large classification of performance data. The list on the right specifies a small classification of performance data.

For the combination of items of Object and Monitor Data fields, see Object and Monitor Data combinations on page A-52.

Performance Object Selection

Objects that can be displayed in graphs.

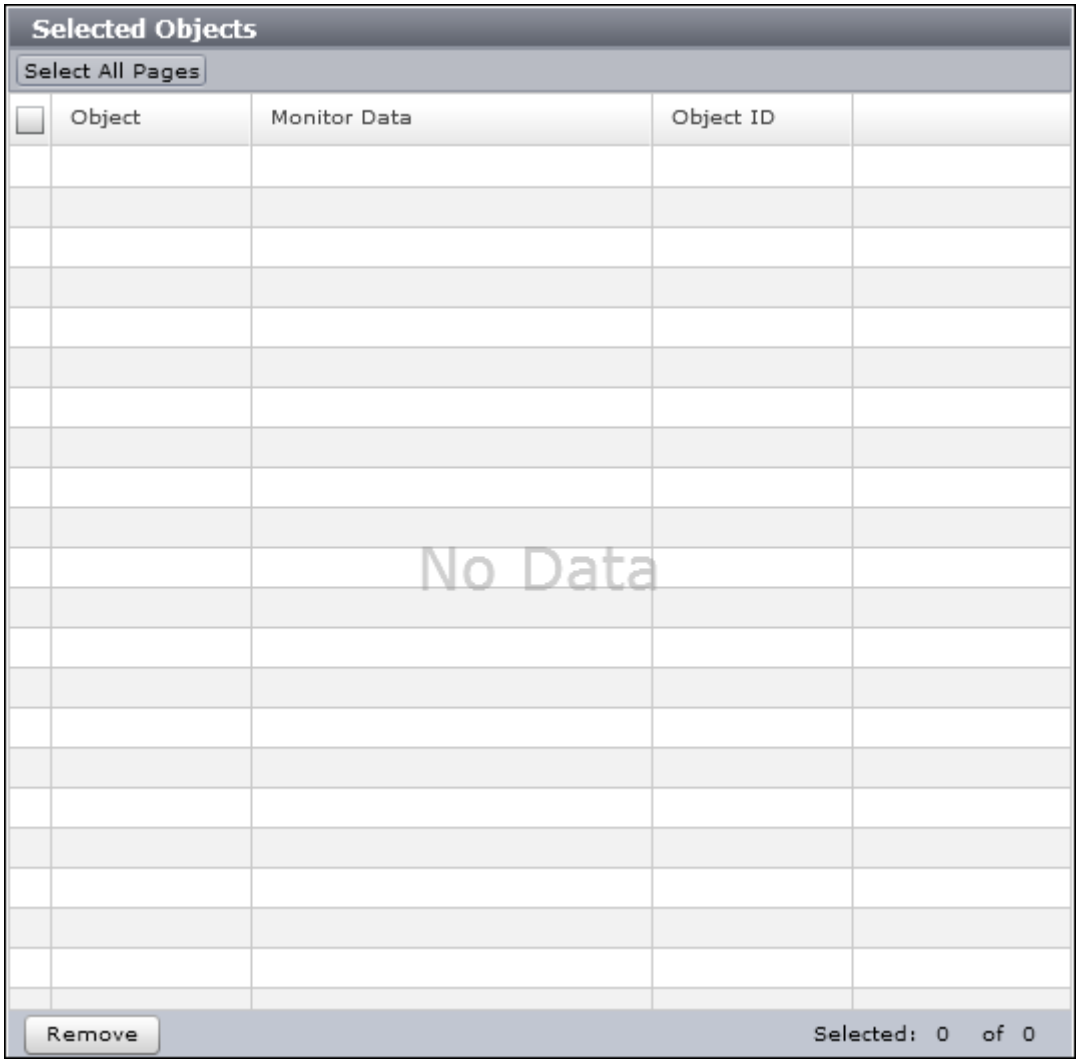
Available Objects table

The columns depend on the object selected. For details, see Available Objects table on page A-61.

Add

Adds objects to display the graph.

Selected Objects table



Objects to display the graph.

Item	Description
Object	Object to display the graph.
Monitor Data	Type of monitoring data.
Object ID	ID of the monitoring object.
Remove	Remove the object in this table.

Object and Monitor Data combinations

The following table shows the possible Object and Monitor Data combinations that can be selected in the Performance Objects area of the Monitor Performance window.

- If Controller is selected on the left side of the Object field, the item on the right side of Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
MP	Usage Rate	%

- If Cache is selected on the left side of the Object field, the item on the right side of the Monitor Data is blank field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
None	Usage Rate	%
None	Write Pending Rate	%

- If Fibre Port is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If iSCSI Port is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If NAS Platform (User LU) or NAS Platform (System LU) is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If WWN is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
WWN	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Port	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- Logical Device is selected on the left side of the Object field or Base is selected on the right of the Object field.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate[1]	None	%
Drive Access Rate[1]	Read (Sequential)	%
	Read (Random)	
	Write (Sequential)	
	Write (Random)	
ShadowImage[1]	None	%

1. Only information about internal volumes is displayed. Information about external volumes is not displayed.

- If Logical Device is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, the following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if UR is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- The item on the right side of the Object field is blank.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate*	None	%
* Only information about internal volumes is displayed. Information about external volumes is not displayed.		

- If LUN is selected on the left side of the Object field and if Base is selected on the right of the Object field, the following items can be selected.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	

- If LUN is selected on the left side of the Object field and if TC or GAD is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if UR is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- If Journal is selected on the left side of the Object field, UR is selected on the right side of the Object field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%

- If Entire Storage System is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If Entire Storage System is selected on the left side of the Object field and if UR is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms

- If External Storage is selected on the left side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Logical Device	Data Trans.	Total	MB/s
		Read	
		Write	
	Response Time	Total	ms
		Read	
		Write	
Parity Group	Data Trans.	Total	MB/s
		Read	
		Write	
	Response Time	Total	ms
		Read	
		Write	

Available Objects table

The items appearing in the Available Objects table depend on the objects selected in the Performance Objects fields.

Monitoring object	Item	Description
Fibre Port	Port ID	Name of the port. Only the ports assigned to the user are displayed.
iSCSI Port	Port ID	Name of the port. Only the ports assigned to the user are displayed.
WWN/WWN	HBA WWN	Worldwide name of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter. Only the WWNs that correspond to the ports assigned to the user are displayed.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.
WWN/Port	Port ID	Name of the port. Only the ports assigned to the user are displayed.
	HBA WWN	WWN of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.
Logical Device/Base	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Logical Device/TC/GAD	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.

Monitoring object	Item	Description
Logical Device/UR	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Parity Group	Parity Group ID	ID of the parity group. Only the parity groups assigned to the user are displayed.
LUN/Base	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
LUN/TC/GAD	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
LUN/UR	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
External Storage/Logical Device	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.

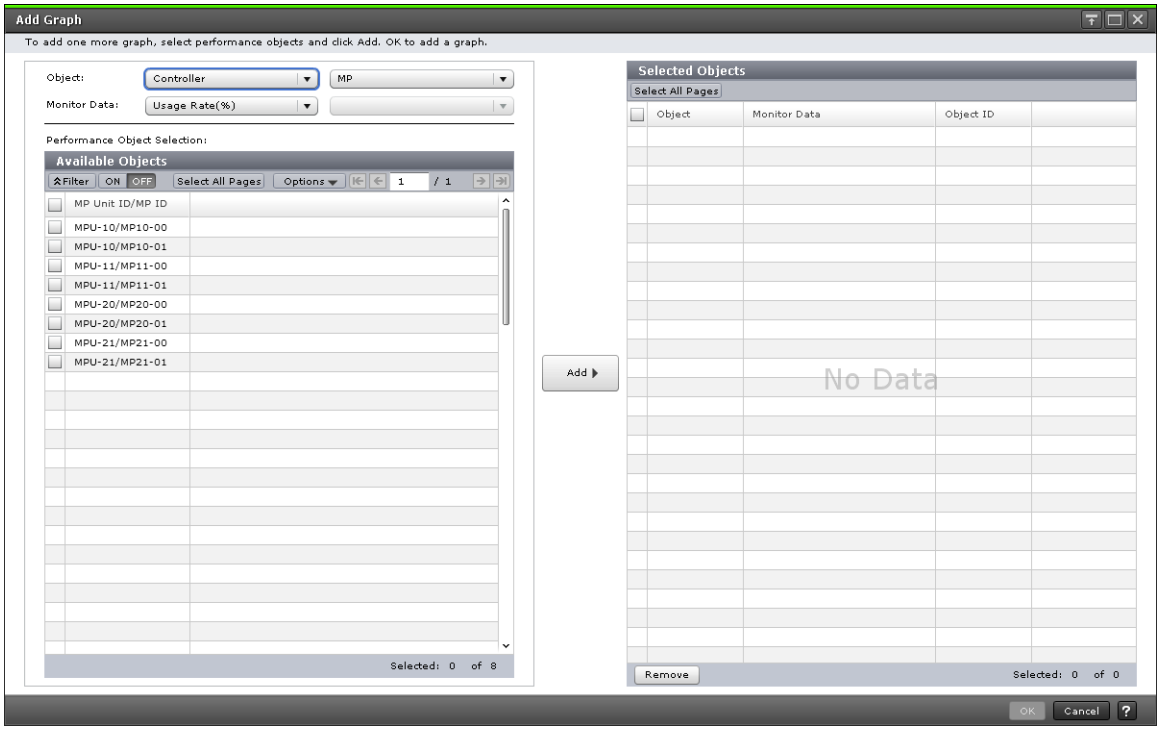
Monitoring object	Item	Description
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
External Storage/Parity Group	Parity Group ID	Parity group ID of the external volume. Only the parity groups assigned to the user are aisplayed.
Controller/MP	MP Unit ID/MP ID	ID of an MP unit and processor.
Cache	MP Unit ID	ID of an MP unit.
	Cache	Name of the cache.
Entire Storage System/ TC/GAD	Object	Item for entire storage system.
Entire Storage System/ UR	Object	Item for entire storage system.
Journal/UR	Journal ID	ID of the journal.

Related topics

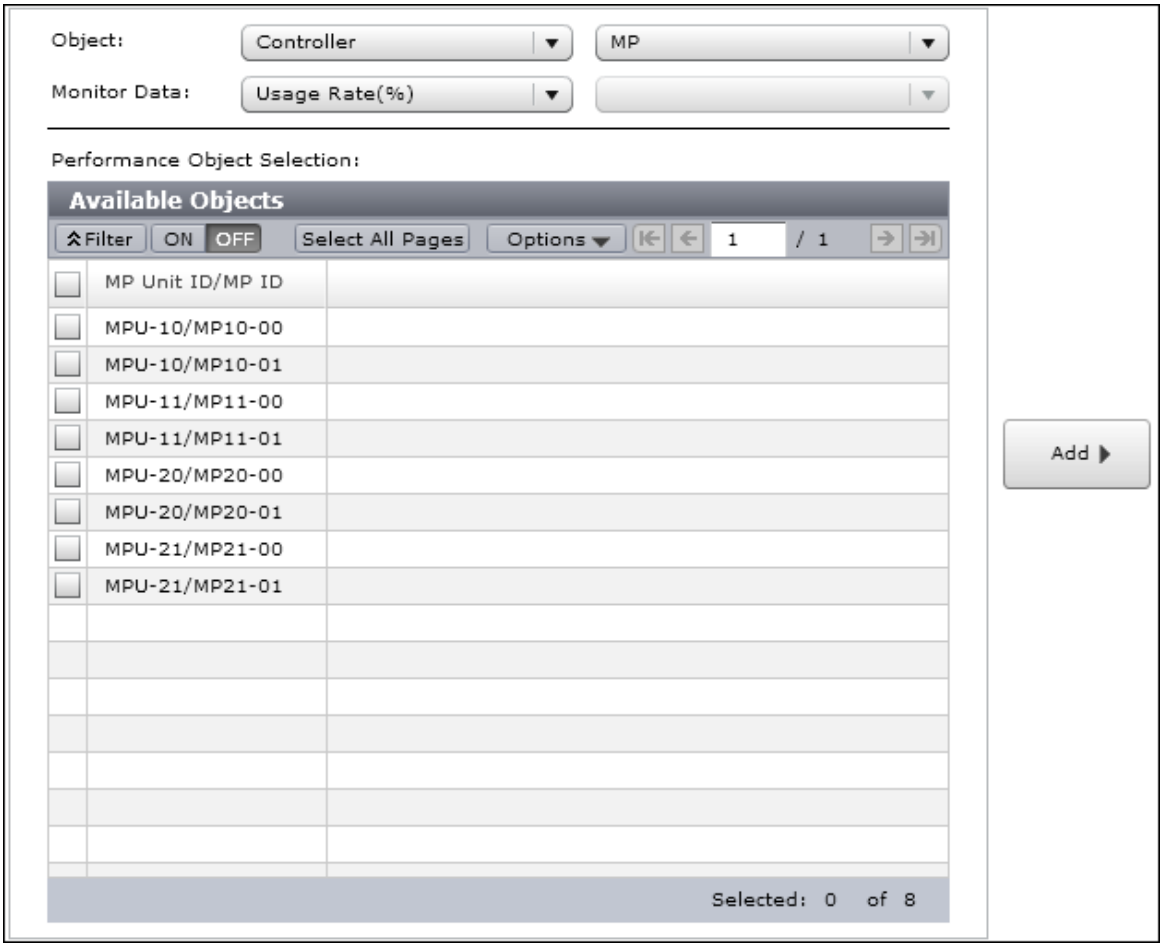
- Changing the data displayed on a graph on page 2-21

Add Graph window

Use this window to add the monitoring object to display a graph.



Object



Object types to display graphs. The list on the left specifies a large classification of monitoring objects. The list on the right specifies a small classification of monitoring objects.

Monitor Data

Performance data specified in the Object field. The list on the left specifies a large classification of performance data. The list on the right specifies a small classification of performance data.

For the combination of items of Object and Monitor Data fields, see Object and Monitor Data combinations on page A-66.

Performance Object Selection

Objects that can be displayed in graphs.

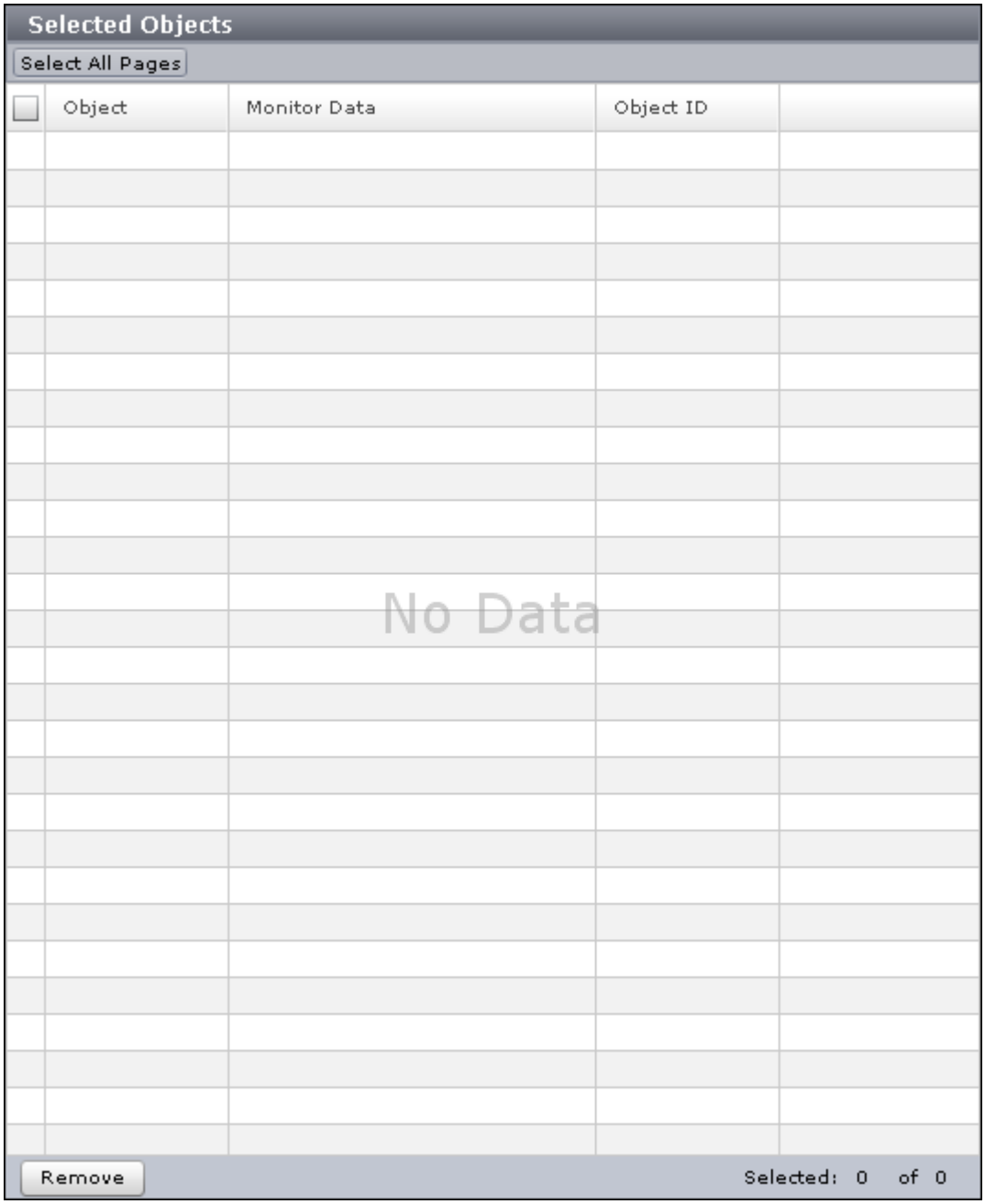
Available Objects table

The columns depend on the object selected. For details, see Available Objects table on page A-74.

Add

Adds objects to display the graph.

Selected Objects table



Item	Description
Object	Object to display the graph.
Monitor Data	Type of monitoring data.
Object ID	ID of the monitoring object.

Item	Description
Remove	Remove the object in this table.

Object and Monitor Data combinations

The following table shows the possible Object and Monitor Data combinations that can be selected in the Performance Objects area of the Monitor Performance window.

- If Controller is selected on the left side of the Object field, the item on the right side of Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
MP	Usage Rate	%

- If Cache is selected on the left side of the Object field, the item on the right side of the Monitor Data is blank field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
None	Usage Rate	%
None	Write Pending Rate	%

- If Fibre Port is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If iSCSI Port is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Response Time	ms
Initiator	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If NAS Platform (User LU) or NAS Platform (System LU) is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Target	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If WWN is selected on the left side of the Object field, the item on the right side of the Monitor Data field is blank.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
WWN	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms
Port	Throughput	IOPS
	Data Trans.	MB/s
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if Base is selected on the right of the Object field, the following items can be selected.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Write Throughput	Total	IOPS
	Sequential	
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate[1]	None	%
Drive Access Rate[1]	Read (Sequential)	%
	Read (Random)	
	Write (Sequential)	
	Write (Random)	
ShadowImage[1]	None	%

Notes:

1. Only information about internal volumes is displayed. Information about external volumes is not displayed.

- If Logical Device is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If Logical Device is selected on the left side of the Object field and if UR is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- If Parity Group is selected on the left side of the Object field, the item on the right side of the Object field is blank. A parity group is displayed only when the CU number of each LDEV within the parity group is to be monitored.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	
Drive Usage Rate*	None	%
* Only information about internal volumes is displayed. Information about external volumes is not displayed.		

- If LUN is selected on the left side of the Object field and if Base is selected on the right of the Object field, the following items can be selected.

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Total Throughput	Total	IOPS
	Sequential	
	Random	
Read Throughput	Total	IOPS
	Sequential	
	Random	
Write Throughput	Total	IOPS
	Sequential	

Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
	Random	
Cache Hit	Read (Total)	%
	Read (Sequential)	
	Read (Random)	
	Write (Total)	
	Write (Sequential)	
	Write (Random)	
Data Trans.	Total	MB/s
	Read	
	Write	
Response Time	Total	ms
	Read	
	Write	
Back Trans.	Total	count/sec
	Cache To Drive	
	Drive To Cache (Sequential)	
	Drive To Cache (Random)	

- If LUN is selected on the left side of the Object field and if TC or GAD is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If LUN is selected on the left side of the Object field and if UR is selected on the right of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s

- If Journal is selected on the left side of the Object field, UR is selected on the right side of the Object field.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
	Data Usage Rate	%
	Meta Data Usage Rate	%

- If Entire Storage System is selected on the left side of the Object field and if TC or GAD is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
RIO	Total	count
	Write	

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
	Error	
Pair Synchronization Rate	None	%
Differential Track	None	count
Initial Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms
Update Copy	Throughput	count
	Data Trans.	MB/s
	Response Time	ms

- If Entire Storage System is selected on the left side of the Object field and if UR is selected on the right side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Unit of monitoring data
Write Host I/O	Throughput	IOPS
	Data Trans.	MB/s
Initial Copy	Cache Hit	%
	Data Trans.	MB/s
Master Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms
Restore Journal	Throughput	IOPS
	Journal	count/sec
	Data Trans.	MB/s
	Response Time	ms

- If External Storage is selected on the left side of the Object field, following items can be selected.

Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
Logical Device	Data Trans.	Total	MB/s
		Read	

Item on right side of Object field	Item on left side of Monitor Data field	Item on right side of Monitor Data field	Unit of monitoring data
		Write	
	Response Time	Total	ms
		Read	
		Write	
Parity Group	Data Trans.	Total	MB/s
		Read	
		Write	
	Response Time	Total	ms
		Read	
		Write	

Available Objects table

The items appearing in the Available Objects table depend on the objects selected in the Performance Objects fields.

Monitoring object	Item	Description
Fibre Port/Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
Fibre Port/Initiator		
iSCSI Port/Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
iSCSI Port/Initiator		
NAS Platform (User LU) / Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
NAS Platform (System LU) / Target	Port ID	Name of the port. Only the ports assigned to the user are displayed.
WWN/WWN	HBA WWN	Worldwide name of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter. Only the WWNs that correspond to the ports assigned to the user are displayed.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.

Monitoring object	Item	Description
WWN/Port	Port ID	Name of the port. Only the ports assigned to the user are displayed.
	HBA WWN	WWN of the host bus adapter. A WWN is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter.
	WWN Name	Nickname of the host bus adapter. A WWN name is up to 64 alphanumeric characters and some signs.
Logical Device/Base	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Logical Device/TC/GAD	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only theLDEVs assigned to the user aredisplayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Logical Device/UR	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
Parity Group	Parity Group ID	ID of the parity group. Only the parity groups assigned to the user are displayed.
LUN/Base	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.

Monitoring object	Item	Description
LUN/TC/GAD	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
LUN/UR	Port ID	Name of the port.
	Type	Type of the port.
	Host Group Name/iSCSI Target Alias	Name of the host group or iSCSI target alias.
	iSCSI Target Name	Name of the iSCSI target.
	LUN	ID of the LUN. Only the LUNs that correspond to the host groups and LDEVs assigned to the user are displayed.
External Storage/Logical Device	LDEV ID	ID of the volume, in the following format: LDKC:CU:LDEV. Only the LDEVs assigned to the user are displayed.
	LDEV Name	Name of the LDEV. LDEV Name is the combination of fixed characters and numbers.
External Storage/Parity Group	Parity Group ID	Parity group ID of the external volume. Only the parity groups assigned to the user are displayed.
Controller/MP	MP Unit ID/MP ID	ID of an MP unit and processor.
Cache	MP Unit ID	ID of an MP unit.
	Cache	Name of the cache.
Entire Storage System/ TC/GAD	Object	Item for entire storage system.
Entire Storage System/ UR	Object	Item for entire storage system.
Journal/UR	Journal ID	ID of the journal.

Related topics

- Adding a new graph on page 2-20

Wizard buttons

These standard buttons are used to set information in and navigate among the monitoring windows.

Item	Description
Go to tasks window for status	Check to go to the task window after clicking Apply.
Back	Click to move to the previous task.
Next	Click to move to the next task.
Apply	Click to apply the settings to the storage system.
Finish	Finishes the task.
Cancel	Cancels the current task and closes this window.
Help	Opens the help topic for this window.

Navigation buttons

These standard buttons are used to control the information appearing the monitoring windows.

Item	Description
Filter	• **ON:** Click to activate the filter. • **OFF:** Click to cancel the filter.
Select All Pages	Click to select all pages.
Options	Click to specify options for how the table displays information.
|<	Click to view the first page.
<	Click to view the previous page.
Page	Page numbers in N/M format, where N indicates the number of the current page and M indicates total number of pages.
>	Click to view the next page.
>|	Click to view the last page.

B

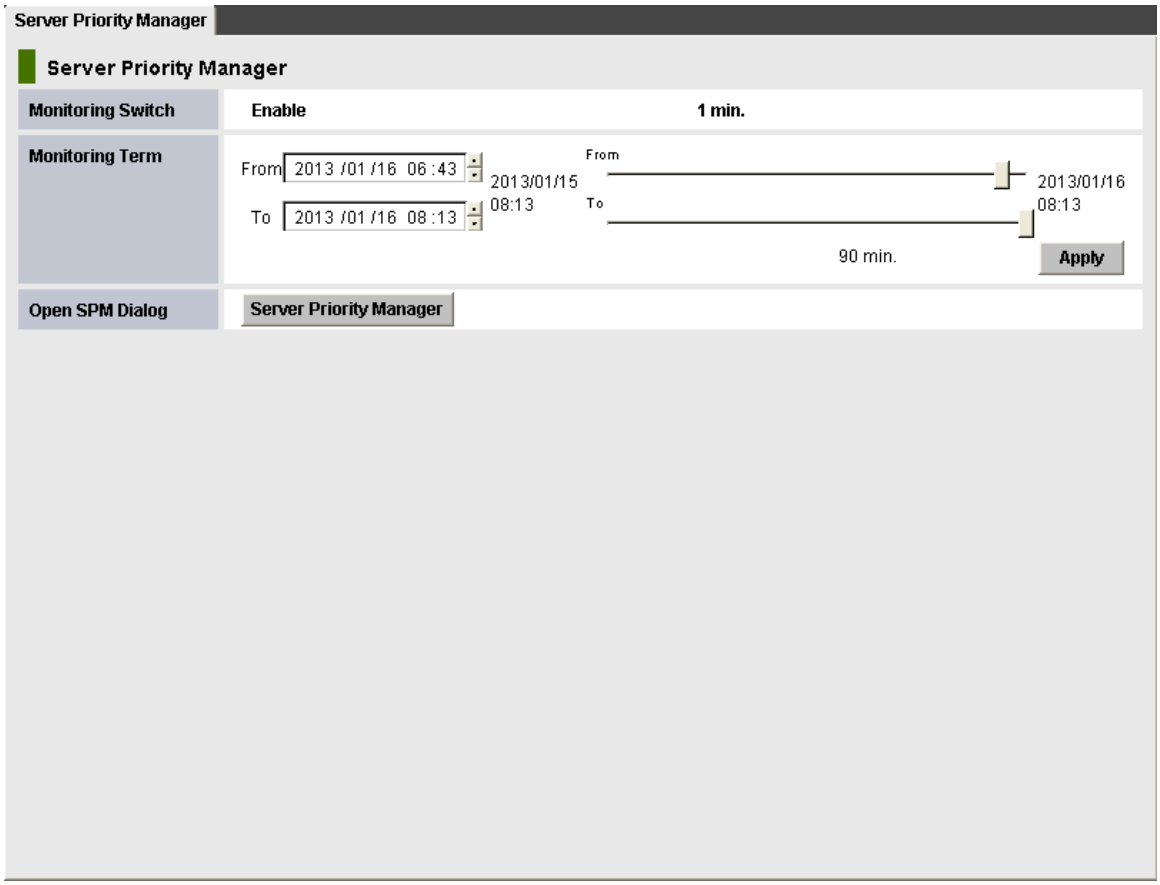
Server Priority Manager GUI reference

This chapter provides detailed information about the Server Priority Manager GUI. The Server Priority Manager window allows you to prioritize/non-prioritize ports and WWNs and create WWN monitor groups.

- Server Priority Manager window
- Port tab of the Server Priority Manager main window
- WWN tab of the Server Priority Manager main window
- Add WWN window
- Change WWN and SPM Name window
- Add New SPM Group window
- Change Upper Limit window
- Rename SPM Group window

Server Priority Manager window

The Server Priority Manager window displays the status of performance monitoring, allows you to set the monitoring term, and provides access to the Server Priority Manager main window.

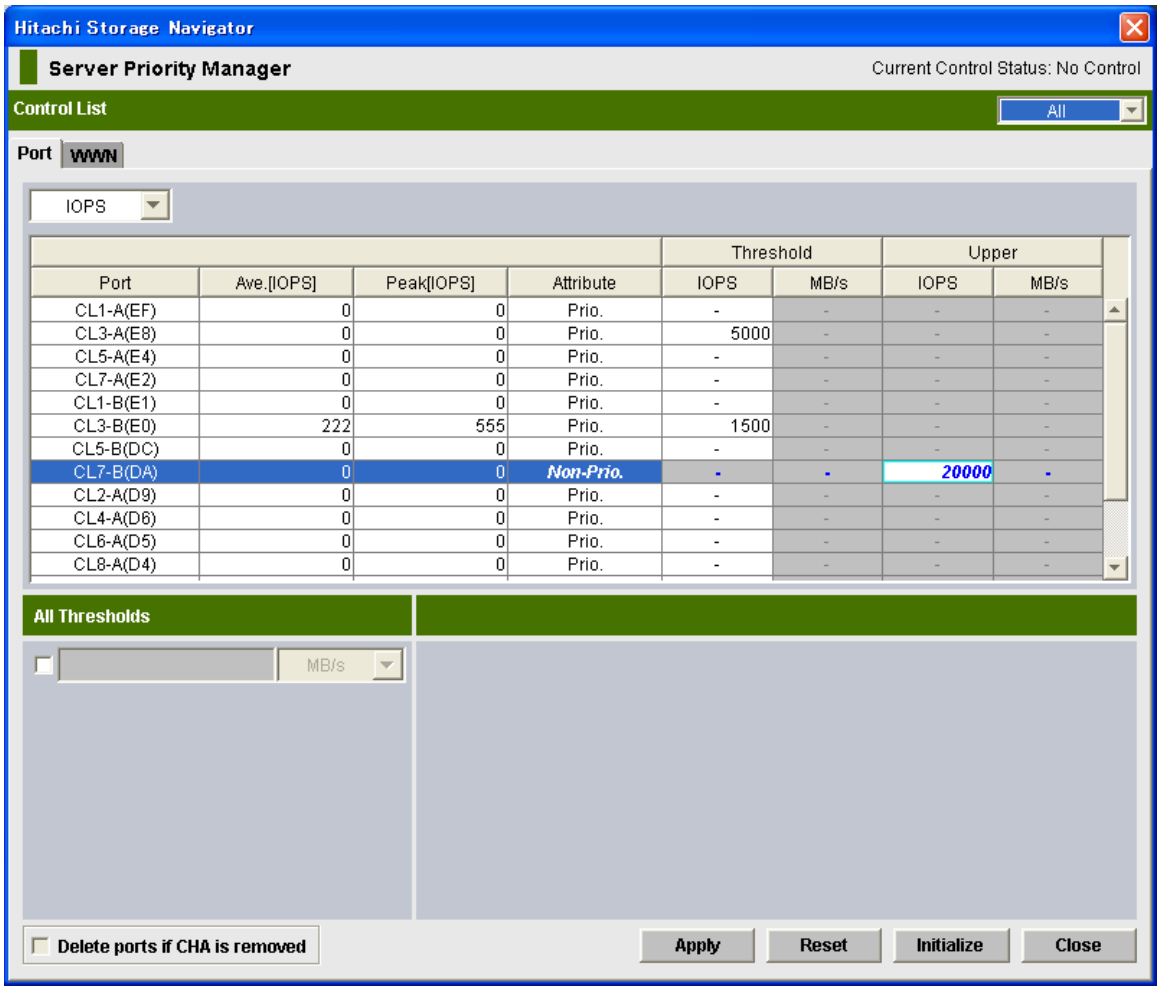


Item	Description
Monitoring Switch	**Enable:** Performance Monitor is monitoring the storage system **Disable:** The storage system is not being monitored.
Monitoring Term	Specify a period in which to collect monitoring data and display in Server Priority Manager main window. A day is set by default. To set a date and time in the **From** and **To** fields, do either of the following: • Move the sliders to the left or to the right to adjust the date and time. • In the text box, select a date or time unit that you want to change and then use the up or down arrows. Starting and ending times for collecting statistics are displayed on both sides of the slide bars. Performance Monitor stores the monitoring data between these times. For example, if you want to view usage statistics within the range of 10:30 July 1 2013 to 22:30 July 31 2013, you set `2013/07/01 10:30` in the **From** field, set `2013/07/31 22:30` in the **To** field, and then click **Apply**.

Item	Description
	When you specify dates and time in the **From** and **To** fields, Performance Monitor calculates and displays the length of the specified period. The length of the period is in days. **From** and **To** are unavailable if Server Priority Manager is in View mode or the monitoring data (that is, usage statistics) is not stored in the storage system.
Open SPM Dialog	Click Server Priority Manager to open the Server Priority Manager main window.

Port tab of the Server Priority Manager main window

Use this tab to set the limit on the performance of non-prioritized ports and set the threshold on the performance of prioritized ports.



Item	Description
Current Control Status	Shows the current control status of the system. • **Port Control** indicates the system is controlled by the upper limits and threshold specified on the Port tab.

Item	Description
	• **WWN Control** indicates the system is controlled by the upper limits and threshold specified on the WWN tab. • **No Control** indicates the system performance is not controlled by Server Priority Manager. *Tip*: If **WWN Control** is displayed when the Port tab is active, click **Apply** to switch control so that **Port Control** is displayed. *Tip*: To return the control status to **No Control**, specify **Prio.** for attributes of all ports and then click **Apply**.
Control List	Allows you to narrow ports appearing in the list: • If **All** is selected, all ports appear in the list. • If **Prioritize** is selected, only the prioritized ports appear in the list. • If **Non-Prioritize** is selected, only the non-prioritized ports appear in the list. If you change settings of a port, that port remains in the list regardless of the selection in the list.
Statistic type list	Allows you to change the type of performance statistics to be displayed in the list. • If **IOPS** (I/Os per second) is selected, the list displays I/O rates for ports. The I/O rate indicates the number of I/Os per second. • If **MB/s** (megabytes per second) is selected, the list displays the transfer rates for ports. The transfer rate indicates the size of data transferred via a port in one second.
Ports table	A list of ports, including the I/O rate or the transfer rate for each port. You can specify the port attributes, and the threshold and upper limit of the port traffic. The measurement unit for the values in the list can be specified by the drop-down list above this table. The port traffic (I/O rate and transfer rate) is monitored by Performance Monitor. To specify the monitoring period, use the **Monitoring Term** area of Performance Monitor. The table contains these columns: • **Port** indicates ports on the storage system. • **Ave.[IOPS]** indicates the average I/O rate or the average transfer rate for the specified period. • **Peak[IOPS]** indicates the peak I/O rate or the peak transfer rate of the ports for the specified period. This value means the top of the Max. line in the detailed port-traffic graph drawn in the Monitor Performance window. For details, see Chapter 3, Hitachi Performance Monitor data on page 3-1. • **Attribute** indicates the priority of each port. **Prio** indicates a prioritized port. **Non-Prio** indicates a non-prioritized port. • Use the **Threshold** columns to specify the threshold for the I/O rate and the transfer rate for each prioritized port. Either the **IOPS** or **MB/s** column in the list is activated depending on the selection from the list above. Use the **IOPS** column to specify the threshold for I/O rates. Use the **MB/s** column to specify the threshold for transfer rates. To specify a threshold, double-click a cell to display the cursor in the cell. If you specify a value in either the **IOPS** or **MB/s** column,

Item	Description
	the other column is unavailable. You can specify thresholds for I/O rates and transfer rates all together for different prioritized ports. Even if you use the type of rate for the threshold different from that used for the upper limit values, the threshold control can work for all ports. • Use the **Upper** columns to specify the upper limit on the I/O rate and the transfer rate for each non-prioritized port. Either the **IOPS** or **MB/s** column in the list is activated depending on the selection from the list above. Use the **IOPS** column to specify the upper limit for I/O rates. Use the **MB/s** column to specify the upper limit for transfer rates. To specify an upper limit, double-click a cell to display the cursor in the cell. If you specify a value in either of the **IOPS** or **MB/s** column, the other column is unavailable. You can specify upper limit values for I/O rates and transfer rates all together for different non-prioritized ports.
All Thresholds	If you select this check box and enter a threshold value in the text box, the threshold value is applied to the entire storage system. To specify the threshold for the I/O rate, select **IOPS** from the list on the right of the text box. To specify the threshold for the transfer rate, select **MB/s** from the list. For example, if you specify 128 IOPS in **All Thresholds**, the upper limits on non-prioritized ports are disabled when the sum of I/O rates for all prioritized ports is below 128 IOPS. Even if you use the different type of rate (**IOPS** or **MB/s**) for the threshold as that used for the upper limit values, the threshold control can work for all ports.
Delete ports if CHA is removed	If you check this check box, Server Priority Manager deletes, from SVP, the setting information of Server Priority Manager on ports in front-end directors that have been removed. When a front-end director is removed, the port and its settings are removed from the Server Priority Manager main window automatically, but they remain in SVP. This may cause the old setting for Server Priority Manager to be applied to a different front-end director than the one newly-installed on the same location. The **Delete ports if CHA is removed** check box is available only when the following Server Priority Manager settings on ports in a removed front-end director remains on SVP: • The setting of prioritized ports or non-prioritized ports. • The setting of prioritized WWNs or non-prioritized WWNs.
Apply	Applies the settings in this window to the storage system.
Reset	Restores the last applied settings in the window. When you click this button, all changes displayed with the blue text in the window are canceled.
Initialize	Changes the settings in this window as explained below, and then applies the resulting settings to the storage system: • All ports become prioritized ports. • The threshold value for all ports becomes 0 (zero). • The window will display a hyphen (-) instead of 0 (zero).

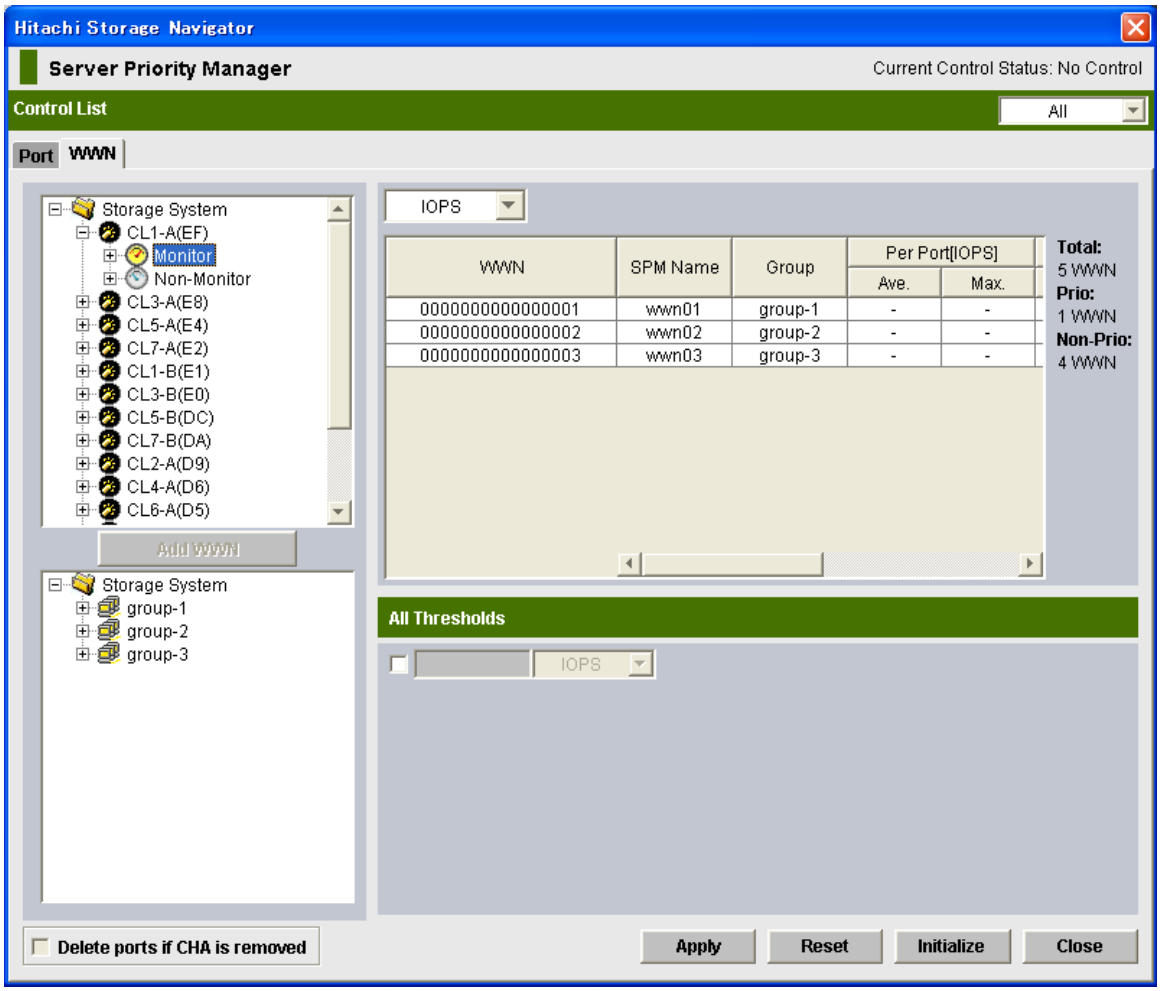
Item	Description
	• If the **All Thresholds** check box is checked, the check mark disappears.
Close	Closes the Server Priority Manager main window.

Related topics

- Analyzing traffic statistics: one-to-one connections on page 5-16
- Setting priority for ports: one-to-one connections on page 5-15
- Setting upper-limit values for non-prioritized ports: one-to-one connections on page 5-17
- Setting a threshold: one-to-one connections on page 5-19

WWN tab of the Server Priority Manager main window

Use this tab to set the limit on the performance of non-prioritized WWNs and set the threshold on the performance of prioritized WWNs.



Item	Description
Current Control Status	The current system control. • **Port Control:** The system is controlled by the upper limits and threshold specified on the Port tab. • **WWN Control:** The system is controlled by the upper limits and threshold specified on the WWN tab. • **No Control:** The system performance is not controlled by Server Priority Manager. *Tip*: If **Port Control** appears when the WWN tab is active, click **Apply** to switch control so that **WWN Control** is displayed. *Tip*: To return the control status to **No Control**, specify **Prio.** for attributes of all host bus adapters and then click **Apply**.
Control List	Allows you to narrow WWNs in the list: • If **All** is selected, all WWNs appear in the list. • If **Prioritize** is selected, only the prioritized WWNs appear in the list. • If **Non-Prioritize** is selected, only the non-prioritized WWNs appear in the list.
Upper-left tree	Ports and the host bus adapters connected to these ports in the storage system. Ports on the storage system are shown below the **Storage System** folder. The ports are indicated by icons such as  and . When you double-click on a port, the tree expands to display two items: **Monitor** and **Non-Monitor**. The host bus adapters that are connected to the specified port are displayed below **Monitor** or **Non-Monitor**. • If you double-click **Monitor**, the host bus adapters () whose traffic with the specified port is monitored are displayed below Monitor. • If you double-click **Non-Monitor**, the host bus adapters whose traffic with the specified port is not monitored are displayed below **Non-Monitor**. The WWN and SPM names of the host bus adapters are displayed on the right of the host bus adapter icon () below **Monitor**. WWNs (Worldwide Name) are 16-digit hexadecimal numbers used to uniquely identify host bus adapters. SPM names are nicknames assigned by the system administrator so that they can easily identify each host bus adapter. Only the WWN is displayed on the right of the host bus adapter icon ( ) below **Non-Monitor**. When many-to-many connections are established between host bus adapters (HBAs) and ports, make sure that all traffic between HBAs and ports is monitored. Therefore, make sure that all connected HBAs are displayed below **Monitor**. For details on how to move an HBA displayed below **Non-Monitor** to below **Monitor**, see Monitoring all port-HBA traffic: many-to-many connections on page 5-23. The list on the right of the tree changes depending on the item you select in the tree as follows.

Item	Description
	• When you select a port or **Monitor** icon, the list shows the information of host bus adapters that are connected to the ports and monitored by Performance Monitor. • When you select the **Monitor** icon or the Storage System folder, the list becomes blank.
Lower-left tree	SPM groups and host bus adapters (WWNs) in each SPM group: • SPM groups (), which contain one or more WWNs, appear below the **Storage System** folder. For details on SPM groups, see Working with SPM groups on page 5-35. • If you double-click an SPM group, host bus adapters in that group expand in the tree. The WWN and SPM name appear to the right of the host bus adapter icon (). If the WWN of a host bus adapter (HBA) appears in red in the tree, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports is not monitored by Performance Monitor. When many-to-many connections are established between HBAs and ports, make sure that all traffic between HBAs and ports is monitored. For details on the measures when a WWN is displayed in red, see Monitoring all port-HBA traffic: many-to-many connections on page 5-23. The list on the right of the tree changes depending on the item you selected in the tree as follows: • When you select the Storage System folder, the WWN list shows the information of SPM groups. • When you select an SPM group icon (), the WWN list shows the information of host bus adapters () contained in that SPM group.
Add WWN	Adds a host bus adapter to an SPM group. Before using this button, you must select a host bus adapter () from the upper-left tree and also select an SPM group () from the lower-left tree. You can add a host bus adapter that appears below **Monitor** and is not yet registered on any other SPM group. If you select a host bus adapter below **Non-Monitor** or a host bus adapter already registered on an SPM group, the **Add NNW** button is unavailable.
Statistic type	Allows you to change the type of performance statistics to be displayed in the WWN list. • If **IOPS** (I/Os per second) is selected, the list displays I/O rates for ports. The I/O rate indicates the number of I/Os per second. • If **MB/s** (megabytes per second) is selected, the list displays the transfer rates for ports. The transfer rate indicates the size of data transferred via a port in one second.
WWN list	A list of WWNs and the I/O rate or the transfer rate for each host bus adapter corresponding to the selection in the upper-left tree or lower-left tree. Use this list to specify the host bus adapter attributes and the upper limit of the host bus adapter traffic.

Item	Description
	The measurement unit for the values in the list can be specified by the list at the upper left corner of the list. The displayed items will change depending on the selected tree and item. The host bus adapter traffic (I/O rate and transfer rate) is monitored by Performance Monitor. To specify the monitoring period, use the **Monitoring Term** area of Performance Monitor. On the right side of the list appear total number of WWNs, the number of prioritized WWNs, and the number of non-prioritized WWNs. The list contains the following columns (use the slide bar to view all of the columns): • **WWN:** column indicates WWNs of host bus adapters. This column does not appear when you select the **Storage System** folder in the lower-left tree. • **SPM Name:** SPM names of host bus adapters. Use Server Priority Manager to assign an SPM name to each host bus adapter so that you can easily identify each host bus adapters in the Server Priority Manager main window. This column does not appear when you select the Storage System folder in the lower-left tree. • **Group:** The SPM group to which the host bus adapter belongs. This column appears when a port is selected in the upper-left tree and does not appear when an SPM group is selected in the lower-left tree. • **Per Port[IOPS]:** The traffic (I/O rate or transfer rate) between the host bus adapter and the port selected in the upper-left tree. This item is displayed only when you select an icon in the upper-left tree. The **Per Port** column contains the following: **Ave.:** Average I/O rate or the average transfer rate for the specified period. **Max.:** Maximum I/O rate or the maximum transfer rate for the specified period. • **WWN Total[IOPS]:** The sum of the traffic (I/O rate or transfer rate) between the host bus adapter and all ports connected to the host bus adapter. This value means the total traffic of that host bus adapter. This item is displayed only when you select an icon in the upper-left tree. Whichever port you select in the tree, the **WWN Total** column shows the sum of the traffic to all ports.
WWN list (continued)	• The WWN Port column contains the following: **Ave.:** Indicates the average I/O rate or the average transfer rate for the specified period. The **Ave.** column is also displayed when you select an icon in the lower-left tree. In this case, the **Ave.** column shows the average value same as that of **WWN Total**. When you select the Storage System folder in the lower-left tree, the Ave. column shows the sum of the traffic of the host bus adapters registered on each SPM group. **Max.:** Indicates the maximum I/O rate or the maximum transfer rate for the specified period. The **Max.** column is also displayed when you select an icon in the lower-left tree. In this case, the **Max.** column shows the maximum value same as that of **WWN Total**. When you select the Storage System folder in the lower-left tree, the Max. column shows the sum of the traffic of the host bus adapters registered on each SPM group. • **Attribute:** The priority of each WWN. **Prio.** indicates a prioritized WWN. **Non-Prio.** indicates a non-prioritized WWN. For details on

Item	Description
	how to change the priority, see Setting priority for WWNs: many-to-many connections on page 5-22. If one host bus adapter connects to multiple ports, the attribute setting of the host bus adapter is common to all of the ports. Therefore, if you specify a host bus adapter as a prioritized WWN or a non-prioritized WWN for one port, the setting is applied to all of the other connected ports automatically. • The **Upper** columns let you specify the upper limit on the I/O rate and the transfer rate for each host bus adapter. Either of the **IOPS** or **MB/s** column in the list is activated depending on the selection from the list above. Use the **IOPS** column to specify the upper limit for I/O rates. Use the **MB/s** column to specify the upper limit for transfer rates. To specify an upper limit, double-click a cell to display the cursor in the cell. If you specify a value in either the **IOPS** or **MB/s** column, the other column is unavailable. You can specify upper limit values for I/O rates and transfer rates all together for different non-prioritized WWNs. **Notes**: • If one host bus adapter connects to multiple ports, the setting of the upper limit value for a non-prioritized WWN is common to all of the ports. Therefore, if you specify an upper limit value of non-prioritized WWN for one port, the setting is applied to all of the other connected ports automatically. • You cannot change the upper limit value of a host bus adapter that has registered on an SPM group. The upper limit value of such a host bus adapter is defined by the setting of the SPM group to which the host bus adapter is registered. For details on setting the upper limit value of an SPM group, see Setting an upper-limit value to HBAs in an SPM group on page 5-39. • The Upper columns will not appear if an SPM group () or a host bus adapter ()is selected in the lower-left tree.
All Thresholds	If you select this check box and enter a threshold value in the text box, the threshold value will be applied to the entire storage system. To specify the threshold for the I/O rate, select **IOPS** from the list on the right of the text box. To specify the threshold for the transfer rate, select **MB/s** from the list. For example, if you specify 128 IOPS in **All Thresholds**, the upper limits on non-prioritized WWNs are disabled when the sum of I/O rates for all prioritized WWNs is below 128 IOPS. Even if you use the different type of rate (**IOPS** or **MB/s**) for the threshold as that used for the upper limit values of the non-prioritized WWNs, the threshold control can work for all WWNs. On the WWN tab, you cannot specify individual thresholds for each host bus adapter.
Delete ports if CHA is removed	If checked, Server Priority Manager will delete, from SVP, the setting information of Server Priority Manager on ports in front-end directors that have been removed. If checked, when a front-end director is removed, the port and its settings are removed from the Server Priority Manager main window automatically, but remain in SVP. This may cause the old settings for

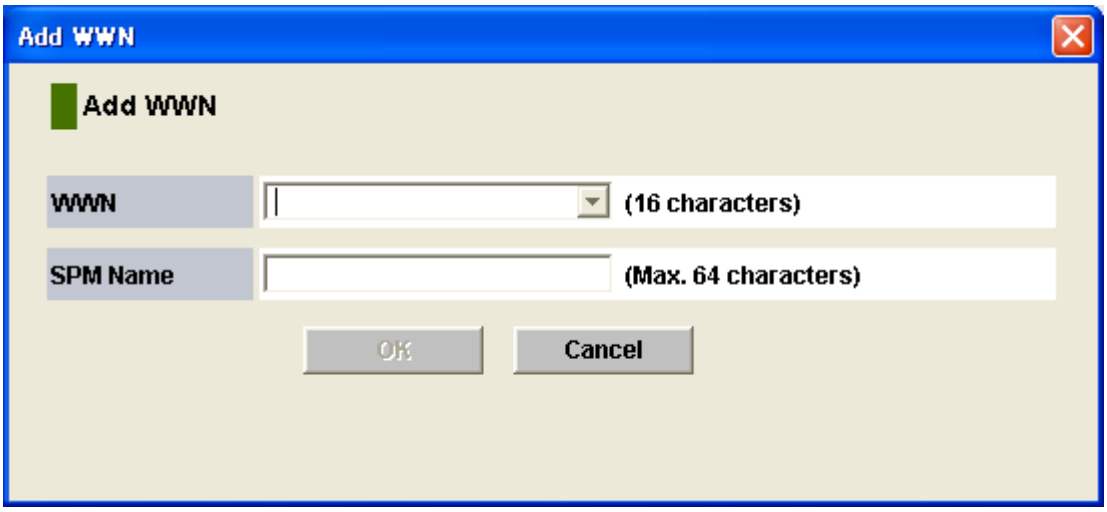
Item	Description
	Server Priority Manager to be applied to a different front-end director that is newly installed on the same location. This check box is available only when the following Server Priority Manager settings on ports in a removed front-end director remain on the SVP: • The setting of prioritized ports or non-prioritized ports. • The setting of prioritized WWNs or non-prioritized WWNs.
Apply	Applies the settings in this window to the storage system.
Reset	Restores the last applied settings in the window. When you click this button, all changes displayed in blue text in the window are canceled.
Initialize	Changes the settings in this window, as explained below, and then applies the resulting settings to the storage system: • All host bus adapters become prioritized WWNs. • If the **All Thresholds** checkbox is checked, the check mark disappears.
Close	Closes the Server Priority Manager main window.

Related topics

- Implementing Server Priority Manager: many-to-many connections on page 5-20

Add WWN window

Use this window to set the WWN and SPM name.

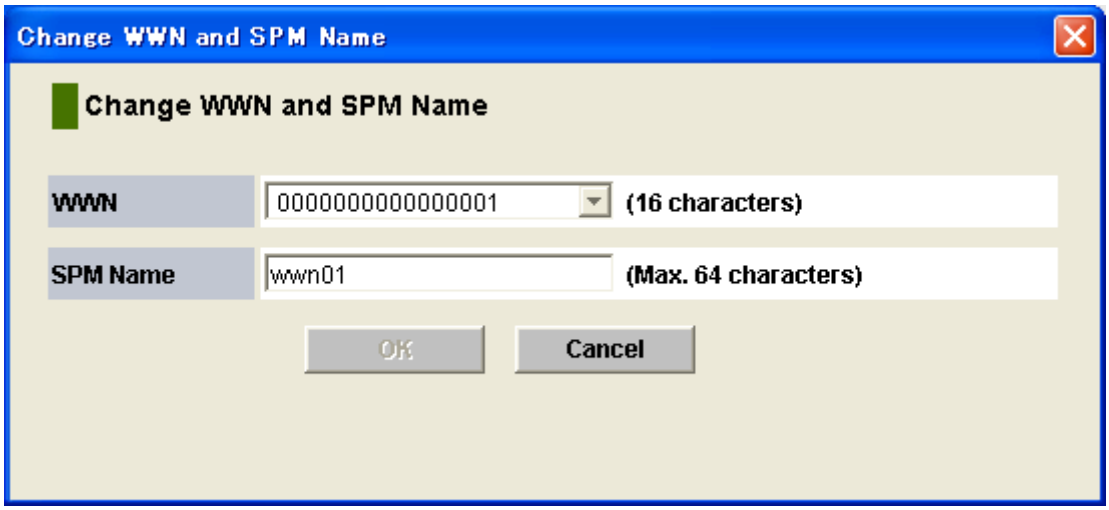


Item	Description
WWN	When you click here, the host bus adapter (WWN) that is out of monitoring target displays. Select WWN from the drop down list.

Item	Description
SPM Name	Enter SPM name (maximum of 64 characters).

Change WWN and SPM Name window

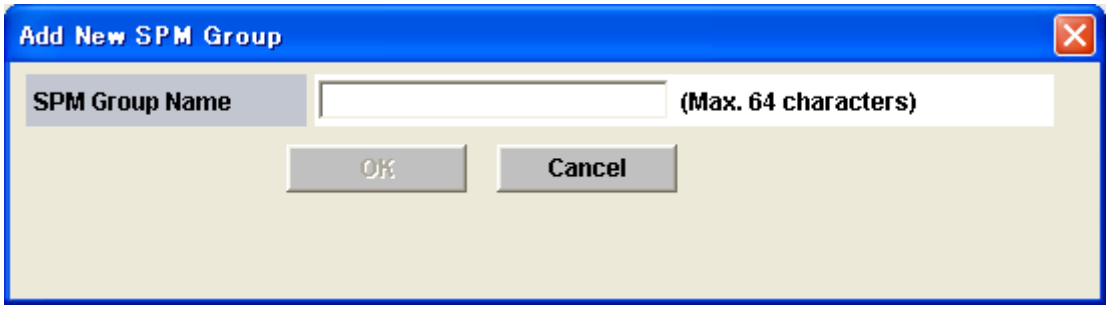
Use this window to change WWN and SPM Name.



Item	Description
WWN	When you click here, the host bus adapter (WWN) connected to the port displays. Select WWN from the drop down list.
SPM Name	Enter the SPM name (maximum of 64 characters).

Add New SPM Group window

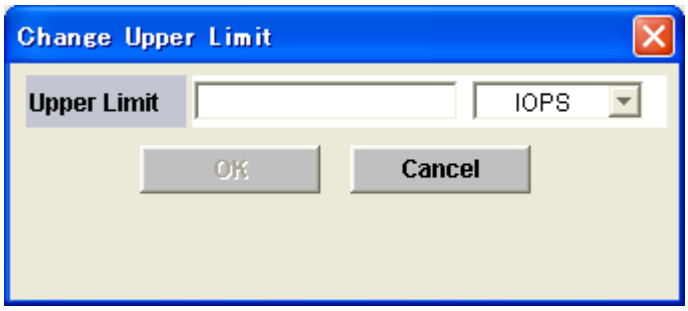
Use this window to add a new SPM group.



Item	Description
SPM Group Name	Enter SPM group name (maximum of 64 characters).

Change Upper Limit window

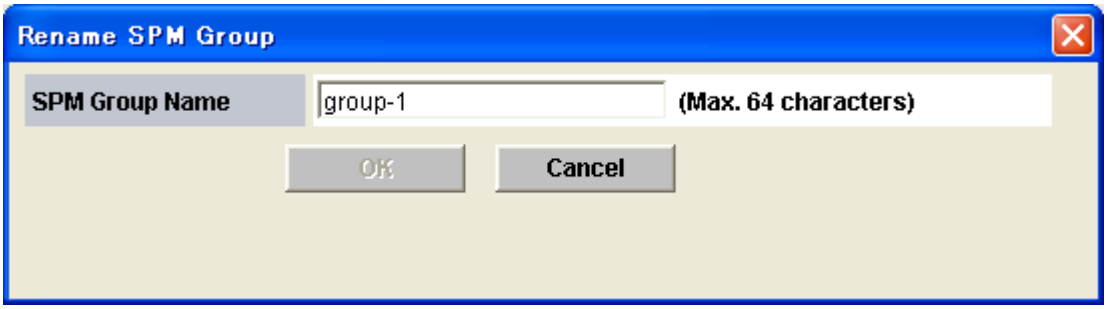
Use this window to change the upper limit.



Item	Description
Upper Limit	Enter the upper limit value. If you want to set the upper limit value of the I/O rate, enter the upper limit value in the text box and select IOPS. If you want to set the upper limit value of the transfer rate, enter the upper limmit value in the text box and select MB/s.

Rename SPM Group window

Use this window to rename the SPM group



Item	Description
SPM Group Name	Enter SPM group name (maximum of 64 characters).

C

Virtual Partition Manager GUI reference

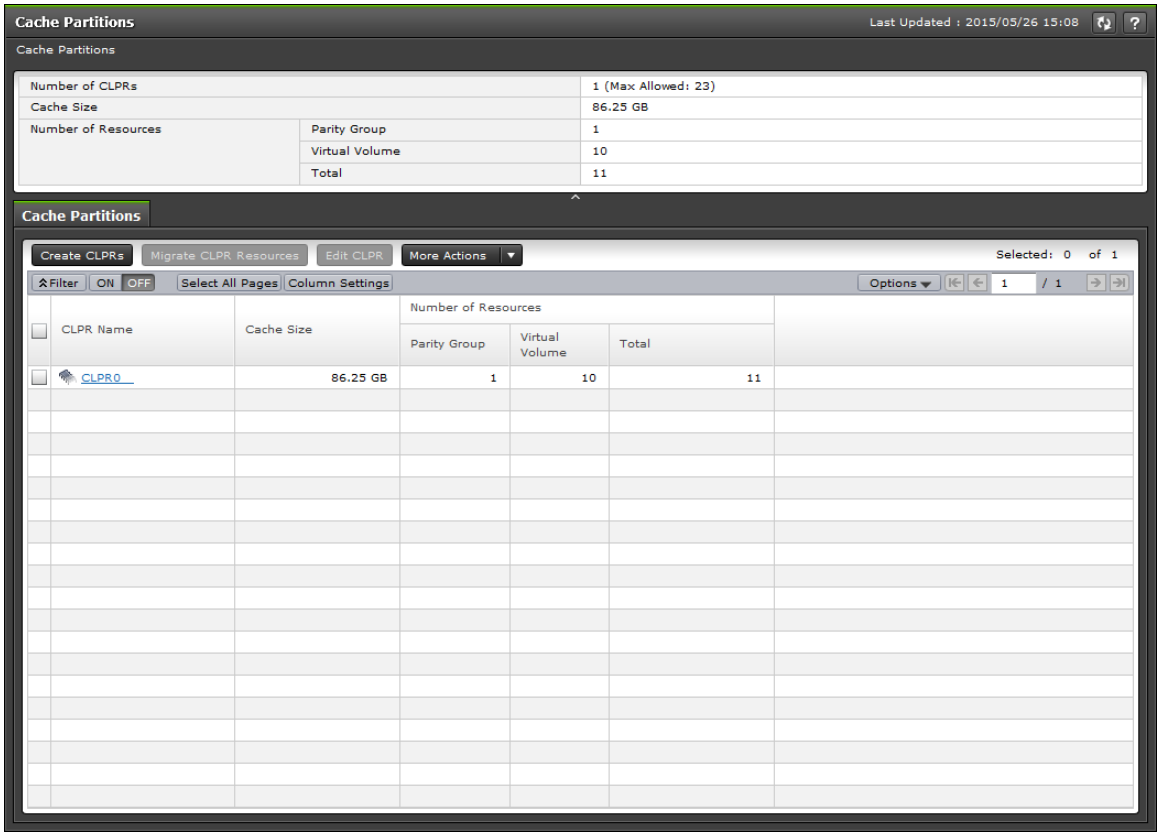
This chapter provides detailed information about the Virtual Partition Manager GUI.

- Cache Partition window
- Individual CLPR window
- Create CLPRs wizard
- Migrate CLPR Resources wizard
- Edit CLPR wizard
- Change Settings window
- CLPR Properties window
- Delete CLPRs window

Cache Partition window

This is the top window that appears when **Cache Partitions** is selected in **Administration**.

- Summary on page C-2
- Cache Partitions tab on page C-3



Summary

Item	Description
Number of CLPRs	Displays the number of CLPRs in the storage system.
Cache Size	Displays the cache capacities in the storage system.
Number of Resources	Displays the number of resources already assigned to CLPRs: • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources already assigned to CLPRs

Cache Partitions tab

Item	Description
CLPR Name	Displays the CLPR names. Click the CLPR name to open the window in which the CLPR is selected.
CLPR ID[1]	Displays CLPR IDs.
Cache Size	Displays the cache capacities in the storage system:
Number of Resources	Displays the number of resources already assigned to CLPRs: • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources already assigned to CLPRs
Create CLPRs	Opens the **Create CLPRs** wizard.
Migrate CLPR Resources	Opens the **Migrate CLPR Resources** wizard.
Edit CLPR	Opens the **Edit CLPR** wizard.
Delete CLPRs[2]	Opens the **Delete CLPRs** window.
Export[2]	Opens the window for outputting the table information.
Notes: 1. This item is not shown in the table by default. To display the item, click **Column Settings**. 2. Click **More Actions** to display these items.	

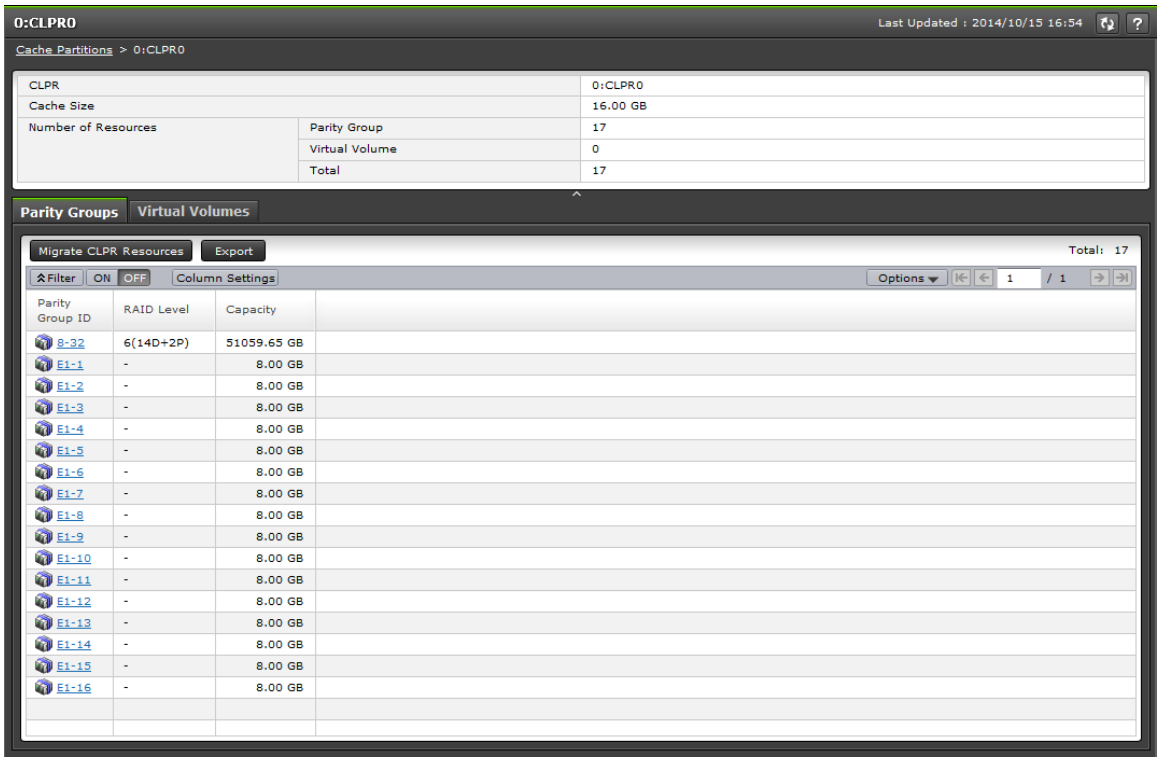
Related information

- Creating a CLPR on page 6-7
- Migrating resources to and from a CLPR on page 6-9
- Editing the settings of an existing CLPR on page 6-10
- Deleting a CLPR on page 6-11

Individual CLPR window

This window appears when a CLPR is selected in **Cache Partitions**.

- Summary on page C-4
- Parity Groups tab on page C-4
- Virtual Volumes tab on page C-5



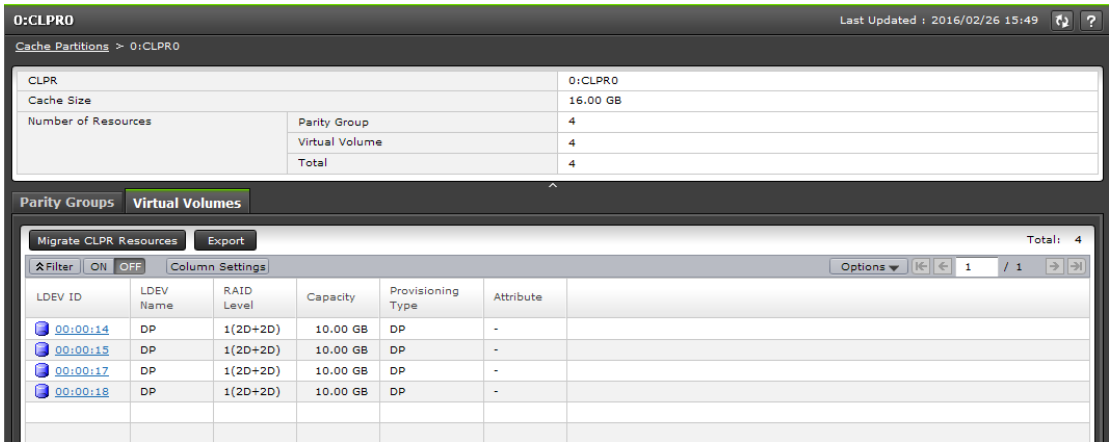
Summary

Item	Description
CLPR	Displays the CLPR ID and CLPR name.
Cache Size	Displays the cache capacities in the storage system:
Number of Resources	Displays the number of resources already assigned to CLPRs: • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources already assigned to CLPRs

Parity Groups tab

Item	Description
Parity Group ID	Displays the parity group IDs. Click the parity group ID to open the window in which the parity group is selected.
RAID Level	Displays the RAID level.
Capacity	Displays the capacity.
Migrate CLPR Resources	Opens the **Migrate CLPR Resources** window.
Export	Opens the window for outputting the table information.

Virtual Volumes tab



Item	Description
LDEV ID	Displays the LDEV IDs. Click the LDEV ID to open the properties window of each LDEV.
LDEV Name	Displays the LDEV name
RAID Level	Displays the RAID level
Capacity	Displays the capacity
Provisioning Type	Displays the LDEV type
Attribute	Displays the LDEV attribute
Virtual Storage Machine*	Displays information about the virtual storage machine: • Model type/Serial number*: Displays the model type and serial number of the virtual storage machine of the LDEV. • LDEV ID*: Displays the virtual LDEV ID of the LDEV. A blank displays when no virtual LDEV ID is assigned. • Device Name*: Displays the virtual device name of the LDEV. The virtual device name is displayed as a combination of the number of virtual LUSE volumes and the virtual CVS attribute. The values of the virtual LUSE volume number, virtual LUSE volume number, and virtual CVS attribute appear only for items that have been set. This column is blank when the virtual LUSE volume number and virtual CVS attribute are not set. If the virtual CVS attribute is set, CVS is attached as the suffix to the device name. • SSID*: Displays the virtual SSID of the LDEV. A blank displays when no virtual SSID is specified.
Migrate CLPR Resources	Opens the **Migrate CLPR Resources** window
Export	Opens the window for outputting the table information
* These items are not shown in the table by default. To display these items, click **Column Settings**.	

Related information

- Migrating resources to and from a CLPR on page 6-9

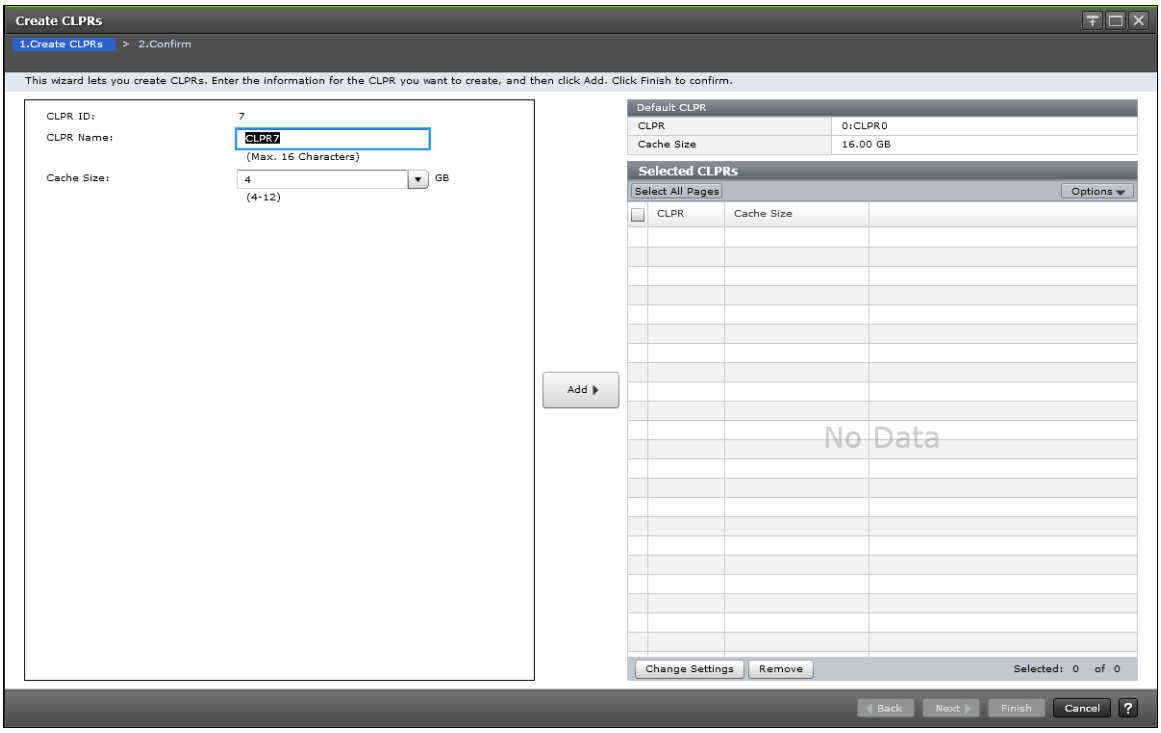
Create CLPRs wizard

Related information

- Creating a CLPR on page 6-7

Create CLPRs window

This window appears when you click **Create CLPRs** on the Cache Partition window.



Create CLPR settings

Use the left side of this window to create CLPRs.

Item	Description
CLPR ID	Displays the smallest CLPR ID of available CLPR IDs. Displays a blank if no CLPR ID is available.
CLPR Name	Enables you to enter the CLPR name. You can use up to 16 alphanumeric characters but cannot specify CLPR names that are already reserved. A blank is displayed if no CLPR ID is available. For details see CLPR names on page 6-2.
Cache Size	Enables you to select the cache capacity of CLPR. A blank is displayed if no CLPR ID is available. You can select 4 GB or higher value for the cache capacity of the CLPR, and the desired value can be selected in increments of 2 GB. The maximum available capacity (subtract the total usage capacity

Item	Description
	of other CLPRs from the total capacity of the storage system) is displayed as the upper limit value.
Add	You can add the CLPR set in the left side of the window to the **Selected CLPRs** table.

Default CLPR table

Displays the information about CLPR 0.

Item	Description
CLPR	Displays the CLPR ID and CLPR name
Cache Size	Displays the cache capacities in the storage system. The values change depending on the created CLPR.

Selected CLPRs table

Displays the information about the CLPRs to be created.

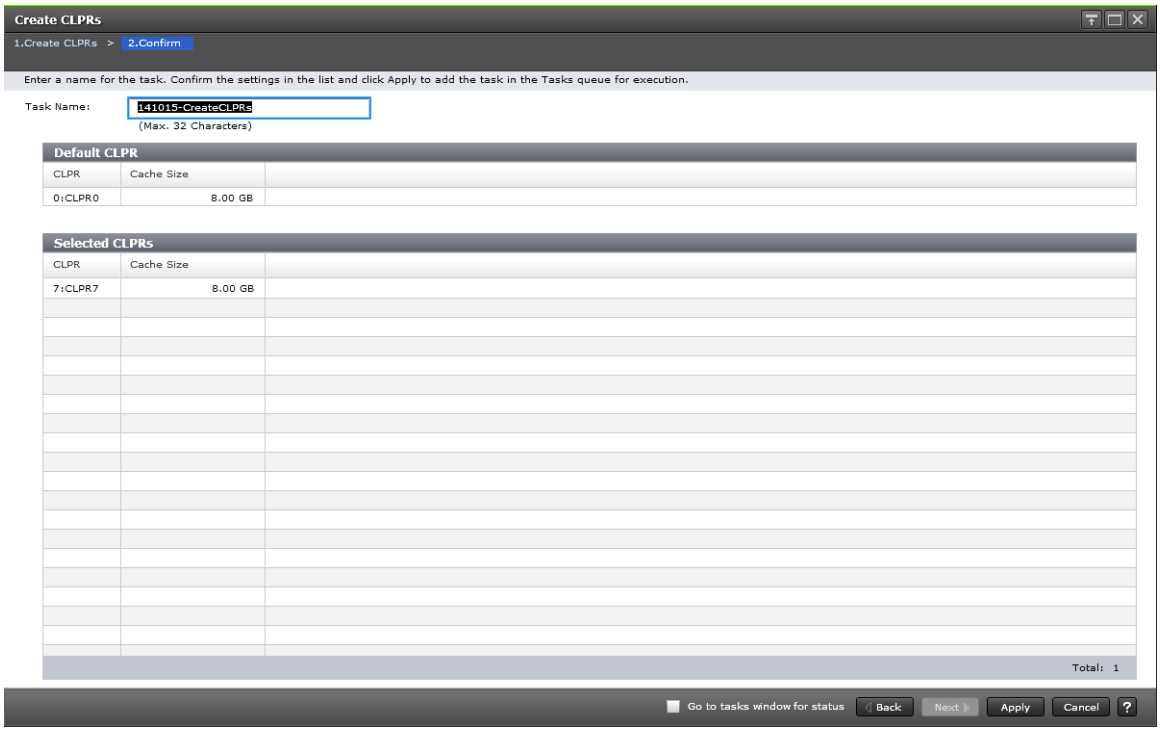
Item	Description
CLPR	Displays the CLPR ID and CLPR name
Cache Size	Displays the cache capacities in the storage system

Buttons

Item	Description
Change Settings	Opens the **Change Settings** window
Remove	Enables you to delete the selected CLPRs from the **Selected CLPRs** table

Confirm window for Create CLPRs

Use this window to confirm the CLPRs to be created and to assign a name to the create CLPR task.



Task Name field

Item	Description
Task Name	Enables you to enter a name (up to 32 alphanumeric characters) for the specified create CLPR task

Default CLPR table

Displays the information about CLPR 0.

Item	Description
CLPR	Displays the CLPR ID and CLPR name
Cache Size	Displays the cache capacities in the storage system

Selected CLPRs table

Use this table to view the information of CLPR to be created.

Item	Description
CLPR	Displays the CLPR ID and CLPR name
Cache Size	Displays the cache capacities

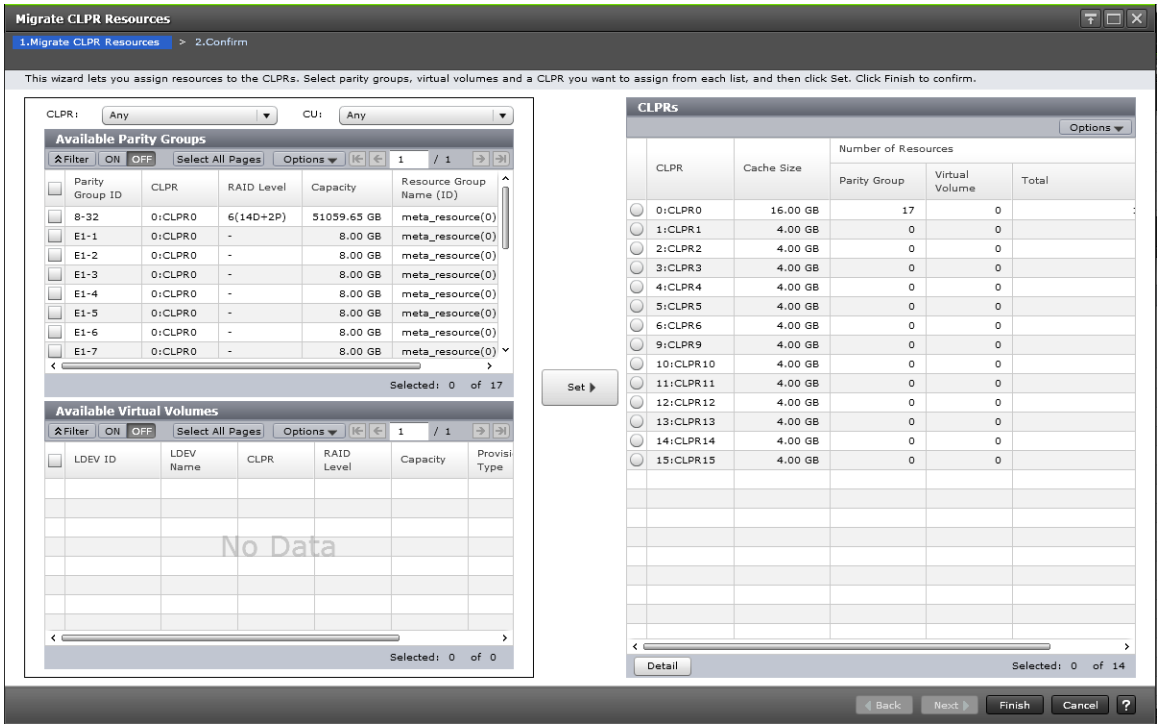
Migrate CLPR Resources wizard

Related information

- Migrating resources to and from a CLPR on page 6-9

Migrate CLPR Resources window

This window appears when you click **Migrate CLPR Resources** on the Cache Partition window.



CLPR and CU filters for parity group and virtual volume tables

Item	Description
CLPR	Enables you to filter the **Available Parity Groups** table or the **Available Virtual Volumes** table. **Any** is selected by default.
CU	Enables you to filter the Available **Virtual Volumes** table. **Any** is selected by default.

Available Parity Groups table

Item	Description
Parity Groups ID	Displays the parity group ID
CLPR	Displays the CLPR ID and CLPR name
RAID Level	Displays the RAID Level

Item	Description
Capacity	Displays the total capacity of the parity group
Resource Group Name (ID)	Displays the name and the ID of the resource group of the parity group. The ID is displayed in parentheses.

Available Virtual Volumes table

Item	Description
LDEV ID	Displays the LDEV IDs
LDEV Name	Displays the LDEV names
CLPR	Displays the CLPR IDs and CLPR names
RAID Level	Displays the RAID levels
Capacity	Displays the capacities
Provisioning Type	Displays the LDEV types
Resource Group Name (ID)	Displays the name and the ID of the resource group of the LDEV.The ID is displayed in parentheses.

Button

Item	Description
Set	Adds the resources assigned at the left area of the window to the CLPR selected in the **CLPRs** table

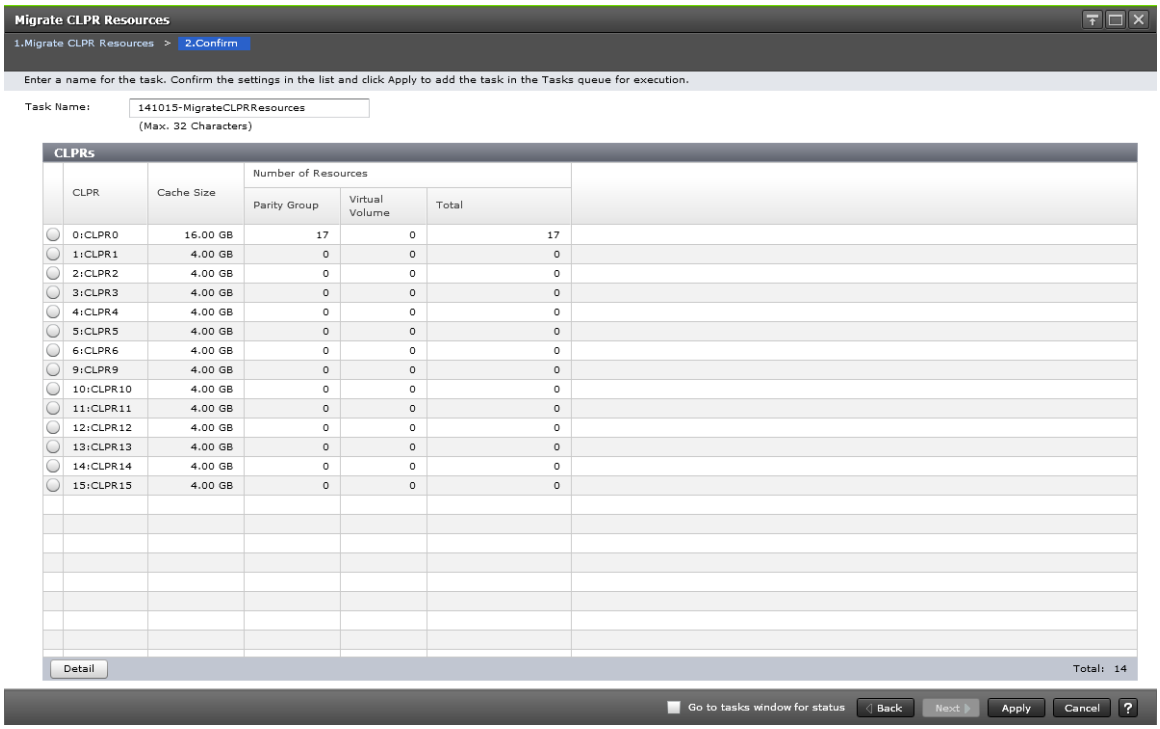
CLPRs table

Displays the information about the resources to assign to CLPRs.

Item	Description
CLPR	Displays the CLPR IDs and CLPR names
Cache Size	Displays the total cache capacities
Number of Resources	Displays the number of resources assigned to CLPRs. The value changes depending on the resources. • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources assigned to CLPRs
Detail	Opens the **CLPR Properties** window for the selected CLPR

Confirm window for Migrate CLPR Resources

Use this window to confirm the CLPR resources to be migrated and to assign a name to the migrate CLPR resources task.



CLPRs table

Displays the information about the CLPRs to be migrated.

Item	Description
CLPR	Displays the CLPR IDs and CLPR names.
Cache Size	Displays the total cache capacities of the CLPRs.
Number of Resources	Displays the number of resources assigned to CLPRs. • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources assigned to the CLPR

Task Name field

Item	Description
Task Name	Enables you to enter a name (up to 32 alphanumeric characters) for the specified migrate CLPR task.

Button

Item	Description
Detail	Opens the **CLPR Properties** window.

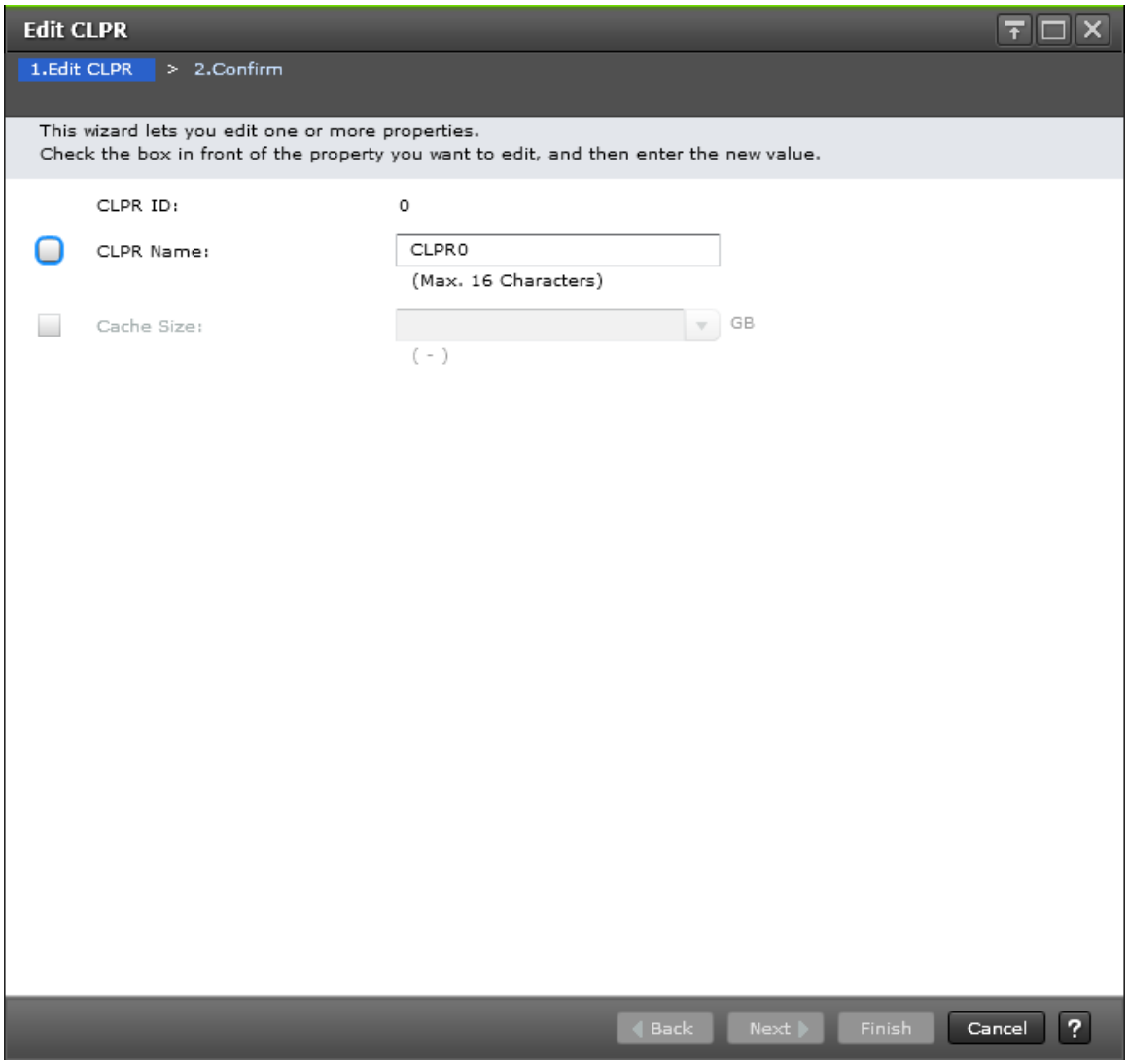
Edit CLPR wizard

Related information

- Editing the settings of an existing CLPR on page 6-10

Edit CLPR window

This window appears when you click **Edit CLPR** on the Cache Partition window.



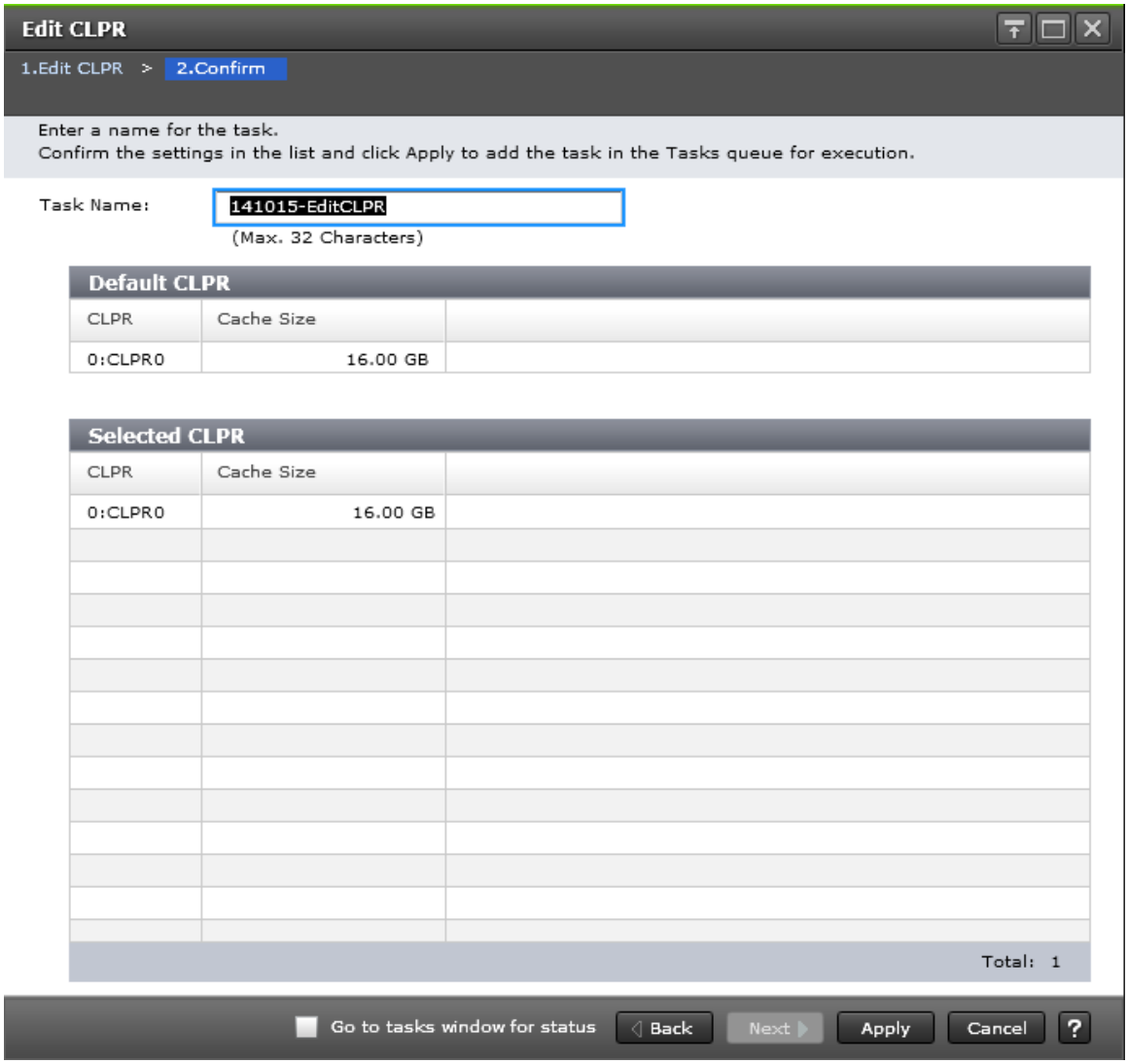
Edit CLPR settings

Item	Description
CLPR ID	Displays the CLPR ID.
CLPR Name	Displays the CLPR name set at the time of the CLPR creation, and enables you to edit the name. You can use up to 16 alphanumeric

Item	Description
	characters but cannot specify CLPR names that are already reserved. For details see CLPR names on page 6-2.
Cache Size	Displays the cache capacity set at the time of the CLPR creation, and enables you to edit the cache capacity. When you select the CLPR0, this item is inactive. You can select 4 GB or higher value in the cache capacity of the CLPR. The value can be selected in increments of 2 GB. The maximum available capacity (subtract the total usage capacity of other CLPRs from the total capacity of the storage system) is displayed as the upper limit value.

Confirm window for Edit CLPR

Use this window to confirm the CLPR to be edited and to assign a name to the edit CLPR task.



Default CLPR table

Displays the information about CLPR 0.

Item	Description
CLPR	Displays the CLPR ID and CLPR name.
Cache Size	Displays the cache capacities in the storage system.

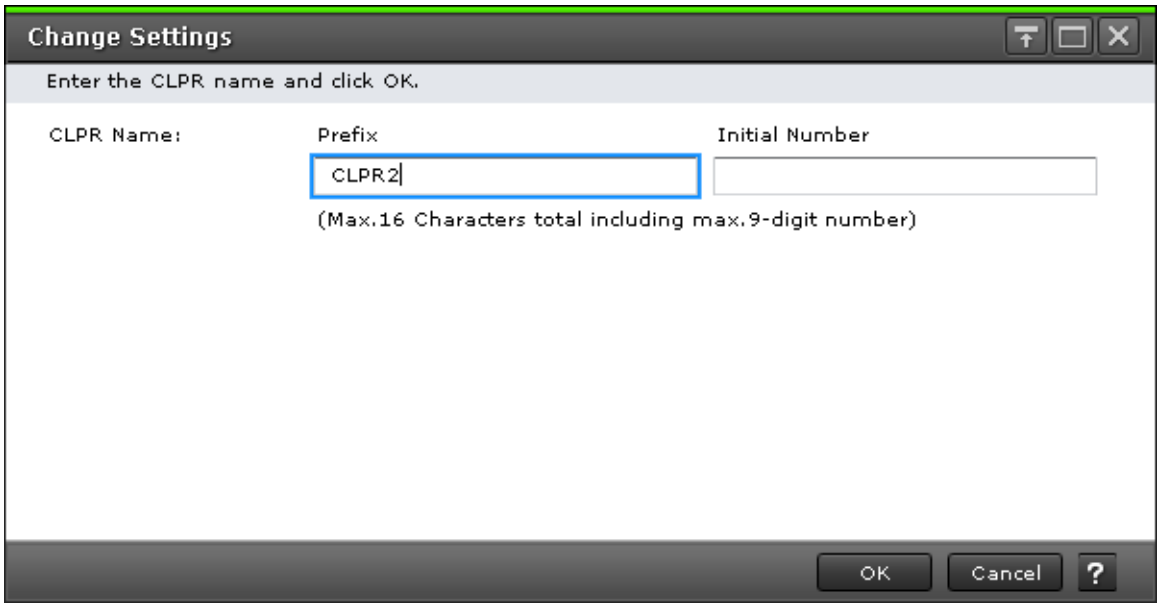
Selected CLPR table

Displays information about CLPRs to be edited.

Item	Description
CLPR	Displays the CLPR IDs and CLPR names.
Cache Size	Displays the cache capacities.

Change Settings window

This window appears when you click **Change Settings** on the **Create CLPRs** window.



CLPR Name field

Item	Description
CLPR Name	Displays the CLPR name set at the time of the CLPR creation, and enables you to edit the name. • **Prefix:** You can use up to 16 alphanumeric characters but cannot specify CLPR names that are already reserved. For details see CLPR names on page 6-2.

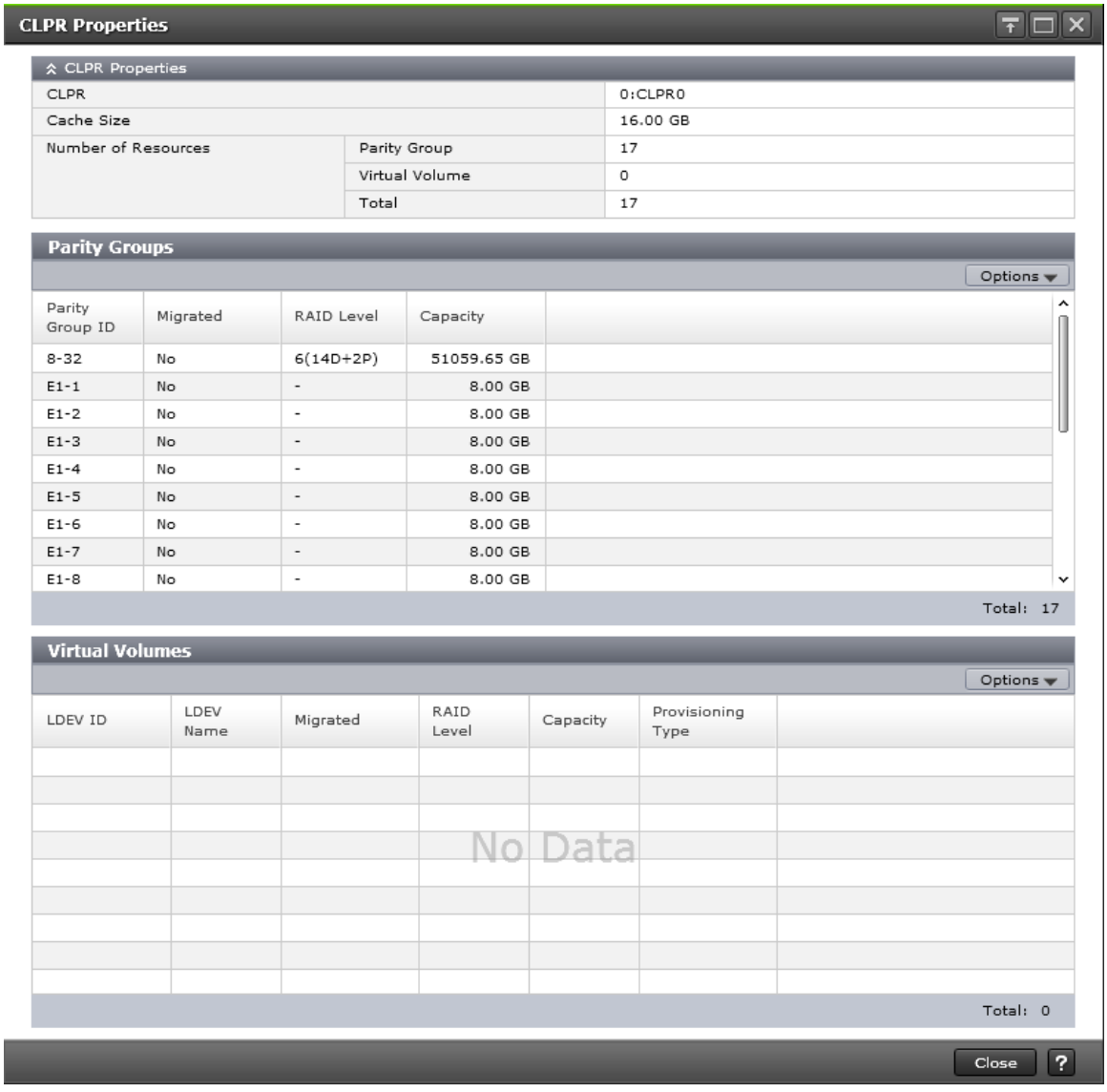
Item	Description
	• **Initial number:** You can use numbers 0 to 9, and a blank is set by default. Up to 9 characters can be used. The maximum number of characters for CLPR name is 16, including both **Prefix** and **Initial number**, not 25 (16+9).

Related topics

- Creating a CLPR on page 6-7

CLPR Properties window

This window appears when you click **Detail** on the **Migrate CLPR Resources** window.



CLPR Properties table

Item	Description
CLPR	Displays the CLPR ID and CLPR name.
Cache Size	Displays the cache capacities in the storage system.
Number of Resources	Displays the number of resources already assigned to CLPRs. • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources assigned to the CLPR

Parity Groups table

Item	Description
Parity Group ID	Displays the parity Group IDs.
Migrated	Indicates whether there is a change by CLPR allocation: • **Yes:** There is a change by CLPR allocation. • **No:** There is not a change by CLPR allocation.
RAID Level	Displays the RAID levels.
Capacity	Displays the capacity.

Virtual Volume table

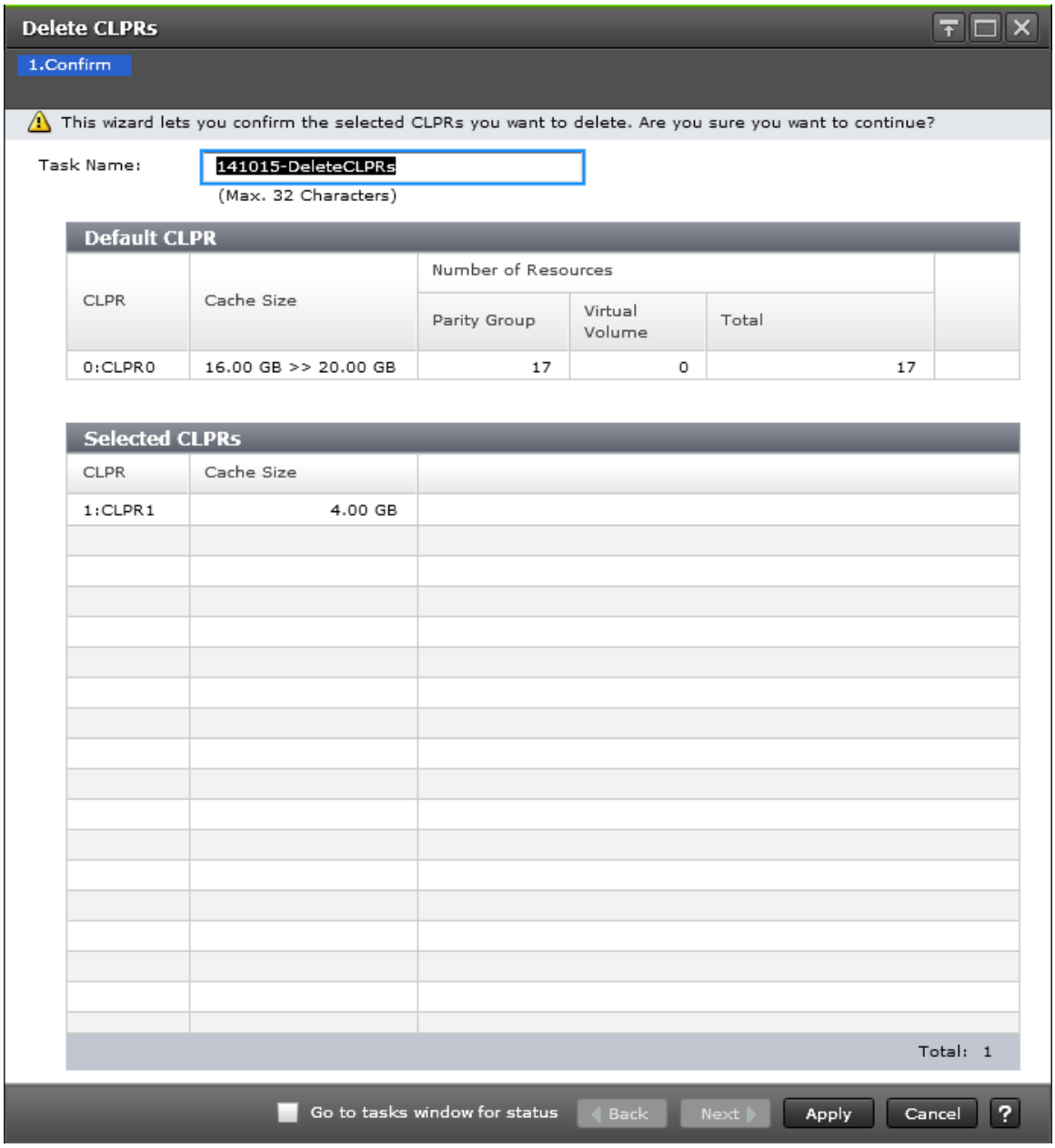
Item	Description
LDEV ID	Displays the LDEV IDs.
LDEV Name	Displays the LDEV names.
Migrated	Indicates whether there is a change by CLPR allocation: • **Yes:** There is a change by CLPR allocation. • **No:** There is not a change by CLPR allocation.
RAID Level	Displays the RAID levels.
Capacity	Displays the capacities.
Provisioning Type	Displays the LDEV types.

Related information

- Migrating resources to and from a CLPR on page 6-9

Delete CLPRs window

This window appears when you click **Delete CLPR** on the **Cache Partition** window.



Default CLPR table

Displays the information about CLPR 0.

Item	Description
CLPR	Displays the CLPR ID and CLPR name.
Cache Size	Displays the cache capacities in the storage system.
Number of Resources	Displays the number of resources already assigned to the CLPR. • **Parity Group:** Number of parity groups • **Virtual Volume:** Number of virtual volumes • **Total:** Number of resources assigned to CLPRs

Selected CLPRs table

Displays information about CLPRs to be deleted.

Item	Description
CLPR	Displays the CLPR IDs and CLPR names.
Cache Size	Displays the cache capacities.

Related information

- Deleting a CLPR on page 6-11

Glossary

This glossary defines the special terms used in this document. Click the letter links below to navigate.

A

access path
A path through which data and commands are transferred within the storage system.

array
Another name for a Virtual Storage Platform G1000 system.

B

back-end director (BED)
The hardware component that controls the transfer of data between the drives and cache. A BED feature consists of a pair of boards. A BED is also referred to as a disk adapter (DKA).

BED
See *back-end director (BED)*.

bind mode
In bind mode the Cache Residency Manager extents are used to hold read and write data for specific extents on volumes. Data written to the Cache Residency Manager bind area is not destaged to the drives. For bind mode, all targeted read and write data is transferred at host data transfer speed.

| # | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

C

cache ESW
Access paths between the cache switch and the cache memory.

cache logical partition (CLPR)
Consists of virtual cache memory that is set up to be allocated to different hosts in contention for cache memory.

capacity
The amount of data storage space available on a physical storage system, usually measured in bytes (MB, GB, TB, and so on.).

CCI
Command Control Interface

CHA ESW
Access paths between channel adapters and the cache switch.

CHA
channel adapter. Another name for a front-end director (FED).

channel adapter (CHA)
Another name for a front-end director. See *front-end director (FED)*.

CHP
channel path; channel processor. The channel processors are the microprocessors on the front-end director features of the Universal Storage Platform V.

CLI
command line interface

CLPR
cache logical partition

command device
A dedicated logical volume used only by Command Control Interface to interface with the storage system. Can be shared by several hosts.

consistency group (CTG)
A group of pairs on which copy operations are performed. Specifying a consistency group ID performs a specific operation for all pairs belonging to the consistency group simultaneously while keeping data consistency.

CRM
Hitachi Cache Residency Manager

CTG
Consistency group, for details see consistency group (CTG).

CU
control unit

custom volume (CV)
A custom-size volume whose size is defined by the user using Virtual LVI/Virtual LUN.

D

device
A physical or logical unit with a specific function.

disk adapter (DKA)
Another name for back-end director. See *back-end director (BED)*.

disk array
Disk array, or just array, is another name for a Virtual Storage Platform G1000 system.

disk controller (DKC)
The hardware component that manages front-end and back-end storage operations. The term DKC is sometimes used to refer to the entire Virtual Storage Platform G1000 system.

DKA
disk adapter. Another name for a back-end director (BED).

DKA ESW
Access paths between disk adapters and the cache switch.

DKC
disk controller. Can refer to the Virtual Storage Platform G1000 system or the controller components.

DKCMAIN
disk controller main. Refers to the microcode for the Virtual Storage Platform G1000 system.

DKP
disk processor. Refers to the microprocessors on the back-end director features of the Universal Storage Platform V.

DP
Dynamic Provisioning

DP-VOL
Dynamic Provisioning virtual volume. A virtual volume with no memory space used by Dynamic Provisioning.

DRR
data recovery and reconstruction

Dynamic Provisioning
An approach to managing storage. Instead of "reserving" a fixed amount of storage, it removes capacity from the available pool when data is actually written to disk. Also called thin provisioning.

E

EB
exabyte

external port
A Fibre Channel port that is configured to be connected to an external storage system for Universal Volume Manager operations.

ESW
PCI Express Switch adapter.

Export Tool
Software used to export monitoring data (statistics) shown in the Hitachi Performance Monitor Monitor Performance window to text files.

external volume
A logical volume whose data resides on drives that are physically located outside the Hitachi Virtual Storage Platform G1000 system.

F

FD Dump Tool
Downloads Storage Navigator configuration information onto disk for backup and troubleshooting purposes.

FED
front-end director

front-end director (FED)
The hardware component that processes channel commands from hosts and manages host access to cache. A FED is also referred to as a channel adapter (CHA).

G

GUI
graphical user interface

H

HBA
host bus adapter

HDP
Hitachi Dynamic Provisioning

HDS
Hitachi Data Systems

host group
A group of hosts of the same operating system platform. Also known as a host storage domain.

host mode
Operational modes that provide enhanced compatibility with supported host platforms. Used with Fibre Channel ports on Virtual Storage Platform G1000 systems.

host mode option
Additional options for Fibre Channel ports on Virtual Storage Platform G1000 systems. Provide enhanced functionality for host software and middleware.

HUR
Hitachi Universal Replicator

I

initial copy
An initial copy operation is performed when a copy pair is created. Data on the primary volume is copied to the secondary volume.

internal volume
A logical volume whose data resides on drives that are physically located within the storage system. See also *external volume*.

I/O
input/output

IOPS
I/Os per second

IP
internet protocol

iSNS
internet storage name service

J

JRE
Java Runtime Environment

L

LAN
local-area network

LBA
logical block address

LCP
local control port; link control processor

LDEV
logical device

LDKC
See *logical disk controller (LDKC)*.

license key
A specific set of characters that unlocks an application and allows it to be used.

local copy
See *in-system replication*.

logical device (LDEV)
An individual logical data volume (on multiple drives in a RAID configuration) in the storage system. An LDEV may or may not contain any data and may or may not be defined to any hosts. Each LDEV has a unique identifier or "address" within the storage system composed of the logical disk controller (LDKC) number, control unit (CU) number, and LDEV number. The LDEV IDs within a storage system do not change.An

LDEV formatted for use by mainframe hosts is called a logical volume image (LVI). An LDEV formatted for use by open-system hosts is called a logical unit (LU).

logical disk controller (LDKC)
A group of 255 control unit (CU) images in the Virtual Storage Platform G1000 system that is controlled by a virtual (logical) storage system within the single physical storage system. For example, the Universal Storage Platform V storage system supports two LDKCs, LDKC 00 and LDKC 01.

logical unit (LU)
A logical volume that is configured for use by open-systems hosts (for example, OPEN-V).

logical unit (LU) path
The path between an open-systems host and a logical unit.

logical volume
See *volume*.

LU
logical unit

LUN
logical unit number

LUSE
Hitachi LUN Expansion; Hitachi LU Size Expansion

M

MF, M/F
mainframe

modify mode
The mode of operation of Storage Navigator that allows changes to the storage system configuration. See also *view mode*.

MP
microprocessor

MP blade
Processor blade.

MP blade ESW
Access paths between the MP bland and the cache switch.

monitoring target
An object selected to be monitored using Performance Monitor.

multipathing
A performance and fault-tolerant technique that uses more than one physical connection between the storage system and host system. Also called multipath I/O.

N

NAS
network-attached storage

no.
number

NVS
nonvolatile storage

O

OPEN-*x*
A logical unit (LU) of fixed size (for example, OPEN-3 or OPEN-9) that is used primarily for sharing data between mainframe and open-systems hosts using Hitachi Cross-OS File Exchange.

OS
operating system

P

pair
Two logical volumes in a replication relationship in which one volume contains original data to be copied and the other volume contains the copy of the original data. The copy operations can be synchronous or asynchronous, and the pair volumes can be located in the same storage system (in-system replication) or in different storage systems (remote replication).

parity group
See *RAID group*.

PDEV
physical device

prestaging of data
Places specific data in Cache Residency Manager cache before it is accessed by the host. When prestaging is selected, the host locates the prestaged data in the CRM cache from the first access, thus enhancing its access performance.

pool
A set of volumes that are reserved for storing pool volumes (pool-VOL), and used by Thin Image, Dynamic Provisioning, Dynamic Provisioning for Mainframe, Dynamic Tiering, Dynamic Tiering for Mainframe, active flash, active flash for mainframe write data.

pool volume (pool-VOL)
A logical volume that is reserved for storing snapshot data for Thin Image operations or write data for Dynamic Provisioning, Dynamic Provisioning for Mainframe, Dynamic Tiering, Dynamic Tiering for Mainframe, active flash, active flash for mainframe.

primary site
The physical location of the storage system that contains the original data to be replicated and that is connected to one or more storage systems at the remote or secondary site via remote copy connections. A primary site can also be called a "main site" or "local site".
The term "primary site" is also used for host failover operations. In that case, the primary site is the host computer where the production applications are running, and the secondary site is where the backup applications run when the applications at the primary site fail, or where the primary site itself fails.

prio, priority
priority mode. Used in Cache Residency Manager.

PSUE
Pair suspended-error

PSUS
Pair suspended-split

P-VOL
Primary volume.

Q

quick format
The quick format feature in Virtual LVI/Virtual LUN in which the formatting of the internal volumes is done in the background. This allows system configuration (such as defining a path or creating a TrueCopy pair) before the formatting is completed. To execute quick formatting, the volumes must be in blocked status.

quick restore
A reverse resynchronization in which no data is actually copied: the primary and secondary volumes are swapped.

R

RAID
redundant array of inexpensive disks

RAID level
The type of RAID implementation. RAID levels include RAID0, RAID1, RAID2, RAID3, RAID4, RAID5 and RAID6.

RCU
See *remote control unit (RCU)*.

remote console PC
A previous term for the personal computer (PC) system that is LAN-connected to a Virtual Storage Platform G1000 system. The current term is Storage Navigator PC.

resync
"Resync" is short for resynchronize.

S

SAN
storage area network

scripting
The use of command line scripts, or spreadsheets downloaded by Configuration File Loader, to automate storage management operations.

SCSI
small computer system interface

secondary site
The physical location of the storage system that contains the primary volumes of remote replication pairs at the main or primary site. The storage system at the secondary site is connected to the storage system at the main or primary site via remote copy connections. The secondary site can also be called the "remote site" or "secondary storage system". See also *primary site*.

secondary volume (S-VOL)
The volume in a copy pair that is the copy of the original data on the primary volume (P-VOL). The following Hitachi products use the term "secondary volume": ShadowImage, TrueCopy, Universal Replicator, Universal Replicator for Mainframe, and High Availability Manager.
See also *primary volume (P-VOL)*.

service processor (SVP)
The computer inside a Virtual Storage Platform G1000 system that hosts the Storage Navigator software and is used by service personnel for configuration and maintenance of the storage system.

severity level
Applies to service information messages (SIMs) and Hitachi Storage Navigator User Guide error codes.

SIM
service information message

SM
shared memory

SMPL
simplex

SMTP
simple mail transfer protocol

source volume (S-VOL)
The volume in a copy pair containing the original data that is duplicated on the target volume (T-VOL). The following Hitachi products use the term source volume: ShadowImage for Mainframe, Dataset Replication, IBM FlashCopy™.

SSID
storage subsystem ID. SSIDs are used for reporting information from the CU to the mainframe operating system. Each group of 64 or 256 volumes requires one SSID, so there are one or four SSIDs per CU image. The user-specified SSIDs are assigned during storage system installation and must be unique to all connected host operating environments.

S-VOL
See *secondary volume (S-VOL)* or *source volume (S-VOL)*.

SVP
See *service processor (SVP)*.

sync
synchronous

T

throughput (of storage system)
Total throughput is the sum of I/Os to LDEVs, parity groups, or LUNs. Read throughput is I/Os to the disk per second when the file read processing is performed. Write throughput is I/Os to the disk per second when the file write processing is performed. In Performance Monitor, throughputs in the following modes can be displayed. - Sequential access mode - Random access mode - CFW (cache fast write) mode - Total value in the above-mentioned mode

total capacity
The aggregate amount of storage space in a data storage system.

V

VDEV
See *virtual device (VDEV)*.

view mode
The mode of operation of Storage Navigator that allows viewing only of the storage system configuration. The two Storage Navigator modes are view mode and modify mode.

virtual device (VDEV)
A group of logical devices (LDEVs) in a RAID group. A VDEV typically consists of some fixed volumes (FVs) and some free space. The number of fixed volumes is determined by the RAID level and device emulation type.

virtual volume (V-VOL)
A logical volume in a storage system that has no physical storage space. Thin Image uses V-VOLs as secondary volumes of copy pairs. In Dynamic Provisioning, Dynamic Provisioning for Mainframe, Dynamic Tiering, Dynamic Tiering for Mainframe, active flash, and active flash for mainframe, V-VOLs are referred to as DP-VOLs.

VOL, vol
volume

volume
A logical device (LDEV), or a set of concatenated LDEVs in the case of LUSE, that has been defined to one or more hosts as a single data storage unit. A mainframe volume is called a logical volume image (LVI), and an open-systems volume is called a logical unit. (LU).

VSP
Hitachi Virtual Storage Platform

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V-VOL
virtual volume

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