

PRELIMINARY RELEASE



**Hitachi Freedom Storage™
Lightning 9900™ V Series**

**Priority Access (Prioritized Port Control)
User's Guide**

PRELIMINARY RELEASE

© 2002 Hitachi Data Systems, ALL RIGHTS RESERVED

Notice: No part of this publication may be reproduced or transmitted in any form or by any electronic or mechanical means, including photocopying and recording, or stored in a database or retrieval system for any purpose, without the express written permission of Hitachi Data Systems.

Hitachi Data Systems reserves the right to make changes to this document at any time without notice and assumes no responsibility for its use. Hitachi Data Systems products and services can only be ordered under the terms and conditions of Hitachi Data Systems' applicable agreements, including license agreements. All of the features described in this document may not be currently available. Refer to the most recent product announcement or contact your Hitachi Data Systems representative for information on feature and product availability.

This document contains the most current information available at the time of publication. When new and/or revised information becomes available, this entire document will be updated and distributed to all registered users.

Trademarks

Hitachi Data Systems is a registered trademark and service mark of Hitachi, Ltd., and the Hitachi Data Systems design mark is a trademark and service mark of Hitachi, Ltd.

Hitachi Freedom Storage, Lightning 9900 V Series, Hitachi CruiseControl, LUN Manager, Performance Monitor (Performance Management), Priority Access (Prioritized Port Control), and Remote Console are trademarks of Hitachi Data Systems Corporation.

Windows and Windows NT are registered trademarks of Microsoft Corporation.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and other countries.

All other brand or product names are or may be trademarks or service marks of and are used to identify products or services of their respective owners.

Notice of Export Controls

Export of technical data contained in this document may require an export license from the United States government and/or the government of Japan. Contact the Hitachi Data Systems Legal Department for any export compliance questions.

Document Revision Level

Revision	Date	Description
MK-92RD117-P	April 2002	Preliminary Release

Changes in this Revision

- New panel screen captures added.
- New descriptions added.

Source Documents Used in this Revision

The following source documents were used to produce this Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access (Prioritized Port Control) User's Guide.

- Hitachi Lightning 9900™ V Series Performance Management User's Guide, RSD source document (RSD-Mon45d2), dated 03/08/02.
- Hitachi Lightning 9900™ V Series Performance Management User's Guide, RSD source document (RSD-Mon45d0a), dated 04/15/02.

Referenced Documents

- *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100).
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor (Performance Management) User's Guide* (MK-92RD133).
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl User's Guide* (MK-92RD106).
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console Error Codes* (MK-92RD132).
- *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105).

Preface

The Priority Access (Prioritized Port Control) User's Guide describes and provides instructions for using the Priority Access (Prioritized Port Control) software to allow you to assign higher priority to I/O operations of hosts requiring high performance, thereby increasing throughput and minimizing performance losses. This document assumes that:

- the user has a background in data processing and understands direct-access storage device (DASD) subsystems and their basic functions,
- the user has read and understands the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100), the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101), and the *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor (Performance Management) User's Guide* (MK-92RD133), and
- the user is familiar with the Microsoft® Windows NT® and/or Windows® 2000 operating systems (e.g., opening, closing, minimizing, and restoring windows; using the keyboard and mouse to navigate on screen and select objects).
- the user is familiar with various web browsers.

Note: The term "9900V" refers to the entire Lightning 9900™ V Series subsystem family, unless otherwise noted. The term "Web Console" refers to "Remote Console - Storage Navigator" unless otherwise noted. The term "Performance Management" refers to "Performance Monitor" unless otherwise noted. The terms "PPC" and "Prioritized Port Control" refer to "Priority Access" unless otherwise noted. For additional information on the 9900V disk array subsystems please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100) or contact your Hitachi account team. For additional information on the 9900V Remote Console PC, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101) or contact your Hitachi account team.

Microcode Level

This document revision applies to 9900V microcode versions 21-01-xx/xx and higher.

COMMENTS

Please send us your comments on this document: doc.comments@hds.com.

Make sure to include the document title, number, and revision.
Please refer to specific page(s) and paragraph(s) whenever possible.
(All comments become the property of Hitachi Data Systems Corporation.)

Thank you!

PRELIMINARY RELEASE

Contents

Chapter 1	Overview of Performance Monitor (Performance Management), Hitachi CruiseControl, and Priority Access (Prioritized Port Control)	1
Chapter 2	Priority Access (Prioritized Port Control) Overview	3
	2.1 Preventing Decreased Performance in High-Priority Hosts.....	3
	2.2 Disabling Upper Limit Control Automatically.....	4
	2.3 Procedure for Using Priority Access (Prioritized Port Control)	5
	2.3.1 If One-to-One Connections are Established Between HBAs and Ports.....	5
	2.3.2 If Many-to-Many Connections are Established Between HBAs and Ports.....	8
	2.4 Notes on Using Priority Access (Prioritized Port Control)	12
Chapter 3	Preparing for Priority Access (Prioritized Port Control) Operations	15
	3.1 System Requirements	15
	3.2 Starting Remote Console - Storage Navigator™ and Configuring Your Client PC.....	15
	3.3 Starting Priority Access (Prioritized Port Control).....	16
Chapter 4	Reviewing the Priority Access (Prioritized Port Control) Panel.....	19
	4.1 The Port Tab.....	19
	4.2 The WWN Tab	22
Chapter 5	Performing Priority Access (Prioritized Port Control) Operations	25
	5.1 If One-to-One Connections are Established Between HBAs and Ports	25
	5.1.1 Measuring Traffic between Host Bus Adapters and Ports	26
	5.1.2 Analyzing Traffic Statistics.....	26
	5.1.3 Setting Upper Limit Values to Traffic at Non-prioritized Ports	27
	5.1.4 Setting a Threshold.....	28
	5.2 If Many-to-Many Connections are Established Between HBAs and Ports	29
	5.2.1 Measuring Traffic between Host Bus Adapters and Ports	29
	5.2.2 Analyzing Traffic Statistics.....	31
	5.2.3 Setting Upper Limit Values to Non-prioritized WWNs	31
	5.2.4 Setting a Threshold.....	32
	5.3 Grouping Host Bus Adapters.....	34
	5.3.1 Assigning Multiple HBAs to a Priority Access (Prioritized Port Control) Group	34
	5.3.2 Switching Priority of a Priority Access (Prioritized Port Control) Group.....	35
	5.3.3 Setting the Same Upper Limit Value to Multiple HBAs.....	36
	5.3.4 Renaming a Priority Access (Prioritized Port Control) Group.....	36
	5.3.5 Deleting a Priority Access (Prioritized Port Control) Group	37

Chapter 6 Troubleshooting 39

 6.1 Troubleshooting in General 39

 6.2 Troubleshooting Priority Access 41

 6.3 Calling the Hitachi Data Systems Technical Support Center 41

Acronyms and Abbreviations 43

List of Figures

Figure 2.1	Network A (One-to-one Connections Established between HBAs and Ports)	5
Figure 2.2	Priority Specified in the Port Tab	6
Figure 2.3	Traffic at Ports.....	7
Figure 2.4	Network B (Many-to-Many Connections Established between HBAs and Ports) ...	8
Figure 2.5	Host Bus Adapters to be Monitored	9
Figure 2.6	Priority Specified in the Priority Access (Prioritized Port Control) Panel	9
Figure 2.7	Traffic at Ports.....	10
Figure 2.8	Upper Limits.....	11
Figure 2.9	Line Graphs that Indicate Changes in Port Traffic	13
Figure 3.1	Performance Monitor (Performance Management) Panel	17
Figure 3.2	Port and WWN Tabs	17
Figure 4.1	The Port Tab in the Priority Access (Prioritized Port Control) Panel	20
Figure 4.2	The WWN Tab in the Priority Access (Prioritized Port Control) Panel	22
Figure 5.1	The Add WWN Panel	30
Figure 5.2	The Add New Priority Access (PPC) Group Panel	35
Figure 5.3	The Change Upper Limit Panel	36
Figure 5.4	The Change Priority Access (Prioritized Port Control) Group Name Panel	37

List of Tables

Table 6.1	General Error Conditions	40
-----------	--------------------------------	----

PRELIMINARY RELEASE

Chapter 1 Overview of Performance Monitor (Performance Management), Hitachi CruiseControl, and Priority Access (Prioritized Port Control)

Performance Monitor (Performance Management) serves as the foundation for a suite of programs that allow you to monitor and tune disk subsystem performance. This suite of software consists of:

- Performance Monitor (Performance Management)
- Hitachi CruiseControl
- Priority Access (Prioritized Port Control)

Performance Monitor (Performance Management) lets you obtain usage statistics about the physical hard disk drive, logical volumes, processors, or other resources in your disk subsystem. Performance Monitor (Performance Management) also lets you obtain statistics about workloads on disk drives and traffic between hosts and the disk subsystem. The Hitachi Performance Monitor (Performance Management) panel displays a line graph that indicates changes in the usage rates, workloads, or traffic. You can view information in the panel and analyze trends in disk I/Os and detect peak I/O time. If the system performance is low, you can use information in the panel to detect bottlenecks in the system. For details, see

Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide (MK-92RD133).

Hitachi CruiseControl lets you balance workload among hard disk drives, logical volumes, and processors to remove bottlenecks from your system. If Performance Monitor (Performance Management) indicates that a lot of I/Os are made to certain hard disk drives, you can use Hitachi CruiseControl to distribute workloads to other disk drives. For details, see the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106).*

Priority Access (Prioritized Port Control) lets you tune the system to provide high-priority hosts with relatively higher throughput. Priority Access (Prioritized Port Control) can prevent production servers from suffering lowered performance.

Caution: If Performance Monitor (Performance Management) is not enabled, you cannot use Hitachi CruiseControl or Priority Access (Prioritized Port Control).

Chapter 2 Priority Access (Prioritized Port Control) Overview

Priority Access (Prioritized Port Control) allows you to assign higher priority to I/O operations of hosts requiring high performance, thereby increasing throughput. The end result is that Priority Access (Prioritized Port Control) can minimize reduced performance in production servers.

2.1 Preventing Decreased Performance in High-Priority Hosts

In a storage area network (SAN) environment, the disk subsystem is usually connected with a number of host servers. Generally these are divided into the following two types:

- Production servers
- Development servers

Some types of the host servers require high performance while others do not.

For example, **production servers** usually require high performance. Production servers, which include database servers and application servers, are used to perform daily tasks of business organizations. If production servers suffer lowered performance, a reduction in business productivity is likely to occur. Therefore, the system administrator needs to maintain high performance levels for production servers.

Computer systems in business organizations often include **development servers** as well as production servers. Development servers are used for developing, testing, and debugging business applications. A decline in development server performance will generally result in far less business disruption than a decline in production servers.

Priority Access (Prioritized Port Control) allows you to limit the number of I/O requests from development servers to the disk subsystem. Priority Access (Prioritized Port Control) also allows you to limit the amount of data that is transferred between the development servers and the disk subsystem.

Throughout this document, the term **upper limit control** is used to refer to the practice of limiting the performance of low-priority host servers in order to maintain higher performance levels in high-priority host servers.

2.2 Disabling Upper Limit Control Automatically

The benefit of upper limit control is that performance of production servers can be maintained at a higher level. However, upper limit control may not always be useful (e.g., when production servers are not busy).

If the number of I/Os from production servers increases greatly from 9:00 a.m. to 3:00 p.m. and decreases markedly after 3:00 p.m., upper limit control will suppresses performance of development servers even after 3:00 p.m. In this case, development servers should be free from upper limit control when production servers are not busy.

Priority Access (Prioritized Port Control) provides a function called *threshold control*. If threshold control is used, upper limit control is automatically disabled when traffic between production servers and the disk subsystem decreases to a certain, specified level. A *threshold* is a value that specifies the time at which upper limit control is disabled. For example, if a threshold of 500 I/Os per second is applied to the entire disk subsystem, development servers will be free from the I/O rate limit (i.e., the number of I/Os per second) when the number of I/Os from all the production servers is below 500 I/Os per second. If the number of I/Os from the production servers increases and exceeds 500 I/Os per second, upper limit control is restored to limit the number of I/Os from the development servers again.

Threshold control can be used to control the I/O rate (the number of I/Os per minute) as well as the transfer rate (the amount of data transferred per second). For example, if a threshold of 20 MB/s (20 megabytes per second) is specified for a disk subsystem, the I/O rate limit for development servers is disabled when the amount of data transferred between the disk subsystem and all the production servers is below 20 MB/s.

2.3 Procedure for Using Priority Access (Prioritized Port Control)

Procedures for using Priority Access (Prioritized Port Control) depend on the connection between host bus adapters and disk subsystem ports. If *one-to-one* connections are established between HBAs and ports, you use the **Port** tab of the Priority Access (Prioritized Port Control) panel. If *many-to-many* connections are established between HBAs and ports, you use the **WWN** tab of the Priority Access (Prioritized Port Control) panel.

Note: *Host bus adapters* (HBAs) are adapters contained in hosts and serve as host ports for connecting the hosts and the disk subsystem.

2.3.1 If One-to-One Connections are Established Between HBAs and Ports

A one-to-one connection refers to a configuration in which a host bus adapter(s) on a production server(s) and a host bus adapter(s) on a development server(s) are each connected to the disk subsystem via a single connection to a single, dedicated port on the disk subsystem. Host bus adapters and the disk subsystem ports are connected directly and are not connected via hubs and switches. Henceforth, this network is referred to as *Network A*.

Figure 2.1 shows an example of a *Network A* configuration. As shown, each host bus adapter is connected to only one port on the disk subsystem.

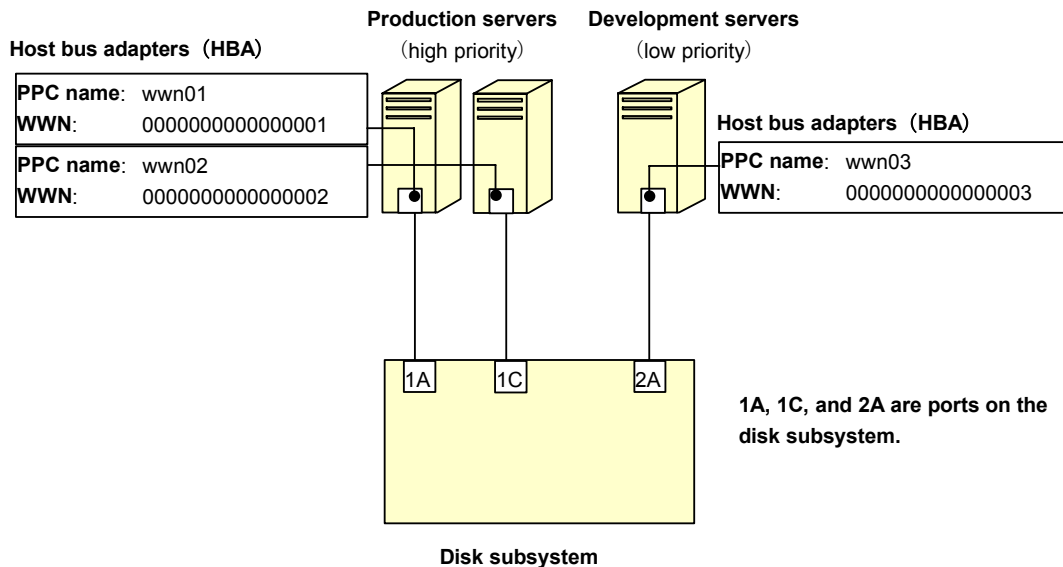


Figure 2.1 Network A (One-to-one Connections Established between HBAs and Ports)

If one-to-one connections are established between HBAs and ports, take the following major steps:

- **Step 1: Set priority to ports on the disk subsystem.** You must use the **Port** tab of the Priority Access (Prioritized Port Control) panel to specify priority to each port on the disk subsystem.

In *Network A*, the ports 1A and 1C are connected to high-priority production servers. The port 2A is connected to a low-priority development server. Therefore, the ports 1A and 1C should be given high priority, and the port 2A should be given low priority.

Figure 2.2 shows only a portion of the Port tab of the Priority Access (Prioritized Port Control) panel. In the Attribute column, **Prio.** indicates that the port is given high priority, **Non-Prio.** indicates that the port is given low priority.

Note: Throughout this manual, the term *prioritized port* is used to refer to a high-priority port. The term *non-prioritized port* is used to refer to a low-priority port.

Port	Ave.[IOPS]	Max.[IOPS]	Attribute
CL1-A	-	-	Prio.
CL1-C	-	-	Prio.
CL2-A	-	-	Non-Prio.

Figure 2.2 Priority Specified in the Port Tab

- **Step 2: Monitor traffic at ports.** You must obtain statistics about traffic at each port on the disk subsystem.

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 amount of data transferred between a host and the disk subsystem. When you view traffic statistics in the panel, you select either the I/O rate or the transfer rate. The **Port-LUN** tab of the **Performance Monitor (Performance Management)** panel lets you view a line graph that illustrates changes in traffic (for details, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide (MK-92RD133)*).

Figure 2.3 is a graph that illustrates changes in the I/O rate for the three ports (1A, 1C, and 2A). According to the graph, the I/O rate for 1A and 1C was approximately 400 I/Os per second at first. The I/O rate for 2A was approximately 100 I/Os per second at first. However, as the I/O rate for 2A gradually increased from 100 I/Os per second to 200 I/Os per second, the I/O rate for 1A and 1C decreased from 400 I/Os per second to 200 I/Os per second. This finding indicates that the high-priority production servers have suffered lowered performance. If you were the network administrator, you probably would like to maintain the I/O rate for prioritized ports (1A and 1C) at 400 I/Os per second. To maintain the I/O rate at 400 I/Os per second, you must set an upper limit to the I/O rate for the port 2A.

For detailed information about monitoring traffic, see section 5.1.1 and 5.1.2.

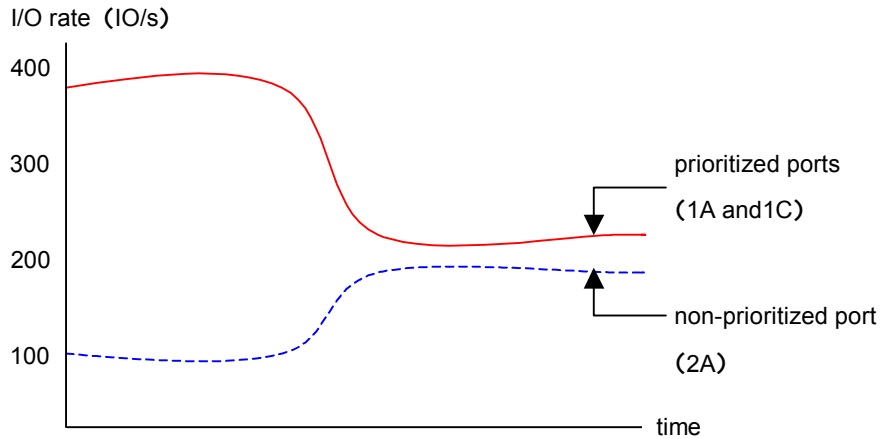


Figure 2.3 Traffic at Ports

- Step 3: Set an upper limit to traffic at the non-prioritized port.** To prevent decline in I/O rates at prioritized ports, you set upper limit values to the I/O rate for non-prioritized ports.

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. In *Network A*, the peak I/O rate for the non-prioritized port (2A) is 200 I/Os per second. So, the recommended upper limit for 2A is 180 I/Os per second.

For details on how to set an upper limit, see section 5.1.3.

- Step 4: Check the result of applying upper limit values.** After applying upper limit values, you must measure traffic at ports. You must view traffic statistics for prioritized ports 1A and 1C to check whether the host performance is improved to a desirable level.

In *Network A*, the desirable I/O rate for ports 1A and 1C is 400 I/Os per second. If the I/O rate reaches 400 I/Os per second, production server performance has reached a desirable level. If production server performance is not improved to a desirable level, you can change the upper limit to a smaller value and then apply the new upper limit to the disk subsystem. In *Network A*, if the upper limit is set to 180 I/Os per second but the I/O rate for 1A and 1C is still below 400 I/Os per second, the administrator needs to change the upper limit until the I/O rate reaches 400 I/Os per second.

- Step 5: If necessary, apply a threshold.** If you want to use threshold control, set threshold values in the **Port** tab in the Priority Access (Prioritized Port Control) panel. You can set threshold values in either of the following ways:

- Set one threshold to each prioritized port.

In *Network A*, if you set a threshold of 200 I/Os per second to the port 1A and set a threshold of 100 I/Os per second to the port 1C, the upper limit on the non-prioritized port (2A) is disabled when the I/O rate goes below the threshold at both port 1A and port 1C.

- Set only one threshold to the entire disk subsystem.

In *Network A*, if you set a threshold of 500 I/Os per second to the disk subsystem, 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) goes below 500 I/Os per second.

For details on how to set a threshold, see section 5.2.4.

2.3.2 If Many-to-Many Connections are Established Between HBAs and Ports

A many-to-many connection refers to a configuration in which a production server(s) and a development server(s) are connected to the disk subsystem via a fibre channel switch. This allows host bus adapters on the production and development server(s) to share multiple ports on the disk subsystem. Henceforth, this network is referred to as *Network B*.

Figure 2.4 shows an example of a Network B configuration. The host bus adapter (wwn01) in the production server is connected to four ports (1A, 1C, 2A and 2C). The host bus adapters (wwn02 and wwn03) in the development server are also connected to the same four ports via a Fibre Channel switch.

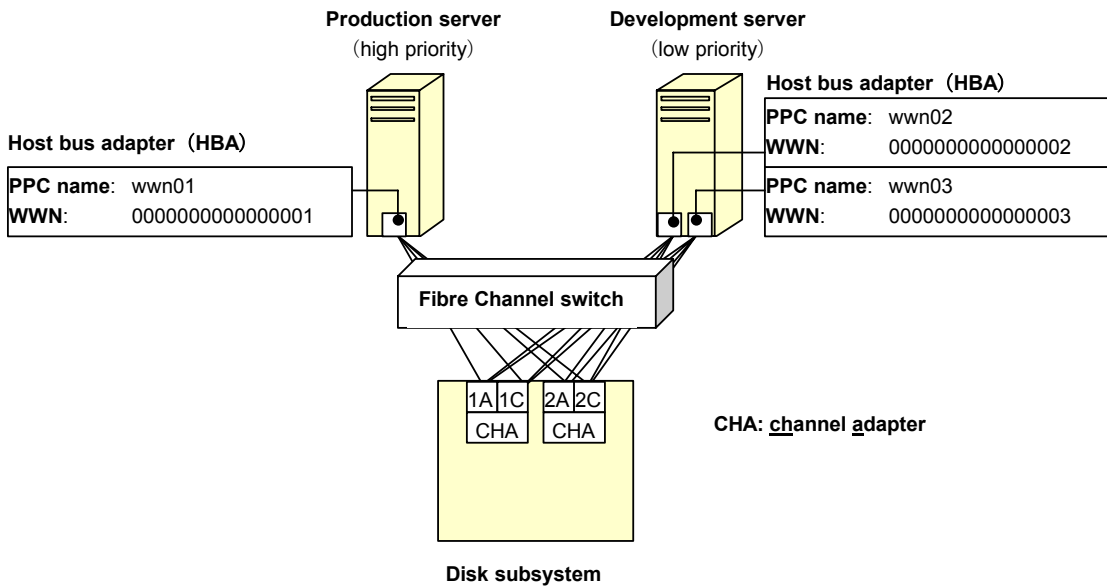


Figure 2.4 Network B (Many-to-Many Connections Established between HBAs and Ports)

If many-to-many connections are established between HBAs and ports, take the following major steps:

- **Step 1: Find WWNs of host bus adapters.** Before using Priority Access (Prioritized Port Control), 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, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide (MK-92RD105)*.
- **Step 2: Define relationships between host bus adapters and ports:** You must use the **WWN** tab of the Priority Access (Prioritized Port Control) panel to define which port is connected to which host bus adapter.

In *Network B*, each of the four ports is connected to three host bus adapters (wwn01, wwn02 and wwn03). So, the resulting definitions on the panel are as follows:

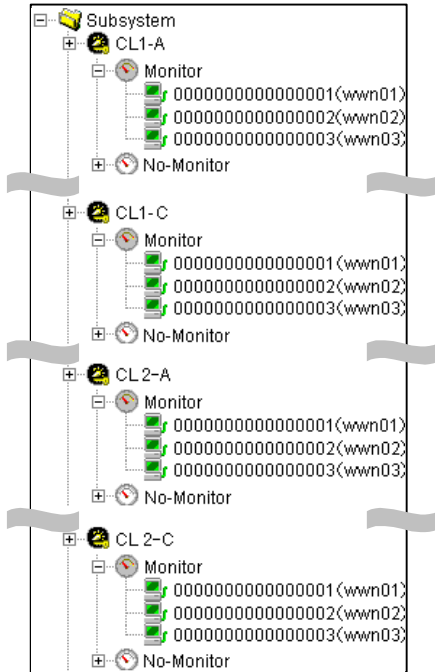


Figure 2.5 Host Bus Adapters to be Monitored

For more detailed instruction, see section 5.2.

Note: When you define relationships, you must place the host bus adapters below the **Monitor** tree, as illustrated in Figure 2.5. Priority Access (Prioritized Port Control) is unable to monitor and control host bus adapters below the **No-Monitor** tree.

- **Step 3: Set priority to host bus adapters.** You must use the **WWN** tab of the Priority Access (Prioritized Port Control) panel to specify priority to each host bus adapter.

In *Network B*, the production server is given high priority and the development server is given low priority. If your network is configured as in Figure 2.4, you must give high priority to wwn01 and also give low priority to wwn02 and wwn03.

To give priority to the three host bus adapters, take the following steps (see Figure 2.6 below):

- In the **WWN** tab, select one of the four ports that the HBAs are connected to (i.e., ports 1A, 1C, 3A, and 3C).
- Set **Prio.** to wwn01. Also, set **Non-Prio.** to wwn02 and wwn03.

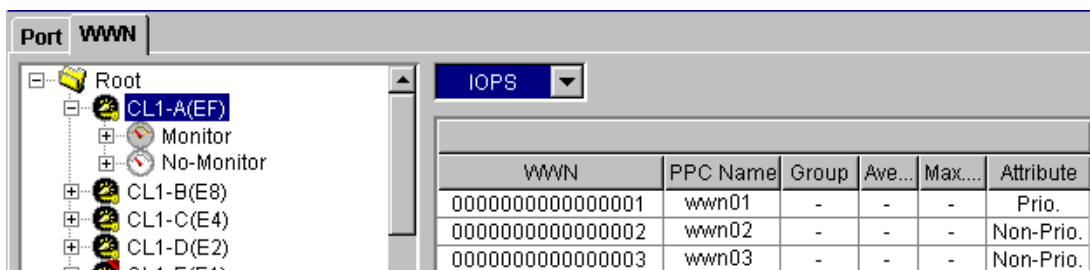


Figure 2.6 Priority Specified in the Priority Access (Prioritized Port Control) Panel

Note: Throughout this manual, the term *prioritized WWN* is used to refer to a high-priority host bus adapter (for example, wwn01). The term *non-prioritized port* is used to refer to a low-priority host bus adapter (for example, wwn02 and wwn03).

- **Step 4: Monitor traffic between host bus adapter and ports.** You must obtain statistics about 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 amount of data transferred between a host and the disk subsystem. When you view traffic statistics in the panel, you select either the I/O rate or the transfer rate.

If your network is configured as *Network B*, you must do the following:

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

Figure 2.7 is a graph that illustrates the I/O rate at the paths between each port and the host bus adapters. According to the graph, the I/O rate at the path between 1A and the prioritized WWN (wwn01) was approximately 400 I/Os per second at first. The I/O rate at the path between 1A and the non-prioritized WWNs (wwn02 and wwn03) was approximately 100 I/Os per second at first. However, as the I/O rate for non-prioritized WWNs (wwn02 and wwn03) gradually increased from 100 I/Os per second to 200 I/Os per second, the I/O rate for the prioritized WWN (wwn01) decreased from 400 I/Os per second to 200 I/Os per second. This finding indicates that the high-priority production server has suffered lowered performance. If you were the network administrator, you probably would like to maintain the I/O rate for the prioritized WWN (wwn01) at 400 I/Os per second.

For detailed information about monitoring traffic, see section 5.2.1 and 5.2.2.

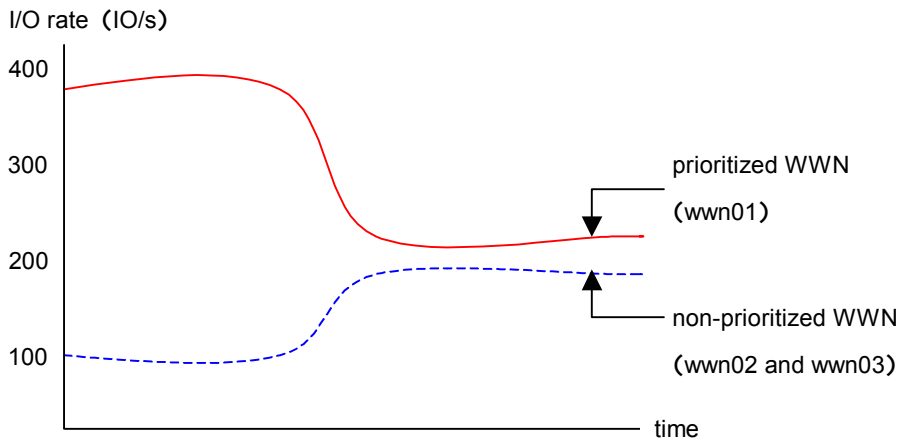


Figure 2.7 Traffic at Ports

- Step 5: Set an upper limit to traffic between ports and the non-prioritized WWN.** To prevent decline in I/O rates at prioritized WWNs, you set upper limit values to the I/O rate for non-prioritized WWNs.

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.

In *Network B*, the peak I/O rate at the paths between port 1A and the non-prioritized WWNs (wwn02 and wwn03) is 200 I/Os per second. The peak I/O rate at the paths between port 1C and the non-prioritized WWNs is also 200 I/Os per second. The peak I/O rate at the paths between port 3A and the non-prioritized WWNs is also 200 I/Os per second. The peak I/O rate at the paths between port 3C and the non-prioritized WWNs is also 200 I/Os per second. So, the recommended upper limit for the non-prioritized WWNs is 720 I/Os per second ($= 200 \times 4 \times 0.90$).

If your network is configured as in Figure 2.4, you must do the following in this order:

- In the **WWN** tab, select one of the four ports that the HBAs are connected to (i.e., ports 1A, 1C, 3A, and 3C).
- Set an upper limit to the non-prioritized WWNs (wwn02 and wwn03).

Figure 2.8 shows the result of setting the upper limit of 720 I/Os per second to the paths between 1A and the non-prioritized WWNs. For details on how to set an upper limit, see section 5.1.3.

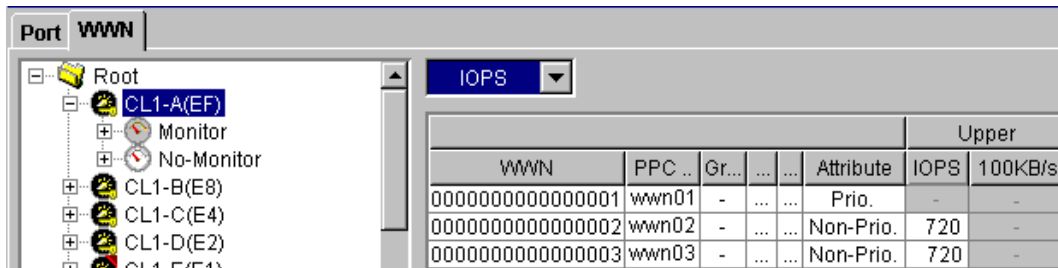


Figure 2.8 Upper Limits

- Step 6: Check the result of applying upper limit values.** After applying upper limit values, you must measure traffic at ports. You must view traffic statistics for the prioritized WWN to check whether the host performance is improved to a desirable level.

In *Network B*, the desirable I/O rate for the prioritized WWN is 400 I/Os per second. If the I/O rate reaches 400 I/Os per second, production server performance has reached a desirable level. If production server performance is not improved to a desirable level, you can change the upper limit to a smaller value and then apply the new upper limit to the disk subsystem. In *Network B*, if the upper limit is set to 720 I/Os per second but the I/O rate for wwn01 is still below 400 I/Os per second, the administrator needs to change the upper limit until the I/O rate reaches 400 I/Os per second.

- **Step 7: If necessary, apply a threshold.** If you want to use threshold control, set a threshold in the **WWN** tab in the Priority Access (Prioritized Port Control) panel.

In the **WWN** tab, you can specify only one threshold to the entire subsystem, regardless of the number of prioritized WWNs. For example, if there are three prioritized WWNs in the network and the threshold is 100 I/Os per second, the upper limit on the non-prioritized WWNs is disabled when the sum of the I/O rates for all prioritized WWNs goes below 100 I/Os per second.

For details on how to set a threshold, see section 5.2.4.

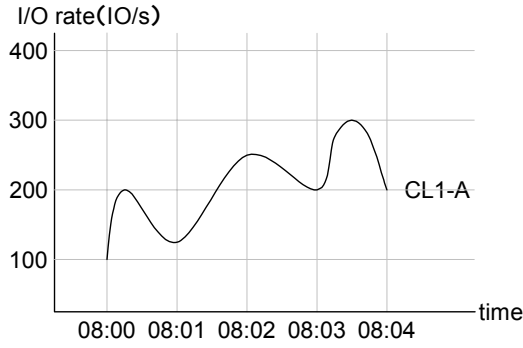
2.4 Notes on Using Priority Access (Prioritized Port Control)

The following are notes on I/O rates and transfer rates:

Priority Access (Prioritized Port Control) measures I/O rates and transfer rates every second, and calculates the average I/O rate and the average transfer rate for the last one minute regularly at one-minute interval.

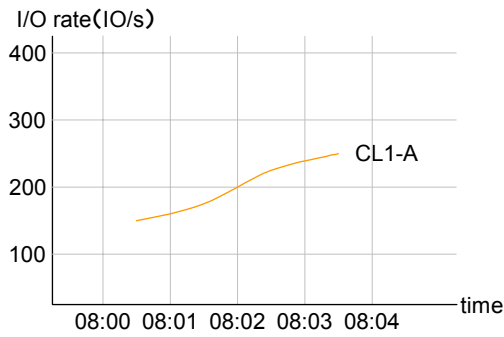
Suppose that the I/O rate at the port 1-A changes as illustrated in Graph 1 in Figure 2.9. When you use Performance Monitor (Performance Management) to display the I/O rate graph for 1A, the line in the graph indicates changes in the average I/O rate calculated every minute (see Graph 2). If you select the **Detail** check box in the Performance Monitor (Performance Management) panel, the graph displays changes in the maximum, average, and minimum I/O rates in one minute.

Priority Access (Prioritized Port Control) applies upper limits and thresholds to the average I/O rate or the average transfer rate calculated every minute. For example, if you set an upper limit of 150 I/Os per second to the port 1A, the highest data point in the line *CL1-A* in Graph 2 and the line *Ave.(1 min)* in Graph 3 is somewhere around 150 I/Os per second. It is possible that the lines *Max (1 min.)* and *Min (1 min.)* in Graph 3 might exceed the upper limit.

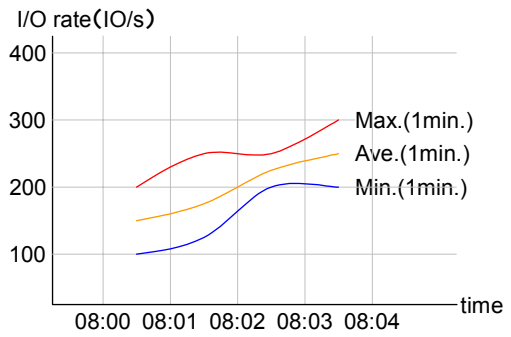


Period	Minimum	Average	Maximum
08:00 - 08:01	100	160	200
08:01 - 08:02	130	180	250
08:02 - 08:03	200	225	250
08:03 - 08:04	200	250	300

Graph 1: Actual I/O rate (measured every second)



**Graph 2: I/O rate displayed in Performance Monitor
(The Detail check box is not selected)**



**Graph 3: I/O rate displayed in Performance Monitor
(The Detail check box is selected)**

Figure 2.9 Line Graphs that Indicate Changes in Port Traffic

Chapter 3 Preparing for Priority Access (Prioritized Port Control) Operations

3.1 System Requirements

To be able to use Priority Access (Prioritized Port Control), you need:

- the 9900V subsystem installed
- the Hitachi Performance Monitor (Performance Management) software enabled (refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101))
- a client PC(s) connected to the 9900V subsystem via LAN (intended for use as a Remote Console(s))
- the Hitachi Priority Access (Prioritized Port Control) software enabled (refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101))

To use Hitachi Performance Monitor (Performance Management), you must use the client PC(s) to log on to the SVP. When you are logged on, the Remote Console-Storage Navigator program, which is a Java applet, will be downloaded to the client PC(s). You will then be able to perform Performance Monitor (Performance Management) operations within the Remote Console - Storage Navigator panel.

For details on all of the above, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).

3.2 Starting Remote Console – Storage Navigator™ and Configuring Your Client PC


Hitachi Performance Monitor (Performance Management) and Priority Access (Prioritized Port Control) operations require the Remote Console program, which is downloaded to your client PC. Your client PC must be connected to the 9900V subsystem via LAN. Browser settings are also required on your client PC. For details, refer to the *Hitachi Lightning 9900V™ Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).


3.3 Starting Priority Access (Prioritized Port Control)



Before you can start Priority Access (Prioritized Port Control), Remote Console and Performance Monitor (Performance Management) must be running (refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator™ User's Guide* (MK-92RD101) and the *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide* (MK-92RD133)).


To start Priority Access (Prioritized Port Control):

1. Ensure that the Remote Console main panel is in **Modify** mode.

The Remote Console main panel is in **Modify** mode if the background color of the  icon is light yellow. If the background color is gray, the panel is in View mode and you must change it to Modify mode by taking the following steps:

- a) Check to see if the background color of the lock icon  is blue.

If the background color is red , you will not be able to switch from View mode to Modify mode. Wait for a while and click the  button. If the background color turns blue, you can go to the next step.

- b) Click the  icon.

A message appears, asking whether you want to change the mode.

- c) Click **OK** to close the message.

The background color of the icon changes to light yellow. The mode changes to Modify mode.

2. Ensure that either the **WWN tab** or the **Port-LUN tab** in the Hitachi Performance Monitor (Performance Management) panel is selected (see Figure 3.1). For details, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide* (MK-92RD133).

Notes:

- Select **Port-LUN** tab if one-to-one connection is established between host bus adapters and disk subsystem ports (for details, refer to section 2.3.1).
 - Select **WWN** tab if many-to-many connection is established between host bus adapters and disk subsystem ports (for details, refer to section 2.3.2).
3. In the resulting Port-LUN or WWN tab, click the **Priority Access (PPC)** button.

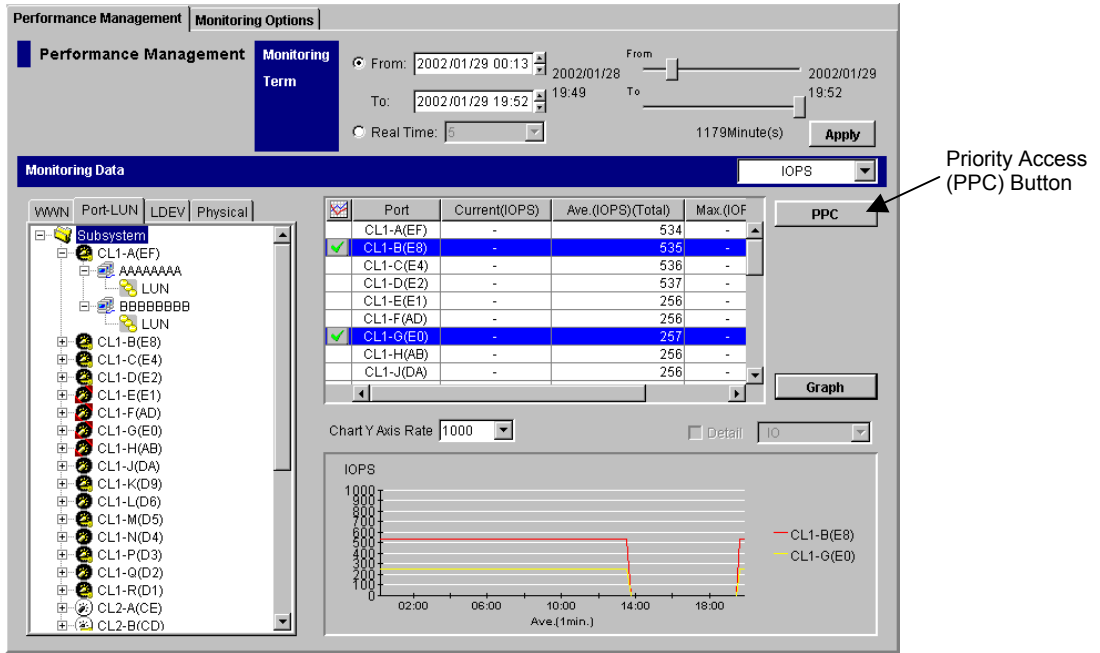


Figure 3.1 Performance Monitor (Performance Management) Panel

- From the resulting Priority Access (Prioritized Port Control) panel, select either the Port tab or the WWN tab.

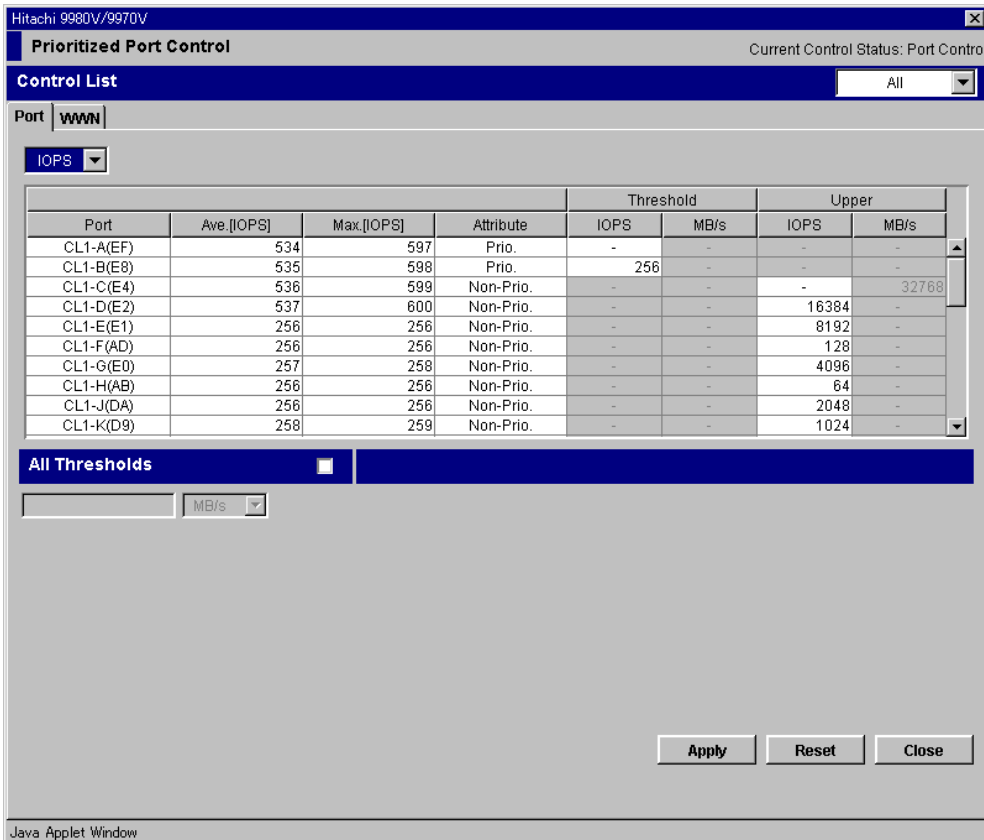


Figure 3.2 Port and WWN Tabs

PRELIMINARY RELEASE

- Use the **Port** tab (see Figure 4.1) if one-to-one connection is established between host bus adapters and disk subsystem ports. For details on operations in the **Port** tab, see sections 4.1 and 5.1.
- Use the **WWN** tab (see Figure 4.2) if many-to-many connection is established between host bus adapters and disk subsystem ports. For details on operations in the **WWN** tab, see sections 4.2 and 5.2.

Chapter 4 Reviewing the Priority Access (Prioritized Port Control) Panel

The Priority Access (Prioritized Port Control) panel consists of the following:

- Current Control Status line
- Control List drop-down
- Port Tab
- WWN Tab

This chapter describes these options, buttons, and other components of the Priority Access (Prioritized Port Control) panel and tabs.

Note: Performance Monitor (Performance Management) must be running to allow Priority Access (Prioritized Port Control) operations. The Priority Access (Prioritized Port Control) panel appears when the Priority Access (PPC) button in the Performance Monitor (Performance Management) WWN or Port-LUN tab is clicked (see Figure 3.1).

4.1 The Port Tab

The **Port** tab lets you set the limit on the performance of non-prioritized ports and set the threshold on the performance of prioritized ports.

For operations in this tab, see section 5.1.

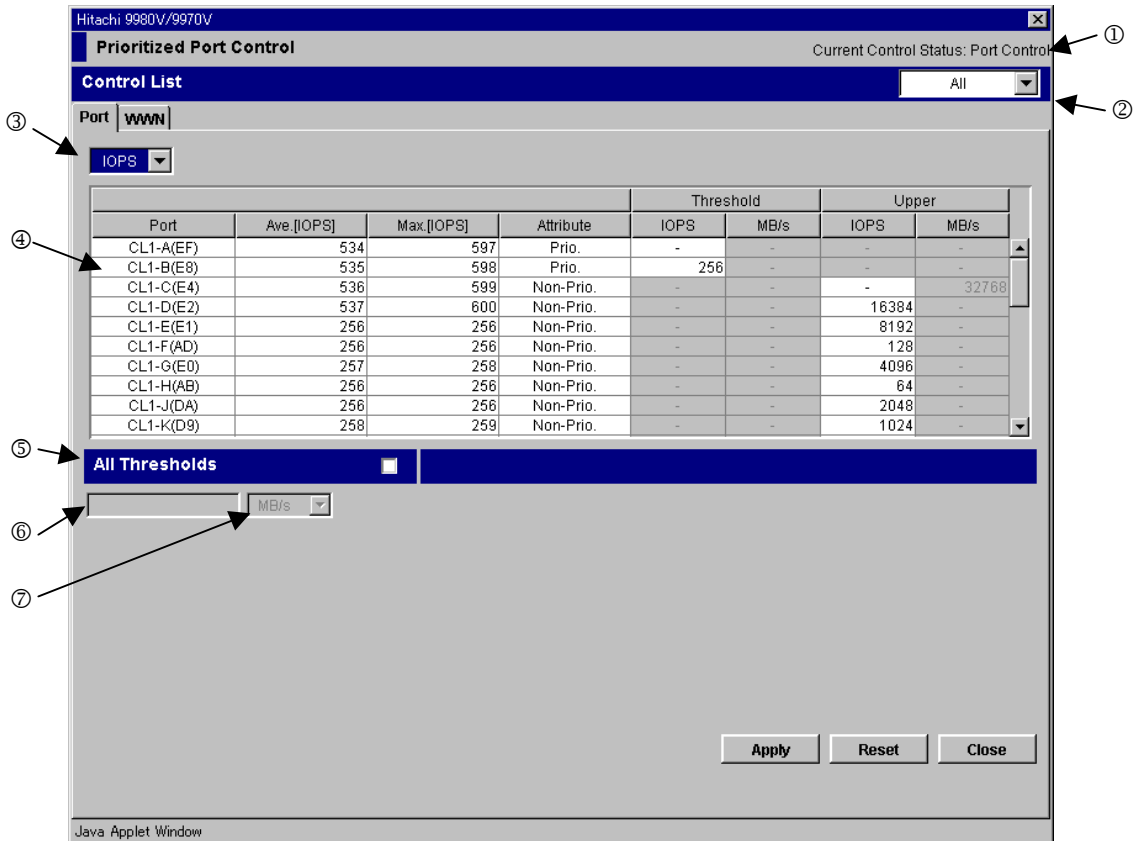


Figure 4.1 The Port Tab in the Priority Access (Prioritized Port Control) Panel

The Port tab displays the following:

- **Current Control Status ①:** Can display either **Port Control** or **WWN Control**.
 - If **Port Control** is displayed, the system is controlled by the upper limits and threshold specified in the **Port** tab.
 - If **WWN Control** is displayed, the system is controlled by the upper limits and threshold specified in the **WWN** tab.

Tips: If **WWN Control** is displayed when the **Port** tab is active, you can click the **Apply** button to switch control so that **Port Control** appears.
- **The Control List drop-down list ②** (upper right corner of the Priority Access (Prioritized Port Control) panel): Enables you to narrow ports in the table:
 - If **All** is selected, all the ports appear in the table.
 - If **Prioritize** is selected, only the prioritized ports appear in the table.
 - If **Non-Prioritize** is selected, only the non-prioritized ports appear in the table.

Note: If you change settings of a port, the port will remain in the table regardless of the selection in the drop-down list.

- **The Port tab drop-down list ③ (upper left corner of the Port tab):** Enables you to change the type of performance statistics to be displayed in the table.
 - If **IOPS** (I/Os per second) is selected, the table 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 table displays the transfer rates for ports. The transfer rate indicates the amount of data transferred via a port in one second.
- **The table ④:** Displays a list of ports and indicates the I/O rate or the transfer rate for each port. The measurement unit for the values in the table can be specified by the drop-down list above the tree views.
 - The **Port** column indicates ports on the disk subsystem.
 - The **Ave.** column indicates the average I/O rate or the average transfer rate for the specified period.
 - The **Max.** column indicates the maximum I/O rate or the maximum transfer rate for the specified period.
 - The **Attribute** column indicates the priority of each port. **Prio.** indicates a prioritized port. **Non-Prio.** indicates a non-prioritized port.
 - The **Threshold** columns let you specify the threshold for the I/O rate and the transfer rate for each prioritized port. The **IOPS** column lets you specify the threshold for I/O rates. The **MB/s** column lets you specify the threshold for transfer rates. To specify a threshold, double-click a cell to display the cursor in the cell.
 - The **Upper** columns let you specify the upper limit on the I/O rate and the transfer rate for each non-prioritized port. The **IOPS** column lets you specify the upper limit for I/O rates. The **MB/s** column lets you 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 select the **All Thresholds check box** ⑤ and enter a threshold value in the **text box** ⑥, the threshold value will be applied to the entire disk subsystem. If you want to specify the threshold for the I/O rate, select **IOPS** from the drop-down list on the right of the **text box** ⑦. If you want to specify the threshold for the transfer rate, select **MB/s** from the drop-down 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 the prioritized ports is below 128 IOPS.
- The **Apply** button applies the settings in this panel to the disk subsystem.
- The **Reset** button restores the original settings in the panel.
- The **Close** button closes the Priority Access (Prioritized Port Control) panel.

4.2 The WWN Tab

The **WWN** tab lets you set the limit on the performance of non-prioritized WWNs and set the threshold on the performance of prioritized WWNs.

For operations in this tab, see sections 5.2 and 5.3.

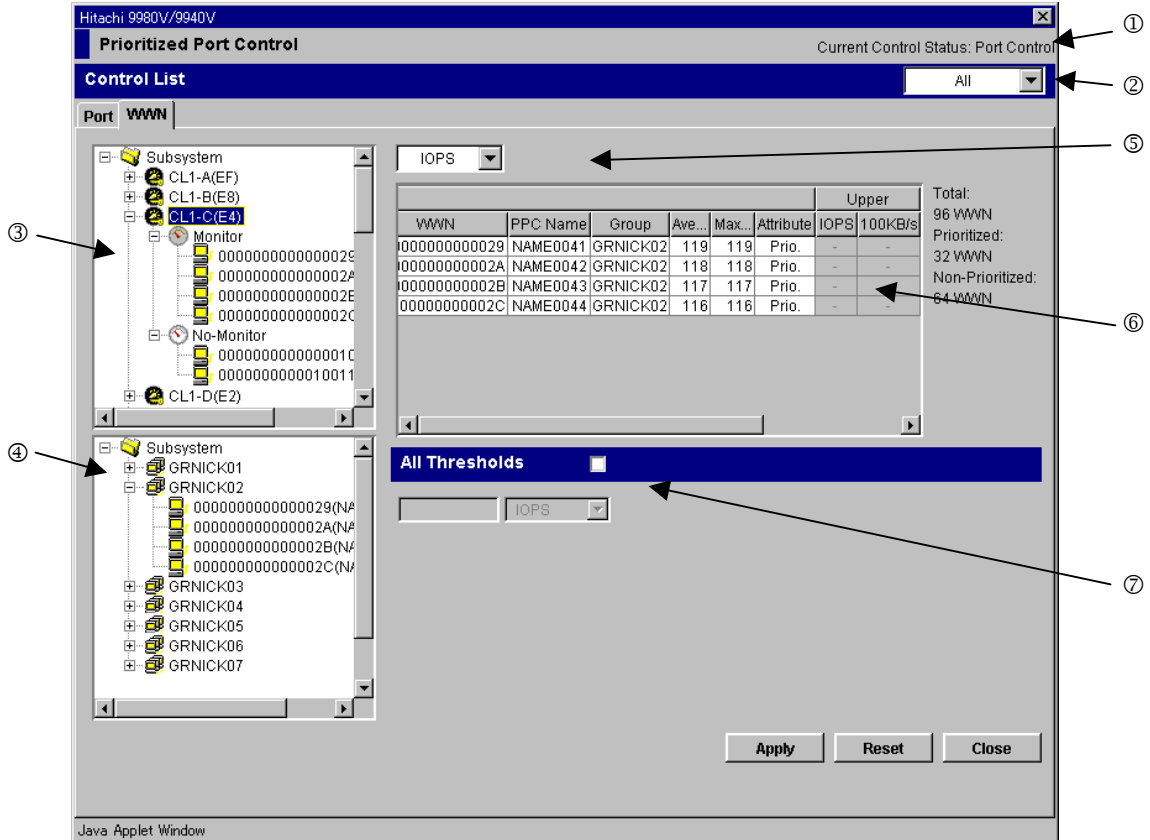




Figure 4.2 The WWN Tab in the Priority Access (Prioritized Port Control) Panel

The **WWN** tab displays the following:



- **Current Control Status** ①: Can display either **Port Control** or **WWN Control**.
 - If **Port Control** is displayed, the system is controlled by the upper limits and threshold specified in the **Port** tab.
 - If **WWN Control** is displayed, the system is controlled by the upper limits and threshold specified in the **WWN** tab.

Tips: If **Port Control** is displayed when the **WWN** tab is active, you can click the **Apply** button to switch control so that **WWN Control** appears.

- **The Control List drop-down list ②** (upper right corner of the Priority Access (Prioritized Port Control) panel): Enables you to narrow WWNs (host bus adapters) in the table:
 - If **All** is selected, all the WWNs appear in the table.
 - If **Prioritize** is selected, only the prioritized WWNs appear in the table.
 - If **Non-Prioritize** is selected, only the non-prioritized WWNs appear in the table.


- **The upper-left tree view ③**: Lists ports in the disk subsystem.
 - Below the **Subsystem** folder appear ports on the disk subsystem. 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 **No-Monitor**. The table on the right displays a list of host bus adapters that are connected to the specified port and can be monitored by Priority Access (Prioritized Port Control).
 - If you double-click the **Monitor** icon, the tree view and the table display a list of host bus adapters that are connected to the specified port and can be monitored by Priority Access (Prioritized Port Control).
 - If you double-click the **No-Monitor** icon, the tree view and the table display a list of host bus adapters that are connected to the specified port and cannot be monitored by Priority Access (Prioritized Port Control).

Note: If the WWN of a host bus adapter is displayed in red in the tree view, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports are not controlled by upper limits and/or thresholds. Refer to 6.2 for how to control the traffic between the HBA and the all the connected ports.


- **The lower-left tree view ④**: Lists **Priority Access (Prioritized Port Control) groups**. The tree view also lists host bus adapters (WWNs) in each Priority Access (Prioritized Port Control) group.
 - Below the **Subsystem** folder appear Priority Access (Prioritized Port Control) groups, which contain one or more WWNs. For details of Priority Access (Prioritized Port Control) groups, see section 5.3.
 - If you double-click a Priority Access (Prioritized Port Control) group () , host bus adapters in the Priority Access (Prioritized Port Control) group appear. On the right of the host bus adapter icon () appear the WWN and the nickname. WWNs are 16-digit hexadecimal numbers used to uniquely identify host bus adapters. The system administrator can assign nicknames so that users can easily identify each host bus adapter.

Note: If the WWN of a host bus adapter is displayed by red in the tree view, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports are not controlled by upper limits and/or thresholds. Refer to 6.2 for how to control the traffic between the HBA and the all the connected ports.

- **The drop-down list (upper left corner of the table) ⑤**: Enables you to change the type of performance statistics to be displayed in the table.
 - If **IOPS** (I/Os per second) is selected, the table displays I/O rates for WWNs (host bus adapters). The I/O rate indicates the number of I/Os per second.

- If **100KB/s** (100 kilobytes per second) is selected, the table displays the transfer rates for WWNs (host bus adapters). The transfer rate indicates the amount of data transferred in one second.
- **The table** : Displays a list of WWNs and indicates the I/O rate and the transfer rate for each host bus adapter. The measurement unit for the values in the table can be specified by the drop-down list at the upper left corner of the table.

On the right side of the table appear the total number of WWNs, the number of prioritized WWNs, and the number of non-prioritized WWNs.

- The **WWN** column indicates WWNs of host bus adapters.
- The **Priority Access (Prioritized Port Control) Name** column indicates Priority Access (Prioritized Port Control) names of host bus adapters. Priority Access (Prioritized Port Control) allows you to assign a *Priority Access (Prioritized Port Control) name* to each host bus adapter so that you can easily identify each host bus adapter in the Priority Access (Prioritized Port Control) panels.
- The **Group** column indicates the Priority Access (Prioritized Port Control) group to which the host bus adapter belongs. This column appears when a port is selected in the upper-left tree view and does not appear when a Priority Access (Prioritized Port Control) group is selected in the lower-left tree view.
- The **Port** column indicates the port to which the host bus adapter is connected.
- The **Ave.** column indicates the average I/O rate or the average transfer rate for the specified period.
- The **Max.** column indicates the maximum I/O rate or the maximum transfer rate for the specified period.
- The **Attribute** column indicates the priority of each WWN. **Prio.** indicates a prioritized WWN. **Non-Prio.** indicates a non-prioritized WWN. For details on how to change the priority, see section 5.2.1.
- The **Upper** columns let you specify the upper limit on the I/O rate and the transfer rate for each host bus adapter. The **IOPS** column lets you specify the upper limit for I/O rates. The **100KB/s** column lets you 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 select the **All Thresholds check box**  and enter a threshold value in the text box, the threshold value will be applied to the entire disk subsystem. If you want to specify the threshold for the I/O rate, select **IOPS** from the drop-down list on the right of the text box. If you want to specify the threshold for the transfer rate, select **100KB/s** from the drop-down 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 the prioritized WWNs is below 128 IOPS.
- The **Apply** button applies the settings in this panel to the disk subsystem.
- The **Reset** button restores the original settings in the panel.
- The **Close** button closes the Priority Access (Prioritized Port Control) panel.

Chapter 5 Performing Priority Access (Prioritized Port Control) Operations

This chapter provides the procedures for performing the following Priority Access (Prioritized Port Control) operations:

- Measure traffic between host bus adapters and disk subsystem ports (see sections 5.1.1 or 5.2.1)
- Analyze traffic statistics (see section 5.1.2 or 5.2.2)
- Set an upper limit to traffic at each non-prioritized port (see section 5.1.3 or 5.2.3)
- Set a threshold to the disk subsystem or to each prioritized port, if necessary (see section 5.1.4 or 5.2.4)
- Grouping Host Bus Adapters (creating Priority Access (Prioritized Port Control) Groups) (see section 5.3)

Section 5.1 is for those users whose systems are configured using a one-to-one HBA to port connection. Section 5.2 is for those users whose systems are configured using a many-to-many HBA to port connection. Section 5.3 describes creating Priority Access (Prioritized Port Control) Groups.

5.1 If One-to-One Connections are Established Between HBAs and Ports

If one-to-one connections are established between host bus adapters (HBAs) and disk subsystem ports, you use the **Port** tab in the Priority Access (Prioritized Port Control) panel to do the following:

- Measure traffic between host bus adapters and disk subsystem ports (see section 5.1.1)
- Analyze traffic statistics (see section 5.1.2)
- Set an upper limit to traffic at each non-prioritized port (see section 5.1.3)
- Set a threshold to the disk subsystem or to each prioritized port, if necessary (see section 5.1.4).

5.1.1 Measuring Traffic between Host Bus Adapters and Ports

If a one-to-one connection is established between HBAs and ports, you need to measure traffic between high-priority HBAs and prioritized ports. You also need to measure traffic between low-priority HBAs and non-prioritized ports. *Prioritized ports* are ports to which high-priority HBAs are connected. *Non-prioritized ports* are ports to which low-priority HBAs are connected.

To measure traffic between HBAs and ports:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the Port tab is displayed (see Figure 4.1).
3. Select **All** from the drop-down list at the top right corner of the panel.
4. Right-click a high-priority port and then select **Non-Prioritized ->> Prioritized** from the pop-up menu. If there is more than one high-priority port, repeat this operation.
The **Attribute** column displays **Prio**.
5. Right-click a low-priority port and then select **Prioritized ->> Non-Prioritized** from the pop-up menu. If there is more than one low-priority port, repeat this operation.
The **Attribute** column displays **Non-Prio**.
6. Click the **Apply** button.
The settings on the panel are applied to the disk subsystem.
7. Follow the instruction in section 2.3.1, step 2 to measure traffic (i.e., I/O rates and transfer rates).

5.1.2 Analyzing Traffic Statistics

The traffic statistics reveal the number of I/Os that have been made via ports. The traffic statistics also reveal the amount of data that have been transferred via ports. You must analyze the traffic statistics to determine upper limit values that should be applied to I/O rates or transfer rates for non-prioritized ports.

The following is the procedure for using the Priority Access (Prioritized Port Control) panel to analyze traffic statistics. Note that you can also use the Performance Monitor (Performance Management) panel to analyze traffic statistics. Performance Monitor (Performance Management) can display a line graph that indicates changes in traffic (for details, refer to section 2.1.9 in the *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide* (MK-92RD133)).

To analyze traffic statistics:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the Port tab is displayed (see Figure 4.1).
3. Select **All** from the drop-down list at the top right corner of the panel.

4. Do either of the following:
 - If you want to analyze I/O rates, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to analyze transfer rates, select **MB/s** from the drop-down list at the upper left corner of the table.

The table displays traffic statistics (i.e., I/O rates or transfer rates).

5. Analyze the information in the table and then determine upper limit values that should be applied to non-prioritized ports. If necessary, determine threshold values that should be applied to prioritized ports. For details, refer to section 5.2.3.

5.1.3 Setting Upper Limit Values to Traffic at Non-prioritized Ports

After you analyze traffic statistics about prioritized ports and non-prioritized ports, you must set upper limit values to I/O rates or transfer rates for non-prioritized ports. 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 disk subsystem and the low priority ports and thus provide better performance for high-priority host servers.

To limit the I/O rate or transfer rate of a non-prioritized port:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the Port tab is displayed (see Figure 4.1).
3. Do either of the following:
 - If you want to limit the I/O rate for the non-prioritized port, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to limit the transfer rate for the non-prioritized port, select **MB/s** from the drop-down list at the upper left corner of the table.
4. Locate the non-prioritized port in the table.

Notes:

- The **Attribute** column of the table indicates whether ports are prioritized or non-prioritized.
- If you cannot find any non-prioritized ports in the table, check the drop-down list at the top right corner of the panel. If the drop-down list displays **Prioritize**, select **All** or **Non-Prioritize** from the drop-down list.

5. Do either of the following:
 - If you want to limit the I/O rate for the non-prioritized port, double-click the desired cell in the **IOPS** column in table area labeled **Upper**. Next, enter the upper limit value in the cell.
 - If you want to limit the transfer rate for the non-prioritized port, double-click the desired cell in the **MB/s** column in table area labeled **Upper**. Next, enter the upper limit value in the cell.

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

6. Click the **Apply** button.

The settings in the panel are applied to the disk subsystem. The upper limit value that you entered turns **black**.

5.1.4 Setting a Threshold

If threshold control is used, upper limit control is automatically disabled when traffic between production servers and the disk subsystem is reduced to a specified level. For details, refer to section 4.2.

To set threshold values to traffic at prioritized ports:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).

The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the Port tab is displayed (see Figure 4.1).
3. Do either of the following:
 - If you want to disable the upper limit on I/O rates, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to disable the upper limit on transfer rates, select **MB/s** from the drop-down list at the upper left corner of the table.
4. Do either of the following:
 - If you want to set a threshold to a 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.

Caution: If you enter 0 (zero) in a cell, the cell displays a hyphen (-) and the threshold for the prioritized port becomes ineffective. If the threshold for any of the prioritized ports is ineffective, threshold control will not be performed but upper limit control will be performed.
 - If you want to set a threshold to the entire disk subsystem, select the **All Thresholds** check box. Next, enter the threshold value in the text box and select **IOPS** or **MB/s** from the drop-down list in **All Thresholds**.
5. Click the **Apply** button.

The settings in the panel are applied to the disk subsystem.

5.2 If Many-to-Many Connections are Established Between HBAs and Ports

If many-to-many connections are established between host bus adapters (HBAs) and disk subsystem ports, you use the **WWN** tab in the Priority Access (Prioritized Port Control) panel to do the following:

- Measure traffic between host bus adapters and disk subsystem ports (see section 5.2.1)
- Analyze traffic statistics (see section 5.2.2)
- Set an upper limit on traffic at non-prioritized WWNs (see section 5.2.3)
- Set a threshold, if necessary (see section 5.2.4).

5.2.1 Measuring Traffic between Host Bus Adapters and Ports

If a many-to-many connection is established between host bus adapters (HBAs) and ports, you need to measure traffic between each HBA and the port that the HBA is connected to.

This manual uses the term *prioritized WWNs* to refer to high-priority HBAs (**Note:** WWNs are unique identifiers of HBAs). This manual also uses the term *non-prioritized WWNs* to refer to low-priority HBAs.

To measure traffic between HBAs and ports:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. Select **All** from the drop-down list at the top right corner of the panel.
4. In the upper-left tree view, double-click a port.
5. Double-click the **Monitor** icon, which appears below the specified port.
6. Check to see if all the prioritized WWNs and non-prioritized WWNs appears below the **Monitor** icon.

If some of the prioritized WWNs and non-prioritized WWNs are missing, do either of the following to ensure that all the WWNs appear below the **Monitor** icon:

- Double-click the **No-Monitor** icon to display a list of WWNs. Next, drag the desired WWNs to the **Monitor** icon.
- If the desired WWNs are not located below the **No-Monitor** icon, right-click the **Monitor** icon and then select **Add WWN** from the pop-up menu.
- Next, specify the WWN and the Priority Access (Prioritized Port Control) name of the HBA in the Add Priority Access (Prioritized Port Control) panel (see Figure 5.1) and click **OK**. The specified WWN will appear below the **Monitor** icon.

Notes:

- The HBAs below the **No-Monitor** icon will not be monitored by Priority Access (Prioritized Port Control). You cannot set upper limits and thresholds to HBAs that are not monitored.
 - Up to 32 HBAs (WWNs) can be monitored for each port.
7. Click the **Monitor** icon.
The table on the right lists HBAs that appear below the **Monitor** icon.
 8. Right-click a prioritized WWN in the table and then select **Non-Prioritized ->> Prioritized** from the pop-up menu. If there is more than one high-priority port, repeat this operation.
The **Attribute** column displays **Prio**.
 9. Right-click a non-prioritized WWN in the table and then select **Prioritized ->> Non-Prioritized** from the pop-up menu. If there is more than one non-prioritized WWN, repeat this operation.
The **Attribute** column displays **Non-Prio**.
 10. Repeat steps 4 to 9 for ports (except for the port selected in step 4).
 11. Click the **Apply** button in the Priority Access (Prioritized Port Control) panel.
The settings on the panel are applied to the disk subsystem.
 12. Follow the instruction in section 2.3.2, step 4 to measure traffic (i.e., I/O rates and transfer rates).

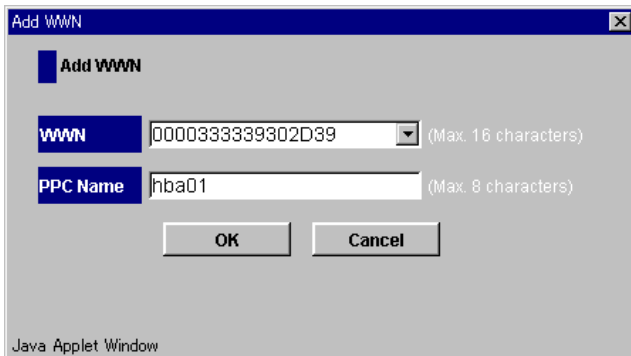


Figure 5.1 The Add WWN Panel

5.2.2 Analyzing Traffic Statistics

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

The following is the procedure for using the Priority Access (Prioritized Port Control) panel to analyze traffic statistics. **Note:** You can also use the Performance Monitor (Performance Management) panel to analyze traffic statistics. Performance Monitor (Performance Management) can display a line graph that indicates changes in traffic (for details, refer to section 2.1.9 in the *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide* (MK-92RD133)).

To analyze traffic statistics:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. Select **All** from the drop-down list at the top right corner of the panel.
4. Do either of the following:
 - If you want to analyze I/O rates, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to analyze transfer rates, select **100KB/s** from the drop-down list at the upper left corner of the table.

The table displays traffic statistics (i.e., I/O rates and transfer rates).
5. Analyze the information in the table 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, refer to section 5.2.3.

5.2.3 Setting Upper Limit Values to Non-prioritized WWNs

After you analyze traffic statistics about prioritized WWNs and non-prioritized WWNs, you can 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 is transferred between the disk subsystem and the low priority ports and thus provide better performance for high-priority host servers.

Tip: If you want to set the same upper limit value to more than one non-prioritized WWN, you are advised to use a Priority Access (Prioritized Port Control) group. For details on Priority Access (Prioritized Port Control) groups, see section 5.3.

To limit the I/O rate or transfer rate of a non-prioritized WWN:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. Do either of the following:
 - If you want to limit the I/O rate of the non-prioritized WWNs, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to limit the transfer rate of the non-prioritized WWN, select **100KB/s** from the drop-down list at the upper left corner of the table.
4. Locate the non-prioritized WWN in the table.

Notes:

- The **Attribute** column of the table indicates whether WWNs are prioritized or non-prioritized.
 - If you cannot find any non-prioritized WWN in the table, check the drop-down list at the top right corner of the panel. If the drop-down list displays **Prioritize**, select **All** or **Non-Prioritize** from the drop-down list.
5. Do either of the following:
 - If you want to limit the I/O rate of the non-prioritized WWN, double-click the desired cell in the **IOPS** column in table area labeled **Upper**. Next, enter the upper limit value in the cell.
 - If you want to limit the transfer rate of the non-prioritized WWN, double-click the desired cell in the **100KB/s** column in table area labeled **Upper**. Next, enter the upper limit value in the cell.

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

6. Click the **Apply** button.
The settings in the panel are applied to the disk subsystem. The upper limit value that you entered turns **black**.

5.2.4 Setting a Threshold

If threshold control is used, upper limit control is automatically disabled when traffic between production servers and the disk subsystem is reduced to a specified level. For details, refer to sections 2.2, 2.3.1 (step 5), 2.3.2 (step 7), and 4.1.

To set a threshold value:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).

PRELIMINARY RELEASE

3. Do either of the following:
 - If you want to disable the upper limit on I/O rates, select **IOPS** from the drop-down list at the upper left corner of the table.
 - If you want to disable the upper limit on transfer rates, select **100KB/s** from the drop-down list at the upper left corner of the table.
4. Select the **All Thresholds** check box.
5. Do either of the following:
 - If you want to disable the upper limit on I/O rates, select **IOPS** from the drop-down list below the check box.
 - If you want to disable the upper limit on transfer rates, select **100KB/s** from the drop-down list below the check box.
6. Enter the threshold in the text box.
7. Click the **Apply** button.

The settings in the panel are applied to the disk subsystem.



5.3 Grouping Host Bus Adapters

Priority Access (Prioritized Port Control) allows you to create a *Priority Access (Prioritized Port Control) group* to group multiple host bus adapters. A *Priority Access (Prioritized Port Control) group* allows you to switch the priority of multiple HBAs from *prioritized* to *non-prioritized*, or vice versa. You can also use a *Priority Access (Prioritized Port Control) group* to set the same upper limit value to all the HBAs in the group.

Note: All the host bus adapters (HBAs) in one *Priority Access (Prioritized Port Control) group* must be of the same priority. Prioritized WWNs (i.e., high-priority HBAs) and non-prioritized WWNs (i.e., low-priority HBAs) cannot be intermixed in one *Priority Access (Prioritized Port Control) group*.

5.3.1 Assigning Multiple HBAs to a Priority Access (Prioritized Port Control) Group

To create a Priority Access (Prioritized Port Control) group and assign multiple host bus adapters to the group, take the following steps:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. In the lower-left tree view, select and right-click the **Subsystem** folder.
4. From the pop-up menu, select **Add New Priority Access (Prioritized Port Control) Group**.
5. In the Add New Priority Access (PPC) panel (see Figure 5.2), enter the name of the Priority Access (Prioritized Port Control) group and then select **OK**.
A Priority Access (Prioritized Port Control) group is created. A Priority Access (Prioritized Port Control) group icon () is added to the lower-left tree view.
6. Drag an HBA  from the upper-left tree view to the Priority Access (Prioritized Port Control) group. Repeat this operation until all the desired HBAs are dropped to the Priority Access (Prioritized Port Control) group.
Note: You cannot drag HBAs from any **No-Monitor** tree area. You can only drag HBAs from the **Monitor** tree areas.
7. Click the **Apply** button.
The settings in the panel are applied to the disk subsystem.

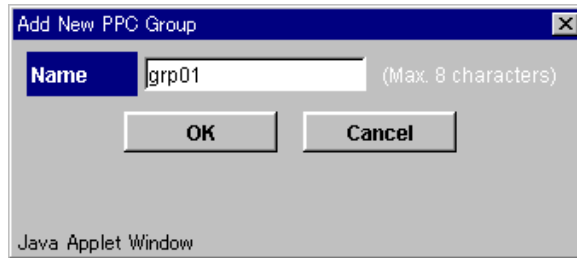


Figure 5.2 The Add New Priority Access (PPC) Group Panel

5.3.2 Switching Priority of a Priority Access (Prioritized Port Control) Group

All the host bus adapters (HBAs) in one Priority Access (Prioritized Port Control) group must be of the same priority. Prioritized WWNs (i.e., high-priority HBAs) and non-prioritized WWNs (i.e., low-priority HBAs) cannot be intermixed in one Priority Access (Prioritized Port Control) group.

You can use a Priority Access (Prioritized Port Control) group to switch priority of multiple HBAs from *prioritized* to *non-prioritized*, or vice versa.

To switch priority:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. In the lower-left tree view, select and right-click a Priority Access (Prioritized Port Control) group (📁).
4. Do either of the following:
 - To switch priority from *prioritized* to *non-prioritized*, select **Prioritized ->> Non-Prioritized** from the pop-up menu.
 - To switch priority from *non-prioritized* to *prioritized*, select **Non-Prioritized ->> Prioritized** from the pop-up menu.
5. Click the **Apply** button.
The settings in the panel are applied to the disk subsystem.

5.3.3 Setting the Same Upper Limit Value to Multiple HBAs

If all the host bus adapters in a Priority Access (Prioritized Port Control) group are *non-prioritized WWNs* (i.e., low-priority HBAs), you can set the same upper limit value to all the HBAs.

To set the same upper limit value to multiple HBAs:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. In the lower-left tree view, select and right-click a Priority Access (Prioritized Port Control) group (📁).
4. Select **Change Upper Limit** from the pop-up menu.
The Change Upper Limit panel appears (see Figure 5.3).
5. Do either of the following:
 - To limit the I/O rate, enter the upper limit value and then select **IOPS** from the drop-down list. Next, select **OK**.
 - To limit the transfer rate, enter the upper limit value and then select **100KB/s** from the drop-down list. Next, select **OK**.
6. In the Priority Access (Prioritized Port Control) panel, click the **Apply** button.
The settings in the panel are applied to the disk subsystem.

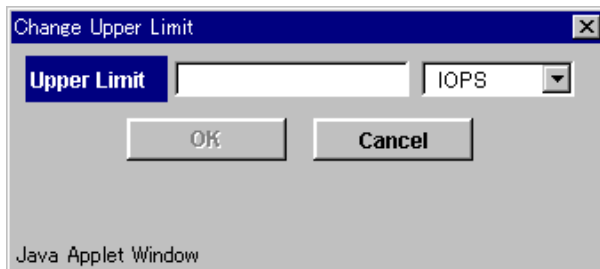


Figure 5.3 The Change Upper Limit Panel

5.3.4 Renaming a Priority Access (Prioritized Port Control) Group

If you want to rename a Priority Access (Prioritized Port Control) group, take the following steps.

To rename a Priority Access (Prioritized Port Control) group:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).

3. In the lower-left tree view, select and right-click a Priority Access (Prioritized Port Control) group (🗄️).
4. Select **Change Name** from the pop-up menu.
The Change Priority Access (Prioritized Port Control) Group Name panel appears (see Figure 5.4).
5. Enter the new name and select **OK**.
6. In the Priority Access (Prioritized Port Control) panel, click the **Apply** button.
The settings in the panel are applied to the disk subsystem.

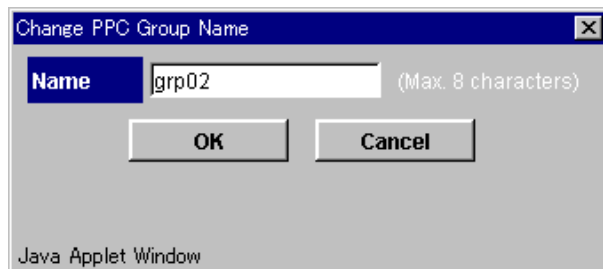


Figure 5.4 The Change Priority Access (Prioritized Port Control) Group Name Panel

5.3.5 Deleting a Priority Access (Prioritized Port Control) Group

If you want to delete a Priority Access (Prioritized Port Control) group, take the following steps:

To delete a Priority Access (Prioritized Port Control) group:

1. Start Priority Access (Prioritized Port Control) (refer to section 3.3).
The Priority Access (Prioritized Port Control) panel appears.
2. Ensure that the WWN tab is displayed (see Figure 4.2).
3. In the lower-left tree view, select and right-click a Priority Access (Prioritized Port Control) group (🗄️).
4. Select **Delete** from the pop-up menu.
5. In the Priority Access (Prioritized Port Control) panel, click the **Apply** button.

The settings in the panel are applied to the disk subsystem.

Chapter 6 Troubleshooting

6.1 Troubleshooting in General


For troubleshooting information on the 9900V subsystem, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100). For information on the 9900V Remote Console software error codes, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator Error Codes* (MK-92RD132).

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

- **Check the cabling and the LAN.** Verify that both the computer and LAN cabling are firmly attached, and that the LAN is operating properly.
- **Reboot the PC.** Close any programs that are not responding. If necessary, reboot the PC and restart the 9900V Remote Console - Storage Navigator Java™ applet program.
- **Check for any General Error Conditions.**

Table 6.1 describes some general error conditions, along with the recommended resolution for each item. If you are still unable to resolve an error condition, call the Hitachi Technical Support Center for assistance (see section 6.3).
- **Check the status lamp on the Hitachi Remote Console - Storage Navigator.** If the lamp becomes yellow (🟡) or red (🔴), confirm the severity level of the error on the Status panel. If you are unable to resolve an error condition, please contact the Hitachi Data Systems Support Center (see section 6.3).
- **Download the Remote Console trace files using the FD Dump Tool.** If you are unable to resolve an error condition, first copy the 9900VRemote Console configuration information onto floppy disk(s) using the FD Dump Tool (refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101). Contact the Hitachi Data Systems Technical Support Center (see section 6.3), and give the information on the floppy disk(s) to the Hitachi Data Systems service personnel.

Table 6.1 General Error Conditions

Error Condition	Recommended Action
The program on the SVP is updated.	Exit all Web browsers on the Remote Console PC, and then restart the browsers. If in doubt, you should exit and restart the browsers.
The Remote Console PC experiences an error.	Save the Java log file on the Remote Console PC, and report to the Hitachi Data Systems Technical Support Center. For Windows 2000, the Java log file is in the following place: c:\Documents and Settings\login user ID\plugin131.trace Restart the Remote Console PC.
A network error occurred.	Restart the Remote Console PC.
Only the Exit and Refresh buttons are effective when accessing the SVP from the Remote Console PC.	The SVP might not be ready or perform some write processes from the other system. Wait for a while, and then select the Refresh button.
After dragging and dropping objects to another location or area, the scroll bar on that location becomes unusable.	Close all panels including the Storage Device List panel, and then log on to the Remote Console again.
A focus disappears from the edit box.	Close all panels including the Storage Device List panel, and then log on to the Remote Console again.
A Remote Console panel is closed by: - Clicking the  button on the panel, - Using the commands such as File and Exit on the Web browser, or - Pressing the Alt and F4 keys.	Wait for an RMI time-out (default is 6 min.), and then restart the Remote Console.
An internal error occurs, or a Web browser ends abnormally (forcibly).	Close all panels including the Storage Device List panel, and then log on to the Remote Console again. If the same error occurs, restart the Remote Console PC.
If you are unable to resolve an error condition.	Copy the 9900V™ Hitachi Remote Console-Storage Navigator configuration information onto floppy disk(s) using the FD Dump Tool (refer to <i>Hitachi Lightning 9900V™ Remote Console – Storage Navigator™ User's Guide (MK-92-RD101)</i>), and contact the Hitachi Data Systems Technical Support Center.

6.2 Troubleshooting Priority Access

If the WWN of a host bus adapter is displayed by red in the WWN tree view, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports are not controlled by upper limits and/or thresholds. To control the traffic between the HBA and the all the connected ports, take the following steps:

1. In the **upper-left tree view**, double-click all the ports to which the HBA is connected.
2. Double-click all the **Monitor** entries and the **No-Monitor** entries that appear below the specified ports.
3. If you find any occurrence of the HBA below the No-Monitor entries, drag the HBA to **Monitor**.
4. Ensure that the HBA appears below each of the Monitor entries and click **Apply**.

6.3 Calling the Hitachi Data Systems Technical Support Center

If you need to call the Hitachi Data Systems Technical Support Center, be sure to provide as much information about the problem as possible. Include the circumstances surrounding the error or failure and the exact content of any error codes and/or messages displayed on the Remote Console. The worldwide Hitachi Data Systems Technical Support Centers are:

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

Acronyms and Abbreviations

CHA	channel adapter
CHP	channel processor
DASD	direct-access storage device
DFW	DASD fast write
DKA	disk adapter
ESCON®	Enterprise System Connection (IBM trademark for optical channels)
LAN	local-area network
LDEV	logical device
LU	logical unit
LUN	logical unit number
many-to-many	A many-to-many connection refers to a configuration in which the production server(s) and development server(s) are connected to the disk subsystem via a fibre channel switch allowing host bus adapters on the production and development server(s) to share multiple ports on the disk subsystem.
one-to-one	A one-to-one connection refers to a configuration in which a host bus adapter(s) on a production and/or development server are each connected to the disk subsystem via a single connection to a single, dedicated port on the disk subsystem.
PC	personal computer
RAID	redundant array of independent disks
SAN	storage area network
SVP	service processor

