Overland Storage

SnapSAN™ Performance Monitor

User Guide

for SnapSAN S5000 Disk Arrays

overland storage

Preface

This user guide explains how to install, setup, and use SnapSAN Performance Monitoring for Windows software to perform analysis by centrally managing disk arrays performance data collected by the performance monitoring function (Performance Monitor).

This guide assumes that you are familiar with computer hardware, data storage, and network administration terminology and tasks. It also assumes you have basic knowledge of Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), Storage Area Network (SAN), and Redundant Array of Independent Disks (RAID) technology.

Product Documentation and Firmware Updates

Overland Storage SnapSAN product documentation and additional literature are available online, along with the latest release of the SnapSAN S5000 software.

Point your browser to:

http://docs.overlandstorage.com/snapsan

Follow the appropriate link to download the **latest** software file or document. For additional assistance, search at http://support.overlandstorage.com.

Overland Technical Support

For help configuring and using your SnapSAN 5000, search for help at:

http://support.overlandstorage.com/kb

You can email our technical support staff at techsupport@overlandstorage.com or get additional technical support information on the Contact Us web page:

http://www.overlandstorage.com/company/contact-us/

For a complete list of support times depending on the type of coverage, visit our web site at:

http://support.overlandstorage.com/support/overland_care.html

Conventions

This user guide exercises several typographical conventions:

Convention	Description & Usage
Boldface	Words in a boldface font (**Example**) indicate items to select such as menu items or command buttons.
Ctrl-Alt-r	This type of format details the keys you press simultaneously. In this example, hold down the **Ctrl** and **Alt** keys and press the **r** key.
NOTE	A Note indicates neutral or positive information that emphasizes or supplements important points of the main text. A note supplies information that may apply only in special cases—for example, memory limitations or details that apply to specific program versions.
IMPORTANT	An Important note is a type of note that provides information essential to the completion of a task or that can impact the product and its function.
CAUTION	A Caution contains information that the user needs to know to avoid damaging or permanently deleting data or causing physical damage to the hardware or system.
WARNING	A Warning contains information concerning personal safety. Failure to follow directions in the warning could result in bodily harm or death.
Menu Flow Indicator (**>**)	Words in bold font with a greater than sign between them indicate the flow of actions to accomplish a task. For example, **Setup > Passwords > User** indicates that you should press the Setup button, then the Passwords button, and finally the User button to accomplish a task.

Information contained in this guide has been reviewed for accuracy, but not for product warranty because of the various environments, operating systems, or settings involved. Information and specifications may change without notice.

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Performance Monitoring

Overview

The performance monitoring function is a function for centrally monitoring performance of storage devices when the devices are under control of the SnapSAN Performance Monitor. The use of this performance monitoring function is capable of real-time monitoring of loads, detection of overload, analysis and management of statistic information (performance information of the past). Since real-time monitoring of loads is a short-term analysis, the performance data of a disk array are displayed with numerical values or graphs on the SnapSAN Performance Monitor client Performance Monitoring screen. The overload monitoring function detects abnormalities during operation, and outputs messages for notification when the performance value exceeding the specified threshold value is detected. Since analysis and management of statistic information are a long-term analysis, the performance data of disk arrays are accumulated as a statistic information history file. These accumulated statistic information history files can be analyzed by the Performance Analysis Supporting Tool (ControlCommand and GUI).
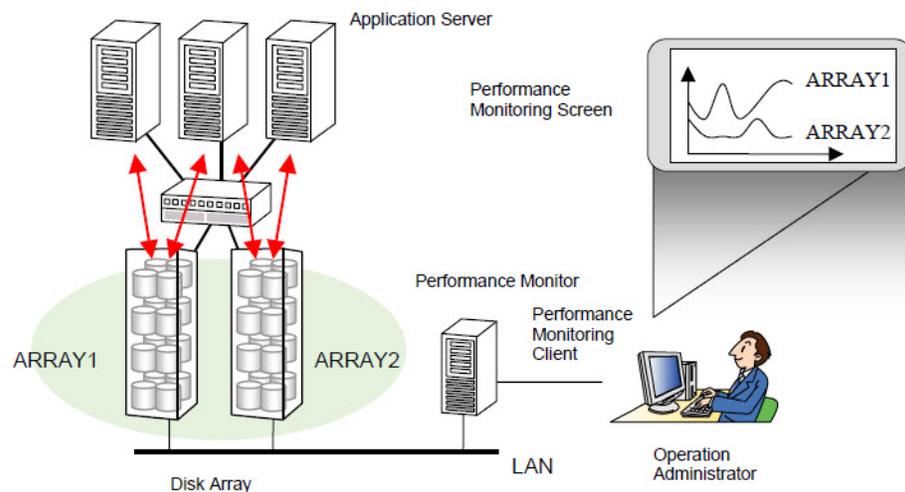
Figure 1-1: Configuration of the Performance Monitoring Function

Performance Monitor and Related Product

Performance Monitor requires the following program product as a precondition.

- BaseProduct

The following program product enables to utilize the performance information accumulated by Performance Monitor and also analyze the storage performance from different angles.

- AutoTune

Operation of Performance Monitoring Function

This section describes operations of the performance monitoring function. The performance monitoring function is operated in the flows shown below:

Operation flow	Reference
Installing performance monitoring function Installation of the performance monitoring function is accompanied by installing SnapSAN Performance Monitor at the same time.	Chapter 2 Installation of Performance Monitoring Function
Specifying targets of monitoring performance in real-time For defining the targets of monitoring performances, specify disk array, ports, logical disks, and physical disks composing logical disks used in operations requiring responsibility such as online processing. Also, specify monitoring items among those allowed for real-time monitoring (I/O Density, transfer rate, etc.). For example, to monitor responses to accesses from an application, average response time and I/O density must be monitored.	1.4.1 Displaying Load Status in Real-Time 3.1 Displaying Load Status in Real-Time
Analyzing performances Accumulate the statistic information of performance monitoring target devices, with accesses from application programs. Then analyze the statistic information by summarizing, extracting, and editing. On the basis of the analyzed information, a maximum load level, load fluctuation, and expected period of heavy load and future load regulation are estimated. This analysis is performed regularly. If a problem about performances is expected, an appropriate measure must be taken in advance.	1.4.3 Supporting Statistic Information Analysis 3.3 Support for Analysis of Statistic Information Appendix A Commands of Performance Monitoring Function Description of the I/O density and write hit ratio: 1.4.1 "Displaying Load Status in Real-Time"
Specifying threshold value and monitoring overloads On the basis of performance analysis results, specify threshold values as indexes for detecting overloads. Loads exceeding a specified threshold value are detected by SnapSAN Performance Monitor automatically, and are reported on the SnapSAN Performance Monitor Client screen.	1.4.2 Monitoring Overloads 3.2 Monitoring Overloads Appendix A Commands of Performance Monitoring Function

Continued to next page

Operation flow	Reference

Continued from previous page

Upon detection of overload

Reviewing cause of overload

Display the Performance Monitoring screen on the SnapSAN Performance Monitor client or use the threshold operation command on the SnapSAN Performance Monitor server to check the location of overload. Then, analyze the accumulated statistic information to determine the cause of the overload.

Identifying the location of overload:
1.4.2   Monitoring Overloads
3.2   Monitoring Overloads
Appendix A Commands of Performance Monitoring Function

Analyzing statistic information:
1.4.3   Supporting Statistic Information Analysis
3.3   Support for Analysis of Statistic Information
Appendix A Commands of Performance Monitoring Function

Improving performance

Analysis of statistic information makes it possible to improve performance as shown in the examples provided below.

• If there is a problem with the file arrangement and the access load concentrates in a specific logical disk, the I/O density of the logical disk should be higher than that of other logical disks and its response time should be longer. If this is the case, it is necessary to review the file arrangement and distribute the load.

• If a write operation onto the disk is slow, the cache memory is insufficient. A write operation onto physical disks may be simultaneously performed. This status is confirmed by checking to see if the Write Hit ratio is less than 100%. If this is the case, it is recommended that the memory of the disk array be added.

• If response is not quick although the access density from the application server to the logical disk is low, the access density to another logical disk on the same RANK/pool may be high. This state is confirmed by the fact that the Busy Ratio of the RANK/pool is high. In this case, use the performance optimization function to move the logical disk, which has the high access density, to another RANK/pool and level out the Busy Ratio of each RANK/pool. On the other hand, reviewing the processes of an application to reduce access operations to a disk or improving access efficiency by batch accessing can be good solutions to some cases.

Against high busy ratio on RANK/pool:
"Performance Optimization User's Manual"

Function Overview

The performance monitoring function includes Real-Time Display of Load Status, Monitoring Overloads, and Statistic Information Analysis Supporting.

Displaying Load Status in Real-Time

This function is capable of displaying the latest load state and usage of the disk array and disk array components. The information is displayed upon the SnapSAN Performance Monitor client screen, on the real-time basis. The function, which can monitor performances of multiple disk arrays, allows centralized monitoring on the same view of one SnapSAN Performance Monitor client. When storage performance decreases, or symptom of a trouble is seen, use this function to display the performance information of disk array and disk array components, and identify the cause of decreased performances or a fault.

The Performance Monitoring screen on the SnapSAN Performance Monitor client is capable of displaying the index values for each component type shown in A.1 "Performance Data Displaying in Real-Time".

• Displays the latest load status in numerical values

• Displays the latest load state in bar graphs

• Displays the latest load state in time-series graphs

You can set the update frequency (Display Refresh Rate) of display on the Numeric Table and the Time-series Graph at environment setting. You can also change the setting from the SnapSAN Performance Monitor server menu while the SnapSAN Performance Monitor server is operating if the performance monitoring screen is not started.

Set the Display Refresh Rate as the number of screen updates per minute. Table 1-1 shows relation between Display Refresh Rate and Display Refresh Interval.

Display Refresh Rate and Display Refresh Interval

| Display refresh rate (times/minute)	1	2	3	4	5	6
Display refresh interval (second)	60	30	20	15	12	10

You cannot change the Display Refresh Rate while the Performance Monitoring screen is started. Change to the Display Refresh Rate applies to all the disk arrays monitored by the server.

Increasing the Display Refresh Rate detects change in the performance information in a shorter interval but the number of components simultaneously display is decreased. This is because the number of collection of performance information by a single disk array unit in certain period is restricted not to obstruct file I/O from the application host in the overhead at collection of performance information. This tendency is eminent especially when statistic information is being stored simultaneously with real-time displaying.

Monitoring Overloads

Specifying a threshold as an index value of overload allows SnapSAN Performance Monitor to automatically detect the occurrence of overload in a disk array or a disk array component (occurrence of a load exceeding a specified threshold value). Upon detecting overload, a message (event log/syslog, operation log) notifying overload is displayed. At the same time, asterisks (**) are displayed at the location where the overload occurred on the Performance Monitoring screen. When the occurrence of overload is reported by a message, an administrator must identify the location of overload occurrence on the Performance Monitoring screen. In addition, by specifying the threshold monitoring conditions and conditions to reset threshold excess state, it is possible to perform operations such that overloads in a temporary disturbance are not detected and, when threshold exceeding continues, overloads are detected and notified continuously.

To detect overload of the entire disk array, it is enough to set thresholds for the entire disk array, IOPS of the port, transfer rate, and average response time, and to monitor the performance. You do not have to specify a threshold for each and every logical disk and physical disk. If you need to restrict the I/O load of a specific logical disk and physical disk for some reason such as data of the database application, specify thresholds for the logical disk and physical disk. Then you can detect an abnormal load on them.
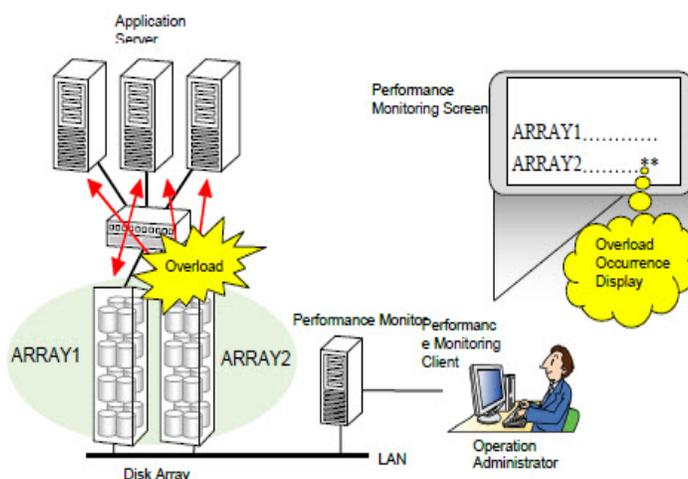
Figure 1-2: Monitoring Overloads

Threshold values can be specified for each item in A.2 "Performance Data Threshold to Be Monitored".

The unit of specifying a threshold is called a threshold monitoring element. Thresholds can be set using the Performance Monitoring screen of the SnapSAN Performance Monitor client or the threshold operation command of the SnapSAN Performance Monitor server.

Notifying threshold excess by e-mail

The event link function of the SnapSAN Performance Monitor server e-mails a message (message ID: SnapSAN Performance Monitor08050) to a specified address in order to notify the occurrence of a threshold excess. For details on the event link function of the SnapSAN Performance Monitor server, refer to "Event Link" in the "User's Manual" of your OS in use.

Threshold monitoring conditions

During a background process of disk array, such as batch processing and fault recovery of physical disks, a threshold value may be temporarily exceeded. Upon such a case, which can occur in usual operation, the excess of threshold should not be reported to an administrator. Specifying the monitoring conditions shown below can prevent such unnecessary reporting of the excess of threshold.

1. Threshold monitoring interval

Time interval of detecting a threshold. Default value is the same as Display Refresh Interval.

2. Minimum I/O count

If the number of I/Os in a threshold monitoring interval does not exceed an I/O count specified here, the threshold is not monitored in this interval. A minimum I/O count is specified with the number of me /Os per minute. Default value is 60 per minute.

Threshold monitoring is performed when the number of I/Os in a threshold monitoring interval exceeds the specified minimum I/O count. If the threshold is exceeded, the excess of threshold is reported. By system operation, analyzing performances, and specifying the

threshold monitoring conditions on the basis of the analysis, monitoring of overload appropriate for the applications can be performed. Figure 1-6 shows an outline of the threshold monitoring interval.
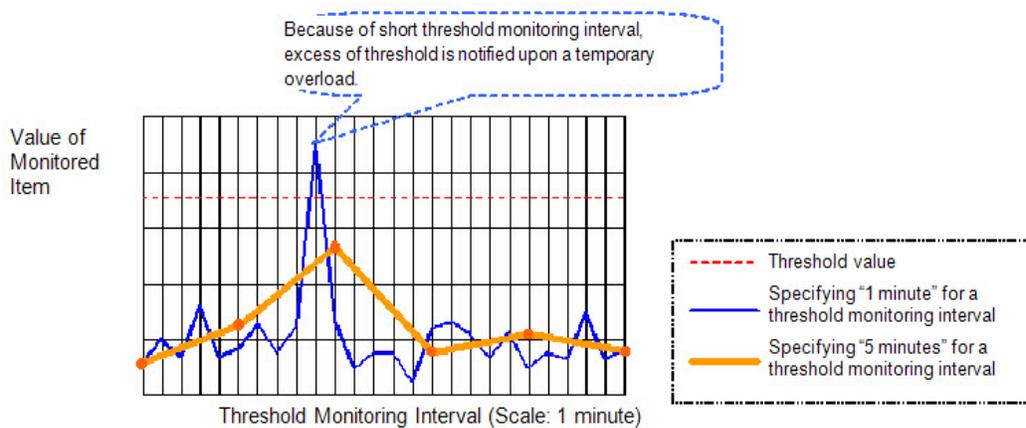
Figure 1-3: Threshold Monitoring Interval

For monitoring overload of a disk array, performance information must be constantly collected from the disk array. If thresholds are set for many monitoring items, collection of performance information burdens the disk array.

The number of monitored items for which a threshold can be set is limited in order to prevent load on the disk array increased by collection of performance information from affecting I/O to and from the application server.

Specification of thresholds for many logical disks and physical disks in a medium or large scale disk array may conflict with the above limit of monitoring items. To prevent this conflict and set thresholds without limit, set the threshold monitoring interval included in the environment definition of the SnapSAN Performance Monitor server to "the same as the logging interval".

This setting enables to decrease the load on the disk array to be increased by threshold monitoring, in conjunction with accumulation of statistic information, which is described in the following section. This measure, however, requires accumulated statistic information.

> NOTE: If the threshold monitoring interval is set to "the same as the logging interval", only the disk array whose statistic information is accumulated is monitored for thresholds. Note that if accumulation of statistic information is stopped, the excess of threshold is not monitored even when thresholds are set for monitoring items.

   3. Resetting threshold excess state

Once a threshold value is exceeded, the value is excluded from threshold monitoring target until the threshold excess state is reset. This feature prevents repeated reporting of the same event of threshold excess state, under largely fluctuating loads.

The threshold excess state can be reset by the Performance Monitoring screen of the SnapSAN Performance Monitor client or the threshold operation command of the SnapSAN Performance Monitor server. Setting the condition to reset threshold excess state allows automatic reset of threshold excess state when the condition is satisfied. The following conditions can be set for resetting the threshold excess state:

a. Time of continued values under threshold

Specify the number of threshold monitoring intervals during which a value is kept under threshold. For each monitoring item satisfying the conditions, threshold excess state is reset. If the number of I/Os does not reach a minimum number of I/Os specified as a threshold monitoring condition, the load of the interval is recognized as under threshold.

b. Time of day

At a specified time each day, the threshold excess state is reset for all monitoring items.

Resetting threshold excess state when "3" is specified as the number of threshold monitoring intervals for a period of continuous values under threshold is shown below:
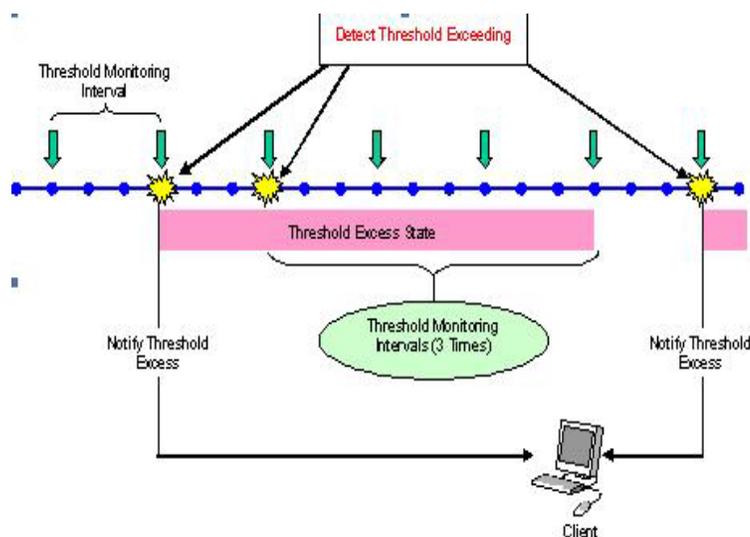
Figure 1-4: Resetting Threshold Excess State

Supporting Statistic Information Analysis

This function is capable of: accumulating, summarizing, extracting, and editing statistic information about the performances of disk array in a file. Using this function allows long-term accumulation of statistic information which lets you grasp long-term load variations and analysis of performance, for efficient use of the disk array.

A file where statistic information is accumulated is called a statistic information history file. The statistic information history file is stored on the SnapSAN Performance Monitor management server, allowing summarizing, extracting, and editing data on the server. In addition, downloading the statistic information history file allows summarizing, extracting, and editing data on a SnapSAN Performance Monitor client.
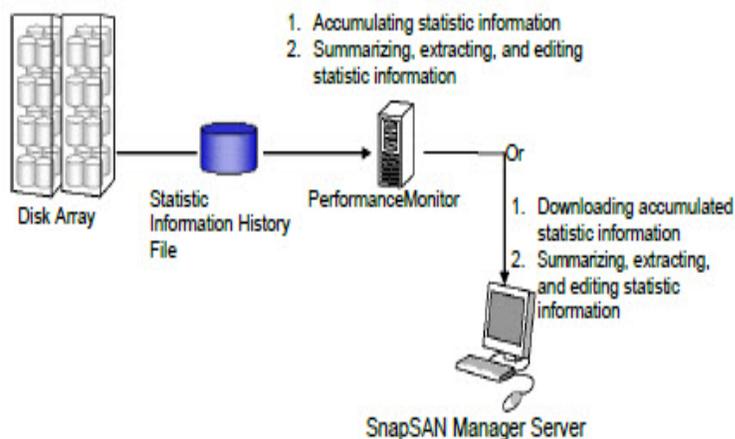
Figure 1-5: Analyzing Statistic Information

NOTE: When statistic information has been accumulated for a long term, disk usage of the statistic information history file increases. Therefore, it is necessary to systematically organize statistic information. Increase of disk usage can be prevented by "summarizing statistic information" and "keep period of statistic information".

Accumulating Statistic Information

The statistic information collected from disk array is accumulated in a statistic information history file. One statistic information history file stores the statistic information for up to one day collected from one disk array. A statistic information history file is automatically created in a directory specified by environment definition.
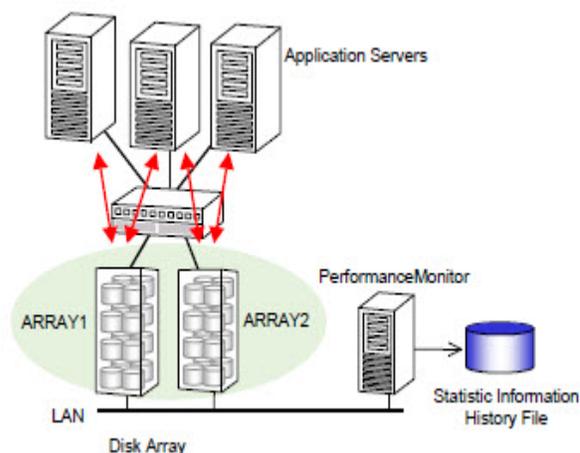
Figure 1-6: Accumulating Statistic Information

Statistic information history files are created based on the following naming conversion.

Naming Convention for Statistic Information History Files:

yyyymmdd<Disk Array Name>[#nnn].psl

     a. yyyymmdd

The year, month, and day when accumulation to the statistic information history file started. If date changes while statistic information is being accumulated, accumulation is done to a new statistic information history file.

yyyy represents the year (four digits), mm represents the month (a two-digit number), and dd represents the day (a two-digit number).

     b. Disk Array Name

This is the name of the disk array. Statistic information history files are created for each disk array.

     c. nnn

This is a file serial number (between 2 and 999). If a file with the same name exists when accumulation of statistic information starts up, a serial number is assigned. For example, if the SnapSAN Performance Monitor server is shut down and started up in operation of one day, the serial number is assigned to accumulated statistic information from the second startup of the SnapSAN Performance Monitor server, and the value increments by one. The serial number has the upper limit. If the number exceeds this limit, accumulation of statistic information fails.

If an operation that results in the serial number exceeding the maximum is performed, move the statistic information history files to the different directory at each shutdown of the SnapSAN Performance Monitor server, or summarize/extract statistic information as required, delete the statistic information history files. Then, restart the SnapSAN Performance Monitor server.

For information on how to estimate the size of a statistic information history file, refer to Appendix E "Estimating Size of Files for Performance Monitoring Function".

The accumulating period of statistic information is called the logging interval. The user can specify the logging Interval from 1 minute to 60 minutes at environment definition of the SnapSAN Performance Monitor server. The logging Interval cannot be changed while the SnapSAN Performance Monitor server is operating. To change the logging Interval, you must terminate the SnapSAN Performance Monitor server.

The accumulating processes of statistic information limits the number of times for collecting statistic information within a specified time, in order not to affect I/O process from the application server. In other words, the statistic information is not collected all at once from the disk array, but it is collected with dividing the accumulating process into several intervals. Therefore, too many disk array components may prevent collecting statistic information within a specified logging interval, and may disable starting of the data accumulation process. In such a case, specifying the automatic adjustment of logging interval in the environment definition of the SnapSAN Performance Monitor server can adjust the appropriate intervals within a range of 60 minutes from the interval set in the environment definition, and start accumulating processes. When a logging interval is automatically adjusted, a message notifies the adjustment.

> NOTE: Effect of statistic information collection on storage units When it is determined that there are many disk array components and the number of times for collecting statistic information is a lot, message SnapSAN Performance Monitor08051 is displayed. If this message is displayed, make a logging interval longer.

The monitored disk arrays collect various types of statistic information by component/load type in the unit of summarizing. From the statistic information, SnapSAN Performance Monitor reads the statistic information of the types shown in Tables A-3 to A-11 in A 3.1 and accumulates the time changes in the statistic information history file. Such statistic information is called basic statistic information.

The information output on a specific resource basis is called additional statistic information, and is described in the form of "resource-name (additional-information)".

SnapSAN Performance Monitor also records information required for displaying the following information in the statistic information history file.

 Component information required interpreting accumulated statistic information

 Name tags used for displaying the results of analysis

Summarizing Statistic Information

The statistic information accumulation function described above accumulates statistic information collected in every logging Interval in statistic information history file. If statistic information collected in relatively short intervals is accumulated in the long term, the amount of data in the statistic information history file will become enormous and eventually exhaust the free disk space.

For saving disk space, the accumulated statistic data is summarized into the information of a period longer than the logging interval, reducing amount of information included in a file, downsizing the data. This function is called summarizing statistic information. The information after summarizing is output to statistic information summarized file. For details about summation, refer to A.3.1"Summarizing Statistic Information".

When you want to accumulate statistic information in the long term, summarize statistic information by using this function as required and delete the statistic information originally accumulated. This can save the disk space. For information on how to estimate the size of a statistic information summarized file, refer to Appendix E "Estimating Size of Files for Performance Monitoring Function".

1. Types of summarized files

In order to select an appropriate balance between the time resolution and amount of accumulated information. You can create summarized files whose average time interval in the period of summarizing is one hour and summarized files whose average time interval is one day.

A file which contains statistic information summarized in units of hours is called a primary summarized file, and file which contains statistic information summarized in units of days is called a secondary summarized file. In other words, SnapSAN Performance Monitor has three types of files which store statistic information, as shown in Table 1-2.

Types of Files in Which Statistic Information Is Stored

Type of File	Average Time Interval of Period of Summarizing	Amount Recorded in One File
Statistic Information History File	Logging Interval	For max. of one day
Statistic Information Primary Summarized File	One hour	For max. of one day
Statistic Information Secondary Summarized File	One day	For max. of one month

NOTE: If the disk array configuration is changed while the statistic information is being accumulated, the period of summarizing is divided at the time when the disk array configuration is changed.For the statistic information on primary summarized file, the period of summarizing might be less than one hour by being divided at the time when the disk array configuration is changed.For the statistic information on secondary summarized file, the period of summarizing might be less than one day by being divided at the time when the disk array configuration is changed.

2. Types of summarizing operations

SnapSAN Performance Monitor provides the following three types of summarizing functions to deal with the two types of summarized files.

a. History file   Primary summarized file (primary summarizing)

The input is a statistic information history file, and the output is a primary summarized file. In other words, statistic information in each logging interval within each period of summarizing in the input file is summarized in units of hours and the result is recorded in the output file.

b. History file   Secondary summarized file (direct secondary summarizing)

The input is a statistic information history file, and the output is a secondary summarized file. In other words, statistic information in each logging interval within each period of summarizing in the input file is summarized in units of days and the result is recorded in the output file.

c. Primary summarized file   Secondary summarized file (secondary summarizing)

The input is a primary summarized file, and the output is a secondary summarized file. In other words, statistic information in each hour within each period of summarizing in the input file is summarized in units of days.

For the enhanced statistic information, the maximum and minimum values are selected from the enhanced statistic information of the same type recorded in the primary summarized file.

3. Auto Archive

Statistic information can be summarized automatically at fixed intervals.

By summarizing statistic information automatically, the following two summarized files are periodically created in the "archive" folder under the statistic information storage folder of the SnapSAN Performance Monitor server. The "archive" folder is automatically created by the SnapSAN Performance Monitor server.

a. Statistic information primary summarized file

The statistic information history file of the previous day is summarized daily at a time set in the environment definition of the SnapSAN Performance Monitor server.

b. Statistic information secondary summarized file

The statistic information primary summarized file of the previous month is summarized at the start of every month at a time set in the environment definition of the SnapSAN Performance Monitor server.

Auto archive is executed under the following cases:

• When auto archive execution is enabled in the environment definition of the SnapSAN Performance Monitor server.

• When the license of the data allocation optimization function is applied.

NOTE: To execute auto archive, disk capacity for the statistic information primary/secondary summarized files must be reserved in addition to the statistic information history file. Therefore, the disk capacity may be overloaded unless statistic information is deleted periodically. To prevent the disk capacity from being overloaded, it is effective to set the keep period of statistic information.Files under the statistic information storage folder of the SnapSAN Performance Monitor server are targeted for auto archive. Therefore, take extra care when storing files in the folder under the statistic information storage folder.

IMPORTANT: Auto archive is not executed when the SnapSAN Performance Monitor server is stopped at auto archive execution. In this case, the summarized file that was not created last time is created at auto archive execution after the SnapSAN Performance Monitor server restarting.

Keep Period of Statistic Information

The disk capacity will overload by continuing to accumulate statistic information. Therefore, you need to delete statistic information as appropriate. This function periodically deletes the unnecessary statistic information by setting the period (keep period) to save the statistic information file. The statistic information files are targeted for deletion when the number of days/months/years elapsed since the day the statistic information was collected has exceeded the set keep period.

Different keep periods can be set to statistic information files the according to their file types. The keep period of statistic information can be set in the environment definition of the SnapSAN Performance Monitor server.

NOTE: The targets for deletion are statistic information files created under the statistic information storage folder of the SnapSAN Performance Monitor server or in the archive folder under the statistic information storage folder. Therefore, take extra care when storing files in each folder. The target files for deletion are determined based on the system time of the machine where SnapSAN Performance Monitor server is operating. Therefore, take extra care when changing the system time. When you want to change the system time substantially, you must save the statistic information files as required.

f the SnapSAN Performance Monitor server is stopped when file deletion is executed, the statistic information files that have exceeded the keep period are not deleted. The files will be deleted at deletion after the SnapSAN Performance Monitor server restarting.

Downloading Statistic Information

The statistic information accumulated on the SnapSAN Performance Monitor management server can be summarized, extracted, and edited by downloading the statistic information file on the SnapSAN Performance Monitor client. If you do not have the SnapSAN Performance Monitor performance analysis supporting tool and SnapSAN Performance Monitor Storage Performance Report Viewer in the SnapSAN Performance Monitor client environment, you have to install them. The statistic information file can be downloaded from the Performance Monitoring screen on the SnapSAN Performance Monitor client by using the SnapSAN Performance Monitor file transfer function. Downloading is allowed for clients of user level L2 or L3. Downloading is also allowed with a commercially available FTP tool without using the SnapSAN Performance Monitor file transfer function.

Extracting Statistic Information

Statistic information about disk array collected by SnapSAN Performance Monitor is accumulated in statistic information history files and statistic information summarized files. This function can extract and output the information to a CSV format file (delimited by commas).

Use of this function allows displaying values of accumulated statistic information. Furthermore, a spreadsheet program can display the data of CSV format file in graphs, allowing review of long-term load fluctuation and performance analysis.

By specifying addition of header upon extracting a CSV file, the header record for the values is added to top of the file. Editing the statistic information with a header record using a spreadsheet program allows easy identification of the statistic data values.

CSV Conversion Tool creates CSV files according to the following naming convention. For information on the structure of a CSV file, refer to Appendix C "CSV File Structure".

Naming Convention for CSV Files

"Name of Statistic Information History (summarization) File "_"Extension of Statistic Information History (summarization) File".csv

Example: Name of the CSV file for the statistic information file "20070417StorageD8.psl"

20070417StorageD8_psl.csv

In statistic information history/summarized files, various types of statistic information regarding components of the disk array are accumulated. You can extract the specified statistic information from the statistic information by giving extraction conditions to CSV Conversion Tool depending on your purpose. The following extraction conditions can be specified for CSV Conversion Tool.

- Period of extraction
- Component of disk array
- Type of statistic information

In statistic information history/summarized files, the component information of the disk array is accumulated in addition to statistic information. CSV Conversion Tool can also extract component information.

1. Extracting statistic information in the specified period

To extract statistic information in the specified period, specify the period in CSV Conversion Tool. To specify a period, you can specify the extraction starting time and end time, or either one of them.

a. Specifying the extraction starting time and end time

Statistic information from the extraction starting time to the extraction end time is extracted.

b. Specifying the extraction starting time only

Statistic information after the extraction starting time is extracted.

c. Specifying the extraction end time only

Statistic information before the extraction end time is extracted.

2. Extracting statistic information regarding the specified component

To extract statistic information of the specified component of the disk array, specify the component of the disk array in CSV Conversion Tool. The following components can be specified.

- Host director
- Disk director

3. Extracting statistic information of the specified type

Statistic information can be generally categorized into the following types.

a. Information regarding the number of inputs/outputs

This information contains the number of inputs/outputs, the maximum values of input/output density (IOPS) and minimum values of input/output density.

b. Information regarding the response time of the I/O process

This information contains the average response time and the maximum response time.

c. Information regarding the Transfer Rate of the I/O process

This information contains Transfer Rate and the maximum and minimum values of Transfer Rate.

d. Information regarding the operating status of the devices

Busy time and maximum and minimum values of the busy time are included. A Busy Ratio and maximum and minimum values of the Busy Ratio are included.

e. Information regarding the I/O request queues

Average queue length and max queue length are included.

f. Information regarding the cache pages

Average dirty pages and max dirty pages are included.

g. Information regarding the wait time of the semi synchronous copy order guarantee buffer

Average wait time and max wait time are included.

h. Information regarding the electric power

Electric power value and electric energy are included.

In a to h above, to extract statistic information of the specified type, specify the type in CSV Conversion Tool.

Extracting configuration information

There are the following types for configuration information of a disk array.

a. Information regarding the disk array and configurations

Information regarding:

- Disk array
- Node
- Host director
- Disk director
- Host port
- Replication port
- Data migration port
- Disk port
- Cache
- Logical disk
- Physical disk
- RANK
- Pool
- Cabinet

    b. Information regarding changes in logical disk names

This is information regarding changes in logical disk names.

    c. Information regarding changes in disk array configuration

This is information regarding changes in disk array configuration.

    d. Information regarding changes in RANK configuration

This is information regarding Logical Disk moving between RANKs by the performance optimization function.

To extract (a) and (b), you must specify extraction of configuration information in CSV Conversion Tool. (c) and (d) is always extracted regardless of specification to CSV Conversion Tool.

When configuration of the disk array and RANK changes, statistic information before and after the change are no longer related. Therefore, you must consider the following to analyze statistic information.

When information (c) is output, statistic information regarding all configuration s collected before and after the output is no longer related.

When information (d) is output, only statistic information on the RANK and pool collected before and after the output is no longer related.

Editing Statistic Information

As described in "Extracting Statistic Information", a user can create CSV format files using the CSV conversion tool, and can edit the data using spreadsheet software as required. This process makes analysis of the statistic information easier.

Furthermore, use of the functions provided by SnapSAN Performance Monitor allows easy analysis without a spreadsheet program. SnapSAN Performance Monitor provides the following edit functions for statistic information:

 A program called Performance Report Editor for the user to edit/modify in a format easy for performance analysis and output to a file the statistic information accumulated in statistic information history files and statistic information summarized files.

 Function of displaying graphs (Storage Performance Report Viewer) for files created with the edit tool (performance report).

    1. Performance Report Editor

The Performance Report Editor uses statistic information in statistic information history/summarized files as inputs and edits/modifies the statistic information into a text-format Performance Report. The user can reference the Performance Report to readily analyze the performance of a disk array.

Types and overview of Performance Report are given below. For details on the Performance Report, refer to Appendix D "Report Format of Performance Report Editor".

    a. Performance Summary Report

The Performance Summary Report is a component-based summary of statistic information on:

- Whole disk array
- Node
- Host directors
- Disk directors

- Host ports
- Replication ports
- Disk ports
- Caches
- Logical disks
- Physical disks
- RANKs
- Pools

Analysis of the Performance Summary Report provides understanding of general load status in the entire disk array and each component of the statistic information collection period.

b. Performance Detail Report

The Performance Detail Report summarizes the following statistic information per statistic information logging Interval of the SnapSAN Performance Monitor and is assigned chronologically:

- Whole disk array
- Node
- Host directors
- Disk directors
- Host ports
- Replication ports
- Disk ports
- Caches
- Logical disks
- Physical disks
- RANKs
- Pools

Analysis of the Performance Detail Report provides understanding of chronological change in the load status of the entire disk array and each component as well as detection of a performance bottleneck.

There are the following 14 types of the performance detail reports.

- Disk array performance detail report
- Node performance detail report
- Host director performance detail report
- Disk director performance detail report
- Host port performance detail report
- Replication port performance detail report (initiator)
- Replication port performance detail report (target)
- Disk port performance detail report
- Cache performance detail report
- Logical disk performance detail report
- Physical disk performance detail report
- RANK performance detail report

- Pool performance detail report

The Performance Report Editor creates a performance report in accordance with the following naming rule:

When input is a statistic information history file (xxxxxx.psl):

xxxxxx_psl_edit type.txt

When input is a statistic information summarized file (xxxxxx.psa):

xxxxxx_psa_edit type.txt

One of the following is set in the "edit type" depending on the performance report type:

sum: Performance summary report

array: Disk array performance detail report

node: Node performance detail report

hd: Host director performance detail report

dd: Disk director performance detail report

hp: Host port performance detail report

rp-i: Replication port performance detail report (initiator)

rp-t: Replication port performance detail report (target)

dp: Disk port performance detail report

cache: Cache performance detail report

ld: Logical disk performance detail report

pd: Physical disk performance detail report

rank: RANK performance detail report

pool: Pool performance detail report

2. Storage Performance Report Viewer

The Storage Performance Report Viewer is a tool that uses a disk array performance detail report created by the Storage Performance Report Editor as inputs to provide graphic representation of statistic information. The user references a graph to understand the load state of disk array and chronological change in the load.

The Storage Performance Report Viewer can be used in an environment where Excel (Microsoft® Excel2000/2002/2003/2007/2010) is installed.

Server Installation

System Requirements

For HW, OS, memory, and disk capacity, the same system requirements as those for the SnapSAN Performance Monitor server are applicable. You need to unlock the licenses of the performance monitoring function and required program products for the disk array to be applied when installing this function.

Installation

Installation of the SnapSAN Performance Monitor server is accompanied by installing the performance monitoring function at the same time.

Environment Setting

To use the performance monitoring function, the environment definition of the SnapSAN Performance Monitor server is necessary.

Client Installation

System Requirements

The same system requirements as those for the SnapSAN Performance Monitor client are applicable to the performance monitoring function.

Installation

The performance monitoring function is installed with the SnapSAN Performance Monitor client.

Operations

Displaying Load Status in Real-Time

Explanation will be made about the operation method for monitoring the load status in real time by using the Performance screen.

1. Performance Monitoring Starting

Clicking the button for activating the performance monitor function opens the Performance Monitor screen, which starts performance monitoring. The Performance Monitor screen displays the following forms for monitoring latest load states.

- Displays the latest load status in numerical values (Numeric Table)
- Displays changes of the load status in a line graph (Time-series Graph)
- Displays the latest load status in a Bar Graph (Bar Graph)

2. Numeric Table Display

The Numeric Table screen appears upon activating the performance monitor function. The screen displays the latest load states in the form of numeric table. The Numeric Table screen allows you to monitor the latest load status as well as to perform settings of real-time display. On this screen, a list with rows of monitoring objects and columns of monitored items is displayed according to the specified component type. The latest values are updated according to specified intervals. The time interval is specified when setting up the SnapSAN Performance Monitor server environment.

This display allows you to monitor the latest values of load status and use status of each port.

The performance monitor screen

Menu bar

The menu bar is used for selecting necessary items from the menu for various operations. For details, refer to Help.

Tool bar

Among the menu items, the following functions that are frequently used can be activated by a single click of a button. For details on the buttons, refer to Help.

- [File]   [Save of Settings]
- [View]   [Numeric Table], [Time-series Graph], [Bar Graph], [Threshold], [Show Threshold in graph], [Release Threshold in graph], [I/O Density], [Transfer Rate], [Average Transfer Length], [Average Response Time], [Read Hit Ratio], [Write Hit Ratio], [Busy Ratio]
- [Settings]   [Monitoring Object Logical Disk], [Monitoring Object Physical Disk], [Set Graph Scale]
- [Threshold Monitoring]   [Set Threshold], [Show All Items Specified Threshold]

- [Operation]   [Start/Stop Accumulation of Statistic Information], [Download Statistic Information files]

Information display area

A numeric table and graph indicating load states are displayed (Note 1).

Status bar

The status bar at the bottom displays the current status of performance monitoring function. The following describes details of the displayed items.

a. Display Refresh Interval

A time interval for updating the Performance screen is indicated by the number of seconds. Any one of 10, 12, 15, 20, 30, and 60 is displayed. The time interval is specified when setting up the SnapSAN Performance Monitor server environment.

Example 10: Update every 10 seconds (specify 6 as number of updates per minute)

b. Operating status

- Information acquiring:

Indicates that the initial information necessary for displaying the load status on the Performance Monitoring screen is being collected from the SnapSAN Performance Monitor server

- Working:

Indicates that various processing on the Performance Monitoring screen is being performed

- Stop

Indicates that various processing on the Performance Monitoring screen has been terminated due to disconnection of the SnapSAN Performance Monitor client from the SnapSAN Performance Monitor server or cancellation instruction in the Information acquiring dialog screen. If the system is connection to the SnapSAN Performance Monitor server, you can select and execute [Refresh] from the menu function to restart various processing on the Performance screen.

Statistic information storing status

It indicates whether or not the SnapSAN Performance Monitor is storing statistic information into a statistic information history file.

- Statistic Information starting:

Indicates that the SnapSAN Performance Monitor is storing statistic information into a statistic information history file.

- Statistic Information stopped:

Indicates that the SnapSAN Performance Monitor is not storing statistic information.

- Checking:

Indicates that SnapSAN Performance Monitor is obtaining statistic information required for displaying the client screen.

The order in which the [Number], [OS Type], and [LD Name] columns are displayed on each screen differs depending on the display order of the logical disks. The display order of the logical disks can be set in the option of the login screen for the SnapSAN Performance Monitor client (Web GUI) and on the environment setting screen for the SnapSAN Performance Monitor client (Win GUI). For details on the setting method, refer to "Client Start/Stop" of the "User's Manual" or "User's Manual (UNIX)" in accordance with your OS. The order on each screen is described in the the related screen.

> **NOTE:** With a SnapSAN Performance Monitor server using an older version of software, a hyphen (-) is displayed for some items because the SnapSAN Performance Monitor server does not have the display function. For displaying values, software of the latest version is required.

When logical disks are selected as the component type, you can monitor the latest values of load status and use status of each logical disk.

Left-clicking on a tab label of component type (such as disk array and port) switches the numeric table into a table indicting applicable calculation unit. The numeric table displays the following information, in accordance with the calculation unit selected by the procedure.

a. When the [Disk Array] tab is selected

The Numeric Table indicating load statuses by disk array is displayed. The rows are all the disk arrays which are currently being monitored by the SnapSAN Performance Monitor. The columns indicate:

- External I/O Density
- External Transfer Rate
- External Average Transfer Length
- External Average Response Time.
- Read Hit Ratio
- Write Hit Ratio

However, the string "External" is omitted in the labels.

In this display, the list does not change when you change the disk array to be monitored by using the combo box.

b. When the [Port] tab is selected

The Numeric Table indicating load statuses by port of the disk array specified in the combo box is displayed. The rows are all the ports which belong to the disk array specified in the combo box. The columns indicate:

- External I/O Density
- External Transfer Rate
- External Average Transfer Length
- External Average Response Time

However, the string "External" is omitted in the labels.

When you change the disk array to be monitored by using the combo box, the display switches to the list of load status by port of the selected disk array.

c. When the [Logical Disk] tab is selected

The Numeric Table indicating load state of by logical disk of the disk array specified in the combo box is displayed. The rows are the logical disks registered as monitoring objects among the logical disks created in the disk array specified in the combo box. The columns indicate:

- External I/O Density
- External Transfer Rate
- External Average Transfer Length
- External Average Response Time
- Read Hit Ratio

- Write Hit Ratio

  However, the string "External" is omitted in the labels.

  When you change the disk array to be monitored by using the combo box, the display switches to the list of load status by logical disk of the selected disk array.

  The order in which the [Number], [OS Type], and [LD Name] columns are displayed differs depending on the display order of the logical disks. The display order of the logical disks can be set in the option of the login screen for the SnapSAN Performance Monitor client (Web GUI) and on the environment setting screen for the SnapSAN Performance Monitor client (Win GUI).

  Display in numerical order:

  [Number], [OS Type], [LD Name], [I/O Density], are displayed in this order.

  Display in alphabetical order:

  [OS Type], [LD Name], [Number], [I/O Density], are displayed in this order.

  d. When the [Physical Disk] tab is selected

  The Numeric Table indicating load statuses by physical disk of the disk array specified in the combo box is displayed. The rows are the physical disks registered as monitoring objects among the physical disks created in the disk array specified in the combo box. The columns indicate:

- Internal I/O Density

- Internal Transfer Rate

- Internal Average Transfer Length

- Internal Average Response Time

- Busy Ratio

  However, the string "Internal" is omitted in the labels.

  When you change the disk array to be monitored by using the combo box, the display switches to the list of load status by logical disk of the selected disk array.

  If an overload occurs during overload monitoring, asterisks (**) appear on the left of the applicable item. Cells of the items displayed in graphs are displayed in gray.

3. Sorting the load status list

  By clicking a label indicating a type of the monitored item ([Number], [I/O Density], etc.) in the list of load status, you can sort the lines of the list in an ascending or descending order by using the current value of the monitored item you click as a key. Repeatedly clicking the label will switch between ascending and descending orders.

4. Registering/Deleting logical disks to be monitored

  When you click [Settings] and then select [Monitoring Object Logical Disk] on the Numeric Table screen (Figure 3-2), the Registration of Logical Disks dialog box appears (Figure 3-3). This dialog allows you to change the logical disks for performance monitoring in the disk array specified in the combo box of the Numeric Table.

  [Monitoring Candidate List] displays unregistered logical disks among all the logical disks created in the specified disk array. [Monitoring Object] displays all the logical disks currently registered as monitoring objects. Selecting logical disks in [Monitoring Candidate List] and clicking the [Add] button will register the specified logical disks to

the [Monitoring Object] list. On the other hand, selecting logical disks in the [Monitoring Object] list and clicking the [Delete] button will delete the specified logical disks from the [Monitoring Object] list.

When you click the [OK] button, all the logical disks currently displayed in the [Monitoring Object] list are formally registered as the monitored logical disks and the dialog box closes. When you click the [Cancel] button, the current [Monitoring Object] list is ignored and the dialog box closes with the monitored logical disks registered when the dialog box opened unchanged.

The order in which the [Number], [OS Type], and [LD Name] columns are displayed differs depending on the display order of the logical disks. The display order of the logical disks can be set in the option of the login screen for the SnapSAN Performance Monitor client (Web GUI) and on the environment setting screen for the SnapSAN Performance Monitor client (Win GUI).

Display in numerical order: [Number], [OS Type], and [LD Name] are displayed in this order.

Display in alphabetical order: [OS Type], [LD Name], and [Number] are displayed in this order.

5. Registering/Deleting physical disks to be monitored

When you click [Settings] and select [Monitoring Object Physical Disk] on the Numeric Table screen, the Registration of Physical Disks dialog box appears (Figure 3-4). This screen allows you to register physical disks for performance monitoring among the physical disks installed in the disk array specified in the combo box of the original screen.

[Monitoring Candidate List] displays unregistered physical disks among all the physical disks created in the specified disk array. [Monitoring Object] displays all the physical disks currently registered as monitoring objects. Selecting physical disks in the [Monitoring Candidate List] and clicking the [Add] button will register the specified physical disks to the [Monitoring Object] list. On the other hand, selecting physical disks in the [Monitoring Object] list and clicking the [Delete] button will delete the specified physical disks from the [Monitoring Object] list.

When you click the [OK] button, all the physical disks currently displayed in the [Monitoring Object] list are formally registered as the monitored physical disks and the dialog box closes. When you click the [Cancel] button, the current [Monitoring Object] list is ignored and the dialog box closes with the monitored physical disks registered when the dialog box opened unchanged.

6. Preparation for graph display

For displaying load states on Time-series Graph screen and Bar Graph screen, items to be displayed on a graph must be registered on the Numeric Table screen. The maximum number of monitoring objects that can be registered in one graph is 16.
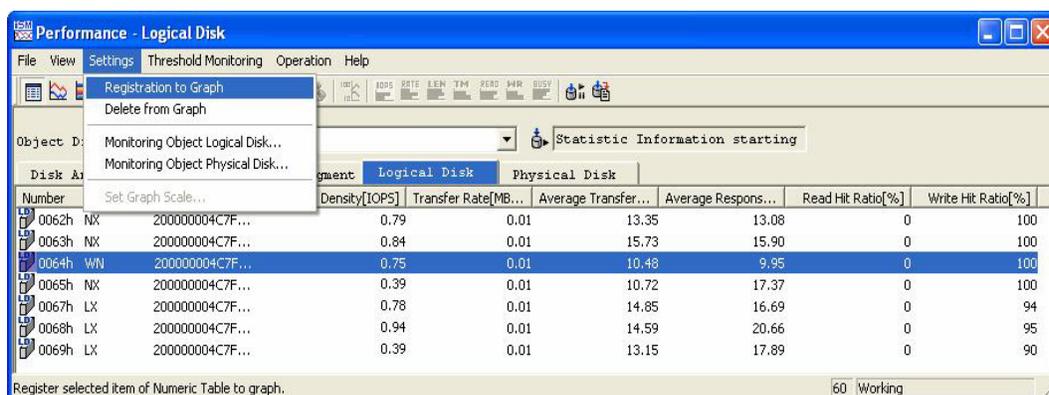
Figure 3-1: Registering to Graphs Menu

On the Numeric Table screen, when you specify a line which shows the latest value (place the cursor over the left cell and click the cell.The line of logical disk 008ch is specified), click [Settings], and then point to [Registration to Graph], all the monitored items for the line are registered as items to be displayed in Time-series Graphs. The cells which have been registered as the items to be displayed in graphs are displayed in gray.

On the other hand, when you specify a line which shows the latest value, click [Settings], and then point to [Delete from Graph], the monitored items of the monitoring object is no longer displayed in Time-series Graphs. In this case, the corresponding cells are displayed in the original background color.

7. Time-Series Graphs display

If you select [View]   [Time-series Graph], the screen will change to the Time-series Graph screen. The Time-series Graph screen displays the fluctuations of loads in line graphs for seven monitoring items. Figure 3-6 shows an example of the display that appears when a Time-series Graph is selected for port and logical disk and physical disk.

The Time-series Graph screen consists of the following items.

- Menu area and tool bar for performing various operations
- The load status display area for showing load status
- The legend display area for showing the items displayed in Time-series Graphs
- The status bar for displaying the connection status

Seven graphs are displayed in the load status display area. The following graphs are individually displayed (Note 1):

- I/O Density
- Transfer Rate
- Average Transfer Length
- Average Response Time
- Busy Ratio
- Read Hit Ratio
- Write Hit Ratio

This section describes the procedures for displaying a line indicating a threshold (index value for overloads) on the graph. For threshold, refer to 3.2 "Monitoring Overloads".

- On the "Time-series Graph" screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [View]   [Show Threshold in graph].
- On the "Time-series Graph" screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [Show Threshold in graph] from the tool bar.
- On the "Time-series Graph" screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [Show Threshold in graph] from the right-click menu.

The threshold line is displayed on the graph. The line is displayed for time zone from the time the threshold is set to the time it is unset. When past information is displayed, a threshold line is displayed in the time zone for which thresholds have been set. When a value exceeded the threshold line, a time line is displayed in a dark color that shows the time from when a value exceeded the threshold to the time when the Release Threshold Excess function was executed.

Immediately after display of Time-series Graphs has started, only the latest values of the monitored items are displayed, and then, the latest values of the monitored items will be plotted at specified time intervals. When line graphs come to the end of the screen width, they scroll so that the oldest values are out of the screen. Operating the scroll bar will allow you to see the past information. The past information that can be displayed varies depending on the setting for Display Refresh Rate. For example, setting 1 for Display Refresh Rate allows you to see the past information of 24 hours. Setting 6 for Display Refresh Rate allows you to see the past information of 3 hours.

If viewing many time-series graphs of monitoring items displayed on a screen is difficult, whether to display/hide time-series graph and displaying order of graphs can be specified for each monitoring item. To specify display/hide time-series graphs for each monitoring item, perform the following process. Select [View]   [Customize Time-series Graph] on menu, and specify whether to display or hide desired monitoring items on the check boxes of the Customize Time-series Graph dialog. To specify displaying order of graphs, select a desired item on the Customize Time-series Graph dialog, and move the item by clicking the [Up] or [Down] button. Figure 3-7 shows the Customize Time-series Graph dialog.
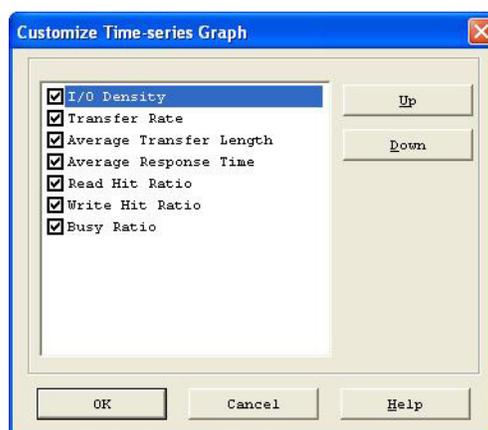
Figure 3-2: Customize Time-Series Graph

Viewing the lines can be difficult behind many overlapping time-series graphs of registered items. Then double-clicking on the legend for the graph line moves the lines onto the front. Selecting a legend and pressing the Enter key also moves the lines to the front.

NOTE: With a SnapSAN Performance Monitor server using an older version of software, only a graph frame is displayed and graph lines are not displayed for some items because the SnapSAN Performance Monitor server does not have the display function. For displaying graph lines, software of the latest version is required.

8. Showing Bar Graphs

Selecting [View] [Bar Graph] menu on Numeric Table screen switches the screen to the Bar Graph screen. The Bar Graph screen is capable of showing latest load states of seven monitoring items in bar-graph format.

The Bar Graph screen consists of the following items.

- Menu area and tool bar for performing various operations
- The load status display for showing the load status
- The legend display area for showing the items displayed in Bar Graphs
- The status bar for displaying the connection status

The load status display area shows one item selected from the following monitored items (Note 1).

- I/O Density
- Transfer Rate
- Average Transfer Length
- Average Response Time
- Read Hit Ratio
- Write Hit Ratio
- Busy Ratio

This section describes the procedures for displaying a line indicating a threshold (index value for overloads) on the graph. For threshold, refer to 3.2 "Monitoring Overloads".

- On the Bar Graph screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [View] [Show Threshold in graph].
- On the Bar Graph screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [Show Threshold in graph] from the popup menu by right-click.
- On the Bar Graph screen, select a line or multiple lines for which you want to display threshold from the legend display area, and then select [Show Threshold in graph] from the tool bar.

The threshold line is displayed on the graph. The line is displayed for time zone from the time the threshold is set to the time it is unset. When a value exceeded the threshold line, hatch lines are displayed until the time when the Release Threshold Excess function is executed.

The Bar Graph screen allows changing display items by selecting [View] menu (similar operation is available by toolbar buttons). For example, selecting [I/O Density] allows displaying a bar graph that shows latest values of I/O Density. Switching to other items is allowed by similar operation.

NOTE: When the version of the SnapSAN Performance Monitor server does not match with that of the SnapSAN Performance Monitor client, only the Bar Graph screen is displayed and bar graphs are not displayed for some items because the SnapSAN Performance Monitor server does not have the display function. For displaying a bar graph, software of the latest version is required.

9. Changing Graph Scales

A maximum value of a graph scale displayed on the Time-series Graph or Bar Graph screen is changeable freely on the Set Graph Scale dialog. The Set Graph Scale dialog is displayed by selecting [Settings]   [Set Graph Scale] menu.
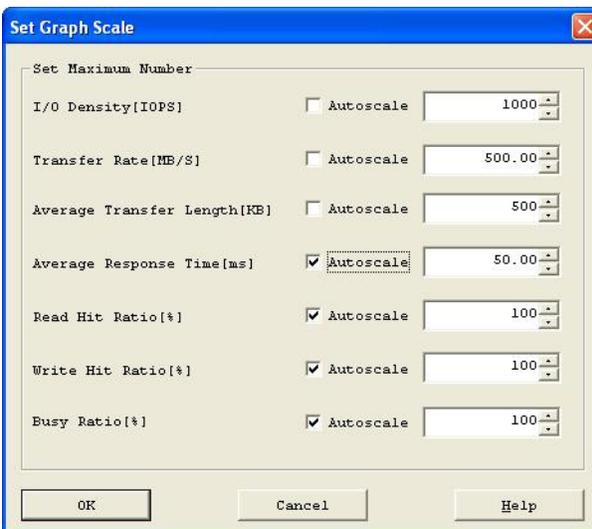
Figure 3-3: Graph Scale Dialog

For specifying a desired maximum value of a graph scale, uncheck the check box of [Autoscale] on the Set Graph Scale dialog, and specify a new maximum value. If [Autoscale] check box is checked, graph scales are automatically calculated based on the past load states.

When you uncheck the check box of [Autoscale] on the Set Graph Scale dialog, you cannot specify "0.00" for the maximum value.

10. Saving Settings

To save registration and deletion settings for graphs performed in the [Settings] menu and change settings of logical/physical disks to be monitored, click [File], and then point to [Save of Settings] as shown in Figure 3-10. The saved settings are restored when the Performance Monitoring screen opens next time.

11. Performance Monitoring Stop

To close the Performance Monitoring screen, click [File] and then click [Close] Menu.
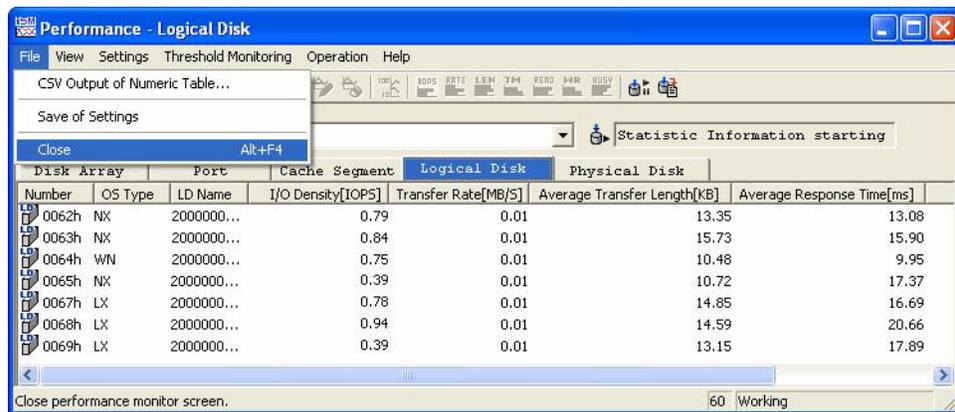
Figure 3-4: Close Menu

Monitoring Overloads

There are the following ways of operation for monitoring overload of a disk array by using the performance monitoring function:

- Operation on the Performance Monitoring screen on the SnapSAN Performance Monitor client
- Operation by using the threshold operation command on the SnapSAN Performance Monitor server

The following sections describe each of them.

Operating Instructions (Performance Monitoring Screen)

This section describes the operation performed on the Performance Monitoring screen of the SnapSAN Performance Monitor client.

Thresholds display
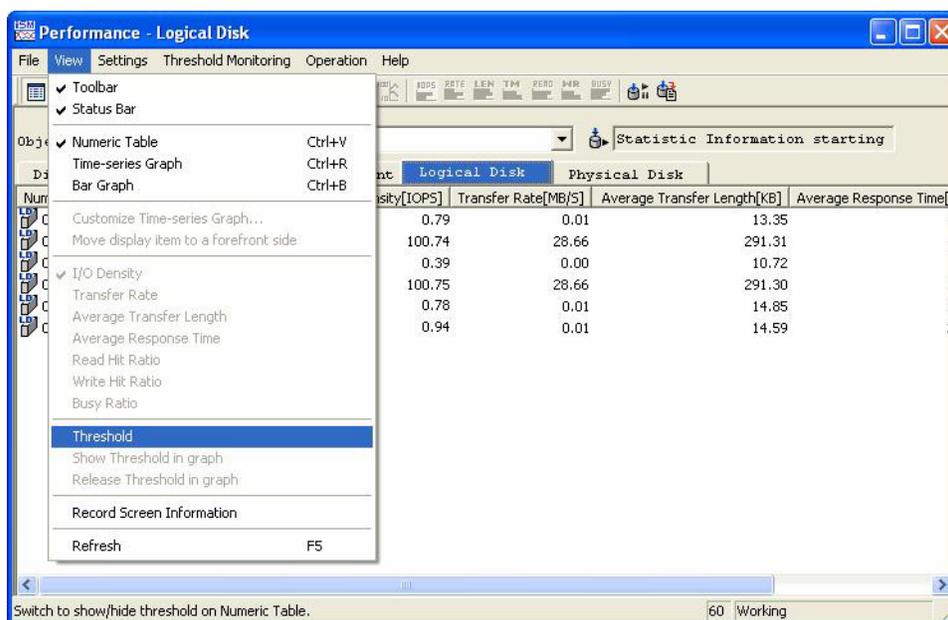
Figure 3-5: Threshold Display

A blank threshold column indicates that a threshold for the threshold monitoring element has not been specified. The [Threshold] menu is a toggle switch. Clicking the menu again will delete the threshold column and restore the original screen.

Thresholds setting

On the Numeric Table screen, select the line (Note 1) or cell (Note 2) of the threshold monitoring element for which you want to set a threshold. Then, select [Threshold Monitoring]   [Set Threshold] menu. The Set Threshold dialog appears.

Figures 3-14 and 3-15 are display samples for setting a threshold by selecting the cell of I/O Density of the logical disk number 0003h. Figures 3-16 and 3-17 are display samples for setting a threshold by selecting the line of the logical disk number 0003h.

The order in which the [Number], [OS Type], and [LD Name] columns are displayed differs depending on the display order of the logical disks. The display order of the logical disks can be set in the option of the login screen for the SnapSAN Performance Monitor client (Web GUI) and on the environment setting screen for the SnapSAN Performance Monitor client (Win GUI).

Display in numerical order: [Number], [OS Type], and [LD Name] are displayed in this order.

Display in alphabetical order: [OS Type], [LD Name], and [Number] are displayed in this order.

To select a line, left-click at the left end of the line.

To select a cell, left-click the cell.
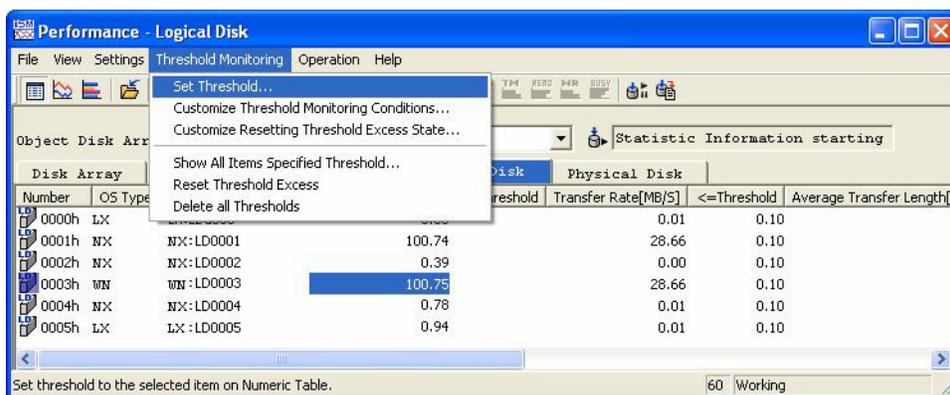
Figure 3-6: Set Threshold Menu (Select a cell)
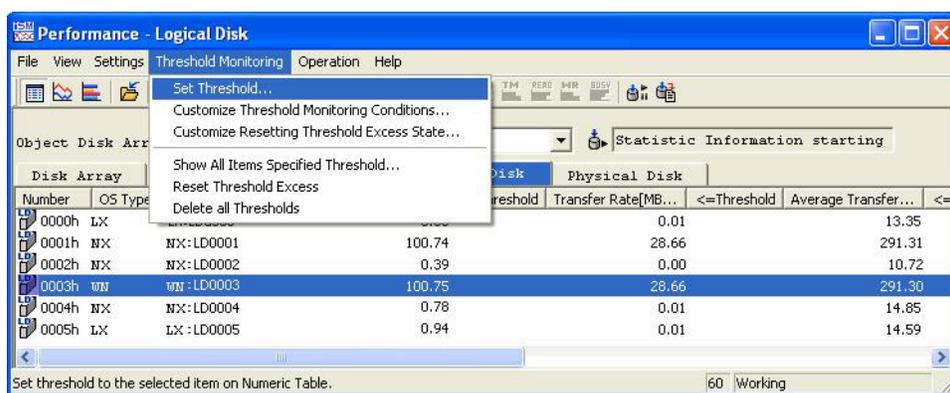
Figure 3-7: Set Threshold Menu (Select a line)

When you specify a threshold value in the [Set Threshold] area (Note 1) and click the [OK] button, the value is set as a threshold and the dialog box closes. If the value of the item for which the threshold has been changed is exceeding the threshold, the threshold exceeding state is cleared and the monitoring of the threshold resumes with the new threshold. On the other hand, when you click the [Cancel] button, the values specified in the [Set Threshold] area are ignored, and the dialog box closes without changing the thresholds which had been registered when the dialog box opened.

Furthermore, when you specify multiple cells in the list and select [Set Threshold], the Set Threshold dialog box appears. If the component type on the original screen is disk array, the thresholds of the selected monitored items for the selected disk array can be changed simultaneously. If the component type on the original screen is port, logical disk or physical disk, the thresholds of the two or more monitored items can be changed simultaneously by selecting monitoring targets (all the logical disks, etc.) in the disk array specified in the combo box of the original screen.

Thresholds are centrally controlled by the SnapSAN Performance Monitor server. If different thresholds are set for the same monitoring items from multiple clients, the threshold most recently specified becomes effective. Therefore, pay careful attention to the settings.

For each display item, you can set a value within the range shown in Table 3-1 as the threshold. For the Read Hit Ratio and Write Hit Ratio, if the setting is not exceeded, the threshold exceeding state occurs. For other items, if the setting is exceeded, the threshold exceeding state occurs.

Item Displayed on the Numeric Table Screen [Unit]	Maximum Value	Minimum Value
I/O Density [IOPS]	2147483.64	0.00
Transfer Rate [MB/S]	9999.99	0.00
Average Transfer Length [KB]	2097151.99	0.00
Average Response Time [ms]	99999.99	0.00
Read Hit Ratio [%]	100	0
Write Hit Ratio [%]	100	0
Busy Ratio [%]	100	0
Average Wait Time [ms]	99999.99	0.00
Maximum Wait Time [ms]	99999.99	0.00

- When the version of the SnapSAN Performance Monitor server does not match with that of the SnapSAN Performance Monitor client, some of the threshold value setting functions may not be supported. In such a case, the applicable fields for setting threshold values are displayed in gray, accepting no settings. For specifying the fields displayed in gray, a performance monitor server using the latest version software is required.

- Since the read response time, write response time, average wait time, and maximum wait time cannot be specified from the SnapSAN Performance Monitor client, use the threshold operation command to specify them. For details about how to use the threshold operation command, refer to 0 "Os management file automatically operating Instructions (Threshold Operation Command).

- Since the thresholds for the host director and the replication port (initiator) cannot be specified from the SnapSAN Performance Monitor client, use the threshold operation command to specify them. For details about how to use the threshold operation command, refer to 0 "Os management file automatically operating Instructions (Threshold Operation Command).

- "Set Threshold Dialog" does not support the setting of the thresholds to the busy ratio of the port. When setting the thresholds to the busy ratio of the port, use the threshold operation command. For details about how to use the threshold operation command, refer to 0 "Os management file automatically operating Instructions (Threshold Operation Command)".

Threshold monitoring condition setting

Selecting [Threshold Monitoring] [Customize Threshold Monitoring Conditions] menu displays the Customize Threshold Monitoring Conditions dialog
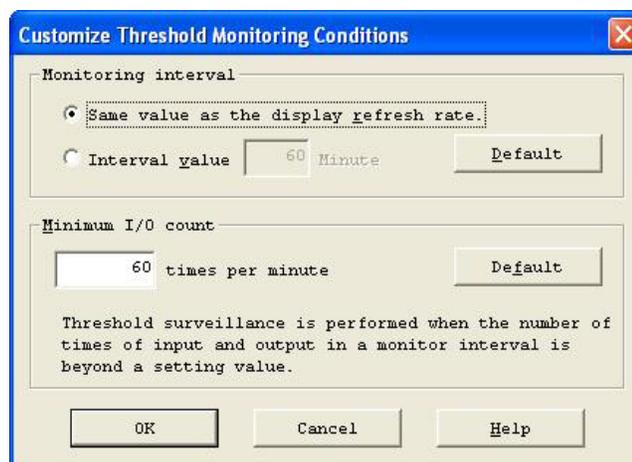
Figure 3-8: Customize Threshold Monitoring Conditions

The Customize Threshold Monitoring Conditions dialog specifies the following information

Monitoring interval

Specifies a time interval for detecting a threshold. For specifying the same value as display refresh time of real-time display screen, select [Same value as the display refresh rate]. For specifying the same value as definition in the environment definition file, click [Default].

Minimum I/O count

Specifies a lower limit of I/O count within the threshold monitoring interval. If the number of I/Os is under this value, a threshold is not detected. For specifying the same value as definition in the environment definition file, click [Default].

After specifying the above settings, clicking [OK] button defines the values as the conditions for threshold monitoring and the Customize Threshold Monitoring Conditions dialog closes. By clicking [Cancel] button, specified values are ignored. Retaining the values shown at opening Customize Threshold Monitoring Conditions dialog, the dialog closes.

- When the threshold monitoring interval is set to "the same as the logging interval" in the environment definition of the SnapSAN Performance Monitor server, the threshold monitoring interval cannot be changed in the Customize Threshold Monitoring Conditions dialog. If you want to change the threshold monitoring interval, you have to change the corresponding information in the environment definition of the SnapSAN Performance Monitor server and restart the SnapSAN Performance Monitor server.

- When the version of the SnapSAN Performance Monitor server does not match with that of the SnapSAN Performance Monitor client, some of the threshold monitoring conditions specifying functions may not be supported. In such a case, the Customize Threshold Monitoring Conditions dialog is not displayed. For displaying the dialog, software of the latest version is required.

Customize Resetting Threshold Excess State

On the Numeric Table screen, selecting [Threshold Monitoring]   [Customize Resetting Threshold Excess State] menu displays the Customize Resetting Threshold Excess State dialog.

Figure 3-9: Customize Resetting Threshold Excess State

The Customize Resetting Threshold Excess State dialog specifies the following information:

- It cancels in the period which the value below a threshold continues.

  When exceeding the number of times of the specified threshold monitoring interval, threshold excess state is canceled individually for each monitoring items. In case of no setting for releasing threshold excess, uncheck [Reset Threshold Excess state according to the period below a threshold] check box.

- It cancels at the appointed time.

- At the appointed time, threshold excess state is canceled for the entire monitoring disk array. In case of no setting for releasing threshold excess, uncheck [Reset Threshold Excess state at the appointed time] check box.

After specifying the above settings, clicking [OK] button defines the values as the condition to auto release threshold excess state and the Customize Resetting Threshold Excess State dialog closes. By clicking [Cancel] button, specified values are ignored. Retaining the values shown at opening Customize Resetting Threshold Excess State dialog, the dialog closes.

- A SnapSAN Performance Monitor server using older version software may not support some of the threshold excess release specifying functions. In such a case, the Customize Resetting Threshold Excess State dialog is not displayed. For specifying release of threshold excess, software of the latest version is required.

Thresholds deletion

For deleting a threshold that has been specified, select a threshold value to be deleted on the Set Threshold dialog and press the Delete key. Then, click the [OK] button. If the value of the monitored item from which the threshold has been deleted is exceeding the threshold, the threshold exceeding state is cleared. By clicking the [Cancel] button, specified values are ignored. Retaining the values shown at opening Set Threshold dialog, the dialog closes. As is the case with specifying thresholds, thresholds deletion can be performed for two or more monitoring targets and monitoring items.

All thresholds deletion

The threshold values for all monitoring targets included in specified disk array subsystem can be deleted by batch processing. On the Numeric Table screen, selecting [Threshold Monitoring]   [Delete all Thresholds] and clicking [OK] button on the Delete all Thresholds dialog executes delete all thresholds. If a monitoring target is under the state of threshold excess, the excess state is released. By clicking [Cancel] button, the dialog closes without executing delete all thresholds.

Show all items specified threshold

On the Numeric Table screen, selecting [Threshold Monitoring]   [Show All Items Specified Threshold] menu displays the Show All Items Specified Threshold dialog appears. The Show All Items Specified Threshold dialog displays a list of devices with threshold values specified.

The Show All Items Specified Threshold dialog displays the threshold by the item of the following component types.

- Disk Array
- Port
- Logical Disk
- Physical Disk

The following describes the display items of each component type.

Disk Array

Displays the name of the disk array for which a threshold is specified for each monitored item, such as I/O Density, Transfer Rate, Average Transfer Length, Average Response Time, Read Hit Ratio, and Write Hit Ratio. The disk array that has a value which has exceeded the threshold is displayed along with the "**" marks appended to the name.

Port

Displays the name of ports, by disk array, for which a threshold is specified for each monitored item, such as I/O Density, Transfer Rate, Average Transfer Length, and Average Response Time. The port that has a value which has exceeded the threshold is displayed along with the "**" marks appended to the name.

Logical Disk

Displays each logical disk, by disk array, for which a threshold is specified for each monitored item, such as I/O Density, Transfer Rate, Average Transfer Length, Average Response Time, Read Hit Ratio, and Write Hit Ratio. The logical disk that has a value exceeding the threshold is displayed along with the "**" mark appended.

How each logical disk is displayed differs depending on the display order of the logical disks. The display order of the logical disks can be set in the option of the login screen for the SnapSAN Performance Monitor client (Web GUI) and on the environment setting screen for the SnapSAN Performance Monitor client (Win GUI).

Display in numerical order: Each logical disk is displayed with "number".

Display in alphabetical order: Each logical disk is displayed with "OS type": "logical disk name".

Physical Disk

Displays the number of physical disks, by disk array, for which a threshold is specified for each monitored item, such as Busy ratio, I/O Density, Transfer Rate, Average Transfer Length, and Average Response Time. The physical disk that has a value which has exceeded the threshold is displayed along with the "**" marks appended to the number.

On the Show All Items Specified Threshold dialog, selecting a device with threshold indicated and clicking [Delete] button deletes the specified threshold value.

Thresholds exceeding state clearing

When you click [Threshold Monitoring] and then click [Reset Threshold Excess] on the Numeric Table screen, the threshold exceeding states which have occurred to the disk array specified in the combo box are all cleared. The marks indicating the threshold exceeding state are removed and the threshold monitoring operation resumes with regard to the items for which a threshold has been specified. Before this operation is carried out, the Confirm Reset Threshold Excess dialog appears.

Clicking the [OK] button will clear the threshold exceeding state and then close the dialog box. Clicking the [Cancel] button will close the dialog box without clearing the threshold exceeding state.

Thresholds saving

To manage the thresholds information, the SnapSAN Performance Monitor server creates the thresholds management file (file name: SnapSAN Performance Monitorthreshold.dat) in the place storing the statistic information history file set in the environment definition of the SnapSAN Performance Monitor server.

When the thresholds, thresholds monitoring conditions, and conditions to reset threshold excess state are set, they are saved in the thresholds management file automatically operating Instructions (Threshold Operation Command)

This section describes the operation by using the threshold operation command (SnapSAN Performance Monitorprfthre) of the SnapSAN Performance Monitor server. The threshold operation command (SnapSAN Performance Monitorprfthre) can be executed on the server where SnapSAN Performance Monitor server is running.

Operation by the threshold operation command (SnapSAN Performance Monitorprfthre) can be performed by using the following subcommands.

Thresholds setting

Subcommand	Function
set	Sets thresholds
clear	Deletes thresholds
list	Displays thresholds
reset_excess	Resets the threshold excess state
monitor_cond	Sets the threshold monitoring condition
reset_cond	Customizing resetting threshold excess state

Use the SnapSAN Performance Monitorprfthre set command to set thresholds.

The SnapSAN Performance Monitorprfthre set command can set thresholds for a disk array that satisfies the following conditions:

It is a disk array which is registered as a target of control by the SnapSAN Performance Monitor server.

It is a disk array which is a target of monitoring by the SnapSAN Performance Monitor server.

You can set thresholds by selecting the components and monitoring items to which you want to set thresholds for a disk array that meets the above requirements.

The ranges for thresholds that can be set by using the threshold operation command are the same as the specifiable ranges for thresholds that can be set on the Performance Monitoring screen of the SnapSAN Performance Monitor client (refer to Table 3-1).

The following shows execution examples of the threshold operation command.

Example 1: : Setting a threshold to 640000 [IOPS] for the I/O density and threshold to 6000 [MB/s] for the transfer rate of the entire disk array (StorageD8)

SnapSAN Performance Monitorprfthre set -d StorageD8 -array -iops 640000 -trrate 6000

Example 2: Setting a threshold to 160 [MB/s] for the transfer rate of the host port whose director number is 10h and port number is 1eh

SnapSAN Performance Monitorprfthre set -d StorageD8 -port 10h-1eh -trrate 160

Example 3: Setting a threshold to 80 [MB/s] for the transfer rate of all host ports

SnapSAN Performance Monitorprfthre set -d StorageD8 -port -trrate 80

Example 4: Setting a threshold to 160 [MB/s] for the transfer rate of the host port whose name is NX_PORT1

SnapSAN Performance Monitorprfthre set -d StorageD8 -portname NX_PORT1 -trrate 160

SnapSAN Performance Monitorprfthre set -d StorageD8 -chesegname segment1 -wrhit 90

Example 6: Setting a threshold to 1000 [ms] for the average response time of the logical disk whose number is 2ah

SnapSAN Performance Monitorprfthre set -d StorageD8 -ld 2ah -avresp 1000

Example 7: Setting a read hit ratio threshold to 70 [%] and write hit ratio threshold to 90 [%] for the logical disk with the name CX: WORK

SnapSAN Performance Monitorprfthre set -d StorageD8 -ldname CX: WORK -rdhit 70 -wrhit 90

Example 8: Setting a threshold to 80 [%] for the busy ratio of the physical disk whose group number is 01h and disk number is 12h

SnapSAN Performance Monitorprfthre set -d StorageD8 -pd 01h-12h -busy 80

Example 9: Setting a threshold to 2000 [ms] for the average response time of all logical disks assigned to the LD Set whose name is LX: EXPRESS1

SnapSAN Performance Monitorprfthre set -d StorageD8 -ldset LX: EXPRESS1 -avresp 2000

Example 10: Setting a threshold to 60 [%] for the busy ratio of all host directors

SnapSAN Performance Monitorprfthre set -d StorageD8 -hd -busy 60

Example 11: Setting a threshold to 16000 [IOPS] for the I/O density of all replication ports.

SnapSAN Performance Monitorprfthre set -d StorageD8 -rpi -iops 16000

Example 12: Setting a threshold to 80 [%] for the busy ratio of physical disk whose pool number is 0000h

SnapSAN Performance Monitorprfthre set -d StorageD8 -pool 0000h -busy 80

Example 13: Setting a threshold to 50 [%] for the busy ratio of physical disk whose pool name is Pool0000

SnapSAN Performance Monitorprfthre set -d StorageD8 -poolname Pool0000 -busy 50

Example 14: Setting a threshold to 10000 [IOPS] for the I/O density of host ports of all disk arrays

SnapSAN Performance Monitorprfthre set -a -port -iops 10000

Thresholds deletion

Use the SnapSAN Performance Monitorprfthre clear command to delete thresholds.

The SnapSAN Performance Monitorprfthre clear command can delete thresholds for a disk array that satisfies the following conditions:

 It is a disk array which is registered as a target of control by the SnapSAN Performance Monitor server.

 It is a disk array which is a target of monitoring by the SnapSAN Performance Monitor server.

You can delete the specified thresholds by selecting the components and monitoring items from which you want to delete thresholds for a disk array that meets the above requirements.

Execution of thresholds deletion for an item for which no threshold is set will normally end without causing an error.

The following shows execution examples of the threshold operation command.

Example 1: Deleting all thresholds set for the disk array StorageD8

SnapSAN Performance Monitorprfthre clear -d StorageD8 -all

Example 2: Deleting the threshold set for the I/O density of the entire disk array

SnapSAN Performance Monitorprfthre clear -d StorageD8 -array -iops

Example 3: Deleting the threshold set for the transfer rate of the host port whose director number is 10h and port number is 1eh

SnapSAN Performance Monitorprfthre clear -d StorageD8 -port 10h-1eh -trrate

SnapSAN Performance Monitorprfthre clear -d StorageD8 -cheseg -rdhit -wrhit

Example 4: Deleting the threshold set for the average transfer length of the logical disk whose number is 10fh

SnapSAN Performance Monitorprfthre clear -d StorageD8 -ld 10fh -avlen

Example 5: Deleting all thresholds set for all statistic information of the physical disk whose group number is 0h and disk number is 10h

SnapSAN Performance Monitorprfthre clear -d StorageD8 -pd 0h-10h -allitem

Example 6: Deleting the threshold set for the average response time of all logical disks assigned to the LD Set whose name is WN: EXPRESS2

SnapSAN Performance Monitorprfthre clear -d StorageD8 -ldset WN: EXPRESS2 -avresp

Example 7: Deleting the threshold set for the busy ratio of all host directors

SnapSAN Performance Monitorprfthre clear -d StorageD8 -hd -busy

Example 8: Deleting the threshold set for the I/O density of all replication ports

SnapSAN Performance Monitorprfthre clear -d StorageD8 -rpi -iops

Example 9: Deleting the threshold set for the busy ratio of physical disk whose pool number is 0000h

SnapSAN Performance Monitorprfthre clear -d StorageD8 -pool 0000h -busy

Example 10: Deleting the threshold set for the busy ratio of physical disk whose pool name is Pool0000

SnapSAN Performance Monitorprfthre clear -d StorageD8 -poolname Pool0000 -busy

Example 11: Deleting the threshold set for the I/O density of host ports of all disk arrays

SnapSAN Performance Monitorprfthre clear -a -port -iops

Threshold excess state resetting

Use the SnapSAN Performance Monitorprfthre reset_excess command to reset the threshold excess state.

The SnapSAN Performance Monitorprfthre reset_excess command can reset the threshold excess state for a disk array that satisfies the following conditions:

- It is a disk array which is registered as a target of control by the SnapSAN Performance Monitor server.
- It is a disk array which is a target of monitoring by the SnapSAN Performance Monitor server.

Resetting a threshold excess state resets all threshold excess states for any monitoring items of the specified disk array.

If the specified disk array does not have any monitoring items for which threshold is exceeded, this command ends normally without causing an error.

The following shows an execution example of the threshold operation command.

Example 1: Resetting all threshold excess states of the disk array (StorageD8)

SnapSAN Performance Monitorprfthre reset_excess -d StorageD8 -all

Example 2: Resetting all threshold excess states of all disk arrays

SnapSAN Performance Monitorprfthre reset_excess -a -all

Threshold monitoring condition setting

Use the SnapSAN Performance Monitorprfthre monitor_cond command to set the threshold monitoring condition.

The SnapSAN Performance Monitorprfthre monitor_cond command sets the following information:

Monitoring interval

Specifies a time interval for detecting a threshold.

Minimum I/O count

Specifies a lower limit of I/O count within the threshold monitoring interval. If the number of I/Os is under this value, a threshold is not detected.

The threshold monitoring condition is unified for one SnapSAN Performance Monitor server, and therefore it can be set if the SnapSAN Performance Monitor server is running regardless of the status of the disk array.

You can also display the currently set threshold monitoring condition and environment setting. The following shows execution examples of the threshold operation command.

Example 1: Changing the threshold monitoring interval to the same value as the display refresh rate of the Performance Monitoring screen

SnapSAN Performance Monitorprfthre monitor_cond -refrate

Example 2: Changing the threshold monitoring interval to two minutes

SnapSAN Performance Monitorprfthre monitor_cond -intvl 2

Example 3: Changing the minimum I/O count of a threshold monitoring condition to 60

SnapSAN Performance Monitorprfthre monitor_cond -border 60

Example 4: Changing the threshold monitoring interval to 10 minutes and minimum I/O count to 30

SnapSAN Performance Monitorprfthre monitor_cond -intvl 10 -border 30

Example 5: Displaying the current threshold monitoring condition and environment setting

SnapSAN Performance Monitorprfthre monitor_cond -info

When the threshold monitoring interval is set to "the same as the logging interval" in the environment definition of the SnapSAN Performance Monitor server, the threshold operation command cannot change the threshold monitoring interval. If you want to change the threshold monitoring interval, you have to change the corresponding information in the environment definition of the SnapSAN Performance Monitor server and restart the SnapSAN Performance Monitor server.

(6)   Customize resetting threshold excess state

Use the SnapSAN Performance Monitorprfthre reset_cond command to customize resetting threshold excess state.

The SnapSAN Performance Monitorprfthre reset_cond command sets the following:

* It cancels in the period which the value below a threshold continues.

   When exceeding the number of times of the specified threshold monitoring intervals, threshold excess state is canceled individually for each monitoring item.

* It cancels at the appointed time.

   At the appointed time, threshold excess state is canceled for the entire monitoring disk array.

The condition to reset threshold excess state is unified for one SnapSAN Performance Monitor server, and therefore it can be set if the SnapSAN Performance Monitor server is running regardless of the status of the disk array.

You can also display the currently set condition to reset threshold excess state.

The following shows execution examples of the threshold operation command.

Example 1: Changing the period for which the value below a threshold continues (number of intervals) of a condition to reset threshold excess state to 10

SnapSAN Performance Monitorprfthre reset_cond -cntset on -cnt 10

Example 2: Disabling the function of automatically resetting threshold excess state according to the period for which the value below a threshold continues (number of intervals)

SnapSAN Performance Monitorprfthre reset_cond -cntset off

Example 3: Changing the time for automatically resetting threshold excess state to 12:00

SnapSAN Performance Monitorprfthre reset_cond -timeset on -time 12:00

Example 4: Disabling the function of automatically resetting threshold excess state at the appointed time.

SnapSAN Performance Monitorprfthre reset_cond -timeset off

Example 5: Changing the condition to reset threshold excess state: change the period (number of intervals) for which the value below a threshold continues to 6 and change the time to automatically reset the threshold excess state to 0:00

SnapSAN Performance Monitorprfthre reset_cond -cntset on -cnt 6 -timeset on -time 0:00

Example 6: Displaying the current condition to reset threshold excess state

SnapSAN Performance Monitorprfthre reset_cond -info

Support for Analysis of Statistic Information

For analyzing statistic information, specify settings to accumulate statistic information history files on the SnapSAN Performance Monitor Management server first. By summarizing, extracting, and editing the accumulated statistic information history files on the SnapSAN Performance Monitor Management server, the statistic information history is managed. Otherwise, by downloading the accumulated statistic information files and summarizing, extracting, and editing the data on the hard disk of a SnapSAN Performance Monitor client, the statistic information history is managed. If you do not have the SnapSAN Performance Monitor performance analysis supporting tool and SnapSAN Performance Monitor Storage Performance Report Viewer in the SnapSAN Performance Monitor client environment, you have to install them.

Accumulating Statistic Information

To accumulate statistic information in a file by using this function, the following requirements for the accumulation of statistic information must be met.

- It is a disk array which is registered as a target of control by the SnapSAN Performance Monitor server.
- It is a disk array which is a target of monitoring by the SnapSAN Performance Monitor server.

The following methods are available for controlling the operation of accumulating statistic information of the disk arrays which satisfy the above requirements.

- Method for using the SnapSAN Performance Monitorprflog command
- Method for controlling from the real-time display screen
- Method for performing settings in the environment definition file

Each method will be described below.

(1) Operations by using the SnapSAN Performance Monitorprflog command

- Start storing of statistic information

To start the accumulation of statistic information, the following two methods are available.

- A method for specifying a specific disk array
- A method for specifying all the disk arrays monitored by the SnapSAN Performance Monitor server simultaneously

To start the accumulation of statistic information of a specific disk array, assign a disk array name to the end of -d option and then execute the SnapSAN Performance Monitorprflog start command. For example, when you start the accumulation of statistic information of a disk array (StorageD8), perform the operation below.

SnapSAN Performance Monitorprflog start -d StorageD8

Activating this command results in a fault in the following situation.

- When the specified disk array does not satisfy the requirements for accumulating statistic information
- When statistic information is being accumulated

On the other hand, when you start the accumulation of statistic information of all the disk arrays which satisfy the above requirements and for which statistic information has not been accumulated, perform the operation below.

SnapSAN Performance Monitorprflog start -a

- Stop storing of statistic information

To stop the accumulation of statistic information, the following two methods are available.

- A method for specifying a specific disk array
- A method for specifying all the disk arrays monitored by the SnapSAN Performance Monitor server simultaneously

To terminate the accumulation of statistic information of a specific disk array, assign a disk array name to the end of -d option and then execute the SnapSAN Performance Monitorprflog terminate command. For example, when you terminate the accumulation of statistic information of a disk array (StorageD8), perform the operation below.

SnapSAN Performance Monitorprflog stop -d StorageD8

If a specified disk array has terminated accumulating information already, this command results in an error.

On the other hand, when you terminate the accumulation of current statistic information of all the disk arrays, perform the operation below.

SnapSAN Performance Monitorprflog stop -a

Operations on the real-time display screen

The operation procedures will be described below. To utilize this function, it is required that the user role be operator or administrator.

- Select [Operation]   [Start/Stop Accumulation of Statistic Information] from the menu to display the Start/Stop Accumulation Statistic Information dialog screen.
- From [Start/Stop Accumulation] on the dialog screen, select and click the disk array for which the accumulation of statistic information is started or stopped, and then click the [Start] button to start accumulation and click the [Stop] button to terminate accumulation.

You can confirm the settings performed on this dialog screen by looking at the statistic information storing status filed in the Numeric Table (Refer to Figure 3-1 "Numeric Table Screen (When the Port is Selected)").

Setting in the environment definition file

The operation of accumulating statistic information can be controlled by performing setting in the environment definition file.

By specifying "Continue to Output when SnapSAN Manager Server Restarts" in the environment definition file at restarting, it is possible to automatically start accumulating statistic information at the start of the SnapSAN Performance Monitor server with regard to the disk array of which statistic information had been accumulated when the SnapSAN Performance Monitor server was previously in operation. Moreover, it is possible to set the environment definition file to start accumulating on all disk arrays at the first activation.

Downloading Statistic Information

This section describes the procedures for downloading statistic information history files accumulated on the SnapSAN Performance Monitor server onto a SnapSAN Performance Monitor client. The following two methods are available for downloading statistic information history files:

Downloading on performance monitoring function screen

If the SnapSAN Performance Monitor server is operating, downloading is executed on the performance monitoring function screen.

Downloading with a commercially available FTP tool

If the SnapSAN Performance Monitor server is not operating, it can be downloaded with a commercially available FTP tool.

The statistic information history files remains after downloading onto the SnapSAN Performance Monitor Management server. In consideration of disk spaces on SnapSAN Performance Monitor Management server, the statistic information history files must be summarized as necessary. For summarizing operations, refer to 3.3.3 "Summarizing Statistic Information".

- Downloading Statistic Information on the performance monitoring function screen

The following describes the operating procedures for downloading statistic information on the performance monitoring function screen.

1. Select [Operation]   [Download Statistics Information files] menu to display the Download Statistics Information files dialog (Figure 3-23). Or, this dialog is displayed by clicking [Download Statistic Information files] button on tool bar.

2. Select statistic information files to download, from the [Statistic Information files].

3. Specify a downloading target directory for [Download place] field. Specifying by clicking [Browse] is allowed also.

4. Click [Download] button.

5. Clicking the [Download] button starts downloading, displaying a dialog that indicates progress. "finished downloading" displayed on the dialog indicates successful completion of downloading. The downloaded statistic information file allows summarizing, extracting, and editing by the performance analysis support tool.

- Downloading with a commercially available FTP tool

If the SnapSAN Performance Monitor server is not operating, it can be downloaded with a commercially available FTP tool. For downloading, log in to the management server, specify applicable files and downloading target directory, and then execute downloading in binary mode.

Summarizing Statistic Information

Description of Operations (UNIX)

Operations with the Archiver (SnapSAN Performance Monitorprfarc) command for summarizing statistic information will be described below.

- Files to be summarized and determination of the summarizing method

Before executing Archiver, specify the following items:

- Files to be summarized

Specify statistic information files you want to summarize. You can directly specify files as summarizing objects, or you can specify files in a specified directory in a specific period as summarizing objects.

The names of the statistic information files to be summarized must be in accordance with the naming convention for statistic information files. For naming conditions and rules of statistic information files, refer to 1.4.3.1 "Accumulating Statistic Information".

[Naming Convention for Statistic Information Files]

<YYYY><MM><DD><NN-N>.psl(History file)

<YYYY><MM><DD><NN-N>.psa(Primary summarized file)

<YYYY><MM><NN-N>.psa(Secondary summarized file)

<YYYY> indicates year (4 digits), <MM> indicates month (2 digits), <DD> indicates day (2 digits), and <NN-N> indicates the disk array name.

 Summarizing method

Select a method (primary summarizing, secondary summarizing, or direct secondary summarizing) of statistic information files.

If a summarizing period is not an integral multiple of the logging interval specified by an accumulation process, summarizing is not performed evenly. For such cases as I/O count applicable to that condition, refer to statistic information items with no fluctuation by changing period of summarizing, such as I/O density and transfer rate.

- Executing Archiver

Specify files, directory and option according to the specified contents and execute Archiver. Archiver operates regardless of the SnapSAN Performance Monitor server process. Archiver can be executed in any directory. The names of the summarized files output by Archiver are automatically created in accordance with the naming convention for statistic information files.

Examples of execution of Archiver will be provided below.

Example 1: Example of summarizing when a file is specified

Assume that the statistic information history file (20070417StorageD8.psl) on April 17, 2007 regarding "StorageD8" is located in the /opt/SnapSAN Performance Monitorsvr/etc/mon directory. To summarize this file and output a primary summarized file to the current directory, enter the following command and execute it:

SnapSAN Performance Monitorprfarc /opt/SnapSAN Performance Monitorsvr/etc/mon/20070417StorageD8.psl

As a result, the primary summarized file (20070417StorageD8.psa) on April 17, 2007 is created in the current directory.

Example 2: Example 1 of summarizing when a period is specified

Assume that the statistic information history files (20070401StorageD8.psl - 20070430StorageD8.psl) from April 1, 2007 to April 30, 2007 regarding "StorageD8" are located in the /opt/SnapSAN Performance Monitorsvr/etc/mon directory. Among all files in this directory, if you want to summarize the statistic information history files from April 17, 2007 to April 30, 2007 and output primary summarized files to the same directory, enter the following command in a directory and execute it:

SnapSAN Performance Monitorprfarc -p /opt/SnapSAN Performance Monitorsvr/etc/mon -hour 20070417.20070430

As a result, the primary summarized files (20070417StorageD8.psa - 20070430StorageD8.psa) from April 17, 2007 to April 30, 2007 are created in the /opt/SnapSAN Performance Monitorsvr/etc/mon directory. For each day's worth of statistic information history file data, one statistic information primary summarized file is created.

Example 3: Example 2 of summarizing when a period is specified

Assume that the statistic information history files (20060501StorageD8.psl - 20070430StorageD8.psl) from May 1, 2006 to April 30, 2007 regarding "StorageD8" are located in the /opt/SnapSAN Performance Monitorsvr/etc/mon directory. Among all files in

this directory, if you want to summarize all the statistic information history files collected one month before the current time and output direct secondary summarized files to the same directory, enter the following command in a directory and execute it.

If the current time is April 28, 2007, the statistic information files in the period from May 1, 2006 to March 28, 2007 are the targets of summarizing.

SnapSAN Performance Monitorprfarc -p /opt/SnapSAN Performance Monitorsvr/etc/mon -day 1m

As a result, the secondary summarized files (200605StorageD8.psa - 200704StorageD8.psa) from May, 2006 to April, 2007 are created in the /opt/SnapSAN Performance Monitorsvr/etc/mon directory.

Description of Operations (Windows)

Explanation will be made about the operations to summarize statistic information.

Before summarizing statistic information, specify the following items:

Files to be summarized

Specify statistic information files you want to summarize. You can directly specify files as summarizing objects, or you can specify files in a specified directory in a specific period as summarizing objects.

The names of the statistic information files to be summarized must be in accordance with the naming convention for statistic information files (For details, refer to 1.4.3.1 "Accumulating Statistic Information").

[Naming Convention for Statistic Information Files]

<YYYY><MM><DD><NN-N>.psl(History file)

<YYYY><MM><DD><NN-N>.psa(Primary summarized file)

<YYYY><MM><NN-N>.psa(Secondary summarized file)

<YYYY> indicates year (4 digits), <MM> indicates month (2 digits), <DD> indicates day (2 digits), and <NN-N> indicates the disk array name.

 Summarizing method

Select a summarizing method (primary summarizing, secondary summarizing, or direct secondary summarizing) of statistic information files.

If a summarizing period is not an integral multiple of the logging interval specified by an accumulation process, summarizing is not performed evenly. For such cases as I/O count applicable to that condition, refer to statistic information items with no fluctuation by changing period of summarizing, such as I/O density and transfer rate.

Next, summarize statistic information. Archiver provides the following two operation methods:

Operations on the "Performance Analysis Supporting Tool" screen

Select [Performance Analysis Supporting Tool] on [Start] menu or execute SnapSAN Performance Monitorprfcom.exe to display the Performance Analysis Supporting Tool screen. Specify the operations with [Archiver] tab on the Performance Analysis Supporting Tool screen to execute summarizing.

Operations with the Archiver command

Specify an option in the SnapSAN Performance Monitorprfarc command and execute the command to perform a summarizing operation.

The two methods of operation will be described below.

Operations on the "Performance Analysis Supporting Tool" screen

Select the [Archiver] tab on the Performance Analysis Supporting Tool screen, and enter parameters for performing a summarizing operation. Screen images and operations will be described below.
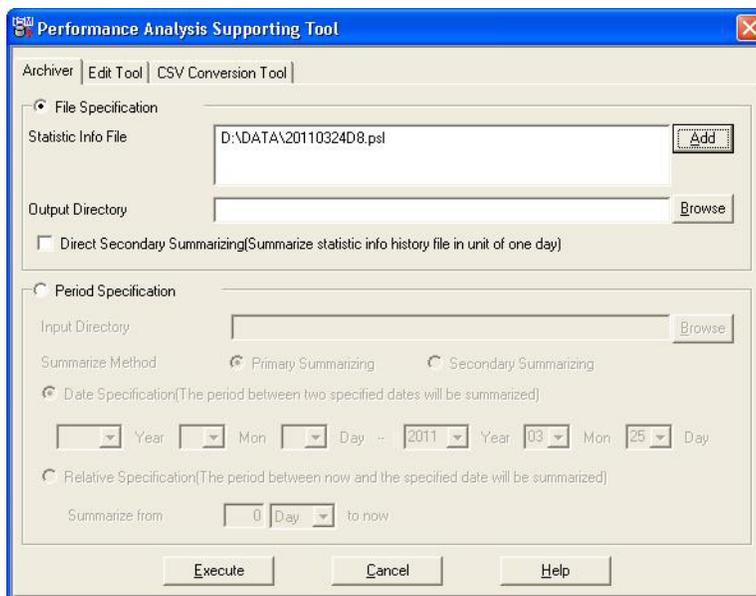
Figure 3-10: Performance Analysis Supporting Tool

File Specification

Select this function when you want to perform a summarizing operation by specifying statistic information files. This function cannot be selected together with Period Specification.

Statistic Info File

Specify statistic information history/summarized files. Multiple files can be specified; however, statistic information files with different summarizing levels, such as statistic information history files and primary summarized files cannot be mixed.

Output Directory

Specify the directory to which summarized files are output. If specification of the output directory is omitted, the summarized files are output to the same directory as the statistic information file specified first. If the file with the same name exists in the output directory, the file is overwritten.

Direct Secondary Summarizing

Select this function when you want to enter statistic information history files and directly create secondary summarized files. If a primary summarized file is specified as an input file, a normal secondary summarizing operation is conducted.)Period Specification

Select this function when you want to perform a summarizing operation by specifying the directory in which statistic information files are located and the summarizing period. This function cannot be selected together with File Specification.

Input Directory

Specify the directory in which input statistic information files exist. All of the summarized files are output to the specified directory.

Summarize Method

Select either Primary Summarizing or Secondary Summarizing.

Date Specification

Specify the target period of summarizing in a Year/Month/Day format (from starting date to end date). If the starting date is omitted, all the days before the end date are set to be the target period of summarizing. The end date cannot be omitted.

Relative Specification

Select this function to specify the target period of summarizing in a relative period by regarding the current time as the reference point.

Operations with the Archiver command (SnapSAN Performance Monitorprfarc command)

Specify files, directory or option and execute Archiver. Archiver operates regardless of the SnapSAN Performance Monitor server process. Archiver can be executed in any directory. The names of the summarized files output by Archiver are automatically created in accordance with the naming convention for statistic information files.

Examples of execution of the Archiver will be provided below:
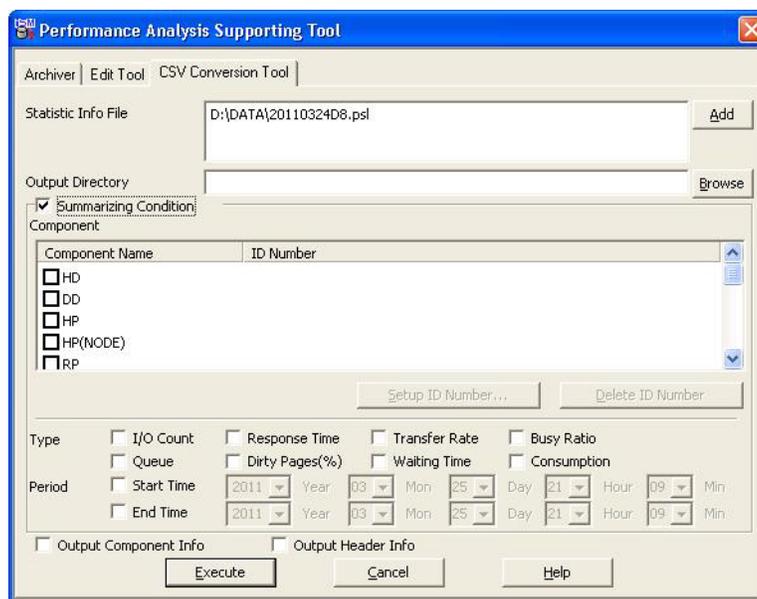
Figure 3-11: Performance Analysis (CSV Conversion Tool)

Statistic Info File

Specify statistic information history/summarized files. Multiple files can be specified, and statistic information history files and statistic information summarized files can be mixed.

Output Directory

Specify a directory in which output files (CSV files) are created. If multiple statistic information files are specified, all CSV files of the statistic information files are created in the directory specified here. If the specification of the output directory is omitted, a CSV file is created in the same directory as the statistic information file. If the file with the same name exists in the output directory, the file is overwritten.

Summarizing Condition

Select this function to extract statistic information by specifying extracting conditions. In this case, at least one extracting condition must be selected from component, type, and period. If summarizing conditions are not specified, all statistic information in the specified statistic information file is extracted.

Component

Select components for the extraction. Multiple components can be selected. Only statistic information that matches the selected component identification numbers is extracted. If no component is selected, statistic information of all components is extracted.

Setup ID Number

Select a component name in the component list and click the [Setup ID Number] button to display the [ID Number Setup] dialog (Figure 3-26). Enter the ID numbers and click the [OK] button. Then, the input ID numbers are displayed in the component list.
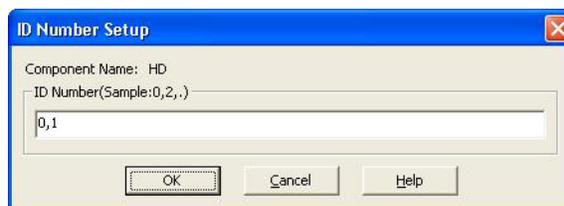
Figure 3-12: ID Number Setup Dialog

Delete ID Number

Select a component name in the component list and click the [Delete ID Number] button to delete the ID numbers.

Type

Select types of statistic information for the extraction. Multiple types can be selected. Only statistic information that matches the selected types is extracted. If no type is selected, statistic information of all types is extracted.

Period

Only statistic information in the period specified here is extracted. You can specify the extraction starting time and end time, or either one of them. If no period is specified, statistic information in all periods is extracted.

Output Component Info

Select this function to output component information of the disk array in addition to statistic information.

Output Header Info

Select this function to output header record showing field name to the head of file.

Operations with the CSV conversion command

Extracting statistic information

When you specify statistic information history/summarized files in the CSV conversion command, the CSV conversion command extracts statistic information and creates CSV files. The CSV conversion command creates CSV files in accordance with the following rules:

If a statistic information history/summarized file is specified, a CSV format file corresponding to the file is created in the same path. If a creating path of CSV format file is specified (-p option), the CSV format files are created in the specified path. Two or more statistic information history/summarized files and -p option are specified, all CSV format files corresponding to the files are created in the path specified by -p option. If files under the same names exist in the path where the CSV format files are created, the existing files are overwritten. To specify files or directory that include blanks in their names, the names of file or directory must be enclosed by double quotation marks (").

Examples of extraction of statistic information are provided below.

Example 1: Extracting statistic information from the statistic information history file "20070417StorageD8.psl"

SnapSAN Performance Monitorprfext -file 20070417StorageD8.psl

Example 2: Extracting statistic information from the statistic information history files "20070417StorageD8.psl" and "20070418StorageD8.psa"

SnapSAN Performance Monitorprfext -file 20070417StorageD8.psl 20070418StorageD8.psa

Example 3: Extracting statistic information from the statistic information history file "20070417StorageD8.psl" and creating a CSV file in "C:\temp"

SnapSAN Performance Monitorprfext -file 20070417StorageD8.psl -p C:\temp

Example 4: Extracting statistic information from the statistic information history files "20070417StorageD8.psl" and "20070418StorageD8.psl" and creating CSV files in "C:\temp"

SnapSAN Performance Monitorprfext -file 20070417StorageD8.psl 20070418StorageD8.psl -p C: \temp

Extracting specific statistic information

You can extract specific statistic information by specifying extracting conditions, such as the period of extraction, component of the disk array, type of statistic information, etc. in the CSV conversion command. Multiple conditions can be specified simultaneously. Examples of extraction are provided below.

Extracting statistic information in the specified period

Example 1: Extracting statistic information from 10:00 to 15:30 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -from 20070417/1000 -to 20070417/1530

Example 2: Extracting statistic information after 17: 30 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -from 20070417/1730

Extracting statistic information of the specific component

Example 1: Extracting statistic information of the host port with the director number 10h and port number 0ah

SnapSAN Performance Monitorprfext -file file1 -hp 10-a

Example 2: Extracting statistic information of the logical disk of 001eh and the physical disk with the group number 00h and disk number 01

SnapSAN Performance Monitorprfext -file file1 -ld 1e -pd 0-1

Extracting statistic information of the specific type

Example 1: Extracting statistic information regarding the number of inputs/outputs

SnapSAN Performance Monitorprfext -file file1 -iocnt

Example 2: Extracting statistic information regarding the number of inputs/outputs and Transfer Rate

SnapSAN Performance Monitorprfext -file file1 -iocnt -rate

Extracting statistic information of the specific component in the specified period

Example: Extracting statistic information of the logical disk of 0020h from 10: 00 to 15: 30 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -from 20070417/1000 -to 20070417/1530 -ld 20

Extracting statistic information of the specific type in the specified period

Example: Extracting statistic information regarding the response time after 17: 30 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -from 20070417/1730 -resp

Extracting statistic information of the specific component regarding the specific type in the specified period

Example 1: Extracting statistic information of the logical disk of 0020h regarding the number of inputs/outputs from 10: 00 to 15: 30 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -from 20070417/1000 -to 20070417/1530 -ld 20 -iocnt

Example 2: Extracting statistic information of the logical disk of 0020h and the physical disk with the group number 00h and disk number 01h regarding the Transfer Rate before 16: 00 on April 17, 2007

SnapSAN Performance Monitorprfext -file file1 -to 20070417/1600 -ld 20 -pd 0-1 -rate

Extracting statistic information of all the concentrator numbers

SnapSAN Performance Monitorprfext -file file1 -conc

Notes

- If the CSV file with the same name exists in the path in which CSV files are created, the file is overwritten.
- The maximum number of records of a CSV file is 65,536. If the number of records of a CSV file exceeds 65,536, the CSV Conversion Tool outputs an error message and terminates processing.
- The CSV Conversion Tool creates one CSV file for one statistic information history/summarized file. Therefore, it is not possible to put statistic information of multiple statistic information history/summarized files together in one CSV file by using the CSV Conversion Tool.

To put statistic information of multiple statistic information history/summarized files together in one CSV file, follow the procedures below.

- Specify multiple files to the CSV Conversion Tool and create corresponding CSV files.

- Link the CSV files created in procedure (a) by using the cat command to put them together in one CSV file.

The following example illustrates how to put statistic information of multiple statistic information history files together in one CSV file.

Example: Extracting statistic information from the statistic information history files "20070417StorageD8.psl" and "20070418StorageD8.psl" and put them together in a CSV file "StorageD8.csv".

SnapSAN Performance Monitorprfext -file 20070417StorageD8.psl 20070418StorageD8.psl

copy 20070417StorageD8_psl.csv+20070418StorageD8_psl.csv StorageD8.csv

Editing Statistic Information

Description of Operations (UNIX)

This section will explain how to operate the edit tool and the Storage Performance Report Viewer.

Edit tool

You can perform an editing operation by specifying an option in the SnapSAN Performance Monitorprfedit command and executing it. Multiple statistic information history/summarized files, output directory, and the type of performance reports to be created can be specified. Examples of execution of the SnapSAN Performance Monitorprfedit commands will be provided below.

Example 1: Creating a performance summary report of the statistic information history file "20070430StorageD8.psl"

SnapSAN Performance Monitorprfedit 20070430StorageD8.psl

Example 2: Creating a performance summary report of the statistic information history file "20070430StorageD8.psl" in "/tmp".

SnapSAN Performance Monitorprfedit -o /tmp 20070430StorageD8.psl

Example 3: Creating a performance summary report of the statistic information history file "20070430StorageD8.psl" and all performance detail reports

SnapSAN Performance Monitorprfedit -det -all 20070430StorageD8.psl

Example 4: Creating only the disk array performance detail report of the statistic information history file "20070430StorageD8.psl"

SnapSAN Performance Monitorprfedit -nosum -det 20070430StorageD8.psl

Storage Performance Report Viewer

The Storage Performance Report Viewer can be used in an environment in which Excel (Microsoft Excel2000/2002/2003/2007) is installed. For information on how to operate the Storage Performance Report Viewer, refer to 3.3.5.2 "Description of Operations (Windows)".

Description of Operations (Windows)

This section will explain how to operate the edit tool and the Storage Performance Report Viewer, and the procedures for editing statistic information using spreadsheet software.

Edit Tool

The edit tool provides the following two operation methods:

Operations on the Performance Analysis Supporting Tool screen

Select [Performance Analysis Supporting Tool] on [Start] menu or execute SnapSAN Performance Monitorprfcom.exe to display the Performance Analysis Supporting Tool screen. Specify the operations with [Edit Tool] tab on the Performance Analysis Supporting Tool screen to execute summarizing.
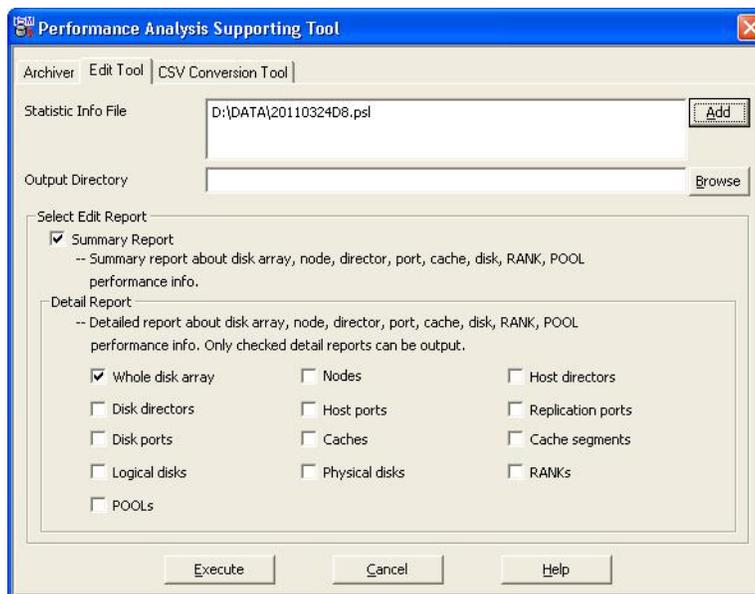
Figure 3-13: Performance Analysis Supporting Tool (Edit)

Statistic Info File

Specify statistic information history/summarized files. Multiple files can be specified, and statistic information history files and statistic information summarized files can be mixed. Specification of the statistic information file cannot be omitted.

Output Directory

Specify a directory in which edit reports (text file) are created. If multiple statistic information files are specified, all edit reports of each statistic information file are created in the directory specified here. If specification of the output directory is omitted, an edit report is created in the same directory as the statistic information file.

Select Edit Report

Select this function to output edit reports.

Summary Report

Specify this function to output summary reports.

Detail Report

Select a detail report to be output.

Whole disk array

Select this parameter to output a disk array performance detail report.

Nodes

Select this parameter to output a node performance detail report.

Host directors

Select this parameter to output a host director performance detail report.

Disk directors

Select this parameter to output a disk director performance detail report.

Host ports

Select this parameter to output a host port performance detail report.

Replication ports

Select this parameter to output a replication port performance detail report.

Disk ports

Select this parameter to output a disk port performance detail report.

Caches

Select this parameter to output a cache performance detail report.

Logical disks

Select this parameter to output a logical disk performance detail report.

Physical disks

Select this parameter to output a physical disk performance detail report.

RANKs

Select this parameter to output a RANK performance detail report.

POOLs

Select this parameter to output a pool performance detail report.

You can create only a desirable edit report by selecting a specific report and execute the edit tool. You can also create all edit reports by selecting all reports.

Operations with the edit tool command

To perform an editing operation, specify an option in the SnapSAN Performance Monitorprfedit command and then execute it. Similar to the case where the edit tool is operated on the Performance Analysis Supporting Tool screen, the following items can be specified.

"Multiple statistic information history/summarized files

"Output directory

"Type of edit reports to be created can be specified

Examples of execution of the SnapSAN Performance Monitorprfedit commands are provided below.

Example 1: Creating a summary report of the statistic information history file "20070430StorageD8.psl"

SnapSAN Performance Monitorprfedit 20070430StorageD8.psl

Example 2: Creating a summary report of the statistic information history file "20070430StorageD8.psl" in "C:\tmp".

SnapSAN Performance Monitorprfedit -o C:\tmp 20070430StorageD8.psl

Example 3: Creating a summary report of the statistic information history file "20070430StorageD8.psl" and all detail reports.

SnapSAN Performance Monitorprfedit -det -all 20070430StorageD8.psl

Example 4: Creating only a disk array performance detail report of the statistic information history file "20070430StorageD8.psl".

SnapSAN Performance Monitorprfedit -nosum -det 20070430StorageD8.psl

Storage Performance Report Viewer

To create graphs, execute SnapSAN Performance Monitorprfview.xls and specify necessary items on the Storage Performance Report Viewer screen. Screen images and operations will be described below.

The Storage Performance Report Viewer can be used in an environment in which Excel (Microsoft Excel2000/2002/2003/2007/2010) is installed.
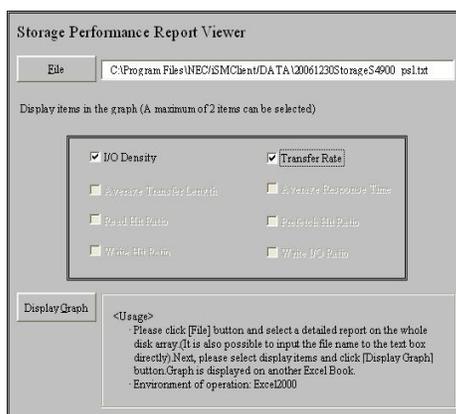
Figure 3-14: Storage Performance Report Viewer

File

You can specify only a disk array performance detail report created by using the edit tool. If other files are specified, the creation of the graph will fail.

Display items in the graph

Specify statistic information to be displayed in a graph. Up to two items can be specified. Applicable statistic information includes:

I/O Density

This is the number of input/output requests per second (IOPS).

Transfer Rate

This is the data transfer volume per second. The unit is MB (megabyte)/second.

Average Transfer Length

This is the Average Transfer Length of a single input/output request. The unit is KB (kilobyte)/second.

Average Response Time

This is the average response time of a single input/output request. The unit is ms (millisecond).

Read Hit Ratio

This is a ratio of the number of inputs that hit the cache to the total number of input requests.

Prefetch Hit Ratio

This is a ratio of the number of inputs that hit the cache via the disk array prefetch function to the total number of inputs that hit the cache.

Write Hit Ratio

This is a ratio of the number of outputs that hit the cache to the total number of output requests.

Write I/O Ratio

This is a ratio of output requests to the total number of input/output requests.

Display Graph

Clicking the [Display Graph] button will display a graph in a separate book.

When you create a graph and then want to create another graph with different settings, return to the Storage Performance Report Viewer start screen. Then change the settings, and then click the [Display Graph] button. A separate book is created to display the graph.

The following illustrates an example in which a graph is created by specifying the I/O density and Transfer Rate:
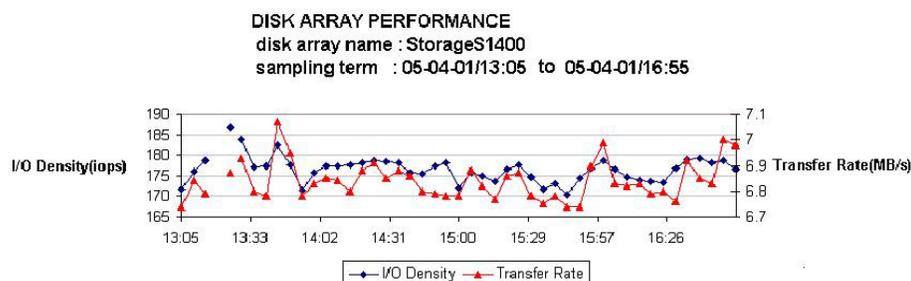
Figure 3-15: Graph Example

Items displayed in a graph include

disk array name: Displays the name of the disk array.

sampling term: Displays the collection period of the statistic information shown in a graph.

Ordinate: Displays the scale of statistic information selected in the Storage Performance Report Viewer start screen. If two types of statistic information are selected, scales are displayed in both ordinates.

Abscissa: Displays the time.

Legend: Displays the name of the statistic information selected on the Storage Performance Report Viewer start screen.

The Storage Performance Report Viewer does not link points with lines when statistic information is no longer continuous in order to accurately express the continuity of the statistic information in the graph. The statistic information loses its continuity in the following cases:

Configuration of the disk array was changed during the monitoring of performance.

A fault occurred in the disk array during the monitoring of the performance and the monitoring of the disk array performance could not be continued.

A user terminated the accumulation of statistic information due to the specification during the monitoring of performance.

If log accumulation interval is adjusted automatically (for giving a higher priority to file input/output from an application server), the intervals between the points increase in accordance with the adjusted time interval.

Editing with spreadsheet software

The statistic information history files extracted with header options specified can be used on spreadsheet software, such as Microsoft Excel (Microsoft Excel 2000/2002/2003/2007/2010). On the software, sorting the output values makes it easier to identify the values.
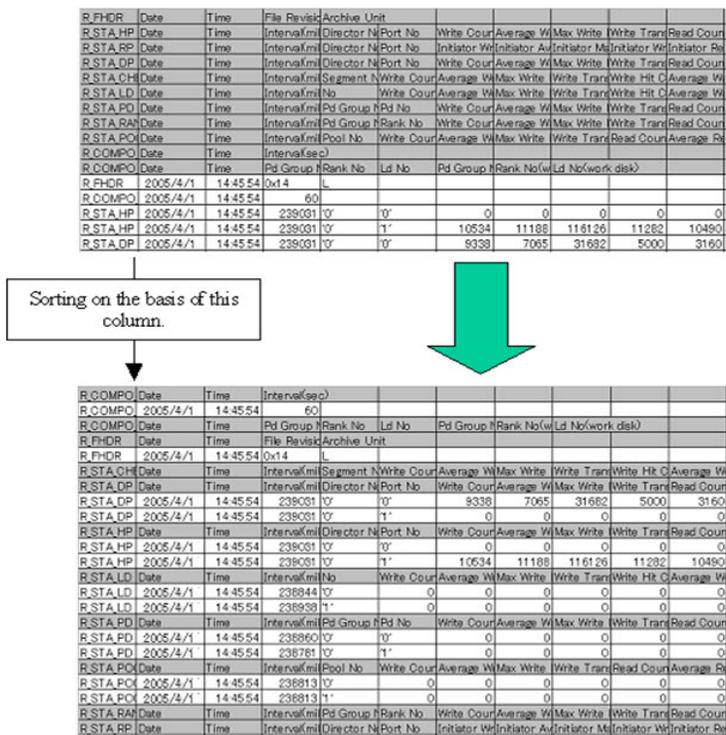
Figure 3-16: Editing CSV File

Monitored Performance Data

Real-Time Performance Data

The table below shows the items displayed (✓) and items not displayed (-). Items with an asterisk (*) indicate that some disk arrays cannot be monitored.

Monitored Item	Component Type			
	Disk Array	Port	Logical Disk	Physical Disk
External I/O Density	✓	✓	✓	-
External Transfer Rate	✓	✓	✓	-
External Average Transfer Length	✓	✓	✓	-
External Average Response Time	✓	✓	✓	-
Read Hit Ratio	✓*	-	✓	-
Write Hit Ratio	✓*	-	✓	-
Internal I/O Density	-	-	-	✓
Internal Transfer Rate	-	-	-	✓
Internal Average Transfer Length	-	-	-	✓
Internal Average Response Time	-	-	-	✓
Busy Ratio	-	-	-	✓*

- For the following disk arrays in which the function to collect the cache hit ratio of the whole of the disk arrays has not been installed, the read hit ratio and write hit ratio of the disk arrays cannot be monitored.S3100, S4100*

- If, however, BaseProduct Ver2.1 or later (SnapSAN Manager Ver 2.1 or later or storage control software version 170E or later) has been applied to the disk arrays above, the hit ratios can be monitored.

Items Monitored

Monitored items are types of index values which indicate status of load or performance. SnapSAN Performance Monitor displays values of the following types of the monitored items on the SnapSAN Performance Monitor client Performance Monitoring screen:

- **External I/O Density** – This is the number of input/output requests received by the disk array from the external per unit time. The unit is IOPS (Input Output Per Second). This is calculated by measuring the external I/O count during the unit measurement period and dividing it by the time interval of the measurement period.

- **External Transfer Rate** – This is the Average Transfer Rate of the input/output process achieved in response to the input/output requests received by the disk array from the external. The unit is megabyte/second. This is calculated by measuring the sum of the external data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

- **External Average Transfer Length** – This is the average input/output data length per one input/output request received by the disk array from the external. The unit is kilobyte. This is calculated by measuring the sum of the external data transfer and external I/O count during the unit measurement period and dividing the former by the latter.

- **External Average Response Time** – This is the Average Response Time for the input/output requests received by the disk array from the external. The unit is millisecond. This is calculated by measuring the total of the external response time and external I/O count during the unit measurement period and dividing the former by the latter.

- **Read Hit Ratio** – It is the ratio of case where the READ request has been completed using data stored in the cache without reading from disk unit (Read hit), when the disk array receives the input requests from outside. The unit is percentage [%]. It is calculated by following expression; dividing the number of cache hit I/Os by the number of receiving READ requests during the measuring interval.

- **Write Hit Ratio** – This is the ratio of case where the WRITE request has been completed quickly by writing data only in the cache (Write hit), when the disk array receives the output requests from outside. The unit is percentage [%]. It is calculated by following expression; dividing the number of cache hit I/Os by the number of receiving WRITE requests during the measuring interval.

- **Internal I/O Density** – This is the number of input/output requests issued to the internal disk devices by the control device of the disk array. The unit is IOPS (Input Output Per Second). This is calculated by measuring the internal I/O count during the unit measurement period and dividing it by the time interval of the measurement period.

- **Internal Transfer Rate** – This is the average transfer rate of the input/output requests issued to the internal disk devices by the control device of the disk array. The unit is megabyte/second. This is calculated by measuring the sum of the internal data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

- **Internal Average Transfer Length** – This is the average input/output data length of the input/output process performed for the internal disk devices by the control device of the disk array. The unit is kilobyte. This is calculated by measuring the sum of the internal data transfer and internal I/O count during the unit measurement period and dividing the former by the latter.

- **Internal Average Response Time** – This is the average response time for the input/output requests issued to the internal disk devices by the control device of the disk array. The unit is millisecond. This is calculated by measuring the total of the internal response time and internal I/O count during the unit measurement period and dividing the former by the latter.

- **Busy Ratio** – This is the rate of operation of physical disks. The unit is percentage (%). This is calculated by measuring the busy time of physical disks during the unit measurement period and dividing it by the time slot of measured segments.

Component Type

SnapSAN Performance Monitor separately displays values of the monitored items collected in the following units:

- **Disk Array** – Statistic information of the entire disk array to be monitored is collected and load status for each disk array is reported. For this component type, the following monitored items can be reported.
  - External I/O Density
  - External Transfer Rate
  - External Average Transfer Length
  - External Average Response Time
  - Read Hit Ratio
  - Write Hit Ratio

- **Port** – Port for host connection installed on the host director is called a host port or port. For the monitored disk arrays, statistic information related to each host port is collected separately, and load status for each host port is reported. For this component type, the following monitored items can be reported.
  - External I/O Density
  - External Transfer Rate
  - External Average Transfer Length
  - External Average Response Time

  In principle, the sum of the values of a monitored item over all the host ports in one disk array is equal to the sum of the values of the same monitored item over all the disk arrays. However, in a real-world situation, some errors may exist due to varied sampling time of the statistic information which is the basis of the values of the monitored item.

- **Logical Disk** – For the monitored disk arrays, statistic information related to each logical disk is collected separately, and load status for each logical disk is reported. For this component type, the following monitored items can be reported.

NOTE: When a monitored logical disk has been linked to an LV (link volume), the statistic information on the I/O having accessed the relevant logical disk via the LV is also added for the report. When a monitored logical disk is LV, the statistic information on the I/O having accessed via the relevant LV is collected and reported as the load status of the relevant LV.

- **Physical Disk** – Disk devices installed in a disk array are called physical disks. Statistic information related to each physical disk installed in the monitored disk arrays is collected separately, and load status for each physical disk is reported. For this component type, the following monitored items can be reported.
  - Internal I/O Density
  - Internal Transfer Rate
  - Internal Average Transfer Length
  - Internal Average Response Time
  - Busy Ratio

Performance Data Threshold Monitored

The table below shows the items monitored (✓) and items not monitored (-). Items with an asterisk (*) indicate that some disk arrays cannot be monitored.

Monitored Item	Component Types					
	Disk Array	Host Director	Port	Replication Port (Initiator)	Logical Disk	Physical Disk
External I/O Density	✓	-	✓	✓*	✓	-
External Transfer Rate	✓	-	✓	✓*	✓	-
External Average Transfer Length	✓	-	✓	✓*	✓	-
External Average Response Time	✓	-	✓	✓*	✓	-
Read Hit Ratio	✓	-	-	-	✓	-
Write Hit Ratio	✓	-	-	-	✓	-
Internal I/O Density	-	-	-	-	-	✓
Internal Transfer Rate	-	-	-	-	-	✓
Internal Average Transfer Length	-	-	-	-	-	✓
Internal Average Response Time	-	-	-	-	-	✓
Busy Ratio	-	✓*	✓*	✓*	-	✓
Average Wait time of the Semi Synchronous Copy Order Guarantee Buffer	-	-	-	-	✓*	-
Maximum Wait time of the Semi Synchronous Copy Order Guarantee Buffer	-	-	-	-	✓*	-

The table below shows the items monitored (✓) and items not monitored (-). Items with an asterisk (*) indicate that some disk arrays cannot be monitored.

Statistic Information Type/Load Type		Component Type												
		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
External I/O Count	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-

Statistic Information Type/Load Type		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
External Average Response Time	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
External Maximum Response Time	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
External Transfer Rate	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
Internal I/O Count	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Internal Average Response Time	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Internal Maximum Response Time	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Internal Transfer Rate	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Average Busy Ratio	-	✓	✓	✓	✓	✓	-	✓	✓	✓	-	-	-	-
Busy Time	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-

Statistic Information Type/Load Type		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
Average/ Max Queue Length	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
Average/ Max Dirty Pages (%)	L1 Cache	-	-	-	-	-	✓	-	-	-	-	-	-	-
	L2 Cache	-	-	-	-	-	✓*	-	-	-	-	-	-	-
Page-in	L2 Cache	-	-	-	-	-	✓*	-	-	-	-	-	-	-
Power	Electric Power [W]	-	-	-	-	-	-	-	-	-	-	-	-	✓
	Electric Energy [Wh]	-	-	-	-	-	-	-	-	-	-	-	-	✓
Thin Provisioni ng Capacity	Actual Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Actual Used Capacity	-	-	-	-	-	-	-	-	-	-	✓*	✓*	-
	Actual Capacity Threshol d/ Actual Capacity Threshol d (Pre)	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Capacity (Virtual Capacity)	-	-	-	-	-	-	-	-	-	-	✓*	-	-
	LD Capacity Quota/ LD Capacity Threshol d	-	-	-	-	-	-	-	-	-	-	✓*	-	-
Snapshot Capacity	Snapshot Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Snapshot Used Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Snapshot Threshol d	-	-	-	-	-	-	-	-	-	-	-	✓*	-

	Component Type												
Statistic Information Type/Load Type	Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
Semi-Synchronous Ordering Buffer Waiting Time	Write Count	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Average Waiting Time	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Max Waiting Time	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Transfer Rate	-	-	-	-	-	-	✓*	-	-	-	-	-	-
Semi-Synchronous Ordering Buffer Used Capacity	Whole Setting Amount	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	ATgroup Setting Amount	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	Current Size	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	Max Size	-	-	-	-	-	-	-	-	-	✓*	-	-	-

- For the disk arrays for which the remote data replication function has not been supported, the replication port statistic information is not accumulated in the statistic information history file.

- For disk arrays in which the snapshot function has not been installed, the statistic information of pool (capacity) is not accumulated in the statistic information history file.

- For the disk arrays in which the data migration function has not been installed, the statistic information about the data migration port is not accumulated in the statistic information history file.

- For disk arrays in which the thin provisioning function has not been installed, the statistic information of logical disks (capacity) is not accumulated in the statistic information history file.

- For disk arrays in which the thin provisioning function has not been installed, the statistic information of pool (capacity) is not accumulated in the statistic information history file.

- For disk arrays that do not support the function to monitor the wait time of the semi synchronous copy order guarantee buffer, the statistic information about the wait time of the semi synchronous copy order guarantee buffer is not accumulated in the statistic information history file.

- For disk arrays that do not support the L2 cache function, the statistic information about the L2 cache of the cache is not accumulated in the statistic information history file.

Types of Statistic Information

SnapSAN Performance Monitor accumulates the following types of statistic information in statistic information history files.

External I/O Count

This is the number of input/output requests received by the disk array from the external in each measurement period. The unit is the number of times.

External Average Response Time

This is the Average Response Time for the input/output requests received by the disk array from the external in each measurement period. The unit is microsecond. This is calculated by measuring the total of the external response time and external I/O count during the unit measurement period and dividing the former by the latter.

External Maximum Response Time

This is the maximum response time for the input/output requests received by the disk array from the external in each measurement period. The unit is microsecond.

External Transfer Rate

This is the average Transfer Rate of the input/output process achieved in response to the input/output requests received by the disk array from the external in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the external data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

Internal I/O Count

This is the number of input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is the number of times.

Internal Average Response Time

This is the Average Response Time for the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is microsecond. This is calculated by measuring the total of the internal response time and internal I/O count during the unit measurement period and dividing the former by the latter.

Internal Maximum Response Time

This is the maximum response time for the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is microsecond.

Internal Transfer Rate

This is the average Transfer Rate of the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the internal data transfer during the unit measurement period and dividing it by the time interval of the monitoring period.

Average Busy Ratio

Busy Ratio of a host director and disk director indicates the utilization of the CPU installed in the director, in the unit of percentage (%). This is calculated by measuring the CPU time during the measurement period and dividing it by the time interval of the measurement period.

Busy Ratio of a host port, replication port, or disk port, and data migration port indicates the utilization of the bandwidth of the port, in the unit of percentage (%). This is calculated by dividing the transfer rate in the measurement period by the bandwidth.

Busy Ratio of a physical disk, RANK, or pool indicates the busy time per unit time, in the unit of percentage (%). This is calculated by measuring the busy time of the physical disk, RANK, or pool during the unit measurement period and dividing it by the time interval of the measurement period.

Busy Ratio of logical disk is found by dividing the Busy Ratio of the RANK or pool by the ratio of loads on the logical disk.

Busy Time

The value indicates the busy time of the physical disk, RANK, and pool within a measurement time of unit. Unit is millisecond.

Average Queue Length

This is the average value of the queue length for input/output requests received by the disk array from the external (hosts and link disk arrays). The unit is the I/O count. The queue length indicates the number of input/output requests being processed in the director (no response has been made after the requests have been received).

Max Queue Length

This is the maximum value of the queue length for input/output requests received by the disk array from the external (hosts and link disk arrays). The unit is the I/O count.

Average Dirty Pages

This is the average value of the dirty pages in the measurement period. The "dirty pages" indicates the proportion of pages containing data that has not yet been written to the physical disk among write cache pages (cache pages that can be used as write caches). The unit is percentage (%). If the number of dirty pages exceeds the number of write cache pages, the unwritten data must be written to the physical disk.

The dirty pages of cache are calculated by dividing the number of dirty pages of the relevant cache by the number of write cache pages of the relevant cache.

Max Dirty Pages

This is the maximum value of the dirty pages in the measurement period. The unit is percentage (%).

Whole Setting Amount

This is the setting amount of semi synchronous copy order guarantee buffer across the disk array. The unit is MB (megabyte).

Tgroup Setting Amount

This is the setting amount of semi synchronous copy order guarantee buffer for the specified concentrator. The unit is MB (megabyte).

Current Size

This is the current usage of semi synchronous copy order guarantee buffer for the specified concentrator at the time when the specified record was collected. The unit is KB (kilobyte).

Max Size

This is the maximum usage of semi synchronous copy order guarantee buffer for the specified concentrator during the specified record's interval. The unit is KB (kilobyte).

Capacity of Virtual Capacity Logical Disk

This is the virtual capacity of the virtual capacity logical disk. The unit is KB (kilobyte).

Actual Used Capacity of Virtual Capacity Logical Disk

This is the actual used capacity of the virtual capacity logical disk. The unit is KB (kilobyte).

LD Capacity Quota of Virtual Capacity Logical Disk

This is the quota value of the virtual capacity logical disk. The unit is percent (%), and the value indicates the proportion taken up in the virtual capacity.

LD Capacity Threshold of Virtual Capacity Logical Disk

This is the threshold of the virtual capacity logical disk. The unit is percent (%), and the value indicates the proportion taken up in the virtual capacity.

Actual Capacity of Virtual Capacity Pool

This is the actual capacity of the virtual capacity pool. The unit is MB (megabyte).

Actual Used Capacity of Virtual Capacity Pool

This is the actual used capacity of the virtual capacity pool. The unit is MB (megabyte).

Actual Capacity Threshold of Virtual Capacity Pool

This is the threshold of the virtual capacity pool. The unit is percent (%), and the value indicates the proportion taken up in the actual capacity.

Actual Capacity Threshold (Pre) of Virtual Capacity Pool

This is the threshold (pre) of the virtual capacity pool. The unit is percent (%), and the value indicates the proportion taken up in the actual capacity.

Snapshot Capacity (Reserve Area)

This is the capacity of the snapshot reserve area. The unit is MB (megabyte).

Snapshot Used Capacity

This is the snapshot used capacity. The unit is MB (megabyte).

Snapshot Threshold

This is the snapshot threshold. The unit is percent (%), and the value indicates the proportion taken up in the snapshot capacity.

Semi-Synchronous Ordering Buffer Write Count

This is the number of write requests that the MV issued to the semi synchronous copy order guarantee buffer in each measurement period. The unit is the number of times.

Average Semi-Synchronous Ordering Buffer Waiting Time

This is the average time that the MV waits for I/O operations for the semi synchronous copy order guarantee buffer in each measurement period. The unit is microseconds.

Max Semi-Synchronous Ordering Buffer Waiting Time

This is the maximum time that the MV waits for I/O operations for the semi synchronous copy order guarantee buffer in each measurement period. The unit is microseconds.

Semi-Synchronous Ordering Buffer Write Transfer Rate

This is the average Transfer Rate of write requests that the MV issued to the semi synchronous copy order guarantee buffer in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the data transferred to the semi synchronous copy order guarantee buffer during the unit measurement period and dividing it by the time interval of the monitoring period.

Electric Power

This is the electrical power [W] of DAC or DE.

Electric Energy

This is the electric energy [Wh] of DAC or DE. This is calculated by multiplying the electric power by the monitoring period. This value might be different from the actual electrical energy because it is calculated by using the method different from an actual electric power meter.

Page-in Count

This is the input/output request page-in count in each measurement period.

Component Types

Component types are the units used for summarizing statistic information. SnapSAN Performance Monitor summarizes statistic information by the following types of components and accumulates them separately.

Host director

Load state of each host director of the monitored disk array is accumulated. Statistic information is accumulated for the number of host directors.

Disk director

Load state of each disk director of the monitored disk array is accumulated. Statistic information is accumulated for the number of disk directors.

Host port

Load state of each host port of the monitored disk array is accumulated. Statistic information is accumulated for the number of host ports.

Host port (node)

Load state of each host port of the monitored disk array is accumulated in units of access destination nodes. Statistic information is accumulated for the number of host ports multiplied with the number of nodes.

Replication port

Port for replication installed in the replication director or host director is called a replication port.

Load state of each replication port of the monitored disk array is accumulated. Statistic information is accumulated for the number of replication ports.

Disk port

Port for disk enclosure connection installed in the disk director or host director is called a disk port.

Load state of each disk port of the monitored disk array is accumulated. Statistic information is accumulated for the number of disk ports.

Data migration port

The host port in the host director is called "data migration port" when used by the data migration function.

Load state of each data migration port of the monitored disk array is accumulated. Statistic information is accumulated for the number of data migration ports.

Cache

Cache usage of the monitored disk array is accumulated. For a disk array with node, statistic information is accumulated for the number of nodes that install cache modules. For other than a disk array with node, a single statistic information item is accumulated for the entire disk array.

Logical disk

Load state of each logical disk of the monitored disk array is accumulated. Statistic information is accumulated for the number of logical disks. (Note 1)

Physical disk

Load state of each physical disk of the monitored disk array is accumulated. Statistic information is accumulated for the number of physical disks.

RANK

Load state of each RANK of the monitored disk array is accumulated. Statistic information is accumulated for the number of RANKs.

Pool

Load state of each pool of the monitored disk array is accumulated. Statistic information is accumulated for the number of pools.

Semi synchronous copy order guarantee buffer information

Semi synchronous copy order guarantee buffer usage is accumulated for each concentrator in the monitored disk array. Statistic information is accumulated for the number of concentrators.

Logical disk (capacity)

The usage of each logical disk (capacity) of the disk arrays to be monitored in which the thin provisioning function has been installed is accumulated.

Statistic information of the logical disks whose information has been updated is accumulated.

Pool (capacity)

The usage of each pool (capacity) of the disk arrays to be monitored in which the thin provisioning function has been installed is accumulated.

Statistic information of the pool whose information has been updated is accumulated.

Cabinet

Information of the DAC and DE electric power is accumulated.

- When a monitored logical disk has been linked to an LV (link volume), the statistic information on the I/O having accessed the relevant logical disk via the LV is also added.

When a monitored logical disk is LV, the statistic information on the I/O having accessed via the relevant LV is collected and reported as the load status of the relevant LV.

You can check the correspondence between the concentrator number and the atomic group name and other information for semi synchronous copy order guarantee buffer information by referring to "ATgroup Information" in the replication management screen, execution result of SnapSAN Performance Monitorcsv command, or fault analysis information (SnapSAN Performance Monitor gather file) when fault analysis is performed.

To check the correspondence between the concentrator number and atomic group name and other information by the fault analysis information (gather file), refer to the following file:

- Fault analysis information in Windows

Output destination path name: SnapSAN Performance Monitorsvr/SnapSAN Performance Monitorgather_diskinfo

File name:

Atomic group information: disk array name_ATGinfo.csv

Pair information: disk array name_pairinfo.csv

- Fault analysis information in Unix system

Output destination path name: SnapSAN Performance Monitorsvr/diskinfo

File name:

Atomic group information: disk array name_ATGinfo.csv

Pair information: disk array name_pairinfo.csv

For details about the used amount of and wait time of the semi synchronous copy order guarantee buffer, refer to the "Data Replication User's Manual (Disaster Recovery System Installation and Operation Guide)".

Load types

Load types are the types of loads of the monitored disk array. SnapSAN Performance Monitor distinguishes the following types of loads when it accumulates statistic information.

WriteStatistic information regarding data write operation.

Write HitStatistic information about operations that could respond quickly, by writing data to cache only. It is a subset of Write.

ReadStatistic information regarding data read operation.

Read HitStatistic information regarding data read operation which hit cache. It is a subset of Read.

Prefetch HitStatistic information regarding data read operation which hit data transferred from the physical disk to cache in advance by the prefetch function of the disk device. It is a subset of Read Hit.

OthersStatistic information regarding SCSI command process other than data write and data read.

Summarizing Statistic Information

The summarizing function statistic information summarizes all basic information stored and outputs the information to a statistic information summarized file. The following describes basic statistic information after summarizing.

- For the statistic information regarding the I/O count, the I/O counts within all the measurement periods contained in the period of summarizing are accumulated, and the result is the I/O count of the period of summarizing.

- For the statistic information of the average response time and average wait time, on the basis of all average response times and average wait times and I/O counts within all the measurement periods contained in the period of summarizing, the total response time and total wait time and total I/O count of the period of summarizing are found. The average response time and average wait time of the period of summarizing are calculated by dividing the former by the latter.

- For the statistic information regarding the maximum response time and maximum wait time, the maximum value is taken from the maximum response times and maximum wait times within all the measurement periods contained in the period of summarizing, and it is the maximum response time and maximum wait time of the period of summarizing.

- For the statistic information of the transfer rate, on the basis of all transfer rates within all the measurement periods contained in the period of summarizing, total transfer length is found. A transfer rate of the period of summarizing is calculated by dividing the total transfer length by the period of summarizing.

- For the statistic information of the Busy Ratio, all busy time within all the measurement periods contained in the period of summarizing is accumulated. Average Busy Ratio of the period of summarizing is calculated by dividing the total busy time by the period of summarizing.

- For the statistic information regarding the busy time, the busy time within all the measurement periods contained in the period of summarizing is accumulated and the result is the busy time of the period of summarizing.

- For the statistic information regarding average queue length, the total queue length in the period of summarizing is found from the average queue lengths within all the measurement periods contained in the period of summarizing, the total value is divided by the measurement time of the period of summarizing, and the result is the average queue length of the period of summarizing.

- For the statistic information regarding the max queue length, the maximum value is taken from the max queue lengths within all the measurement periods contained in the period of summarizing, and the result is the max queue length of the period of summarizing.

- For the statistic information regarding the average dirty pages, the total utilization in the period of summarizing is found from the average dirty pages within all the measurement periods contained in the period of summarizing, the total value is divided by the measurement time of the period of summarizing, and the result is the average dirty pages of the period of summarizing.

- For the statistic information regarding the max dirty pages, the maximum value is taken from the max dirty pages within all the measurement periods contained in the period of summarizing and, the result is the max dirty pages of the period of summarizing.

- For the statistic information regarding the setting amount of the semi synchronous copy order guarantee buffer information across the disk array, the latest value is taken from all the setting amounts across the disk array contained in the period of summarizing and, the result is the setting amount across the disk array of the period of summarizing.

- For the statistic information regarding the setting amount of the semi synchronous copy order guarantee buffer information of the ATgroup, the latest value is taken from all the setting amounts of the ATgroup contained in the period of summarizing and, the result is the setting amount of ATgroup of the period of summarizing.

- For the statistic information regarding the current usage of semi synchronous copy order guarantee buffer information, the latest value is taken from all the current usages contained in the period of summarizing and, the result is the current usage of the period of summarizing.

- For the statistic information regarding the max usage of semi synchronous copy order guarantee buffer information, the maximum value is taken from the max usages within all the measurement periods contained in the period of summarizing and, the result is the max usage of the period of summarizing.

- For the statistic information regarding the capacity (virtual capacity), the maximum value is taken from virtual capacity within all the measurement periods contained in the period of summarizing and, the result is the capacity of the period of summarizing.

- For the statistic information regarding the actual used capacity, the maximum value is taken from actual used capacity within all the measurement periods contained in the period of summarizing and, the result is the actual used capacity of the period of summarizing.

- For the statistic information regarding the actual capacity threshold, the latest value is taken from actual capacity thresholds within all the measurement periods contained in the period of summarizing and, the result is the actual capacity threshold of the period of summarizing.

- For the statistic information regarding the actual capacity threshold (pre), the latest value is taken from actual capacity thresholds (pre) within all the measurement periods contained in the period of summarizing and, the result is the actual capacity threshold (pre) of the period of summarizing.

- For the statistic information regarding the LD capacity threshold, the latest value is taken from LD capacity thresholds within all the measurement periods contained in the period of summarizing and, the result is the LD capacity threshold of the period of summarizing.

- For the statistic information regarding the LD capacity quota, the latest value is taken from LD capacity quotas within all the measurement periods contained in the period of summarizing and, the result is the LD capacity quota of the period of summarizing.

- For the statistic information regarding the snapshot capacity, the maximum value is taken form snapshot capacity within all the measurement periods contained in the period of summarizing and, the result is the snapshot capacity of the period of summarizing.

- For the statistic information regarding the snapshot usage, the maximum value is taken form snapshot usages within all the measurement periods contained in the period of summarizing and, the result is the snapshot usage of the period of summarizing.

- For the statistic information regarding the snapshot threshold, the latest value is taken form snapshot thresholds within all the measurement periods contained in the period of summarizing and, the result is the snapshot threshold of the period of summarizing.

- For the statistic information regarding the electric power, the total electric power in the period of summarizing is found and divided by the measurement count of the period of summarizing, and the result is the electric power [W] of the period of summarizing.

- For the statistic information regarding the electric energy, the electric power in the period of summarizing is multiplied by the measurement time, and the result is the electric energy of the period of summarizing. This value might be different from the actual electrical energy because it is calculated by using the method different from an actual electric power meter.

Inserting Extended Statistic Information

For allowing reference to the fluctuation width of statistic information even after summarizing, extension of statistic information is calculated in addition to the summarized basic statistic information and stored in the summarized statistic information file. The extension of statistic information includes the following types.

Inserting configuration information

Types	Description
Maximum/minimum fcExternal I/O Density	This is the maximum and minimum values of the external I/O Density in each measurement period contained in the period of summarizing. The unit is count/1000 seconds.
Maximum/minimum External Transfer Rate	This is the maximum and minimum values of the external transfer rates in each measurement period contained in the period of summarizing. The unit is kilobyte/second.
Maximum/minimum Internal I/O Density	This is the maximum and minimum values of the internal I/O density in each measurement period contained in the period of summarizing. The unit is count/1000 seconds.
Maximum/minimum Internal Transfer Rate	This is the maximum and minimum values of the internal transfer rates in each measurement period contained in the period of summarizing. The unit is kilobyte/second.
Maximum/minimum Busy Ratio	This is the maximum and minimum values of the busy ratios in each measurement period contained in the period of summarizing. The unit is percentage (%).

In addition to the statistics information summarized in the method described in previous sections, configuration information is also stored in the summarized statistic information file. This feature allows easy identification of the various types of statistic information.

Types of summarized files

In order to select an appropriate balance between the time resolution and amount of accumulated information. You can create summarized files whose average time interval in the period of summarizing is one hour and summarized files whose average time interval is one day.

A file which contains statistic information summarized in units of hours is called a primary summarized file, and file which contains statistic information summarized in units of days is called a secondary summarized file. In other words, SnapSAN Performance Monitor has three types of files which store statistic information, as shown in Table A-13.

- If the disk array configuration is changed while the statistic information is being

Type of File	Average Time Interval of Period of Summarizing	Amount Recorded in One File
Statistic Information History File	Logging Interval	For max. of one day
Statistic Information Primary Summarized File	One hour	For max. of one day
Statistic Information Secondary Summarized File	One day	For max. of one month

accumulated, the period of summarizing is divided at the time when the disk array configuration is changed.

- For the statistic information on primary summarized file, the period of summarizing might be less than one hour by being divided at the time when the disk array configuration is changed.

- For the statistic information on secondary summarized file, the period of summarizing might be less than one day by being divided at the time when the disk array configuration is changed.

Threshold Operation

Thresholds Display

Use the SnapSAN Performance Monitorprfthre list command to display thresholds.

- If you specify the -array option to specify the component type, the thresholds for the specified disk array will be displayed.
- If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
> SnapSAN Performance Monitorprfthre list -d StorageD8 –hd

--- THRESHOLD LIST ---


---------------------------------------------------------
Disk Array Name          StorageD8
---------------------------------------------------------


 --- HOST DIRECTOR ---
 00h
   busy(%)
   40.00

 01h
   busy(%)
   40.00


   :
```

The following describes each item.

THRESHOLD LIST

Disk Array Name: The disk array name

HOST DIRECTOR

busy(%): Threshold for the BUSY ratio of the host director(s)

Displaying thresholds for host directors

If you specify the -hd option to specify the component type, the thresholds for the specified host director(s) will be displayed.

If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
> SnapSAN Performance Monitorprfthre list -d StorageD8 -port

--- THRESHOLD LIST ---

-----------------------------------------------------------------------------
Disk Array Name                          StorageD8
-----------------------------------------------------------------------------

--- PORT ---
00h-00h(200000004C7F3E2E0000)
         iops     trrate(MB/s)   av.len(KB)    av.resp(ms)   r.av.resp(ms)   w.av.resp(ms)
      3000.00        100.00      1024.00        1000.00        1024.00        1024.00

00h-01h(200000004C7F3E2E0001)
         iops     trrate(MB/s)   av.len(KB)    av.resp(ms)   r.av.resp(ms)   w.av.resp(ms)
     *3000.00        100.00      1024.00        1000.00        1024.00        1024.00

          :             :            :             :              :              :
```

The following describes each item.

THRESHOLD LIST

Disk Array Name:The disk array name

PORT

Threshold	Description
iops:	Threshold for the I/O density of the host port(s)
trrate(MB/s):	Threshold for the transfer rate of the host port(s)
av.len(KB):	Threshold for the average transfer length of the host port(s)
av.resp(ms):	Threshold for the total average response time of the host port(s)
r.av.resp(ms):	Threshold for the read average response time of the host port(s)
w.av.resp(ms):	Threshold for the write average response time of the host port(s)

Displaying thresholds for replication ports (initiator)

If you specify the -rpi option to specify the component type, the thresholds of the specified replication port(s) (initiator) will be displayed.

If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
> SnapSAN Performance Monitorprfthre list -d StorageD8 -rpi


--- THRESHOLD LIST ---


-------------------------------------------------------
Disk Array Name         StorageD8
-------------------------------------------------------


--- REPLICATION PORT (INITIATOR) ---
00h-02h(200000004C7F3E2E0002)
      iops trrate(MB/s) av.len(KB) av.resp(ms) r.av.resp(ms) w.av.resp(ms)
    4000.00    200.00   1024.00    1000.00      1024.00      1024.00


00h-03h(200000004C7F3E2E0003)
      iops trrate(MB/s) av.len(KB) av.resp(ms) r.av.resp(ms) w.av.resp(ms)
   *4000.00    200.00   1024.00    1000.00      1024.00      1024.00
        :         :        :          :            :            :
```

THRESHOLD LIST

Disk Array Name: The disk array name

REPLICATION PORT (INITIATOR)	Description
iops:	Threshold for the I/O density of the replication port(s) (initiator)
trrate(MB/s):	Threshold for the transfer rate of the replication port(s) (initiator)
av.len(KB):	Threshold for the average transfer length of the replication port(s) (initiator)
av.resp(ms):	Threshold for the total average response time of the replication port(s) (initiator)

REPLICATION PORT (INITIATOR)	Description
r.hit(%):	Threshold for the BUSY ratio of the replication port(s) (initiator)
r.av.resp(ms):	Threshold for the read average response time of the replication port(s) (initiator)
w.av.resp(ms):	Threshold for the write average response time of the replication port(s) (initiator)

THRESHOLD LIST

Disk Array Name: The disk array name

Displaying Thresholds for Logical Disks

If you specify the -ld option, -ldname option, or -ldset option to specify the component type, the thresholds for the specified logical disk(s) will be displayed.

If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
> SnapSAN Performance Monitorprfthre list -d StorageD8 -ldset LX:EXPRESS1


--- THRESHOLD LIST ---


-------------------------------------------------------------------------
Disk Array Name                                    StorageD8
-------------------------------------------------------------------------


--- LOGICAL DISK ---
018ah(LX:EXPRESS1_018A)

        iops   trrate(MB/s)  av.len(KB)  av.resp(ms)  r.hit(%)  w.hit(%)  av.wttm(ms)  max.wttm(ms)  r.av.resp(ms)  w.av.resp(ms)

    20000.00      100.00      1024.00      *500.00       *80       95       1000.00       1500.00       1024.00        1024.00


018bh(NX:EXPRESS1_018B)

        iops   trrate(MB/s)  av.len(KB)  av.resp(ms)  r.hit(%)  w.hit(%)  av.wttm(ms)  max.wttm(ms)  r.av.resp(ms)  w.av.resp(ms)

    20000.00      100.00      1024.00       500.00        80       95       1000.00       1500.00       1024.00        1024.00


        :           :           :            :           :         :           :             :             :              :
```

Disk Array Name: The disk array name

LOGICAL DISK

Threshold	Description
iops:	Threshold for the I/O density of the logical disk(s)
trrate(MB/s):	Threshold for the transfer rate of the logical disk(s)
av.len(KB):	Threshold for the average transfer length of the logical disk(s)
av.resp(ms):	Threshold for the total average response time of the logical disk(s)
r.hit(%):	Threshold for the read hit ratio of the logical disk(s)
w.hit(%):	Threshold for the write hit ratio of the logical disk(s)
av.wttm(ms):	Average wait time of the semi synchronous copy order guarantee buffer of the logical disk(s)
maxwttm(ms):	Maximum wait time of the semi synchronous copy order guarantee buffer of the logical disk(s)
r.av.resp(ms):	Threshold for the read average response time of the logical disk(s)
w.av.resp(ms):	Threshold for the write average response time of the logical disk(s)

Displaying Thresholds For Physical Disks

If you specify the -pd option to specify the component type, the thresholds for the specified physical disk(s) will be displayed.

If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
 > SnapSAN Performance Monitorprfthre list -d StorageD8 -pd

--- THRESHOLD LIST ---


------------------------------------------------------------------------------
Disk Array Name                          StorageD8
------------------------------------------------------------------------------


--- PHYSICAL DISK ---
00h-00h
        iops  trrate(MB/s)  av.len(KB)  av.resp(ms)  busy(%)  r.av.resp(ms)  w.av.resp(ms)
      100.00        20.00      512.00      2000.00       80       1024.00       1024.00

00h-01h
        iops  trrate(MB/s)  av.len(KB)  av.resp(ms)  busy(%)  r.av.resp(ms)  w.av.resp(ms)
      100.00       *20.00      512.00      2000.00      *80       1024.00       1024.00


         :            :           :            :         :           :             :
```

THRESHOLD LIST

Disk Array Name: The disk array name

PHYSICAL DISK

Threshold	Description
iops:	Threshold for the I/O density of the physical disk(s)
trrate(MB/s):	Threshold for the transfer rate of the physical disk(s)
av.len(KB):	Threshold for the average transfer length of the physical disk(s)
av.resp(ms):	Threshold for the total average response time of the physical disk(s)
busy(%):	Threshold for the busy ratio of the physical disk(s)
r.av.resp(ms):	Threshold for the read average response time of the physical disk(s)
w.av.resp(ms):	Threshold for the write average response time of the physical disk(s)

Displaying thresholds for all monitored items

If you specify the -all option to specify the component type, the thresholds for all the monitored items will be displayed. If a monitoring item is in the threshold excess state, an asterisk (*) is displayed with the threshold.

```
> SnapSAN Performance Monitorprfthre list -d StorageDi8 -all

— THRESHOLD LIST —

————————————————————————————————————————
Disk Array Name                          StorageDi8
————————————————————————————————————————

— DISK ARRAY —
        Iops    trrate(MB/s)  av.len(KB)  av.resp(ms)  c.bib(%)  w.bib(%)  c.av.resp(ms)  w.av.resp(ms)
    100000.00    *200.00      1024.00     1000.00      *80       95        1024.00        1024.00

— PORT —
00h-00b(200000004C7F3E2E0000)
        Iops    trrate(MB/s)  av.len(KB)  av.resp(ms)  c.av.resp(ms)   w.av.resp(ms)
     3000.00    100.00       1024.00     1000.00      1024.00         1024.00
       :          :            :            :            :              :

— CACHE SEGMENT —
00b(DefaultSegment)
        Iops    trrate(MB/s)  av.len(KB)  av.resp(ms)  c.bib(%)  w.bib(%)  c.av.resp(ms)  w.av.resp(ms)
    50000.00    200.00       1024.00     *1000.00     *90       95        1024.00        1024.00
       :          :            :            :           :          :         :              :

— LOGICAL DISK —
0000b(NX:NXserver1_0000)
        Iops  trrate(MB/s)  av.len(KB)  av.resp(ms) c.bib(%)  w.bib(%)  av.wtbo(ms)  max.wtbo(ms)  c.av.resp(ms)  w.av.resp(ms)
    20000.00  100.00        1024.00     500.00      80        95        1000.00      1500.00       1024.00        1024.00
       :        :             :            :          :          :         :            :             :              :

— PHYSICAL DISK —
00h-00h
        Iops    trrate(MB/s)  av.len(KB)  av.resp(ms)  busy(%)  c.av.resp(ms)  w.av.resp(ms)
    50000.00    *20.00       512.00      2000.00      *80      1024.00        1024.00
       :          :            :            :           :         :              :

 — HOST DIRECTOR —
 00h
  busy(%)
  40.00

— REPLICATION PORT (INITIATOR) —
00h-00b(200000004C7F3E2E0002)
        Iops    trrate(MB/s)  av.len(KB)  av.resp(ms)  c.av.resp(ms)   w.av.resp(ms)
     4000.00    200.00       1024.00     1000.00      1024.00         1024.00
       :          :            :            :            :              :
```

The following describes each item.

THRESHOLD LIST

Disk Array Name:The disk array name

DISK ARRAY

Displays the thresholds for the disk array.

The displayed information is the same as the information displayed when the -array option is specified.

PORT

Displays the thresholds for the host ports.

The displayed information is the same as the information displayed when the -port/-portname option is specified.

LOGICAL DISK

Displays the thresholds for the logical disks.

The displayed information is the same as the information displayed when the -ld/-ldname/-ldset option is specified.

PHYSICAL DISK

Displays the thresholds for the physical disks.

The displayed information is the same as the information displayed when the -pd option is specified.

HOST DIRECTOR

Displays the thresholds for the host directors.

The displayed information is the same as the information displayed when the -hd option is specified.

REPLICATION PORT (INITIATOR)

Displays the thresholds for the replication port(s) (initiator).

The displayed information is the same as the information displayed when the -rpi option is specified.

Threshold Monitoring Condition Display

The threshold monitoring condition is displayed when the -info option is specified with the SnapSAN Performance Monitorprfthre monitor_cond command.

```
> SnapSAN Performance Monitorprfthre monitor_cond -info

--- THRESHOLD MONITORING CONDITION ---
      interval  :  10(min)
      border    :  120(times/min)

--- ENVIRONMENT SETTING ---
      interval  :  10(sec)(refresh rate)
      border    :  60(times/min)
```

The following describes each item.

THRESHOLD MONITORING CONDITION

Displays the current threshold monitoring condition.

interval: Current threshold monitoring interval.

border: Current minimum I/O count.

ENVIRONMENT SETTING

Displays the environment setting for the threshold monitoring condition.

interval: Environment setting for the threshold monitoring interval.

border: Environment setting for the minimum I/O count.

Displaying Condition to Reset Threshold Excess State

The condition to reset threshold excess state is displayed when the -info option is specified with the SnapSAN Performance Monitorprfthre reset_cond command.

```
> SnapSAN Performance Monitorprfthre reset_cond -info

--- THRESHOLD RESET EXCESS CONDITION ---
        count    :   6(times)
        time     :   12:00
```

THRESHOLD RESET EXCESS CONDITION

Displays the condition to reset threshold excess state.

count: Number of intervals to reset threshold excess state

time: Time of day to reset threshold excess state

Monitored Item	Component Type			
	Disk Array	Port	Logical Disk	Physical Disk
External I/O Density	✓	✓	✓	-
External Transfer Rate	✓	✓	✓	-
External Average Transfer Length	✓	✓	✓	-
External Average Response Time	✓	✓	✓	-
Read Hit Ratio	✓*	-	✓	-
Write Hit Ratio	✓*	-	✓	-
Internal I/O Density	-	-	-	✓
Internal Transfer Rate	-	-	-	✓
Internal Average Transfer Length	-	-	-	✓
Internal Average Response Time	-	-	-	✓
Busy Ratio	-	-	-	✓*

- If, however, BaseProduct Ver2.1 or later (SnapSAN Manager Ver 2.1 or later or storage control software version 170E or later) has been applied to the disk arrays above, the hit ratios can be monitored.

Items Monitored

Monitored items are types of index values which indicate status of load or performance. SnapSAN Performance Monitor displays values of the following types of the monitored items on the SnapSAN Performance Monitor client Performance Monitoring screen:

- **External I/O Density** – This is the number of input/output requests received by the disk array from the external per unit time. The unit is IOPS (Input Output Per Second). This is calculated by measuring the external I/O count during the unit measurement period and dividing it by the time interval of the measurement period.

- **External Transfer Rate** – This is the Average Transfer Rate of the input/output process achieved in response to the input/output requests received by the disk array from the external. The unit is megabyte/second. This is calculated by measuring the sum of the external data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

- **External Average Transfer Length** – This is the average input/output data length per one input/output request received by the disk array from the external. The unit is kilobyte. This is calculated by measuring the sum of the external data transfer and external I/O count during the unit measurement period and dividing the former by the latter.

- **External Average Response Time** – This is the Average Response Time for the input/output requests received by the disk array from the external. The unit is millisecond. This is calculated by measuring the total of the external response time and external I/O count during the unit measurement period and dividing the former by the latter.

- **Read Hit Ratio** – It is the ratio of case where the READ request has been completed using data stored in the cache without reading from disk unit (Read hit), when the disk array receives the input requests from outside. The unit is percentage [%]. It is calculated by following expression; dividing the number of cache hit I/Os by the number of receiving READ requests during the measuring interval.

- **Write Hit Ratio** – This is the ratio of case where the WRITE request has been completed quickly by writing data only in the cache (Write hit), when the disk array receives the output requests from outside. The unit is percentage [%]. It is calculated by following expression; dividing the number of cache hit I/Os by the number of receiving WRITE requests during the measuring interval.

- **Internal I/O Density** – This is the number of input/output requests issued to the internal disk devices by the control device of the disk array. The unit is IOPS (Input Output Per Second). This is calculated by measuring the internal I/O count during the unit measurement period and dividing it by the time interval of the measurement period.

- **Internal Transfer Rate** – This is the average transfer rate of the input/output requests issued to the internal disk devices by the control device of the disk array. The unit is megabyte/second. This is calculated by measuring the sum of the internal data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

- **Internal Average Transfer Length** – This is the average input/output data length of the input/output process performed for the internal disk devices by the control device of the disk array. The unit is kilobyte. This is calculated by measuring the sum of the internal data transfer and internal I/O count during the unit measurement period and dividing the former by the latter.

- **Internal Average Response Time** – This is the average response time for the input/output requests issued to the internal disk devices by the control device of the disk array. The unit is millisecond. This is calculated by measuring the total of the internal response time and internal I/O count during the unit measurement period and dividing the former by the latter.

- **Busy Ratio** – This is the rate of operation of physical disks. The unit is percentage (%). This is calculated by measuring the busy time of physical disks during the unit measurement period and dividing it by the time slot of measured segments.

Component Type

SnapSAN Performance Monitor separately displays values of the monitored items collected in the following units:

- **Disk Array** – Statistic information of the entire disk array to be monitored is collected and load status for each disk array is reported. For this component type, the following monitored items can be reported.

  - External I/O Density
  - External Transfer Rate
  - External Average Transfer Length
  - External Average Response Time
  - Read Hit Ratio
  - Write Hit Ratio

- **Port** – Port for host connection installed on the host director is called a host port or port. For the monitored disk arrays, statistic information related to each host port is collected separately, and load status for each host port is reported. For this component type, the following monitored items can be reported.

  - External I/O Density
  - External Transfer Rate
  - External Average Transfer Length
  - External Average Response Time

  In principle, the sum of the values of a monitored item over all the host ports in one disk array is equal to the sum of the values of the same monitored item over all the disk arrays. However, in a real-world situation, some errors may exist due to varied sampling time of the statistic information which is the basis of the values of the monitored item.

- **Physical Disk** – Disk devices installed in a disk array are called physical disks. Statistic information related to each physical disk installed in the monitored disk arrays is collected separately, and load status for each physical disk is reported. For this component type, the following monitored items can be reported.

  - Internal I/O Density
  - Internal Transfer Rate
  - Internal Average Transfer Length
  - Internal Average Response Time
  - Busy Ratio

Performance Data Threshold Monitored

The table below shows the items monitored (✓) and items not monitored (-). Items with an asterisk (*) indicate that some disk arrays cannot be monitored.

Monitored Item	Component Types					
	Disk Array	Host Director	Port	Replication Port (Initiator)	Logical Disk	Physical Disk
External I/O Density	✓	-	✓	✓*	✓	-
External Transfer Rate	✓	-	✓	✓*	✓	-
External Average Transfer Length	✓	-	✓	✓*	✓	-
External Average Response Time	✓	-	✓	✓*	✓	-
Read Hit Ratio	✓	-	-	-	✓	-
Write Hit Ratio	✓	-	-	-	✓	-
Internal I/O Density	-	-	-	-	-	✓
Internal Transfer Rate	-	-	-	-	-	✓
Internal Average Transfer Length	-	-	-	-	-	✓
Internal Average Response Time	-	-	-	-	-	✓
Busy Ratio	-	✓*	✓*	✓*	-	✓
Average Wait time of the Semi Synchronous Copy Order Guarantee Buffer	-	-	-	-	✓*	-
Maximum Wait time of the Semi Synchronous Copy Order Guarantee Buffer	-	-	-	-	✓*	-

The table below shows the items monitored (✓) and items not monitored (-). Items with an asterisk (*) indicate that some disk arrays cannot be monitored.

Statistic Information Type/Load Type		Component Type												
		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
External I/O Count	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
External Average Response Time	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
External Maximum Response Time	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
External Transfer Rate	Write	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	WriteHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Read	-	✓	✓	✓	-	-	✓	-	-	-	-	-	-
	ReadHit	-	-	✓	✓	-	-	✓	-	-	-	-	-	-
	Prefetch Hit	-	-	-	-	-	-	✓	-	-	-	-	-	-
	Others	-	✓	-	-	-	-	-	-	-	-	-	-	-
Internal I/O Count	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Internal Average Response Time	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-

Statistic Information Type/Load Type		Component Type												
		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
Internal Maximum Response Time	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Internal Transfer Rate	Write	-	-	-	-	✓	-	-	✓	-	-	-	-	-
	Read	-	-	-	-	✓	-	-	✓	✓	-	-	-	-
Average Busy Ratio	-	✓	✓	✓	✓	✓	-	✓	✓	✓	-	-	-	-
Busy Time	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-
Average/ Max Queue Length	-	✓	-	-	-	-	-	-	-	-	-	-	-	-
Average/ Max Dirty Pages (%)	L1 Cache	-	-	-	-	-	✓	-	-	-	-	-	-	-
	L2 Cache	-	-	-	-	-	✓*	-	-	-	-	-	-	-
Page-in	L2 Cache	-	-	-	-	-	✓*	-	-	-	-	-	-	-
Power	Electric Power [W]	-	-	-	-	-	-	-	-	-	-	-	-	✓
	Electric Energy [Wh]	-	-	-	-	-	-	-	-	-	-	-	-	✓
Thin Provisioning Capacity	Actual Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Actual Used Capacity	-	-	-	-	-	-	-	-	-	-	✓*	✓*	-
	Actual Capacity Threshold/ Actual Capacity Threshold (Pre)	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Capacity (Virtual Capacity)	-	-	-	-	-	-	-	-	-	-	✓*	-	-
	LD Capacity Quota/ LD Capacity Threshold	-	-	-	-	-	-	-	-	-	-	✓*	-	-

Statistic Information Type/Load Type		Component Type												
		Host Director	Host Port	Replication Port (Note 1)	Data Migration Port (Note 3)	Disk Port	Cache	Logical Disk	Physical Disk	Pool	Semi Synchronous Copy Order Guarantee Buffer Information	Logical Disk (Capacity) (Note 2)	Pool (Capacity) (Note 2)	Cabinet
Snapshot Capacity	Snapshot Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Snapshot Used Capacity	-	-	-	-	-	-	-	-	-	-	-	✓*	-
	Snapshot Threshold	-	-	-	-	-	-	-	-	-	-	-	✓*	-
Semi-Synchronous Ordering Buffer Waiting Time	Write Count	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Average Waiting Time	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Max Waiting Time	-	-	-	-	-	-	✓*	-	-	-	-	-	-
	Transfer Rate	-	-	-	-	-	-	✓*	-	-	-	-	-	-
Semi-Synchronous Ordering Buffer Used Capacity	Whole Setting Amount	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	ATgroup Setting Amount	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	Current Size	-	-	-	-	-	-	-	-	-	✓*	-	-	-
	Max Size	-	-	-	-	-	-	-	-	-	✓*	-	-	-

- For the disk arrays for which the remote data replication function has not been supported, the replication port statistic information is not accumulated in the statistic information history file.

- For disk arrays in which the snapshot function has not been installed, the statistic information of pool (capacity) is not accumulated in the statistic information history file.

- For the disk arrays in which the data migration function has not been installed, the statistic information about the data migration port is not accumulated in the statistic information history file.

- For disk arrays in which the thin provisioning function has not been installed, the statistic information of logical disks (capacity) is not accumulated in the statistic information history file.

- For disk arrays in which the thin provisioning function has not been installed, the statistic information of pool (capacity) is not accumulated in the statistic information history file.

- For disk arrays that do not support the function to monitor the wait time of the semi synchronous copy order guarantee buffer, the statistic information about the wait time of the semi synchronous copy order guarantee buffer is not accumulated in the statistic information history file.

- For disk arrays that do not support the L2 cache function, the statistic information about the L2 cache of the cache is not accumulated in the statistic information history file.

Types of Statistic Information

SnapSAN Performance Monitor accumulates the following types of statistic information in statistic information history files.

External I/O Count

This is the number of input/output requests received by the disk array from the external in each measurement period. The unit is the number of times.

External Average Response Time

This is the Average Response Time for the input/output requests received by the disk array from the external in each measurement period. The unit is microsecond. This is calculated by measuring the total of the external response time and external I/O count during the unit measurement period and dividing the former by the latter.

External Maximum Response Time

This is the maximum response time for the input/output requests received by the disk array from the external in each measurement period. The unit is microsecond.

External Transfer Rate

This is the average Transfer Rate of the input/output process achieved in response to the input/output requests received by the disk array from the external in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the external data transfer during the unit measurement period and dividing it by the time interval of the measurement period.

Internal I/O Count

This is the number of input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is the number of times.

Internal Average Response Time

This is the Average Response Time for the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is microsecond. This is calculated by measuring the total of the internal response time and internal I/O count during the unit measurement period and dividing the former by the latter.

Internal Maximum Response Time

This is the maximum response time for the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is microsecond.

Internal Transfer Rate

This is the average Transfer Rate of the input/output requests issued to the internal disk devices by the control device of the disk array in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the internal data transfer during the unit measurement period and dividing it by the time interval of the monitoring period.

Average Busy Ratio

Busy Ratio of a host director and disk director indicates the utilization of the CPU installed in the director, in the unit of percentage (%). This is calculated by measuring the CPU time during the measurement period and dividing it by the time interval of the measurement period.

Busy Ratio of a host port, replication port, or disk port, and data migration port indicates the utilization of the bandwidth of the port, in the unit of percentage (%). This is calculated by dividing the transfer rate in the measurement period by the bandwidth.

Busy Ratio of a physical disk, RANK, or pool indicates the busy time per unit time, in the unit of percentage (%). This is calculated by measuring the busy time of the physical disk, RANK, or pool during the unit measurement period and dividing it by the time interval of the measurement period.

Busy Ratio of logical disk is found by dividing the Busy Ratio of the RANK or pool by the ratio of loads on the logical disk.

Busy Time

The value indicates the busy time of the physical disk, RANK, and pool within a measurement time of unit. Unit is millisecond.

Average Queue Length

This is the average value of the queue length for input/output requests received by the disk array from the external (hosts and link disk arrays). The unit is the I/O count. The queue length indicates the number of input/output requests being processed in the director (no response has been made after the requests have been received).

Max Queue Length

This is the maximum value of the queue length for input/output requests received by the disk array from the external (hosts and link disk arrays). The unit is the I/O count.

Average Dirty Pages

This is the average value of the dirty pages in the measurement period. The "dirty pages" indicates the proportion of pages containing data that has not yet been written to the physical disk among write cache pages (cache pages that can be used as write caches). The unit is percentage (%). If the number of dirty pages exceeds the number of write cache pages, the unwritten data must be written to the physical disk.

The dirty pages of cache are calculated by dividing the number of dirty pages of the relevant cache by the number of write cache pages of the relevant cache.

Max Dirty Pages

This is the maximum value of the dirty pages in the measurement period. The unit is percentage (%).

Whole Setting Amount

This is the setting amount of semi synchronous copy order guarantee buffer across the disk array. The unit is MB (megabyte).

Tgroup Setting Amount

This is the setting amount of semi synchronous copy order guarantee buffer for the specified concentrator. The unit is MB (megabyte).

Current Size

This is the current usage of semi synchronous copy order guarantee buffer for the specified concentrator at the time when the specified record was collected. The unit is KB (kilobyte).

Max Size

This is the maximum usage of semi synchronous copy order guarantee buffer for the specified concentrator during the specified record's interval. The unit is KB (kilobyte).

Capacity of Virtual Capacity Logical Disk

This is the virtual capacity of the virtual capacity logical disk. The unit is KB (kilobyte).

Actual Used Capacity of Virtual Capacity Logical Disk

This is the actual used capacity of the virtual capacity logical disk. The unit is KB (kilobyte).

LD Capacity Quota of Virtual Capacity Logical Disk

This is the quota value of the virtual capacity logical disk. The unit is percent (%), and the value indicates the proportion taken up in the virtual capacity.

LD Capacity Threshold of Virtual Capacity Logical Disk

This is the threshold of the virtual capacity logical disk. The unit is percent (%), and the value indicates the proportion taken up in the virtual capacity.

Actual Capacity of Virtual Capacity Pool

This is the actual capacity of the virtual capacity pool. The unit is MB (megabyte).

Actual Used Capacity of Virtual Capacity Pool

This is the actual used capacity of the virtual capacity pool. The unit is MB (megabyte).

Actual Capacity Threshold of Virtual Capacity Pool

This is the threshold of the virtual capacity pool. The unit is percent (%), and the value indicates the proportion taken up in the actual capacity.

Actual Capacity Threshold (Pre) of Virtual Capacity Pool

This is the threshold (pre) of the virtual capacity pool. The unit is percent (%), and the value indicates the proportion taken up in the actual capacity.

Snapshot Capacity (Reserve Area)

This is the capacity of the snapshot reserve area. The unit is MB (megabyte).

Snapshot Used Capacity

This is the snapshot used capacity. The unit is MB (megabyte).

Snapshot Threshold

This is the snapshot threshold. The unit is percent (%), and the value indicates the proportion taken up in the snapshot capacity.

Semi-Synchronous Ordering Buffer Write Count

This is the number of write requests that the MV issued to the semi synchronous copy order guarantee buffer in each measurement period. The unit is the number of times.

Average Semi-Synchronous Ordering Buffer Waiting Time

This is the average time that the MV waits for I/O operations for the semi synchronous copy order guarantee buffer in each measurement period. The unit is microseconds.

Max Semi-Synchronous Ordering Buffer Waiting Time

This is the maximum time that the MV waits for I/O operations for the semi synchronous copy order guarantee buffer in each measurement period. The unit is microseconds.

Semi-Synchronous Ordering Buffer Write Transfer Rate

This is the average Transfer Rate of write requests that the MV issued to the semi synchronous copy order guarantee buffer in each measurement period. The unit is kilobyte/second. This is calculated by measuring the sum of the data transferred to the semi synchronous copy order guarantee buffer during the unit measurement period and dividing it by the time interval of the monitoring period.

Electric Power

This is the electrical power [W] of DAC or DE.

Electric Energy

This is the electric energy [Wh] of DAC or DE. This is calculated by multiplying the electric power by the monitoring period. This value might be different from the actual electrical energy because it is calculated by using the method different from an actual electric power meter.

Page-in Count

This is the input/output request page-in count in each measurement period.

Component Types

Component types are the units used for summarizing statistic information. SnapSAN Performance Monitor summarizes statistic information by the following types of components and accumulates them separately.

Host director

Load state of each host director of the monitored disk array is accumulated. Statistic information is accumulated for the number of host directors.

Disk director

Load state of each disk director of the monitored disk array is accumulated. Statistic information is accumulated for the number of disk directors.

Host port

Load state of each host port of the monitored disk array is accumulated. Statistic information is accumulated for the number of host ports.

Host port (node)

Load state of each host port of the monitored disk array is accumulated in units of access destination nodes. Statistic information is accumulated for the number of host ports multiplied with the number of nodes.

Replication port

Port for replication installed in the replication director or host director is called a replication port.

Load state of each replication port of the monitored disk array is accumulated. Statistic information is accumulated for the number of replication ports.

Disk port

Port for disk enclosure connection installed in the disk director or host director is called a disk port.

Load state of each disk port of the monitored disk array is accumulated. Statistic information is accumulated for the number of disk ports.

Data migration port

The host port in the host director is called "data migration port" when used by the data migration function.

Load state of each data migration port of the monitored disk array is accumulated. Statistic information is accumulated for the number of data migration ports.

Cache

Cache usage of the monitored disk array is accumulated. For a disk array with node, statistic information is accumulated for the number of nodes that install cache modules. For other than a disk array with node, a single statistic information item is accumulated for the entire disk array.

Logical disk

Load state of each logical disk of the monitored disk array is accumulated. Statistic information is accumulated for the number of logical disks. (Note 1)

Physical disk

Load state of each physical disk of the monitored disk array is accumulated. Statistic information is accumulated for the number of physical disks.

RANK

Load state of each RANK of the monitored disk array is accumulated. Statistic information is accumulated for the number of RANKs.

Pool

Load state of each pool of the monitored disk array is accumulated. Statistic information is accumulated for the number of pools.

Semi synchronous copy order guarantee buffer information

Semi synchronous copy order guarantee buffer usage is accumulated for each concentrator in the monitored disk array. Statistic information is accumulated for the number of concentrators.

Logical disk (capacity)

The usage of each logical disk (capacity) of the disk arrays to be monitored in which the thin provisioning function has been installed is accumulated.

Statistic information of the logical disks whose information has been updated is accumulated.

Pool (capacity)

The usage of each pool (capacity) of the disk arrays to be monitored in which the thin provisioning function has been installed is accumulated.

Statistic information of the pool whose information has been updated is accumulated.

Cabinet

Information of the DAC and DE electric power is accumulated.

• When a monitored logical disk has been linked to an LV (link volume), the statistic information on the I/O having accessed the relevant logical disk via the LV is also added.

When a monitored logical disk is LV, the statistic information on the I/O having accessed via the relevant LV is collected and reported as the load status of the relevant LV.

You can check the correspondence between the concentrator number and the atomic group name and other information for semi synchronous copy order guarantee buffer information by referring to "ATgroup Information" in the replication management screen, execution result of SnapSAN Performance Monitorcsv command, or fault analysis information (SnapSAN Performance Monitor gather file) when fault analysis is performed.

To check the correspondence between the concentrator number and atomic group name and other information by the fault analysis information (gather file), refer to the following file:

- Fault analysis information in Windows

Output destination path name: SnapSAN Performance Monitorsvr/SnapSAN Performance Monitorgather_diskinfo

File name:

Atomic group information: disk array name_ATGinfo.csv

Pair information: disk array name_pairinfo.csv

- Fault analysis information in Unix system

Output destination path name: SnapSAN Performance Monitorsvr/diskinfo

File name:

Atomic group information: disk array name_ATGinfo.csv

Pair information: disk array name_pairinfo.csv

For details about the used amount of and wait time of the semi synchronous copy order guarantee buffer, refer to the "Data Replication User's Manual (Disaster Recovery System Installation and Operation Guide)".

Load types

Load types are the types of loads of the monitored disk array. SnapSAN Performance Monitor distinguishes the following types of loads when it accumulates statistic information.

WriteStatistic information regarding data write operation.

Write HitStatistic information about operations that could respond quickly, by writing data to cache only. It is a subset of Write.

ReadStatistic information regarding data read operation.

Read HitStatistic information regarding data read operation which hit cache. It is a subset of Read.

Prefetch HitStatistic information regarding data read operation which hit data transferred from the physical disk to cache in advance by the prefetch function of the disk device. It is a subset of Read Hit.

OthersStatistic information regarding SCSI command process other than data write and data read.

Summarizing Statistic Information

Summarizing basic statistic information

The summarizing function statistic information summarizes all basic information stored and outputs the information to a statistic information summarized file. The following describes basic statistic information after summarizing.

- For the statistic information regarding the I/O count, the I/O counts within all the measurement periods contained in the period of summarizing are accumulated, and the result is the I/O count of the period of summarizing.

- For the statistic information of the average response time and average wait time, on the basis of all average response times and average wait times and I/O counts within all the measurement periods contained in the period of summarizing, the total response time and total wait time and total I/O count of the period of summarizing are found. The average response time and average wait time of the period of summarizing are calculated by dividing the former by the latter.

- For the statistic information regarding the maximum response time and maximum wait time, the maximum value is taken from the maximum response times and maximum wait times within all the measurement periods contained in the period of summarizing, and it is the maximum response time and maximum wait time of the period of summarizing.

- For the statistic information of the transfer rate, on the basis of all transfer rates within all the measurement periods contained in the period of summarizing, total transfer length is found. A transfer rate of the period of summarizing is calculated by dividing the total transfer length by the period of summarizing.

- For the statistic information of the Busy Ratio, all busy time within all the measurement periods contained in the period of summarizing is accumulated. Average Busy Ratio of the period of summarizing is calculated by dividing the total busy time by the period of summarizing.

- For the statistic information regarding the busy time, the busy time within all the measurement periods contained in the period of summarizing is accumulated and the result is the busy time of the period of summarizing.

- For the statistic information regarding average queue length, the total queue length in the period of summarizing is found from the average queue lengths within all the measurement periods contained in the period of summarizing, the total value is divided by the measurement time of the period of summarizing, and the result is the average queue length of the period of summarizing.

- For the statistic information regarding the max queue length, the maximum value is taken from the max queue lengths within all the measurement periods contained in the period of summarizing, and the result is the max queue length of the period of summarizing.

- For the statistic information regarding the average dirty pages, the total utilization in the period of summarizing is found from the average dirty pages within all the measurement periods contained in the period of summarizing, the total value is divided by the measurement time of the period of summarizing, and the result is the average dirty pages of the period of summarizing.

- For the statistic information regarding the max dirty pages, the maximum value is taken from the max dirty pages within all the measurement periods contained in the period of summarizing and, the result is the max dirty pages of the period of summarizing.

- For the statistic information regarding the setting amount of the semi synchronous copy order guarantee buffer information across the disk array, the latest value is taken from all the setting amounts across the disk array contained in the period of summarizing and, the result is the setting amount across the disk array of the period of summarizing.

- For the statistic information regarding the setting amount of the semi synchronous copy order guarantee buffer information of the ATgroup, the latest value is taken from all the setting amounts of the ATgroup contained in the period of summarizing and, the result is the setting amount of ATgroup of the period of summarizing.

- For the statistic information regarding the current usage of semi synchronous copy order guarantee buffer information, the latest value is taken from all the current usages contained in the period of summarizing and, the result is the current usage of the period of summarizing.

- For the statistic information regarding the max usage of semi synchronous copy order guarantee buffer information, the maximum value is taken from the max usages within all the measurement periods contained in the period of summarizing and, the result is the max usage of the period of summarizing.

- For the statistic information regarding the capacity (virtual capacity), the maximum value is taken from virtual capacity within all the measurement periods contained in the period of summarizing and, the result is the capacity of the period of summarizing.

- For the statistic information regarding the actual used capacity, the maximum value is taken from actual used capacity within all the measurement periods contained in the period of summarizing and, the result is the actual used capacity of the period of summarizing.

- For the statistic information regarding the actual capacity threshold, the latest value is taken from actual capacity thresholds within all the measurement periods contained in the period of summarizing and, the result is the actual capacity threshold of the period of summarizing.

- For the statistic information regarding the actual capacity threshold (pre), the latest value is taken from actual capacity thresholds (pre) within all the measurement periods contained in the period of summarizing and, the result is the actual capacity threshold (pre) of the period of summarizing.

- For the statistic information regarding the LD capacity threshold, the latest value is taken from LD capacity thresholds within all the measurement periods contained in the period of summarizing and, the result is the LD capacity threshold of the period of summarizing.

- For the statistic information regarding the LD capacity quota, the latest value is taken from LD capacity quotas within all the measurement periods contained in the period of summarizing and, the result is the LD capacity quota of the period of summarizing.

- For the statistic information regarding the snapshot capacity, the maximum value is taken form snapshot capacity within all the measurement periods contained in the period of summarizing and, the result is the snapshot capacity of the period of summarizing.

- For the statistic information regarding the snapshot usage, the maximum value is taken form snapshot usages within all the measurement periods contained in the period of summarizing and, the result is the snapshot usage of the period of summarizing.

- For the statistic information regarding the snapshot threshold, the latest value is taken form snapshot thresholds within all the measurement periods contained in the period of summarizing and, the result is the snapshot threshold of the period of summarizing.

- For the statistic information regarding the electric power, the total electric power in the period of summarizing is found and divided by the measurement count of the period of summarizing, and the result is the electric power [W] of the period of summarizing.
- For the statistic information regarding the electric energy, the electric power in the period of summarizing is multiplied by the measurement time, and the result is the electric energy of the period of summarizing. This value might be different from the actual electrical energy because it is calculated by using the method different from an actual electric power meter.

Inserting extended statistic information

For allowing reference to the fluctuation width of statistic information even after summarizing, extension of statistic information is calculated in addition to the summarized basic statistic information and stored in the summarized statistic information file. The extension of statistic information includes the following types.

Types	Description
Maximum/minimum fcExternal I/O Density	This is the maximum and minimum values of the external I/O Density in each measurement period contained in the period of summarizing. The unit is count/1000 seconds.
Maximum/minimum External Transfer Rate	This is the maximum and minimum values of the external transfer rates in each measurement period contained in the period of summarizing. The unit is kilobyte/second.

Types	Description
Maximum/minimum Internal I/O Density	This is the maximum and minimum values of the internal I/O density in each measurement period contained in the period of summarizing. The unit is count/1000 seconds.
Maximum/minimum Internal Transfer Rate	This is the maximum and minimum values of the internal transfer rates in each measurement period contained in the period of summarizing. The unit is kilobyte/second.
Maximum/minimum Busy Ratio	This is the maximum and minimum values of the busy ratios in each measurement period contained in the period of summarizing. The unit is percentage (%).

Inserting Configuration Information

In addition to the statistics information summarized in the method described in previous sections, configuration information is also stored in the summarized statistic information file. This feature allows easy identification of the various types of statistic information.

Types Of Summarized Files

In order to select an appropriate balance between the time resolution and amount of accumulated information. You can create summarized files whose average time interval in the period of summarizing is one hour and summarized files whose average time interval is one day.

A file which contains statistic information summarized in units of hours is called a primary summarized file, and file which contains statistic information summarized in units of days is called a secondary summarized file. In other words, SnapSAN Performance Monitor has three types of files which store statistic information, as shown in Table A-13.

Type of File	Average Time Interval of Period of Summarizing	Amount Recorded in One File
Statistic Information History File	Logging Interval	For max. of one day
Statistic Information Primary Summarized File	One hour	For max. of one day
Statistic Information Secondary Summarized File	One day	For max. of one month

- If the disk array configuration is changed while the statistic information is being accumulated, the period of summarizing is divided at the time when the disk array configuration is changed.

- For the statistic information on primary summarized file, the period of summarizing might be less than one hour by being divided at the time when the disk array configuration is changed.

- For the statistic information on secondary summarized file, the period of summarizing might be less than one day by being divided at the time when the disk array configuration is changed.

A CSV file is a set of records with data separated by commas. Records are separated by a line feed character. The maximum number of records is 65,536. The types of records which comprise a CSV file are as follows.

File information record

Statistic information record

Configuration information record

These records are described below.

File Information Record

These records store attribute information of statistic information/summarized files. Only one file information record exists at the beginning of a CSV file. The record format is described below. "Save location" in the table indicates the order of the data separated by commas in the record. The save location of the leftmost data is 1.

Save Location	Field name (-header specified)	Content	Format	Description
1	R_FHDR	Record identifier	String	"R_FHDR" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when information in the statistic information history (summarized) file was collected

Save Location	Field name (-header specified)	Content	Format	Description
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when information in the statistic information history (summarized) file was collected
4	File Revision	File revision	'Hexadecimal	'Revision value of the statistic information history (summarized) file
5	Archive Unit	Unit of summarizing	String	Information indicating the type of unit of summarizing of statistic information. For statistic information history files: "L": Logging interval For statistic information summarized files: "H": Hour "D": Day

Statistic Information Record

This record contains statistic information for each component of the disk array. There are the following types of statistic information records.

- Statistic information record of a host director
- Statistic information record of a disk director
- Statistic information record of a host port
- Statistic information record of a host port (node)
- Statistic information record of a replication port
- Statistic information record of a disk port
- Statistic information record of a data migration port
- Statistic information record of a cache
- Statistic information record of a logical disk
- Statistic information record of a physical disk
- Statistic information record of a RANK
- Statistic information record of a pool
- Statistic information record of logical disks (capacity)
- Statistic information record of pools (capacity)

- Statistic information record of semi synchronous copy order guarantee buffer information
- Statistic information record of cabinet

The record formats of the statistic information records are described below. "Save location" in the table indicates the order of the data separated by commas in the record. The save location of the leftmost data is 1. If the type of statistic information is specified as an extraction condition and the data is excluded from the targets of extraction, or if data does not exist, the save location of the data does not change. In this case, only a comma is written to the location.

Accumulation Period

The period in which statistic information of the statistic information history file is accumulated. It corresponds to logging interval time.

Summarizing Period

The period in which statistic information of the statistic information history file is summarized. It is either 1 hour or 1 day.

The shaded parts in the table are provided only when statistic information of the statistic information summarized file is extracted.

Statistic information record format for host directors

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_HD	Record identifier	String	"R_STA_HD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval(milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the host director
6	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in period of accumulation/summarizing
7	Average Queue Length	Average queue length	'Decimal'	Average queue length in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
8	Max Queue Length	Max queue length	'Decimal'	Max queue length in period of accumulation/summarizing
9	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
10	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format For Disk Directors

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_DD	Record identifier	String	"R_STA_DD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the disk director
6	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in period of accumulation/summarizing
7	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
8	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format For Host Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_HP	Record identifier	String	"R_STA_HP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected.
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the host port
6	Port No	Port number	'Hexadecimal'	Port number of the host port
7	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
8	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
10	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
11	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
12	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
13	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
14	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
15	Others Count	Other I/O count	'Decimal'	Total count of Other I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
16	Average Others Response Time (micro sec)	Average response time of Other I/O	'Decimal'	Average response time (microsecond) of Other I/O in period of accumulation/summarizing
17	Max Others Response Time (micro sec)	Maximum response time of Other I/O	'Decimal'	Maximum response time (microsecond) of Other I/O in period of accumulation/summarizing
18	Others Transfer Rate (KB/S)	Transfer rate of Other I/O	'Decimal'	Transfer rate (kilobyte/second) of Other I/O in period of accumulation/summarizing
19	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
20	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
21	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
22	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
23	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
24	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
25	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
26	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
27	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in the period of accumulation/summarizing. A physical busy ratio is always displayed.
28	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing A physical busy ratio is always displayed.
29	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.

Statistic Information Record Format for Host Ports (Node)

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_HP(NODE)	Record identifier	String	"R_STA_HP(NODE)" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the host port
6	Port No	Port number	'Hexadecimal'	Port number of the host port
7	Access Node No	Node number	'Hexadecimal'	Node number of access destination
8	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
9	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
10	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
11	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
12	Write Hit Count	CacheHit Write I/O count	'Decimal'	Total count of CacheHit Write I/O in period of accumulation/summarizing
13	Average Write Hit Response Time(micro sec)	Average response time of CacheHit Write I/O	'Decimal'	Average response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
14	Max Write Hit Response Time (micro sec)	Maximum response time of CacheHit Write I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
15	Write Hit Transfer Rate (KB/S)	Transfer rate of CacheHit Write I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Write I/O in period of accumulation/summarizing
16	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
17	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
18	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
19	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
20	Read Hit Count	CacheHit Read I/O count	'Decimal'	Total count of CacheHit Read I/O in period of accumulation/summarizing
21	Average Read Hit Response Time(micro sec)	Average response time of CacheHit Read I/O	'Decimal'	Average response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
22	Max Read Hit Response Time(micro sec)	Maximum response time of CacheHit Read I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
23	Read Hit Transfer Rate(KB/S)	Transfer rate of CacheHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Read I/O in period of accumulation/summarizing
24	Prefetch Read Hit Count	PrefetchHit Read I/O count	'Decimal'	Total count of PrefetchHit Read I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
25	Average Prefetch Read Hit Response Time(micro sec)	Average response time of PrefetchHit Read I/O	'Decimal'	Average response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
26	Max Prefetch Read Hit Response Time(micro sec)	Maximum response time of PrefetchHit Read I/O	'Decimal'	Maximum response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
27	Prefetch Read Hit Transfer Rate(KB/S)	Transfer rate of PrefetchHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of PrefetchHit Read I/O in period of accumulation/summarizing
28	Busy Ratio(%)	Average busy ratio	'Decimal'	Average busy ratio (%) in period of accumulation/summarizing. A physical busy ratio is always displayed.
29	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
30	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
31	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
32	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
33	Max Write Hit Count	Max. of I/O density of CacheHit Write I/O	'Decimal'	Maximum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
34	Min Write Hit Count	Min. of I/O density of CacheHit Write I/O	'Decimal'	Minimum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
35	Max Write Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
36	Min Write Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
37	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
38	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
39	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
40	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
41	Max Read Hit Count	Max. of I/O density of CacheHit Read I/O	'Decimal'	Maximum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
42	Min Read Hit Count	Min. of I/O density of CacheHit Read I/O	'Decimal'	Minimum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
43	Max Read Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing
44	Min Read Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing
45	Max Prefetch Read Hit Count	Max. of I/O density of PrefetchHit Read I/O	'Decimal'	Maximum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
46	Min Prefetch Read Hit Count	Min. of I/O density of PrefetchHit Read I/O	'Decimal'	Minimum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
47	Max Prefetch Read Hit Transfer Rate(KB/S)	Max. transfer rate of PrefetchHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
48	Min Prefetch Read Hit Transfer Rate(KB/S)	Min. transfer rate of PrefetchHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing
49	Max Busy Ratio(%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.
50	Min Busy Ratio(%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.

Statistic Information Record Format for Host Ports (Node)

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_HP(NODE)	Record identifier	String	"R_STA_HP(NODE)" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the host port
6	Port No	Port number	'Hexadecimal'	Port number of the host port
7	Access Node No	Node number	'Hexadecimal'	Node number of access destination
8	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
9	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
10	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
11	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
12	Write Hit Count	CacheHit Write I/O count	'Decimal'	Total count of CacheHit Write I/O in period of accumulation/summarizing
13	Average Write Hit Response Time(micro sec)	Average response time of CacheHit Write I/O	'Decimal'	Average response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
14	Max Write Hit Response Time (micro sec)	Maximum response time of CacheHit Write I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
15	Write Hit Transfer Rate (KB/S)	Transfer rate of CacheHit Write I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Write I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
16	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
17	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
18	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
19	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
20	Read Hit Count	CacheHit Read I/O count	'Decimal'	Total count of CacheHit Read I/O in period of accumulation/summarizing
21	Average Read Hit Response Time(micro sec)	Average response time of CacheHit Read I/O	'Decimal'	Average response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
22	Max Read Hit Response Time(micro sec)	Maximum response time of CacheHit Read I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
23	Read Hit Transfer Rate(KB/S)	Transfer rate of CacheHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Read I/O in period of accumulation/summarizing
24	Prefetch Read Hit Count	PrefetchHit Read I/O count	'Decimal'	Total count of PrefetchHit Read I/O in period of accumulation/summarizing
25	Average Prefetch Read Hit Response Time(micro sec)	Average response time of PrefetchHit Read I/O	'Decimal'	Average response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
26	Max Prefetch Read Hit Response Time(micro sec)	Maximum response time of PrefetchHit Read I/O	'Decimal'	Maximum response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
27	Prefetch Read Hit Transfer Rate(KB/S)	Transfer rate of PrefetchHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of PrefetchHit Read I/O in period of accumulation/summarizing
28	Busy Ratio(%)	Average busy ratio	'Decimal'	Average busy ratio (%) in period of accumulation/summarizing. A physical busy ratio is always displayed.
29	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
30	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
31	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
32	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
33	Max Write Hit Count	Max. of I/O density of CacheHit Write I/O	'Decimal'	Maximum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
34	Min Write Hit Count	Min. of I/O density of CacheHit Write I/O	'Decimal'	Minimum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
35	Max Write Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
36	Min Write Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
37	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
38	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
39	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
40	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
41	Max Read Hit Count	Max. of I/O density of CacheHit Read I/O	'Decimal'	Maximum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
42	Min Read Hit Count	Min. of I/O density of CacheHit Read I/O	'Decimal'	Minimum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
43	Max Read Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
44	Min Read Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing
45	Max Prefetch Read Hit Count	Max. of I/O density of PrefetchHit Read I/O	'Decimal'	Maximum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
46	Min Prefetch Read Hit Count	Min. of I/O density of PrefetchHit Read I/O	'Decimal'	Minimum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
47	Max Prefetch Read Hit Transfer Rate(KB/S)	Max. transfer rate of PrefetchHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing
48	Min Prefetch Read Hit Transfer Rate(KB/S)	Min. transfer rate of PrefetchHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing
49	Max Busy Ratio(%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.
50	Min Busy Ratio(%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.

Statistic Information Record Format for Replication Ports.

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_RP	Record identifier	String	"R_STA_RP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected

Save Location	Field name (-header specified)	Content	Format	Description
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (milliseconds). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as is.
5	Director No	Director number	'Hexadecimal'	Director number of the replication port
6	Port No	Port number	'Hexadecimal'	Port number of the replication port
7	Initiator Write Count	Write I/O count of initiator	'Decimal'	Total count of Write I/O of initiator in period of accumulation/summarizing
8	Initiator Average Write Response Time (micro sec)	Average response time of Write I/O of initiator	'Decimal'	Average response time (microseconds) of Write I/O of initiator in period of accumulation/summarizing
9	Initiator Max Write Response Time (micro sec)	Maximum response time of Write I/O of initiator	'Decimal'	Maximum response time (microseconds) of Write I/O of initiator in period of accumulation/summarizing
10	Initiator Write Transfer Rate(KB/S)	Transfer rate of Write I/O of initiator	'Decimal'	Transfer rate (kilobytes/second) of Write I/O of initiator in period of accumulation/summarizing
11	Initiator Read Count	Read I/O count of initiator	'Decimal'	Total count of Read I/O of initiator in period of accumulation/summarizing
12	Initiator Average Read Response Time (micro sec)	Average response time of Read I/O of initiator	'Decimal'	Average response time (microseconds) of Read I/O of initiator in period of accumulation/summarizing
13	Initiator Max Read Response Time (micro sec)	Maximum response time of Read I/O of initiator	'Decimal'	Maximum response time (microseconds) of Read I/O of initiator in period of accumulation/summarizing
14	Initiator Read Transfer Rate(KB/S)	Transfer rate of Read I/O of initiator	'Decimal'	Transfer rate (kilobytes/second) of Read I/O of initiator in period of accumulation/summarizing
15	Target Write Count	Write I/O count of target	'Decimal'	Total count of Write I/O of target in period of accumulation/summarizing
16	Target Average Write Response Time (micro sec)	Average response time of Write I/O of target	'Decimal'	Average response time (microseconds) of Write I/O of target in period of accumulation/summarizing
17	Target Max Write Response Time (micro sec)	Maximum response time of Write I/O of target	'Decimal'	Maximum response time (microseconds) of Write I/O of target in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
18	Target Write Transfer Rate(KB/S)	Transfer rate of Write I/O of target	'Decimal'	Transfer rate (kilobytes/second) of Write I/O of target in period of accumulation/summarizing
19	Target Write Hit Count	CacheHit Write I/O count of target	'Decimal'	Total count of CacheHit Write I/O of target in period of accumulation/summarizing
20	Target Average Write Hit Response Time (micro sec)	Average response time of CacheHit Write I/O of target	'Decimal'	Average response time (microseconds) of CacheHit Write I/O of target in period of accumulation/summarizing
21	Target Max Write Hit Response Time (micro sec)	Maximum response time of CacheHit Write I/O of target	'Decimal'	Maximum response time (microseconds) of CacheHit Write I/O of target in period of accumulation/summarizing
22	Target Write Hit Transfer Rate(KB/S)	Transfer rate of CacheHit Write I/O of target	'Decimal'	Transfer rate (kilobytes/second) of CacheHit Write I/O of target in period of accumulation/summarizing
23	Target Read Count	Read I/O count of target	'Decimal'	Total count of Read I/O of target in period of accumulation/summarizing
24	Target Average Read Response Time (micro sec)	Average response time of Read I/O of target	'Decimal'	Average response time (microseconds) of Read I/O of target in period of accumulation/summarizing
25	Target Max Read Response Time (micro sec)	Maximum response time of Read I/O of target	'Decimal'	Maximum response time (microseconds) of Read I/O of target in period of accumulation/summarizing
26	Target Read Transfer Rate(KB/S)	Transfer rate of Read I/O of target	'Decimal'	Transfer rate (kilobytes/second) of Read I/O of target in period of accumulation/summarizing
27	Target Read Hit Count	CacheHit Read I/O count of target	'Decimal'	Total count of CacheHit Read I/O of target in period of accumulation/summarizing
28	Target Average Read Hit Response Time (micro sec)	Average response time of CacheHit Read I/O of target	'Decimal'	Average response time (microseconds) of CacheHit Read I/O of target in period of accumulation/summarizing
29	Target Max Read Hit Response Time (micro sec)	Maximum response time of CacheHit Read I/O of target	'Decimal'	Maximum response time (microseconds) of CacheHit Read I/O of target in period of accumulation/summarizing
30	Target Read Hit Transfer Rate(KB/S)	Transfer rate of CacheHit Read I/O of target	'Decimal'	Transfer rate (kilobytes/second) of CacheHit Read I/O of target in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
31	Initiator Max Write Count	Max. of I/O density of Write I/O of initiator	'Decimal'	Maximum value of I/O density of Write I/O of initiator in each accumulation period in the period of summarizing
32	Initiator Min Write Count	Min. of I/O density of Write I/O of initiator	'Decimal'	Minimum value of I/O density of Write I/O of initiator in each accumulation period in the period of summarizing
33	Initiator Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O of initiator	'Decimal'	Maximum transfer rate (kilobytes/second) of Write I/O of initiator in each accumulation period in the period of summarizing
34	Initiator Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O of initiator	'Decimal'	Minimum transfer rate (kilobytes/second) of Write I/O of initiator in each accumulation period in the period of summarizing
35	Initiator Max Read Count	Max. of I/O density of Read I/O of initiator	'Decimal'	Maximum value of I/O density of Read I/O of initiator in each accumulation period in the period of summarizing
36	Initiator Min Read Count	Min. of I/O density of Read I/O of initiator	'Decimal'	Minimum value of I/O density of Read I/O of initiator in each accumulation period in the period of summarizing
37	Initiator Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O of initiator	'Decimal'	Maximum transfer rate (kilobytes/second) of Read I/O of initiator in each accumulation period in the period of summarizing
38	Initiator Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O of initiator	'Decimal'	Minimum transfer rate (kilobytes/second) of Read I/O of initiator in each accumulation period in the period of summarizing
39	Target Max Write Count	Max. of I/O density of Write I/O of target	'Decimal'	Maximum value of I/O density of Write I/O of target in each accumulation period in the period of summarizing
40	Target Min Write Count	Min. of I/O density of Write I/O of target	'Decimal'	Minimum value of I/O density of Write I/O of target in each accumulation period in the period of summarizing
41	Target Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O of target	'Decimal'	Maximum transfer rate (kilobytes/second) of Write I/O of target in each accumulation period in the period of summarizing
42	Target Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O of target	'Decimal'	Minimum transfer rate (kilobytes/second) of Write I/O of target in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
43	Target Max Write Hit Count	Max. of I/O density of CacheHit Write I/O of target	'Decimal'	Maximum value of I/O density of CacheHit Write I/O of target in each accumulation period in the period of summarizing
44	Target Min Write Hit Count	Min. of I/O density of CacheHit Write I/O of target	'Decimal'	Minimum value of I/O density of CacheHit Write I/O of target in each accumulation period in the period of summarizing
45	Target Max Write Hit Transfer Rate (KB/S)	Max. transfer rate of CacheHit Write I/O of target	'Decimal'	Maximum transfer rate (kilobytes/second) of CacheHit Write I/O of target in each accumulation period in the period of summarizing
46	Target Min Write Hit Transfer Rate (KB/S)	Min. transfer rate of CacheHit Write I/O of target	'Decimal'	Minimum transfer rate (kilobytes/second) of CacheHit Write I/O of target in each accumulation period in the period of summarizing
47	Target Max Read Count	Max. of I/O density of Read I/O of target	'Decimal'	Maximum value of I/O density of Read I/O of target in each accumulation period in the period of summarizing
48	Target Min Read Count	Min. of I/O density of Read I/O of target	'Decimal'	Minimum value of I/O density of Read I/O of target in each accumulation period in the period of summarizing
49	Target Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O of target	'Decimal'	Maximum transfer rate (kilobytes/second) of Read I/O of target in each accumulation period in the period of summarizing
50	Target Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O of target	'Decimal'	Minimum transfer rate (kilobytes/second) of Read I/O of target in each accumulation period in the period of summarizing
51	Target Max Read Hit Count	Max. of I/O density of CacheHit Read I/O of target	'Decimal'	Maximum value of I/O density of CacheHit Read I/O of target in each accumulation period in the period of summarizing
52	Target Min Read Hit Count	Min. of I/O density of CacheHit Read I/O of target	'Decimal'	Minimum value of I/O density of CacheHit Read I/O of target in each accumulation period in the period of summarizing
53	Target Max Read Hit Transfer Rate (KB/S)	Max. transfer rate of CacheHit Read I/O of target	'Decimal'	Maximum transfer rate (kilobytes/second) of CacheHit Read I/O of target in each accumulation period in the period of summarizing
54	Target Min Read Hit Transfer Rate (KB/S)	Min. transfer rate of CacheHit Read I/O of target	'Decimal'	Minimum transfer rate (kilobytes/second) of CacheHit Read I/O of target in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
55	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in the period of accumulation/summarizing. A physical busy ratio is always displayed.
56	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.
57	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.

Statistic Information Record Format for Data Migration Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_MP	Record identifier	String	"R_STA_MP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the data migration port
6	Port No	Port number	'Hexadecimal'	Port number of the data migration port
7	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
8	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
10	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
11	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
12	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
13	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
14	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
15	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in period of accumulation/summarizing. Even when a single port has multiple functions, the physical busy ratio is always displayed.
16	Max Write Count	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
17	Min Write Count	Min. transfer rate of Write I/	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
18	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
19	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
20	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
21	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
22	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
23	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
24	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing. The physical busy ratio is always displayed.
25	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing. A physical busy ratio is always displayed.

Statistic Information Record Format for Disk Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_DP	Record identifier	String	"R_STA_DP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Director No	Director number	'Hexadecimal'	Director number of the disk port
6	Port No	Port number	'Hexadecimal'	Port number of the disk port
7	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
8	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
10	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
11	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
12	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
13	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
14	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
15	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
16	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
17	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
18	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
19	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
20	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
21	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
22	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
23	Busy Ratio (%)	Average busy ratio	'Decimal'	Average busy ratio (%) in the period of accumulation/summarizing
24	Max Busy Ratio (%)	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
25	Min Busy Ratio (%)	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format for Caches

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_CACHE	Record identifier	String	"R_STA_CACHE" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	No	Number	'Hexadecimal'	Number
6	Average Dirty Pages (%)	Average dirty pages	'Decimal'	Average dirty pages of L1 cache in the measurement period
7	Max Dirty Pages (%)	Maximum dirty pages	'Decimal'	Maximum dirty pages of L1 cache in the measurement period
8	L1 Cache Read Hit Ratio(%)	Read hit ratio of L1 cache	'Decimal'	Read hit ratio of L1 cache in period of accumulation/summarizing
9	L1/L2 Cache Read Hit Ratio(%)	Read hit ratio of L1/L2 cache	'Decimal'	Read hit ratio of L1/L2 cache in period of accumulation/summarizing
10	L2 Cache Page-In Count	L2 cache page-in count	'Decimal'	Total of page-ins of L2 cache in period of accumulation/summarizing
11	L2 Cache Page-In Average Transfer Length(KB)	Average transfer length of L2 cache page-in	'Decimal'	Average transfer length of total of page-ins of L2 cache in period of accumulation/summarizing
12	L1 Cache Write Hit Ratio (%)	Write hit ratio of L1 cache	'Decimal'	Write hit ratio of L1 cache in period of accumulation/summarizing
13	L2 Cache Average Dirty Pages (%)	Average dirty pages of L2 cache	'Decimal'	Average dirty pages of L2 cache in period of accumulation/summarizing
14	L2 Cache Max Dirty Pages (%)	Maximum dirty pages of L2 cache	'Decimal'	Maximum dirty pages of L2 cache in period of accumulation/summarizing

Statistic Information Record Format for Logical Disks

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_LD	Record identifier	String	"R_STA_LD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	No	Logical disk number	'Hexadecimal'	Logical disk number
6	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
7	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
8	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
10	Write Hit Count	CacheHit Write I/O count	'Decimal'	Total count of CacheHit Write I/O in period of accumulation/summarizing
11	Average Write Hit Response Time(micro sec)	Average response time of CacheHit Write I/O	'Decimal'	Average response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
12	Max Write Hit Response Time (micro sec)	Maximum response time of CacheHit Write I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Write I/O in period of accumulation/summarizing
13	Write Hit Transfer Rate (KB/S)	Transfer rate of CacheHit Write I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Write I/O in period of accumulation/summarizing
14	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
15	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
16	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
17	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
18	Read Hit Count	Read I/O count of CacheHit	'Decimal'	Total count of CacheHit Read I/O in period of accumulation/summarizing
19	Average Read Hit Response Time(micro sec)	Average response time of CacheHit Read I/O	'Decimal'	Average response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
20	Max Read Hit Response Time(micro sec)	Maximum response time of CacheHit Read I/O	'Decimal'	Maximum response time (microsecond) of CacheHit Read I/O in period of accumulation/summarizing
21	Read Hit Transfer Rate(KB/S)	Transfer rate of CacheHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of CacheHit Read I/O in period of accumulation/summarizing
22	Prefetch Read Hit Count	PrefetchHit Read I/O count	'Decimal'	Total count of PrefetchHit Read I/O in period of accumulation/summarizing
23	Average Prefetch Read Hit Response Time(micro sec)	Average response time of PrefetchHit Read I/O	'Decimal'	Average response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
24	Max Prefetch Read Hit Response Time(micro sec)	Maximum response time of PrefetchHit Read I/O	'Decimal'	Maximum response time (microsecond) of PrefetchHit Read I/O in period of accumulation/summarizing
25	Prefetch Read Hit Transfer Rate(KB/S)	Transfer rate of PrefetchHit Read I/O	'Decimal'	Transfer rate (kilobyte/second) of PrefetchHit Read I/O in period of accumulation/summarizing
26	Busy Ratio[%]	Average busy ratio	'Decimal'	Average busy ratio (percent) in the period of accumulation/summarizing
27	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
28	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
29	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
30	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
31	Max Write Hit Count	Max. of I/O density of CacheHit Write I/O	'Decimal'	Maximum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
32	Min Write Hit Count	Min. of I/O density of CacheHit Write I/O	'Decimal'	Minimum value of I/O density of CacheHit Write I/O in each accumulation period in the period of summarizing
33	Max Write Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
34	Min Write Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Write I/O in each accumulation period in the period of summarizing
35	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
36	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
37	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
38	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
39	Max Read Hit Count	Max. of I/O density of CacheHit Read I/O	'Decimal'	Maximum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
40	Min Read Hit Count	Min. of I/O density of CacheHit Read I/O	'Decimal'	Minimum value of I/O density of CacheHit Read I/O in each accumulation period in the period of summarizing
41	Max Read Hit Transfer Rate(KB/S)	Max. transfer rate of CacheHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing

Save Location	Field name (-header specified)	Content	Format	Description
42	Min Read Hit Transfer Rate(KB/S)	Min. transfer rate of CacheHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of CacheHit Read I/O in each accumulation period in the period of summarizing
43	Max Prefetch Read Hit Count	Max. of I/O density of PrefetchHit Read I/O	'Decimal'	Maximum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
44	Min Prefetch Read Hit Count	Min. of I/O density of PrefetchHit Read I/O	'Decimal'	Minimum value of I/O density of PrefetchHit Read I/O in each accumulation period in the period of summarizing
45	Max Prefetch Read Hit Transfer Rate(KB/S)	Max. transfer rate of PrefetchHit Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing
46	Min Prefetch Read Hit Transfer Rate(KB/S)	Min. transfer rate of PrefetchHit Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of PrefetchHit Read I/O in each accumulation period in the period of summarizing
47	Max Busy Ratio[%]	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
48	Min Busy Ratio[%]	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing
49	Semi-Synchronous Ordering Buffer Write Count	Number of write operations to the semi synchronous copy order guarantee buffer	'Decimal'	Number of write operations to the MV semi synchronous copy order guarantee buffer in the period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
50	Average Semi-Synchronous Ordering Buffer Waiting Time (micro sec)	Average wait time of the semi synchronous copy order guarantee buffer	'Decimal'	Average wait time (in microseconds) for the MV semi synchronous copy order guarantee buffer in the period of accumulation/summarizing
51	Max Semi-Synchronous Ordering Buffer Waiting Time (micro sec)	Maximum wait time of the semi synchronous copy order guarantee buffer	'Decimal'	Maximum wait time (in microseconds) for the MV semi synchronous copy order guarantee buffer in the period of accumulation/summarizing
52	Semi-Synchronous Ordering Buffer Write Transfer Rate(KB/S)	Transfer rate to write data to the semi synchronous copy order guarantee buffer	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing

Statistic Information Record Format for Physical Disks

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_PD	Record identifier	String	"R_STA_PD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Pd Group No	Group number	'Hexadecimal'	Group number of the physical disk
6	Pd No	Physical disk number	'Hexadecimal'	Physical disk number
7	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
8	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
10	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
11	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
12	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
13	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
14	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
15	Busy Ratio[%]	Average busy ratio	'Decimal'	Average busy ratio (percent) in the period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
16	Busy Time (milli sec)	Operating time	'Decimal'	Operating time (millisecond) in the period of accumulation/summarizing
17	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
18	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
19	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
20	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
21	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
22	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
23	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
24	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
25	Max Busy Ratio[%]	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
26	Min Busy Ratio[%]	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format for Rank

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_RANK	Record identifier	String	"R_STA_RANK" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the accumulation period of the original statistic information history file is saved as it is.
5	Pd Group No	Group number	'Hexadecimal'	Physical disk group number
6	Rank No	RANK number	'Hexadecimal'	RANK number
7	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
8	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microsecond) of Write I/O in period of accumulation/summarizing
9	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microsecond) of Write I/O in period of accumulation/summarizing
10	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobyte/second) of Write I/O in period of accumulation/summarizing
11	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
12	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microsecond) of Read I/O in period of accumulation/summarizing
13	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microsecond) of Read I/O in period of accumulation/summarizing
14	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobyte/second) of Read I/O in period of accumulation/summarizing
15	Busy Ratio[%]	Average busy ratio	'Decimal'	Average busy ratio (percent) in the period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
16	Busy Time (milli sec)	Operating Time	'Decimal'	Operating Time (milli sec) in the period of accumulation/summarizing
17	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
18	Min Write Count	Min. of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
19	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
20	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Write I/O in each accumulation period in the period of summarizing
21	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
22	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
23	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
24	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobyte/second) of Read I/O in each accumulation period in the period of summarizing
25	Max Busy Ratio[%]	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
26	Min Busy Ratio[%]	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format for Pools

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_POOL	Record identifier	String	"R_STA_POOL" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (milliseconds). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as is.
5	Pool No	Pool number	'Hexadecimal'	Pool number
6	Write Count	Write I/O count	'Decimal'	Total count of Write I/O in period of accumulation/summarizing
7	Average Write Response Time (micro sec)	Average response time of Write I/O	'Decimal'	Average response time (microseconds) of Write I/O in period of accumulation/summarizing
8	Max Write Response Time (micro sec)	Maximum response time of Write I/O	'Decimal'	Maximum response time (microseconds) of Write I/O in period of accumulation/summarizing
9	Write Transfer Rate(KB/S)	Transfer rate of Write I/O	'Decimal'	Transfer rate (kilobytes/second) of Write I/O in period of accumulation/summarizing
10	Read Count	Read I/O count	'Decimal'	Total count of Read I/O in period of accumulation/summarizing
11	Average Read Response Time (micro sec)	Average response time of Read I/O	'Decimal'	Average response time (microseconds) of Read I/O in period of accumulation/summarizing
12	Max Read Response Time (micro sec)	Maximum response time of Read I/O	'Decimal'	Maximum response time (microseconds) of Read I/O in period of accumulation/summarizing
13	Read Transfer Rate(KB/S)	Transfer rate of Read I/O	'Decimal'	Transfer rate (kilobytes/second) of Read I/O in period of accumulation/summarizing
14	Busy Ratio[%]	Average busy ratio	'Decimal'	Average busy ratio (percent) in period of accumulation/summarizing

Save Location	Field name (-header specified)	Content	Format	Description
15	Busy Time (milli sec)	Operating time	'Decimal'	Operating time (microseconds) in period of accumulation/summarizing
16	Max Write Count	Max. of I/O density of Write I/O	'Decimal'	Maximum value of I/O density of Write I/O in each accumulation period in the period of summarizing
17	Min Write Count	Min. of I/O density of Write I/O	'Decimal'	Minimum value of I/O density of Write I/O in each accumulation period in the period of summarizing
18	Max Write Transfer Rate (KB/S)	Max. transfer rate of Write I/O	'Decimal'	Maximum transfer rate (kilobytes/second) of Write I/O in each accumulation period in the period of summarizing
19	Min Write Transfer Rate (KB/S)	Min. transfer rate of Write I/O	'Decimal'	Minimum transfer rate (kilobytes/second) of Write I/O in each accumulation period in the period of summarizing
20	Max Read Count	Max. of I/O density of Read I/O	'Decimal'	Maximum value of I/O density of Read I/O in each accumulation period in the period of summarizing
21	Min Read Count	Min. of I/O density of Read I/O	'Decimal'	Minimum value of I/O density of Read I/O in each accumulation period in the period of summarizing
22	Max Read Transfer Rate (KB/S)	Max. transfer rate of Read I/O	'Decimal'	Maximum transfer rate (kilobytes/second) of Read I/O in each accumulation period in the period of summarizing
23	Min Read Transfer Rate(KB/S)	Min. transfer rate of Read I/O	'Decimal'	Minimum transfer rate (kilobytes/second) of Read I/O in each accumulation period in the period of summarizing
24	Max Busy Ratio[%]	Max. value of average busy ratio	'Decimal'	Maximum value of the average busy ratio in each accumulation period in the period of summarizing
25	Min Busy Ratio[%]	Min. value of average busy ratio	'Decimal'	Minimum value of the average busy ratio in each accumulation period in the period of summarizing

Statistic Information Record Format for Logical Disks (Capacity)

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_LDCP	Record identifier	String	"R_STA_LDCP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	No	Logical disk number	'Hexadecimal'	Logical disk number
6	Attribute(virtual)	Virtual capacity attribute	'Hexadecimal'	Attribute of the virtual capacity logical disk. 0x00:The following 7 to 10 items are invalid. 0x01:The following 7 to 10 items are valid.
7	Actual Used Capacity(KB)	Actual used capacity	'Decimal'	Actual used capacity of the virtual capacity logical disks (kilobyte)
8	Virtual Capacity(KB)	Virtual capacity	'Decimal'	Virtual capacity of the virtual capacity logical disks (kilobyte)
9	LD Cap. Threshold(%)	Threshold	'Decimal'	Threshold of the virtual capacity logical disks (percent). (Proportion taken up in virtual capacity) When no value is set or the value is invalid, the item is blank.
10	LD Cap. Quota(%)	Quota value	'Decimal'	Quota value of the virtual capacity logical disks (percent). (Proportion taken up in virtual capacity) If no value is set or the value is invalid, the item is blank.

Statistic Information Record Format for Pools (Capacity)

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_POOLCP	Record identifier	String	"R_STA_POOLCP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (millisecond). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as it is.
5	Pool No	Pool number	'Hexadecimal'	Pool number
6	Attribute(virtual)	Virtual capacity attribute	'Hexadecimal'	Attribute of the virtual capacity pool. 0x00: The following 7 to 10 items are invalid. 0x01: The following 7 to 10 items are valid.
7	Actual Used Capacity(MB)	Actual used capacity	'Decimal'	Actual used capacity (megabyte) of the virtual capacity pool
8	Actual Capacity(MB)	Actual capacity	'Decimal'	Actual capacity (megabyte) of the virtual capacity pool
9	Actual Cap. Threshold (pre)(%)	Threshold (pre)	'Decimal'	Threshold of the virtual capacity pool (pre) (percent). (Proportion taken up in actual capacity) When no value is set or the value is invalid, the item is blank.
10	Actual Cap. Threshold(%)	Threshold	'Decimal'	Threshold of the virtual capacity pool (percent). (Proportion taken up in actual capacity) When no value is set or the value is invalid, the item is blank.
11	Attribute(snap shot)	Snapshot attribute	'Hexadecimal'	Attribute of the snapshot used pool. 0x00: The following 12 to 14 items are invalid. 0x01: The following 12 to 14 items are valid.

Save Location	Field name (-header specified)	Content	Format	Description
12	Snapshot Used Capacity(MB)	Snapshot used capacity	'Decimal'	Snapshot used capacity (megabyte)
13	Snapshot Capacity(MB)	Snapshot capacity	'Decimal'	Snapshot capacity (megabyte)
14	Threshold(Snapshot)(%)	Threshold	'Decimal'	Snapshot threshold (%). (Proportion taken up in snapshot capacity) When no value is set or the value is invalid, the item is blank.

Statistic Information Record Format for Semi Synchronous Copy Order Guarantee Buffer Information

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_CONC	Record identifier	String	"R_STA_CONC" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (milliseconds). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as is.
5	Concentrator No	Concentrator number	'Hexadecimal'	Concentrator number
6	Disk Array High Water Mark (MB)	Whole setting amount	'Decimal'	Setting amount of semi synchronous copy order guarantee buffer across the disk array
7	AT Group High Water Mark (MB)	ATgroup setting amount	'Decimal'	Setting amount of semi synchronous copy order guarantee buffer for the current concentrator
8	Current Size (KB)	Current usage	'Decimal'	Current usage of semi synchronous copy order guarantee buffer for the specified concentrator at the time when the specified record was collected
9	Peak Size (KB)	Max usage	'Decimal'	Maximum usage of semi synchronous copy order guarantee buffer for the specified concentrator during the specified record's interval

Statistic Information Record Format for Cabinet Information

Save Location	Field name (-header specified)	Content	Format	Description
1	R_STA_CAB	Record identifier	String	"R_STA_CAB" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when statistic information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when statistic information in the record was collected
4	Interval (milli sec)	Period of accumulation	'Decimal'	Period of accumulation of statistic information (milliseconds). For a statistic information summarized file, the period of accumulation of the original statistic information history file is stored as is.
5	Cabinet Type	Cabinet number	'Decimal'	Cabinet type. 0: DAC. 1: DE.
6	Cabinet No	Cabinet number	'Hexadecimal'	Cabinet number
7	Electric Power (W)	Consumed power	'Decimal'	The electric power consumed by the cabinet. The unit is W. When summarizing the data, the average value in the period of summarizing is stored.
8	Electric Energy (Wh)	Consumed electric energy	'Decimal'	The electric energy consumed by the cabinet. The unit is Wh. When summarizing the data, the integrated value in the period of summarizing is stored. * Since this value is calculated by a formula, it might be different from the value measured by an electric energy meter.

Configuration Information Record

This record stores configuration information of each component of the disk array. There are the following types of configuration information records.

Configuration information record of a disk array

Configuration information record of a node

Configuration information record of a host director

Configuration information record of a disk director

Configuration information record of a host port

Configuration information record of a replication port

Configuration information record of a disk port

Configuration information record of a data migration port

Configuration information record of a cache

Configuration information record of a logical disk

Configuration information record of a physical disk

Configuration information record of a RANK

Configuration information record of a pool

Configuration information record of a cabinet

Logical disk name change record

Configuration change record

Logical disk move record

Among the above records, those other than the configuration change record and logical disk move records are output only when the option to output the configuration information (-compo) is specified.

"Save location" in the table indicates the order of the data separated by commas in the record. The save location of the leftmost data is 1.

Configuration Information Record Format for Disk Array

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_ARY	Record identifier	String	"R_COMPO_ARY" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Product Name	Product name	String	Product name of the disk array
5	Serial No	Serial number	String	Serial number of the disk array
6	Name	Device name	String	Name of the disk array
7	Saa	SAA	String	SAA of the disk array
8	Ld Num	No. of logical disks	'Decimal'	No. of logical disks of the disk array
9	Pd Num	No. of physical disks	'Decimal'	No. of physical disks of the disk array
10	Product Revision	Product revision	String	Product revision of the disk array

Configuration Information Record Format for Nodes

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_NODE	Record identifier	String	"R_COMPO_NODE" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Node No	Node number	'Hexadecimal'	Node number

Configuration Information Record Format for Host Directors

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_HD	Record identifier	String	"R_COMPO_HD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the host director
5	Node No	Node number	'Hexadecimal'	Node number

Configuration Information Record Format for Disk Directors

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_DD	Record identifier	String	"R_COMPO_DD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected

Save Location	Field name (-header specified)	Content	Format	Description
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the disk director
5	Node No	Node number	'Hexadecimal'	Node number

Configuration Information Record Format for Host Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_HP	Record identifier	String	"R_COMPO_HP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the host port
5	Port No	Port number	'Hexadecimal'	Port number of the host port
6	Node No	Node number	'Hexadecimal'	Node number
7	Port Type	Port type	'Decimal'	Port type 0: FC connection 1: iSCSI connection 2: SAS connection
8	Transfer Rate	Transfer rate	'Decimal'	Current port transfer rate. The unit is MB/s.
9	Function	Port type	'Decimal'	Port function 1: Host port 3: Host/réplication port 5: Host/data migration port

Configuration Information Record Format for Replication Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_RP	Record identifier	String	"R_COMPO_RP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the replication port
5	Port No	Port number	'Hexadecimal'	Port number of the replication port
6	Node No	Node number	'Hexadecimal'	Node number
7	Port Type	Port type	'Decimal'	Port type 0: FC connection 1: iSCSI connection 2: SAS connection
8	Transfer Rate	Transfer rate	'Decimal'	Current port transfer rate. The unit is MB/s.
9	Function	Port type	'Decimal'	Port function 2: Replication port 3: Host/réplication port

Configuration Information Record Format for Data Migration Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_MP	Record identifier	String	"R_COMPO_MP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-?	Date when information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the data migration port
5	Port No	Port number	'Hexadecimal'	Port number of the data migration port

Save Location	Field name (-header specified)	Content	Format	Description
6	Node No	Node number	'Hexadecimal'	Node number
7	Port Type	Port type	'Decimal'	Port type 0: FC connection 1: iSCSI connection 2: SAS connection
8	Transfer Rate	Transfer rate	'Decimal'	Current port transfer rate. The unit is MB/s.
9	Function	Port type	'Decimal'	Port function 5: Host/data migration port

Configuration Information Record Format for Disk Ports

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_DP	Record identifier	String	"R_COMPO_DP" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Director No	Director number	'Hexadecimal'	Director number of the host port
5	Port No	Port number	'Hexadecimal'	Port number of the host port
6	Node No	Node number	'Hexadecimal'	Node number

Configuration Information Record Format for Caches

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_CACHE	Record identifier	String	"R_COMPO_CACHE" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected

Save Location	Field name (-header specified)	Content	Format	Description
4	No	Number	'Decimal'	Cache number For a disk array with node, it indicates a node number.
5	Capacity (MB)	Cache capacity	'Decimal'	Cache capacity (MB)
6	L2 Cache Capacity (MB)	L2 cache capacity	'Decimal'	L2 cache capacity (MB)
7	L2 Cache Type	Operational function of L2 cache	'Decimal'	Operational function of L2 cache 0: L2 cache has not been bound. 8: Invalid L2 cache 9: Operates as the read cache. 13: Read cache/persistent write cache 15: Read/write/persistent write cache

Configuration Information Record Format for Logical Disks

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_LD	Record identifier	String	"R_COMPO_LD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	No	Logical disk number	'Hexadecimal'	Logical disk number
5	Resident	Cache resident	'Hexadecimal'	0x01:Cache resident 0x00:Cache non-resident
6	Capacity(KB)	Capacity	'Decimal'	Capacity (kilobyte) of the logical disk.
7	Os Type	Volume format of the expanded volume name	String	Volume format of the expanded volume name of the logical disk
8	Name	Expanded volume name	String	Expanded volume name of the logical disk
10	Pool No	Pool number	'Hexadecimal'	Number of the higher level pool of the logical disk. This data is not output when the pool function is not installed.

Save Location	Field name (-header specified)	Content	Format	Description
11	Attribute (snap shot)	Snapshot-volume attribute	String	The snapshot-volume attribute of the logical disk. BV:Base-volume SV:Snapshot-volume LV:Link-volume SDV:Snapshot data volume This data is not output when the logical disk is other than above.
12	LV(List) / LCL(List)	List of link-volumes (numbers)/ List of link target volumes (numbers)	'n','n',- n: Hexadecimal	When the logical disk is BV or SV: Numbers of all link-volumes that are used as the link target. When the logical disk is LV: Numbers of BVs or SVs that are used as the link target.
13	PD Type	PD type	String	PD type of the logical disk FC:FC disk ATA:ATA disk SAS:SAS disk SSD:SSD disk NLSAS:Nearline SAS disk SAS(SED):Encryption SAS disk
14	Node No	Node number	'Hexadecimal'	Node number
15	Read Cache	Read cache setting	String	Setting of read caches On:Read caches are enabled. Off:Read caches are disabled.
16	Write Cache	Write cache setting	String	Setting of write caches On:Write caches are enabled. Off:Write caches are disabled.
17	Sequential Data Mode	Cache retention setting of sequential access data	String	Cache retention setting of sequential access data On:Cache retention of sequential access data is enabled. On:Cache retention of sequential access data is disabled.

Configuration Information Record Format for Physical Disks

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_PD	Record identifier	String	"R_COMPO_PD" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Pd Group No	Group number	'Hexadecimal'	Group number of the physical disk
5	Pd No	Physical disk number	'Hexadecimal'	Number of the physical disk
6	Cycle(rpm)	Round per minute	'Decimal'	Round per minute (rpm) of the physical disk
7	Capacity(KB)	Capacity	'Decimal'	Capacity (kilobyte) of the physical disk
8	Serial No	Serial number	String	Serial number of the physical disk
9	Product Name	Product ID	String	Product ID of the physical disk
10	Pool No	Pool number	'Hexadecimal'	Number of the higher level pool of the physical disk
11	Type	Type	String	PD type of the physical disk FC:FC disk ATA:ATA disk SAS:SAS disk SSD:SSD disk NLSAS:Nearline SAS disk SAS(SED):Encryption SAS disk
12	Node No	Node number	'Hexadecimal'	Node number

Configuration Information Record Format for Rank

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_RANK	Record identifier	String	"R_COMPO_RANK" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Pd Group No	Group number	'Hexadecimal'	Physical disk group number
5	Rank No	RANK number	'Hexadecimal'	RANK number
6	Raid	RAID configuration	'Decimal'	RAID configuration for the RANK
7	Capacity(KB)	RANK size	'Decimal'	Size (kilobyte) of the RANK
8	Ld No(List)	Logical disk number	'n','n',– n: 'Hexadecimal'	Numbers of all logical disks bound for the RANK
9	Pd No(List)	Physical disk number	'n','n',– n: 'Hexadecimal'	Numbers of all Physical disks constituting the RANK

Configuration Information Record Format for Pools

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_POOL	Record identifier	String	"R_COMPO_POOL" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Pool No	Pool number	'Hexadecimal'	Pool number
5	Pool Name	Pool name	String	Pool name
6	Capacity(MB)	Pool size	'Decimal'	Size (megabytes) of the pool

Save Location	Field name (-header specified)	Content	Format	Description
7	Pool Type	Pool type	'Hexadecimal'	0x00:Basic pool 0x01:Dynamic pool
8	Raid Type	RAID configuration	String	RAID configuration of the pool
9	PD Type	PD type	String	PD type of the physical disk FC:FC disk ATA:ATA disk SAS:SAS disk SSD:SSD disk NLSAS:Nearline SAS disk SAS(SED):Encryption SAS disk
10	Node No	Node number	'Hexadecimal'	Node number
11	Used Capacity of Virtual cap. Pool(MB)	Used capacity of virtual capacity pool	'Decimal'	Total capacity (in megabytes) of the virtual capacity logical disks in the pool
12	Capacity of Virtual cap. Pool(MB)	Capacity of virtual capacity pool	'Decimal'	Pool capacity (in megabytes) of the virtual capacity pool

Configuration Information Record Format For Cabinets

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_CAB	Record identifier	String	"R_COMPO_CAB" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration information in the record was collected
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration information in the record was collected
4	Power Type	Power Type	'Decimal'	Power type is displayed. 1: AC power 2: DC power 3: Hybrid DC power

LD Name Change Record Format

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_NNC	Record identifier	String	"R_COMPO_NNC" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when the logical disk name was changed
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when the logical disk name was changed
4	No	Logical disk number	'Hexadecimal'	Number of the logical disk whose name was changed
5	Name	New logical disk name	String	Logical disk name after change

Configuration Change Record Format

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_CHG	Record identifier	String	"R_COMPO_CHG" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when configuration of the disk array was changed
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when configuration of the disk array was changed
4	Interval(sec)	Logging interval	'Decimal'	Logging interval time (seconds) for statistic information

Logical Disk Move Record Format

Save Location	Field name (-header specified)	Content	Format	Description
1	R_COMPO_LDM	Record identifier	String	"R_COMPO_LDM" is set.
2	Date	Date	yyyy/mm/dd yyyy-Year mm-Month dd-Day	Date when the logical disk has been transferred
3	Time	Time	hh:mm:ss hh-Hour mm-Minute ss-Second	Time when the logical disk has been transferred
4	Pd Group No	Group number of the source logical disk	'Hexadecimal'	PD group number of the RANK for which the source logical disk has been bound. This is not output for disk arrays with pool.
5	Rank No	RANK number of the source logical disk	'Hexadecimal'	RANK number of RANK for which the source logical disk has been bound. This is not output for disk arrays with pool.
6	Ld No	Source logical disk number	'Hexadecimal'	Source logical disk number
7	Pd Group No (work disk)	Group number of the destination logical disk	'Hexadecimal'	PD group number of the RANK for which the destination logical disk has been bound. This is not output for disk arrays with pool.
8	Rank No (work disk)	RANK number of the destination logical disk	'Hexadecimal'	RANK number of the RANK for which the destination logical disk has been bound. This is not output for disk arrays with pool.
9	Ld No (work disk)	Destination logical disk number	'Hexadecimal'	Destination logical disk number
10	Pool No	Pool number of the source logical disk	'Hexadecimal'	Pool number for which the source logical disk has been bound. This is not output for other than disk arrays with pool.
11	Pool No (work disk)	Pool number of the destination logical disk	'Hexadecimal'	Pool number for which the destination logical disk has been bound. This is not output for other than disk arrays with pool.

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Performance Report Editor

Performance Summary Report

Displays the statistic information on the entire disk array and each component of the disk array throughout the period of summarizing. Below is shown a display image (filename: 20070417Storage_1_psl_sum.txt/20070417Storage4300_psl_sum.txt).

Example for the disk array with pool

Display Item	Explanation
disk array name	Nickname of the disk array
sampling term	Period of accumulation of statistic information
unit	Unit of accumulation of statistic information
	"S": In seconds
	"H": In hours
	"D": In days
no	Device number of each component
iops	External I/O density (count/second) in the accumulation period
trrate	External transfer rate (megabyte/second) in the accumulation period
av.len	External average transfer length (kilobyte) in the accumulation period
av.resp	External average response time (millisecond) in the accumulation period
w.ratio	Ratio (percent) of write I/O in the accumulation period
r.hit	Ratio (percent) of cache-hit read I/O in the accumulation period
pref.hit	Ratio (percent) of prefetch-hit read I/O among cache-hit read I/O in the accumulation period
w.hit	Ratio (percent) of cache-hit write I/O in the accumulation period
busy	Average busy ratio (percent) in the accumulation period. '***.**' is displayed if the information of the busy ratio does not exist.
av.que	Average queue length in the accumulation period
mx.que	Max queue length in the accumulation period
av.dt	Average dirty pages in the measurement period '***.**' is displayed if the information of the average dirty pages does not exist.
mx.dt	Max dirty pages in the measurement period '***.**' is displayed if the information of the max dirty pages does not exist.
LOCAL NODE	Statistical information of the local node This indicates the statistical information of the accumulated I/O requests received by the host port belonging to the corresponding node among the I/O requests that the logical disk belonging to the corresponding node received from the host.
REMOTE NODE	Statistical information of the remote node This indicates the statistical information of the accumulated I/O requests received by the host port belonging to a node other than the corresponding node among the I/O requests that the logical disk belonging to the corresponding node received from the host. If there are multiple nodes other than the corresponding node, the statistical information of remote nodes indicates the total number of I/O requests for the multiple nodes.
INITIATOR	Statistical information as an initiator of the replication port This indicates the statistical information of the I/O requests issued to the disk array connected by Replication from the corresponding replication port.
TARGET	Statistical information as a target of the replication port This indicates the statistical information of the I/O requests received from the disk array connected by Replication in the corresponding replication port.

Disk Array Performance Detail Report

Chronologically displays statistic information on the entire disk array. Below is shown a display image (file name: 20070417Storage_1_psl_array.txt).

```
<< DISK ARRAY PERFORMANCE REPORT >>

disk array name          Storage_1

        date   time       iops   trrate(MB/s)   av.len(KB)   av.resp(ms)   w.ratio(%)   r.hit(%)   pref.hit(%)   w.hit(%)
   07-04-17 13:21          0.17          0.00         7.65          1.26       100.00       0.00         0.00     100.00
 * 07-04-17 13:29        446.01         27.82        63.88          3.85       100.00       0.00         0.00      99.73
 * 07-04-17 13:40       1372.26         85.58        63.86          3.87       100.00       0.00         0.00      99.78
   07-04-17 13:48       1464.96         91.40        63.88          3.83       100.00       0.00         0.00      99.74


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	I/O density (count/second) in the accumulation period
trrate	External transfer rate (megabyte/second) in the accumulation period
av.len	External average transfer length (kilobyte) in the accumulation period
av.resp	External average response time (millisecond) in the accumulation period
w.ratio	Ratio (percent) of write I/O in the accumulation period
r.hit	Ratio (percent) of cache-hit read I/O in the accumulation period
pref.hit	Ratio (percent) of prefetch-hit read I/O among cache-hit read I/O in the accumulation period
w.hit	Ratio (percent) of cache-hit write I/O in the accumulation period

Node Performance Detail Report

Chronologically displays statistic information of the node. Below is shown a display image (file name: 20070524Storage_1_psl_node.txt).

```
<< NODE PERFORMANCE REPORT >>

disk array name        Storage_1

node no = 00h


     +-----------------------------LOCAL NODE----------------------------+-----------------------------REMOTE NODE----------------------------+
   date  time    iops  trrate(MB/s) av.len(KB)  av.resp(ms)  t.hit(%)    iops  trrate(MB/s) av.len(KB) av.resp(ms)  t.hit(%)
   07-05-24  12:44   66.36    66.36    1024.00    28.37   72.59    0.00    0.00    0.00    0.00    0.00
 * 07-05-24  12:48   68.32    68.32    1024.00    27.88   73.29    0.00    0.00    0.00    0.00    0.00
 * 07-05-24  12:52   65.02    65.02    1024.00    29.10   72.64    0.00    0.00    0.00    0.00    0.00
   07-05-24  12:56   68.38    68.38    1024.00    27.66   70.90    0.00    0.00    0.00    0.00    0.00
   07-05-24  13:00   67.07    67.07    1024.00    28.20   71.50    0.00    0.00    0.00    0.00    0.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
node no	Node number
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time when statistic information was collected
iops	I/O density (count/second) in the accumulation period
trrate	External transfer rate (megabyte/second) in the accumulation period
av.len	External average transfer length (kilobyte) in the accumulation period
av.resp	External average response time (millisecond) in the accumulation period
w.ratio	Ratio (percent) of write I/O in the accumulation period
t.hit	Ratio (percent) of cache-hit read I/O and write I/O in the accumulation period
LOCAL NODE	Statistical information of the local node This indicates the statistical information of the accumulated I/O requests received by the host port belonging to the corresponding node among the I/O requests that the logical disk belonging to the corresponding node received from the host.
REMOTE NODE	Statistical information of the remote node This indicates the statistical information of the accumulated I/O requests received by the host port belonging to a node other than the corresponding node among the I/O requests that the logical disk belonging to the corresponding node received from the host. If there are multiple nodes other than the corresponding node, the statistical information of remote nodes indicates the total number of I/O requests for the multiple nodes.

Host Director Performance Detail Report

Chronologically displays port-based statistic information on the host director extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_hp.txt).

```
<<  HOST DIRECTOR PERFORMANCE REPORT  >>

disk array name          Storage_1

dir no = 00h

      date     time  busy(%)  av.que   mx.que

   07-04-17   13:21  100.00     5.00    15.00
 * 07-04-17   13:29    0.00     5.00    15.00
 * 07-04-17   13:40    0.00     5.00    15.00
   07-04-17   13:48    0.00     5.00    15.00

dir no = 01h

      date     time  busy(%)  av.que   mx.que

   07-04-17   13:21  100.00     5.00    15.00
 * 07-04-17   13:29    0.00     5.00    15.00
 * 07-04-17   13:40    0.00     5.00    15.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
dir no	Number of the host director port
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
busy	Average busy ratio (percent) in the accumulation period '***.**' is displayed if the information of the busy ratio does not exist.
av.que	Average queue length in the accumulation period
max.que	Max queue length in the accumulation period

Disk Director Performance Detail Report

Chronologically displays the statistic information about disk directors, which is extracted from the statistic information file, for each disk director. Below is shown a display image (file name: 20070417Storage_1_psl_dd.txt).

```
<< DISK DIRECTOR PERFORMANCE REPORT  >>

disk array name          Storage_1

dir no = 00h

    date  time  busy(%)

    07-04-17 13:21   22.19
 *  07-04-17 13:29   21.61
 *  07-04-17 13:40   23.82
    07-04-17 13:48   19.82

dir no = 01h

    date  time  busy(%)

    07-04-17 13:21    0.00
 *  07-04-17 13:29    0.00
 *  07-04-17 13:40    0.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
dir no	Number of the disk director
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time when statistic information was collected
busy	Average busy ratio (percent) in the accumulation period

Host Port Performance Detail Report

Chronologically displays port-based statistic information on the host port extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_hp.txt).

```
<< HOST DIRECTOR PORT PERFORMANCE REPORT >>

disk array name          Storage_1


port no = 00h-00h

    date  time ------------- iops -------------------- ----------- trrate(MB/s) ---------- ----------- av.len(KB) ----------- -  w.ratio(%)  busy(%)
                    total   read   write   total   read   write   total   read   write -
    07-04-17 13:21  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:29  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:40  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:48  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00

port no = 00h-01h

    date  time ------------- iops -------------------- ----------- trrate(MB/s) ---------- ----------- av.len(KB) ----------- -  w.ratio(%)  busy(%)
                    total   read   write   total   read   write   total   read   write -
    07-04-17 13:21  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:29  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:40  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00
    07-04-17 13:48  0.00   0.00   0.00    0.00   0.00   0.00    0.00   0.00   0.00 -    0.00     0.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
port no	Number of the host port
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	External I/O density (count/second) in the accumulation period
	total:External I/O density for all I/O
	read:External I/O density for read I/O
	write:External I/O density for write I/O
trrate	External transfer rate (megabyte/second) in the accumulation period
	total:External transfer rate for all I/O
	read:External transfer rate for read I/O
	write:External transfer rate for write I/O
av.len	External average transfer length (kilobyte) in the accumulation period
	total:External average transfer length for all I/O
	read:External average transfer length for read I/O
	write:External average transfer length for write I/O
av.resp	External average response time (millisecond) in the accumulation period
	total:External average response time for all I/O
	read:External average response time for read I/O
	write:External average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period
busy	Average rate (percent) BUSY during accumulation period
	'***.**' is displayed if the information of the busy ratio does not exist.

Replication Port Performance Detail Report (Initiator)

Chronologically displays port-based statistic information on the replication port (initiator) extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_rp-i.txt).

```
<< s_REPLICATION DIRECTOR PORT(INITIATOR) PERFORMANCE REPORT >>

disk array name        Storage_1


port no = 01h-00h

   date  time -------------- iops --------------------- ---------- trrate(MB/s) ----------- ------------ av.len(KB) ----------- -  w.ratio(%)  busy(%)
                  total   read   write   total   read   write   total   read   write -
07-04-17  13:21   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:29   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:40   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:48   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00

port no = 01h-01h

   date  time -------------- iops --------------------- ---------- trrate(MB/s) ----------- ------------ av.len(KB) ----------- -  w.ratio(%)  busy(%)
                  total   read   write   total   read   write   total   read   write -
07-04-17  13:21   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:29   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:40   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00
07-04-17  13:48   0.00    0.00   0.00    0.00    0.00   0.00    0.00    0.00   0.00 -    0.00   0.00


PERFORMANCE REPORT SUCCESSFUL
```

Display Item	Explanation
disk array name	Nickname of the disk array
port no	Number of the replication port
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	External I/O density (count/second) in the accumulation period total:External I/O density for all I/O read:External I/O density for read I/O write:External I/O density for write I/O
trrate	External transfer rate (megabytes/second) in the accumulation period total:External transfer rate for all I/O read:External transfer rate for read I/O write:External transfer rate for write I/O
av.len	External average transfer length (kilobytes) in the accumulation period total:External average transfer length for all I/O read:External average transfer length for read I/O write:External average transfer length for write I/O
av.resp	External average response time (milliseconds) in the accumulation period total:External average response time for all I/O read:External average response time for read I/O write:External average response time for write I/O
w.ratio	Rate (percent) of write I/O in the accumulation period
busy	Average rate (percent) of BUSY during accumulation period '***.**' is displayed if the information of the busy ratio does not exist.

Replication Port Performance Detail Report (Target)

Chronologically displays port-based statistic information on the replication port (target) extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_rp-t.txt).

```
<< REPLICATION DIRECTOR PORT(TARGET) PERFORMANCE REPORT >>

disk array name        Storage_1


port no = 01h-00h

    date   time ---------------- iops --------------------- ---------- trrate(MB/s) ----------- -  w.ratio(%) ------ cache hit(%) ----  busy(%)
                 total   read    write    total   read   write -          read     write
    07-04-17  13:21   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:29   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:40   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:48   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00

port no = 01h-01h

    date   time ---------------- iops --------------------- ---------- trrate(MB/s) ----------- -  w.ratio(%) ------ cache hit(%) ----  busy(%)
                 total   read    write    total   read   write -          read     write
    07-04-17  13:21   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:29   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:40   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00
    07-04-17  13:48   0.00    0.00    0.00     0.00    0.00    0.00 -     0.00     0.00    0.00    0.00

PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
port no	Number of the replication port
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	External I/O density (count/second) in the accumulation period
	total:External I/O density for all I/O
	read:External I/O density for read I/O
	write:External I/O density for write I/O
trrate	External transfer rate (megabytes/second) in the accumulation period
	total:External transfer rate for all I/O
	read:External transfer rate for read I/O
	write:External transfer rate for write I/O
av.len	External average transfer length (kilobytes) in the accumulation period
	total:External average transfer length for all I/O
	read:External average transfer length for read I/O
	write:External average transfer length for write I/O
av.resp	External average response time (milliseconds) in the accumulation period
	total:External average response time for all I/O
	read:External average response time for read I/O
	write:External average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period
cache hit	Ratio (percent) of cache-hit I/O in the accumulation period
	read:Ratio of cache-hit read I/O
	write:Ratio of cache-hit write I/O
busy	Average rate (percent) of BUSY during accumulation period
	'***.**' is displayed if the information of the busy ratio does not exist.

Disk Port Performance Detail Report

Chronologically displays port-based statistic information on the disk port extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_dp.txt).

```
<<  DISK DIRECTOR PORT PERFORMANCE REPORT >>

disk array name          Storage_1


port no = 10h-00h

   date  time ---------------- iops --------------------- ---------- trrate(MB/s) ---------- ---------- av.len(KB) ----------  -  w.ratio(%)  busy(%)
                     total     read    write    total    read    write   total    read    write -
07-04-17  13:21    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:29    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:40    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:48    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00

port no = 10h-01h

   date  time ---------------- iops --------------------- ---------- trrate(MB/s) ---------- ---------- av.len(KB) ----------  -  w.ratio(%)  busy(%)
                     total     read    write    total    read    write   total    read    write -
07-04-17  13:21    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:29    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:40    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00
07-04-17  13:48    0.00     0.00     0.00     0.00     0.00     0.00    0.00     0.00     0.00 -       0.00     0.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
port no	Number of the disk port
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	Internal I/O density (count/second) in the accumulation period
	total:Internal I/O density for all I/O
	read:Internal I/O density for read I/O
	write:Internal I/O density for write I/O
trrate	Internal transfer rate (megabyte/second) in the accumulation period
	total:Internal transfer rate for all I/O
	read:Internal transfer rate for read I/O
	write:Internal transfer rate for write I/O
av.len	Internal average transfer length (kilobyte) in the accumulation period
	total:Internal average transfer length for all I/O
	read:Internal average transfer length for read I/O
	write:Internal average transfer length for write I/O
av.resp	Internal average response time (millisecond) in the accumulation period
	total:Internal average response time for all I/O
	read:Internal average response time for read I/O
	write:Internal average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period
busy	Average rate (percent) of BUSY during accumulation period
	'***.**' is displayed if the information of the busy ratio does not exist.

Cache Performance Detail Report

Chronologically displays cache-based statistic information on the cache extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_cache.txt).

```
<< CACHE PERFORMANCE REPORT >>

disk array name          StorageD3


no = 00h

        date   time   av.dt(%)   mx.dt(%)

  07-04-17  13:21      0.55       2.75
* 07-04-17  13:29      0.00       0.00
* 07-04-17  13:40      0.00       0.00
  07-04-17  13:48      0.00       0.00


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
no	Number of the cache
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time performance information was collected
av.dt	Average dirty pages (percent) in the accumulation period
mx.dt	Max dirty pages (percent) in the accumulation period

Logical Disk Performance Detail Report

Chronologically displays disk-based statistic information on the logical disk extracted from the statistic information file. Below is shown a display image (file name: 20070524Storage_1_psl_ld.txt/20070417StorageS4300_psa_ld.txt).

```
<< LOGICAL DISK PERFORMANCE REPORT >>

disk array name       Storage_1


disk no = 0000h   evn = 200000004C7F3E2F0000

  date  time ---------------- iops -------------------- ----------- trrate(MB/s) ----------- - -------- cache hit(%) --------- busy(%) cheseg no  pool no
               total    read   write   total   read   write -   read prefetch  write
  07-05-24 12:44   67.05   33.07   33.98   67.05   33.07   33.98 -   48.62    3.83  97.18  95.31  00h-00h   0000h
* 07-05-24 12:48   66.94   33.30   33.64   66.94   33.30   33.64 -   48.49    4.92  97.00  95.41  00h-00h   0000h
* 07-05-24 12:52   66.35   33.24   33.10   66.35   33.24   33.10 -   45.78    3.38  97.38  95.17  00h-00h   0000h
  07-05-24 12:56   68.79   35.74   33.05   68.79   35.74   33.05 -   46.59    4.23  97.73  95.31  00h-00h   0000h
  07-05-24 13:00   66.64   33.25   33.39   66.64   33.25   33.39 -   46.65    3.61  97.22  95.20  00h-00h   0000h

PERFORMANCE REPORT SUCCESSFUL.
```

```
<< s. LOGICAL DISK PERFORMANCE REPORT >>

disk array name          Storage4300


disk no = 0000h   evn = LD001

     date  time ----------------- iops ------------------ ----------- trrate(MB/s) ----------- - --------- cache hit(%) --------- busy(%) cheseg no   rank no
                total    read    write    total    read    write -    read prefetch write
07-04-17  13:21   67.05   33.07   33.98   67.05   33.07   33.98 -   48.62   3.83 97.18   95.31    00h  00h-11h
07-04-17  13:28   66.94   33.30   33.64   66.94   33.30   33.64 -   48.49   4.92 97.00   95.41    00h  00h-11h
07-04-17  13:40   66.35   33.24   33.10   66.35   33.24   33.10 -   45.78   3.38 97.38   95.17    00h  00h-11h
07-04-17  13:48   68.79   35.74   33.05   68.79   35.74   33.05 -   46.59   4.23 97.73   95.31    00h  00h-11h
PERFORMANCE REPORT SUCCESSFUL
```

Display Item	Explanation
disk array name	Nickname of the disk array
disk no	Number of the logical disk
evn	Nickname of the logical disk
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	External I/O density (count/second) in the accumulation period
	total:External I/O density for all I/O
	read:External I/O density for read I/O
	write:External I/O density for write I/O
trrate	External transfer rate (megabyte/second) in the accumulation period
	total:External transfer rate for all I/O
	read:External transfer rate for read I/O
	write:External transfer rate for write I/O
av.len	External average transfer length (kilobyte) in the accumulation period
	total:External average transfer length for all I/O
	read:External average transfer length for read I/O
	write:External average transfer length for write I/O
av.resp	External average response time (millisecond) in the accumulation period
	total:External average response time for all I/O
	read:External average response time for read I/O
	write:External average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period

Display Item	Explanation
cache hit	Ratio (percent) of cache-hit I/O in the accumulation period
	read:Ratio (percent) of cache-hit read I/O
	prefetch:Ratio (percent) of prefetch-hit read I/O among cache-hit read I/O
	write:Ratio (percent) of cache-hit write I/O
busy	Average busy ratio (percent) in the accumulation period. '***.**' is displayed if the information of the busy ratio does not exist.
rank no	RANK number to which an applicable logical disk currently belongs. In multi-RANK configuration, all RANK numbers are listed.
pool no	Pool number to which the logical disk belongs.

Physical Disk Performance Detail Report

Chronologically displays disk-based statistic information on the physical disk extracted from the statistic information file. Below is shown a display image (file name: 20070524Storage_1_psa_pd.txt).

```
<< PHYSICAL DISK PERFORMANCE REPORT >>

disk array name        Storage_1


disk no = 00h-00h

   date  time ------------------ iops -------------------- ------------ trrate(MB/s) ------------ ---------- av.len(KB) ---------- - w.ratio(%)  busy(%)
            total   read   write   total   read   write   total   read   write -
 07-05-24  12:44   99.10  16.56  82.53  34.27   4.54  29.73  354.16  280.71  368.90 -    83.29  95.47
* 07-05-24  12:48   99.01  16.80  82.21  34.25   4.53  29.72  354.22  276.25  370.15 -    83.03  95.24
* 07-05-24  12:52   99.12  17.26  81.86  34.10   4.82  29.28  352.30  286.11  366.26 -    82.58  95.29
 07-05-24  12:56   99.88  18.68  81.20  34.10   5.07  29.02  349.57  278.06  366.02 -    81.30  95.30
 07-05-24  13:00   99.47  17.30  82.16  34.25   4.72  29.52  352.55  279.51  367.94 -    82.60  95.15


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
disk no	Number of the physical disk
Leftmost position (configuration change mark)	An asterisk is displayed immediately after change in the disk array configuration or restart of accumulation of statistic information.
date, time	Date and time statistic information was collected
iops	Internal I/O density (count/second) in the accumulation period
	total:Internal I/O density for all I/O
	read:Internal I/O density for read I/O
	write:Internal I/O density for write I/O

Display Item	Explanation
trrate	Internal transfer rate (megabyte/second) in the accumulation period
	total:Internal transfer rate for all I/O
	read:Internal transfer rate for read I/O
	write:Internal transfer rate for write I/O
av.len	Internal average transfer length (kilobyte) in the accumulation period
	total:Internal average transfer length for all I/O
	read:Internal average transfer length for read I/O
	write:Internal average transfer length for write I/O
av.resp	Internal average response time (millisecond) in the accumulation period
	total:Internal average response time for all I/O
	read:Internal average response time for read I/O
	write:Internal average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period
busy	Average busy ratio (percent) in the accumulation period. '***.**' is displayed if the information of the busy ratio does not exist.

Rank Performance Detail Report

Chronologically displays RANK-based statistic information on the RANK retrieved from the statistic information file. A display image (file name: 20070417StorageS4300_psa_ rank.txt) is shown below

```
<< RANK PERFORMANCE REPORT >>

disk array name          StorageS4300


rank no = 00h-00h

      date   time ------------------- iops ------------------ ---------- trrate(MB/s) ------------ ---------- av.len(KB) ------------ - w.ratio(%)  busy(%)
                    total    read   write   total   read   write   total   read   write -
    07-04-17  13:21   115.01   52.93   62.08   12.24    5.14    7.10   108.97   99.43  117.11 -   53.98   78.12
  * 07-04-17  13:29   116.69   54.31   62.37   12.39    5.28    7.11   108.73   99.47  116.79 -   53.45   79.05
  * > 07-04-17  13:40  114.76   53.40   61.37   12.13    5.13    7.00   108.23   98.41  116.77 -   53.47   77.85
    07-04-17  13:48   114.54   53.21   61.33   12.16    5.16    7.00   108.67   99.25  116.84 -   53.54   77.77


PERFORMANCE REPORT SUCCESSFUL
```

Display Item	Explanation
disk array name	Nickname of the disk array
rank no	RANK number
First column	An asterisk is displayed immediately after changes have been made to the disk array configuration or the accumulation of statistic information has been restarted.

Display Item	Explanation
Second column	A greater-than sign '>' is displayed when a logical disk has been transferred to the RANK from another RANK by the performance optimization function.
date, time	Date and time when statistic information was collected
iops	Internal I/O density (number of times/second) in the calculating period
	total:Internal I/O density for all I/O
	read:Internal I/O density for read I/O
	write:Internal I/O density for write I/O
trrate	Internal transfer rate (megabytes/second) in the calculating period
	total:Internal transfer rate for all I/O
	read:Internal transfer rate for read I/O
	write:Internal transfer rate for write I/O
av.len	Internal average transfer length (kilobytes) in the calculating period
	total:Internal average transfer length for all I/O
	read:Internal average transfer length for read I/O
	write:Internal average transfer length for write I/O
av.resp	Internal average response (millisecond) in the calculating period
	total:Internal average response time for all I/O
	read:Internal average response time for read I/O
	write:Internal average response time for write I/O
w.ratio	Ratio of Write I/O (percent) in the calculating period
busy	Busy Ratio of the RANK '***.**' is displayed if the information of the busy ratio does not exist.

Pool Performance Detail Report

Chronologically displays pool-based statistic information on the pool extracted from the statistic information file. Below is shown a display image (file name: 20070417Storage_1_psl_pool.txt).

```
<<...POOL PERFORMANCE REPORT >>

disk array name        Storage_1


pool no = 0001h    pool name = Pool0001

    date   time  -------------------- iops -------------------- ---------- trrate(MB/s) ----------- ---------- av.len(KB) ------------- - w.ratio(%) busy(%)
                  total    read    write   total    read    write   total    read    write -
 07-04-17 13:21  118.19   76.15   42.04   36.96   22.06   14.89   320.19  296.67  362.79 -   35.57   67.40
 07-04-17 13:29  123.17   74.92   48.25   36.95   19.78   17.18   307.22  270.31  364.55 -   39.17   65.06
 07-04-17 13:40  122.90   74.11   48.79   36.93   19.66   17.27   307.68  271.63  362.44 -   39.70   65.52
 07-04-17 13:48  123.64   74.13   49.51   37.24   19.57   17.67   308.46  270.37  365.49 -   40.05   63.90


PERFORMANCE REPORT SUCCESSFUL.
```

Display Item	Explanation
disk array name	Nickname of the disk array
pool no	Number of the pool
pool name	Nickname of the pool
First column	An asterisk is displayed immediately after the disk array configuration has been changed or the accumulation of statistic information has been restarted.
Second column	A greater-than sign '>' is displayed when a logical disk has been transferred to the pool from another pool by the performance optimization function.
date, time	Date and time statistic information was collected
iops	Internal I/O density (count/second) in the accumulation period
	total:Internal I/O density for all I/O
	read:Internal I/O density for read I/O
	write:Internal I/O density for write I/O
trrate	Internal transfer rate (megabytes/second) in the accumulation period
	total:Internal transfer rate for all I/O
	read:Internal transfer rate for read I/O
	write:Internal transfer rate for write I/O
av.len	Internal average transfer length (kilobytes) in the accumulation period
	total:Internal average transfer length for all I/O
	read:Internal average transfer length for read I/O
	write:Internal average transfer length for write I/O

Display Item	Explanation
av.resp	Internal average response time (milliseconds) in the accumulation period
	total:Internal average response time for all I/O
	read:Internal average response time for read I/O
	write:Internal average response time for write I/O
w.ratio	Ratio (percent) of write I/O in the accumulation period
busy	Busy ratio (percent) in the accumulation period
	'***.**' is displayed if the information of the busy ratio does not exist.

File Size Estimate

The disk capacity required for accumulating and summarizing statistic information can be estimated by disk array configuration and logging interval.

The capacity to be calculated is assumed as a general case. The actual capacity differs from the calculated one depending on the disk array configuration change and I/O situation, etc.

Therefore, reserve a disk capacity sufficiently larger than the calculated capacity.

Statistic Information History File

The disk capacity for the statistic information history file required when statistic information is accumulated for one month can be calculated by using the following formula.

Required disk capacity [MB] =(A + the number of LDs + the number of PDs) x B / logging interval (min.)

For A, the constant in the following constant table is substituted in accordance with your disk array.

Disk Array	Constant (A)	Constant (B)
SnapSAN S5000	100	4

Statistic Information Summarized File

The capacity for the statistic information summarized file must be reserved when summarizing statistic information.

The disk capacity required when statistic information is summarized for one month can be calculated by using the following formula.

- Statistic information primary summarized file

  Required disk capacity [MB] =(C + the number of LDs + the number of PDs) / 200 24 (hours a day)

- Statistic information secondary summarized file

  Required disk capacity [MB] = (C + the number of LDs + the number of PDs) / 200

  For B, the constant in the following constant table is substituted in accordance with your disk array.

Disk Array	Constant (C)
SnapSAN S3000/SnapSAN S5000	100

Required disk capacity calculation

An example of the calculation procedure for the required disk capacity is shown below.

Disk array targeted for monitoring:S4900
(the number of LDs: 8192, the number of PDs: 1200)

Logging interval:10 min.

Keep period:Statistic information history file: for 3 months

Statistic information primary summarized file: for 6 months

Statistic information secondary summarized file: for one year (=for 12 months)

Capacity for the statistic information history file
= (400 + 8192 + 1200) ´ 4 / 10 ´ 3 (months)
= 11750.4 [MB] = 11.5 [GB]

Capacity for the statistic information primary summarized file
= (1000 + 8192 + 1200) / 200 ´ 24 ´ 6 (months)
= 7482.24 [MB]

Capacity for the statistic information secondary summarized file
= (1000 + 8192 + 1200) / 200 ´ 12 (months)
= 623.52 [MB]

Required disk capacity= 11750.4 + 7482.24 + 623.52
= 19856.16 [MB]
= approx. 20 [GB]

Notes

Notes on Real-Time Display of Load Status

No components of the relevant disk arrays can be displayed in real-time in the following cases.

- When disk array monitoring is stopped
- When an error occurred in communication between the SnapSAN Performance Monitor server and disk arrays

Notes on Accumulating Statistic Information

No statistic information can be accumulated in the following cases.

- When disk array monitoring is stopped
- When accumulation of statistic information is stopped by the SnapSAN Performance Monitorprflog command or the real-time display screen
- When an error occurred in communication between the SnapSAN Performance Monitor server and disk arrays

When the system time of the machine where SnapSAN Performance Monitor server is operating is changed during the SnapSAN Performance Monitor server operation, statistic information may not be accumulated correctly. When changing the system time, stop the SnapSAN Performance Monitor server.

Notes on Summarizing/Extracting/Editing Statistic Information

When the time zone of SnapSAN Performance Monitor Ver6.3 or earlier is different between the machines where summarizing/extracting/editing statistic information is performed and the machine where the SnapSAN Performance Monitor server with statistic information accumulated is operating, summarizing/extracting/editing statistic information cannot be performed correctly.

Summarize, extract, and edit statistic information according to the time zone of the machine where the SnapSAN Performance Monitor server is operating.

In addition, when you perform summarizing/extracting/editing statistic information, use the performance analysis supporting tools (archiver/CSV conversion tool/editor tool) newer than the SnapSAN Performance Monitor server on which statistic information history files are created. In general, it is not allowed to perform summarizing/extracting/editing statistic information using the performance analysis supporting tools older than the SnapSAN Performance Monitor server on which statistic information history files are created. (Here, the value "x.y" of a version "x.y.z" is compared. "z" is ignored.)

Notes on Incompatibility

In SnapSAN Performance Monitor Ver3.4 or earlier, there was a problem that the statistic information could not be accumulated if the statistic information could not be collected within the logging interval specified in the SnapSAN Performance Monitor server environment definition due to the large device configuration.

To solve this problem, the SnapSAN Performance Monitor function was enhanced in Ver4.1 to provide the "automatic adjustment of logging interval" function. This function enables to accumulate the statistic information by automatically changing the logging interval to an appropriate value if the information cannot be collected by the default logging interval.

Since the problem that the statistic information cannot be accumulated has a significant impact on the operation for the users who use the performance monitoring function, "automatic adjustment of logging interval" is set to the default behavior. Therefore, when updating SnapSAN Performance Monitor from Ver3.4 or earlier to Ver4.1 or later, note that the value of the interval to collect the statistic information might vary depending on the device configuration.

Normally, there is no problem in the default setting of "automatic adjustment of logging interval". If you want to specify a certain logging interval for convenience of the operation management, change the setting to "not to adjust automatically" and restart the SnapSAN Performance Monitor server.

If an inappropriate value is set to the "logging interval" after this change, note that the statistic information might not be output properly.

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