Overland Storage

SnapSAN™ S5000 AutoTune

User Guide

November 2012

10400409-002

Preface

This user guide explains how to install, setup, and use your new SnapSAN AutoTune for Windows software to perform analysis by centrally managing disk arrays performance data collected by the performance monitoring function (Performance Monitor). By introducing the performance analysis function, man-hours and management costs of the system administrator engaged in the performance analysis can be reduced.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.

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 S5000, 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.

Contents

Chapter 1

Performance Analysis (Auto Tune)

Overview

The performance analysis function (AutoTune) makes performance analysis efficient by centrally managing disk arrays performance data collected by the performance monitoring function (Performance Monitor). By introducing the performance analysis function, man-hours and management costs of the system administrator engaged in the performance analysis can be reduced.

The performance analysis function has the following features.

- The overall performance situation can be grasped at a point

  The main performance indexes such as the I/O Density, the transfer rate, the response time, the cache hit ratio can graph, in addition to the main capacity indexes such as allocation state with the capacity of the Thin Provisioning function and increase tendency, can be easily graphed and displayed as raw data. Display items are prepared in advance and need not be set first. Also, it is possible to customize a display item flexibly as occasion demands and the whole status can be efficiently grasped according to the purpose.

- The enormous metrics can be multilaterally analyzed efficiently

  The performance situation of related resources in a storage device can be analyzed collectively. In addition, performance analysis function provides features such as comparative analysis with past metrics (specific day of every month, specific day of every week, days with normal operation and so on), statistic data (average, median, and so on), or thresholds, squeezing analysis according to the condition setting, automatic production of summarized data by hour, day, or month, and peak analysis based on summarized data. These features make it possible to multilaterally analyze the metrics which becomes enormous in the accumulation of the variety gathering items without hanging labor. So the bottleneck detection and the trend analysis can be streamlined.

- Analysis environment can be easily built

  Because it is possible to analyze offline without connecting with the other machines such as the management server at the usual time, there is high degree of freedom and the analysis environment can be easily built. Metrics can be downloaded by simple operations when needed and the various types of metrics that are collected and analyzed can be centrally managed using tree views which are easy to understand.

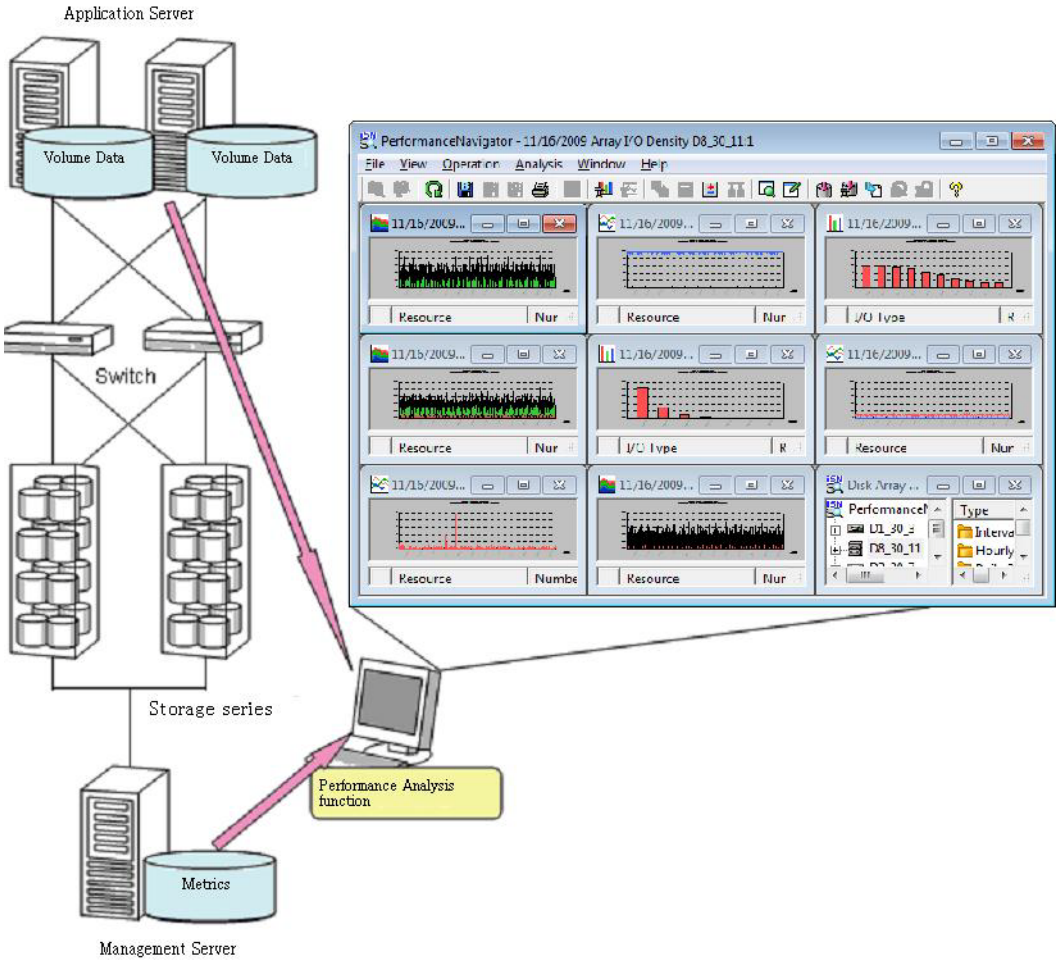


Figure 1-1: Performance Analysis Function

Performance Analysis Function and Related Products

The performance analysis function requires the following program products as a precondition.

- SnapSAN S5000
- Performance Monitor

For capacity analysis by using the Thin Provisioning function, the following program product is also required.

- Thin Provisioning

This version supports SnapSAN S5000 Ver7.4. Information collected by versions of SnapSAN S5000 later than Ver7.4 may not be analyzed.

Operations of Performance Analysis Function

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

Operation Flow	Reference
Installing Performance Analysis Function Install the performance analysis function.	Chapter 2 Installation of Performance Analysis Function
↓	
Getting Metrics/Volume List Get metrics collected on the iSM server machine and the application server volume list.	3.4 Construction of Analysis Environment
↓	
Quick Analysis Analyze the overall performance situation of a disk array unit. Customize the contents of quick analysis to suit the operating situation. This can be used when printing analysis results or saving them in a file or when creating reports.	3.8 Quick Analysis Chapter 4 Performance Analysis Procedures Chapter 5 Capacity Analysis Procedures 3.10 Saving Analysis Results
↓	
Detailed Analysis Proceed to detailed analysis when problems are detected in outline analysis or when undertaking trend analysis. Here it is possible to change analysis contents according to the purpose and the performance situation can be multilaterally analyzed by the correlation analysis and the associated resource analysis. Based on analysis results, devise tuning methods for eliminating bottlenecks and perform storage planning. This can be used when saving them in a file or printing analysis results or when creating reports.	3.9 Detailed Analysis Chapter 4 Performance Analysis Procedures Chapter 5 Capacity Analysis Procedures 3.10 Saving Analysis Results
↓	
Reusing Analysis Results The contents of detailed analysis can be registered as a template and reused in subsequent analyses. Analysis tasks can be made efficient by solving similar performance problems and performing trend analysis periodically.	3.9.5 Reusing Analysis Contents (Templates)

Function Overview

This section provides an overview of the performance analysis function.

Quick Analysis

By executing quick analysis, the main metrics of the disk array and each resource can be analyzed in the various viewpoints like I/O Density, the transfer rate, the average response time, the cache hit ratio, the busy ratio, the current capacity value, the capacity fluctuation value, and so on. The analyzing result can be displayed as the graph or the raw data. This makes it possible to efficiently analyze the overall performance situation.

The current capacity value and capacity fluctuation value can be analyzed only when Thin Provisioning is used.

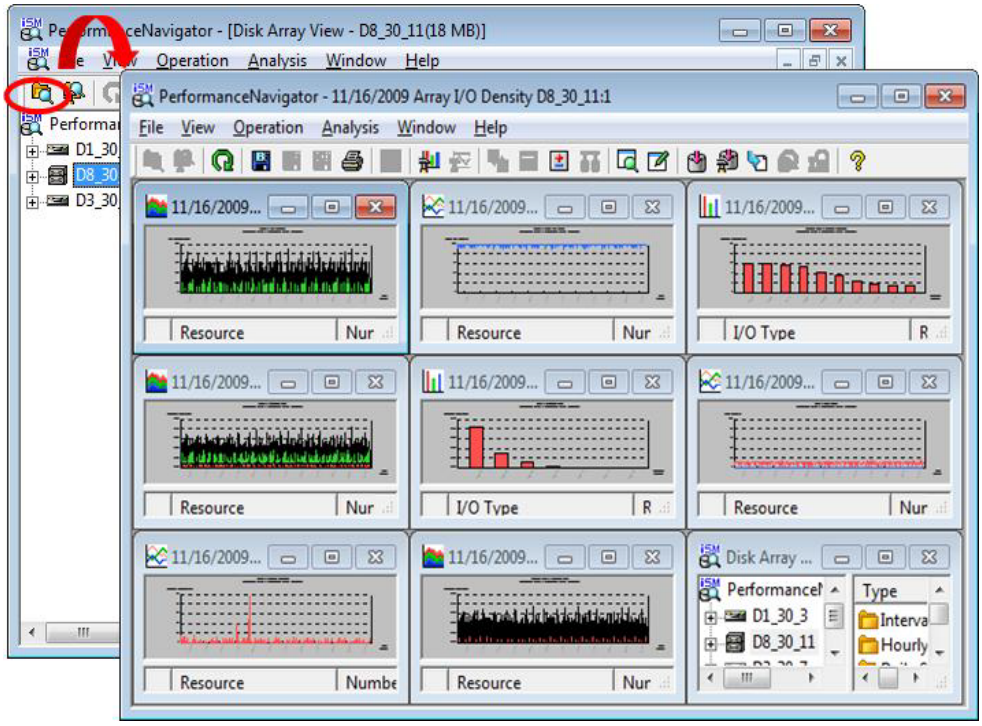


Figure 1-2: Quick Analysis

It is not needed to setup the target items beforehand because the items which are dealt with the quick analysis are prepared as the report template. When necessary, the display item and the displayed contents which are dealt with the quick analysis can be customized. In addition, the items registered in the TemplateSet and the available report template which was created by the detailed analysis can be added to the display item of the quick analysis. Therefore, the quick analysis can be implemented according to the operation.

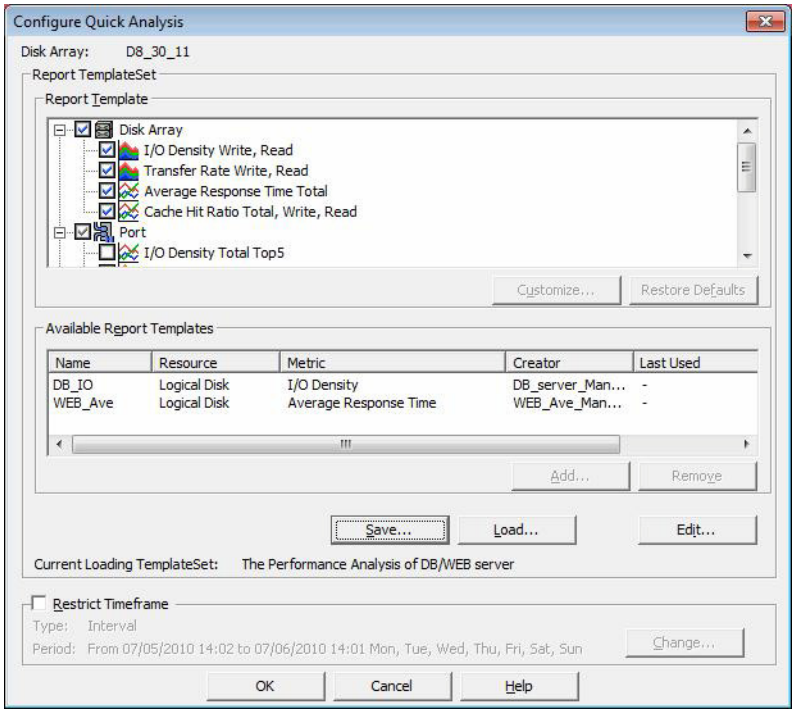


Figure 1-3: Configure Quick Analysis

The shaded part is the template that is set by default as the subject of quick analysis.

Resource	Display Contents	Graph Type	Unit of Traverse
Disk Array	I/O Density (Write/Read)	Stacked Area graph	A time
Disk Array	Transfer Rate (Write/Read)	Stacked Area graph	A time
Disk Array	Average Response Time (Total)	Line graph	A time
Disk Array	Cache Hit Ratio (Total/Write/Read)	Line graph	A time
Node	I/O Density (Local Total/Remote Total)	Stacked Area graph	A time
Node	Transfer Rate (Local Total/Remote Total)	Stacked Area graph	A time
Node	Average Response Time (Local Total/Remote Total)	Line graph	A time
Node	Cache Hit Ratio (Local Total/Remote Total)	Line graph	A time
Port	I/O Density (Total)	Line graph	A time
Port	Transfer Rate (Total)	Stacked Area graph	A time
Port	Average Response Time (Total)	Line graph	A time
Port	Transfer Rate (Total)	Column graph	The resource
Port	Busy Ratio	Line graph	A time
Host Director	Busy Ratio	Line graph	A time

Resource	Display Contents	Graph Type	Unit of Traverse
Replication Port	I/O Density (Initiator Total/Target Total)	Line graph	A time
Replication Port	Transfer Rate (Initiator Total/Target Total)	Line graph	A time
Replication Port	Average Response Time (Initiator Total/Target Total)	Line graph	A time
Replication Port	Busy Ratio	Line graph	A time
Cache	Cache Hit Ratio (Total/Write/Read)	Line graph	A time
Cache	L1/L2 Cache Hit Ratio (Read)	Line graph	A time
Cache	L2 Cache Page-in Size	Line graph	A time
Cache Segment	I/O Density (Total)	Stacked Area graph	A time
Cache Segment	Transfer Rate (Total)	Stacked Area graph	A time
Cache Segment	Average Response Time (Total)	Line graph	A time
Cache Segment	Cache Hit Ratio (Total)	Line graph	A time
Logical Disk	I/O Density (Total)	Stacked Area graph	A time
Logical Disk	Transfer Rate (Total)	Stacked Area graph	A time
Logical Disk	Average Response Time (Total)	Line graph	A time
Logical Disk	Average Response Time (Total)	Column graph	The resource
Logical Disk	Cache Hit Ratio (Total)	Line graph	A time
Logical Disk	Capacity Fluctuation Value	Line graph	A time
Logical Disk	Current Capacity Value (Differential Logical Disk Capacity)	Column graph	The resource
Logical Disk	Current Capacity Value (Differential LD Capacity Threshold)	Column graph	The resource
Logical Disk	Current Capacity Value (Differential LD Capacity Quota)	Column graph	The resource
Disk Port	I/O Density (Total)	Line graph	A time
Disk Port	Transfer Rate (Total)	Line graph	A time
Disk Port	Busy Ratio	Line graph	A time
Disk Director	Busy Ratio	Line graph	A time
Rank/Pool	I/O Density (Total)	Line graph	A time
Rank/Pool	Transfer Rate (Total)	Line graph	A time
Rank/Pool	Average Response Time (Total)	Line graph	A time
Rank/Pool	Average Response Time (Total)	Column graph	The resource
Rank/Pool	Busy Ratio	Line graph	A time
Pool	Capacity Fluctuation Value	Line graph	A time
Pool	Current Capacity Value (Differential Actual Capacity)	Column graph	The resource
Pool	Current Capacity Value (Differential Actual Capacity Threshold)	Column graph	The resource

Resource	Display Contents	Graph Type	Unit of Traverse
Pool	Current Capacity Value (Differential Actual Capacity Threshold (Pre))	Column graph	The resource
Virtual Capacity Pool Total	Current Capacity Value (Actual Used Capacity)	Line graph	A time
Virtual Capacity Pool Total	Current Capacity Value (Actual Capacity, Actual Used Capacity)	Stacked column graph	The resource
Virtual Capacity Pool Total	Capacity Fluctuation Value	Line graph	A time
Physical Disk	I/O Density (Total)	Line graph	A time
Physical Disk	Transfer Rate (Total)	Line graph	A time
Physical Disk	Average Response Time (Total)	Line graph	A time
Physical Disk	Busy Ratio	Line graph	A time
Physical Disk	Average Response Time (Total)	Column graph	The resource
Data Migration Port	I/O Density (Total)	Line graph	A time
Data Migration Port	Transfer Rate (Total)	Line graph	A time
Data Migration Port	Average Response Time (Total)	Line graph	A time
Data Migration Port	Busy Ratio	Line graph	A time
Cabinet	Electric Power	Line graph	A time
Cabinet	Electric Energy	Line graph	A time

Detailed Analysis (Changing Analysis Contents)

The analysis contents can be flexibly changed according to the purpose of the analysis. The following items can be modified.

- Timeframe

  The timeframe depends on the purpose of the analysis. In addition, the summarization level of the performance data to analyze depends on the timeframe. The timeframe and the summarization level of metrics can be modified according to the purpose.

- Resources to analyze

  A disk array is composed of a wide range of resources and basically, all resources relate to the performance. Virtual capacity pools and virtual capacity logical disks relate to the capacity. The resources analyzed can be changed according to the business contents and the purpose of the analysis.

- Metrics to analyze

  There are various kinds of metrics, including I/O Density, transfer rate, average response time, and Current Capacity Value. In addition, there are I/O Types such as Read/Write and Capacity Types such as Actual Used Capacity and Actual Capacity in this metrics. When analyzing summarized data or resource series, users should select a value from measured, maximum, and minimum, for analysis. It is important to examine overall information for analysis of performance. The kind, I/O Type, and Capacity Type of the metrics to analyze and the kind of values for analyze can be changed according to the purpose of the analysis.

- Display

  Metrics differ in the results obtained by time series analysis (time axis directed) and resource series analysis (by resource). It is possible to analyze in another viewpoint which depends on the kind of the graph to display. In the detailed analysis, it is possible to change the time/resource series and the kind of the graph.

- Filtering conditions

  The performance problem and the tendency can be analyzed clearly by setting a condition of the metrics and filtering the resource to analyze. In the detailed analysis, it is possible to set up a filtering condition newly and to change the filtering condition.

Modification of timeframe

Metrics includes interval information and data which is the summarized performance data for each hour/day/month. The kind of metrics can be modified to suit the timeframe. For example, if the timeframe is equal to or less than a day, the daily information may be used. If the period is equal to or more than a month or equal, the monthly information may be used.

The timeframe can be modified by fixed date specification or relative period specification from the present. It is also possible to analyze just specific days of the week.

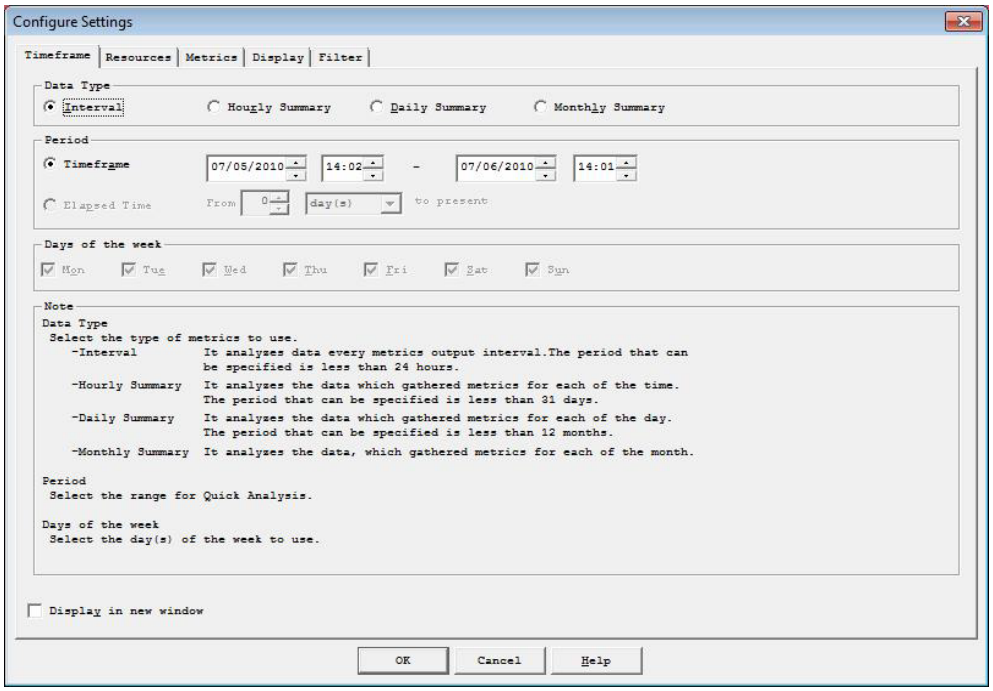


Figure 1-4: Configure Settings

Selecting [View] [Refresh] [Current Window] or [View] [Refresh] [All Windows] from the menu bar can change to the timeframe that the latest information of the imported metrics can be analyzed without displaying the Configure Settings screen ([Timeframe] tab).

Modification of Resources to Analyze

It is possible to add or delete resources to analyze. It is also possible to change the kind of resources to analyze.

Figure 1-5: Addition of Resources Analyzed

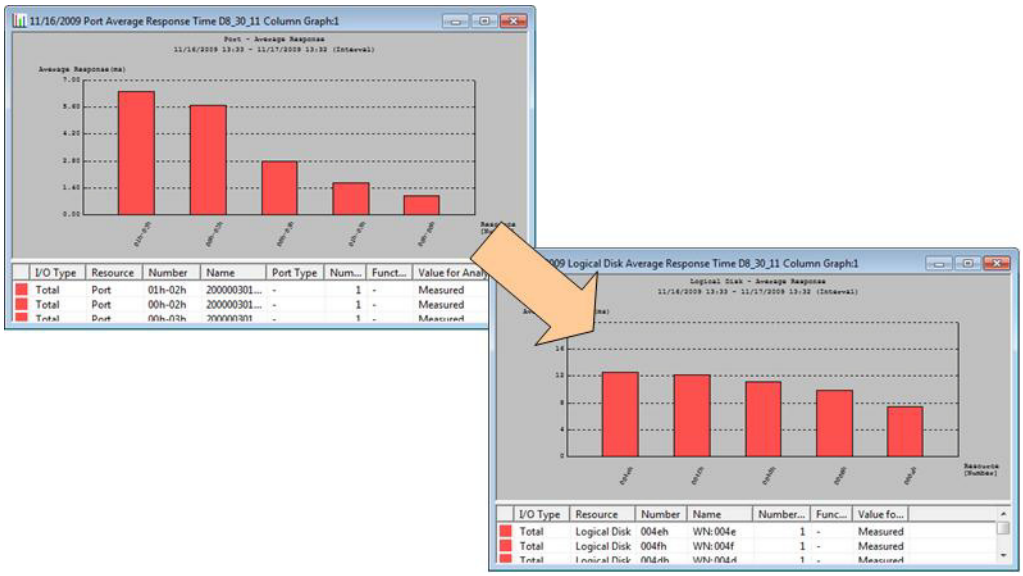


Figure 1-6: Changes Resources Analyzed

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk

- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Logical Disk number

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)

- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

(3)Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

OS type of logical disk

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

"(*)This is the information for the maintenance personnel.

(3)Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Logical Disk name

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)

- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

(3)Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Node number (It is possible to find logical disks constructed in specified node.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

RAID type (It is possible to find logical disks constructed in specified RAID type.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)

- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Port number (It is possible to find logical disks accessed through the specified port.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Port name (It is possible to find logical disks accessed through the specified port.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Logical Disk Set (It is possible to find logical disks registered in specified LD set.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number

- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource.

Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)

- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Rank number (It is possible to find logical disks constructed in specified rank.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Pool name (It is possible to find logical disks constructed in specified pool.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Cache Segment name (It is possible to find logical disks registered in specified cache segment.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number

- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)

Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)

- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Write cache (It is possible to find logical disks in the specified write cache state.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

)Modification of metric to analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Read cache (It is possible to find logical disks in the specified read cache state.)

For logical disks, the analysis object can be filtered in various conditions. Items that can be specified as conditions of filtering are shown below. AND condition (to specify all conditions meets) and OR condition (to specify either conditions meets) can be set as combination of conditions.

- Logical Disk number
- OS type of logical disk
- Logical Disk name
- Node number (It is possible to find logical disks constructed in specified node.)
- RAID type (It is possible to find logical disks constructed in specified RAID type.)
- Port number (It is possible to find logical disks accessed through the specified port.)
- Port name (It is possible to find logical disks accessed through the specified port.)
- Logical Disk Set (It is possible to find logical disks registered in specified LD set.)
- Host name/Path (It is possible to find logical disks corresponding to specified host name or path.)
- Rank number (It is possible to find logical disks constructed in specified rank.)
- Pool name (It is possible to find logical disks constructed in specified pool.)
- Cache Segment name (It is possible to find logical disks registered in specified cache segment.)
- Physical Disk type (It is possible to find logical disks consisting of physical disks of specified Physical Disk type.)
- Capacity allocation (It is possible to find logical disks that have the specified capacity allocated.)
- Write cache (It is possible to find logical disks in the specified write cache state.)
- Read cache (It is possible to find logical disks in the specified read cache state.)
- Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

Modification of Metric to Analyze

When analyzing metrics, various types of metrics must be analyzed in total. It sometimes finds the cause why a load was changed for the first time, analyzing several metrics items. The metrics which can be analyzed is different every resource. For details, refer to Appendix C "List of Metric".

Sequential data mode (It is possible to find logical disks in the specified sequential data mode state.)(*)

(*)This is the information for the maintenance personnel.

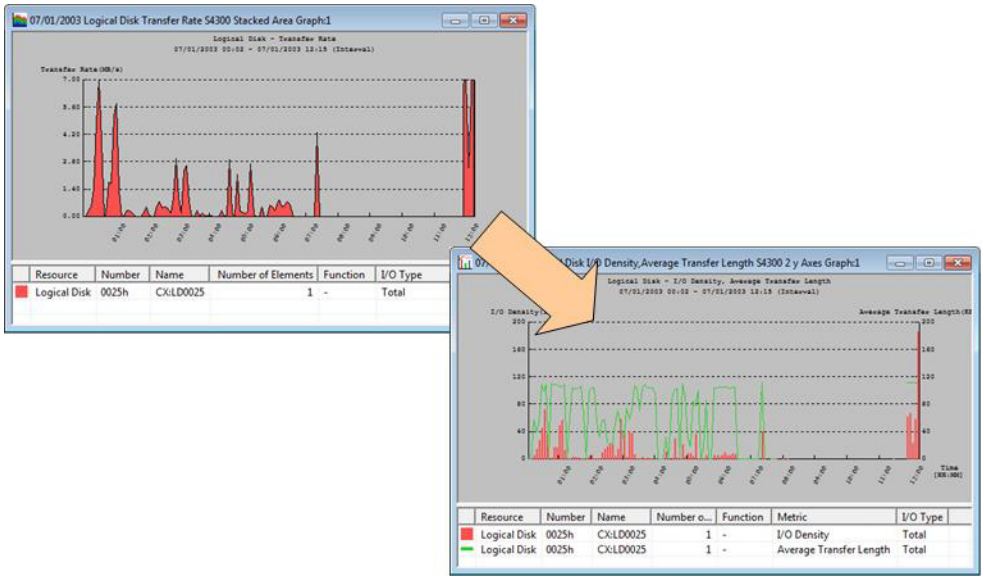


Figure 1-7: Metric (Logical Disk) Changes

Figure 1-8: Value (Logical Disk) Changes Analyzed

Modification of display format

Metrics can be analyzed by displaying it by the time/resource series. It can also be analyzed by varying the display format using various graphs. By changing the display format, it is possible to analyze the same metrics from different viewpoints. The graphs that can be displayed are as follows.

- Line Graph
- Stacked Area Graph
- 100% Stacked Area Graph
- Column Graph
- Stacked Column Graph

- 100% Stacked Column Graphs
- Pie Graph
- 2 y Axes Graph

Detailed values can be confirmed using raw data. The raw data can be displayed by the simple operation when wanting to see.

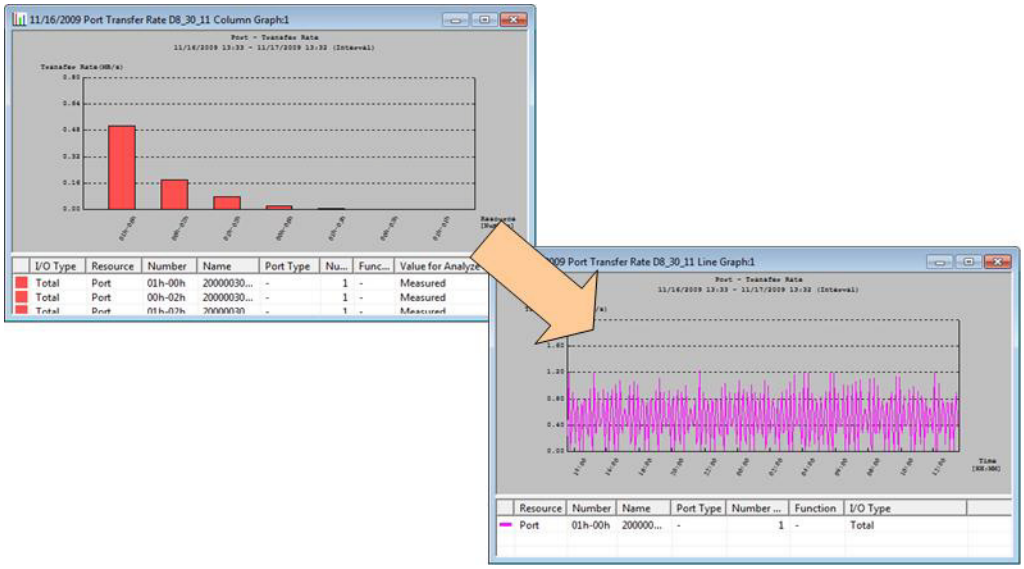


Figure 1-9: Display Format Change

Modification of Filtering Conditions

The metrics to analyze can be filtered by the resource according to the condition. The condition can be changed.

The resource to analyze can be filtered by specifying metrics classification (I/O Density, transfer rate, current capacity value and so on), input/output classification (Read, Write, and so on) and capacity type (Actual Used Capacity, Actual Capacity, and so on) and giving the condition of Compare Against Statistical Data in the timeframe of the specified information. The Compare Against Statistical Data and filtering conditions that can be specified are as follows.

- Compare Against Statistical Data that can be specified

  It is five kinds of the average, the medians, the modes, the maximums, the minimum values.
- Filtering conditions

  It specifies a number to display in the higher rank or the lower rank or a range to display.

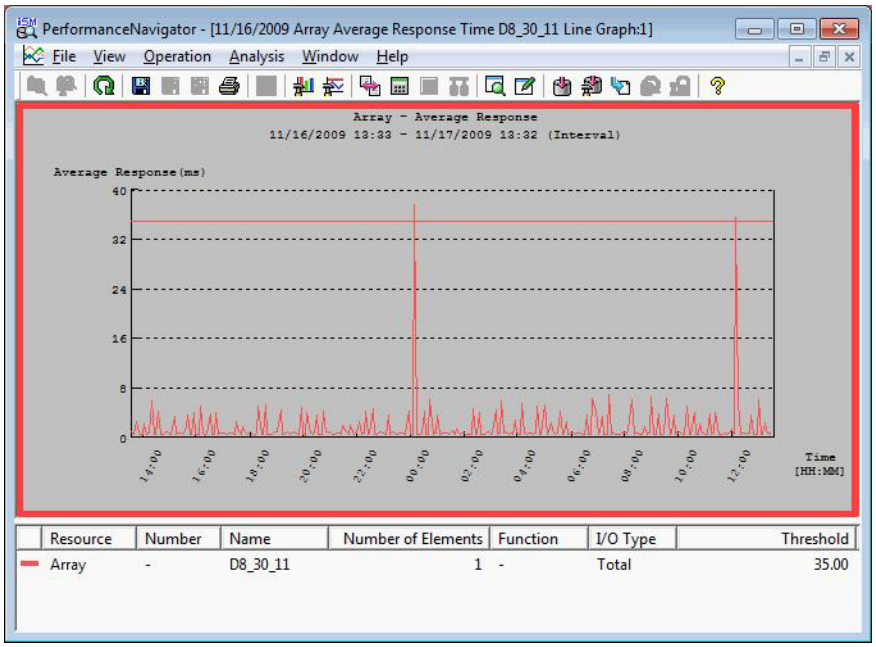


Figure 1-10: Configure Settings - Filter

Detailed Analysis (Changing Thresholds)

User can gain an opportunity for early detection of potential problems by comparing metrics with a threshold suitable for an operation mode.

Thresholds set with the performance monitoring function are automatically imported together with the metrics. Thresholds can be displayed on a graph/raw data. The thresholds specified for the virtual capacity pool and logical disk are displayed during capacity information analysis.

Thresholds can also be changed according to purposes.

(However, in the analysis of the capacity information, the threshold value cannot be changed.)

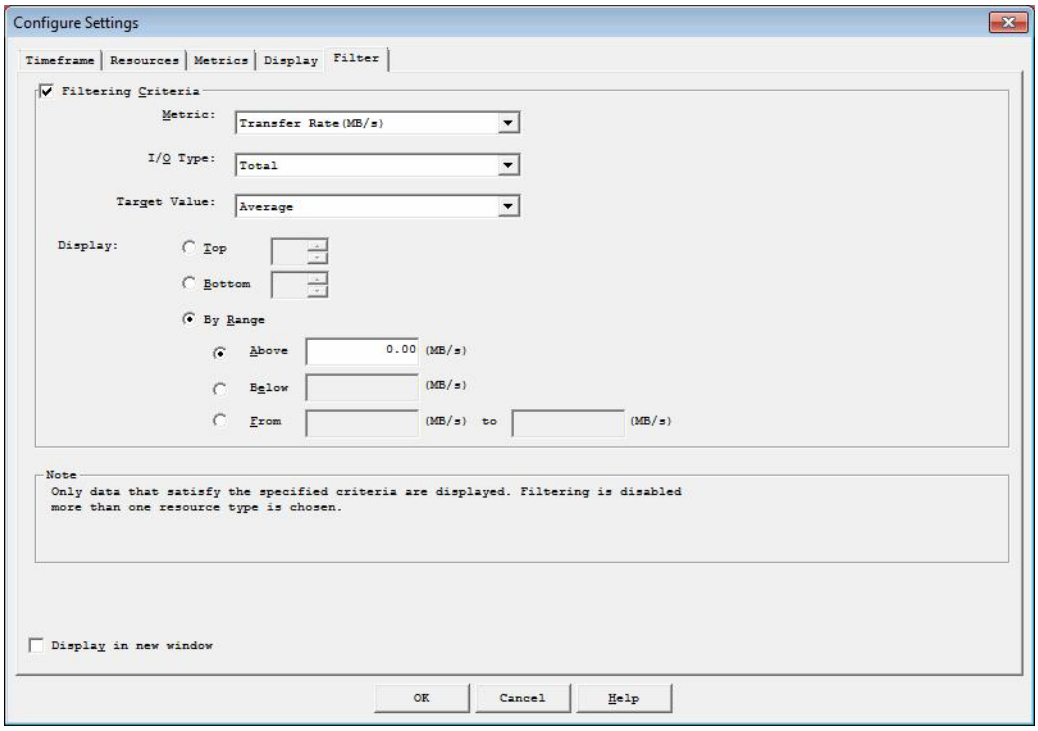


Figure 1-11: Metrics Threshold

Detailed Analysis (Correlation Analysis)

By comparing metrics with available resource data, it is possible to clarify problem points or trends. This section explains comparative analysis functions.

Comparison with Past Metrics

It is possible to compare present metrics and the available resource data like a past metrics in normal situation. The way of specifying a comparative object is as follows.

- The analysis of the time designation

  It specifically specifies the period which deals for the comparison. When analyzing interval information and interval information, it specifies a year, a month/a day. When analyzing day information, it specifies a year/the month. When analyzing the month information, it specifies a year.

- The analysis of the relative specification

  It makes the present timeframe a standard and it specifies a comparative object relatively. When analyzing interval information, time information, it specifies from the information how many days before to begin an analysis. When analyzing day information, it specifies from the information how many months before to begin an analysis. When analyzing the month information, it specifies from the information how many years before to begin an analysis. In the relative specification, it is also possible to compare with the average in the specified relative period.

In the comparative analysis, it is possible to make display a comparative object in one graph/raw data by the simple operation.

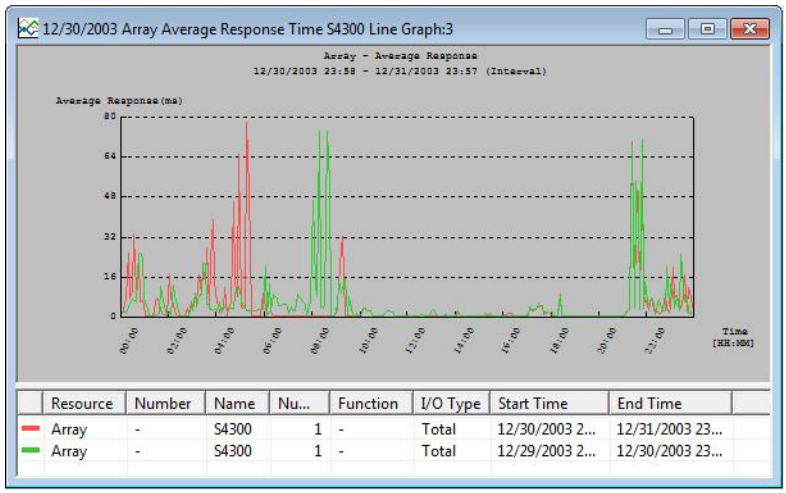


Figure 1-12: Performance Data Comparison

Comparison with Compare Against Statistical Data

It is possible to compare with the data (the compare against statistical data) such as the average which represent the whole metrics of the analysis object. Compare Against Statistical Data that can be compared are as follows.

- Average value (It is average in the timeframe)
- Maximum value (It is a maximum value about the timeframe)
- Minimum value (It is a minimum value about the timeframe)
- Median value (It is the value which is situated at the center when arranging a value size in turn in the timeframe)
- Mode (It is a value with the highest occurring frequency in the timeframe)

In the comparative analysis, it is possible to make display Compare Against Statistical Data in one graph/raw data by the simple operation.

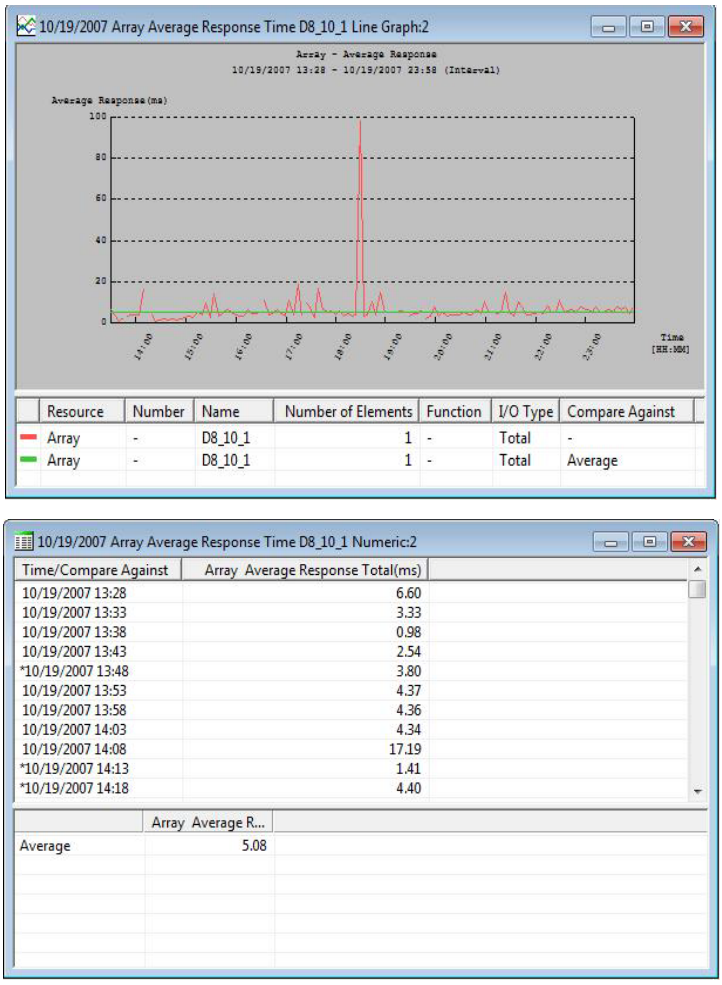


Figure 1-13: Average Value Compared Against Statistical Data

Difference Display

It is possible to choose one available resource data from the inside of the data to be displaying in the same graph/raw data and the finite difference value with the other data can be displayed in the graph/raw data. By this feature, the difference with the metrics and the central value in the past can be made clearer.

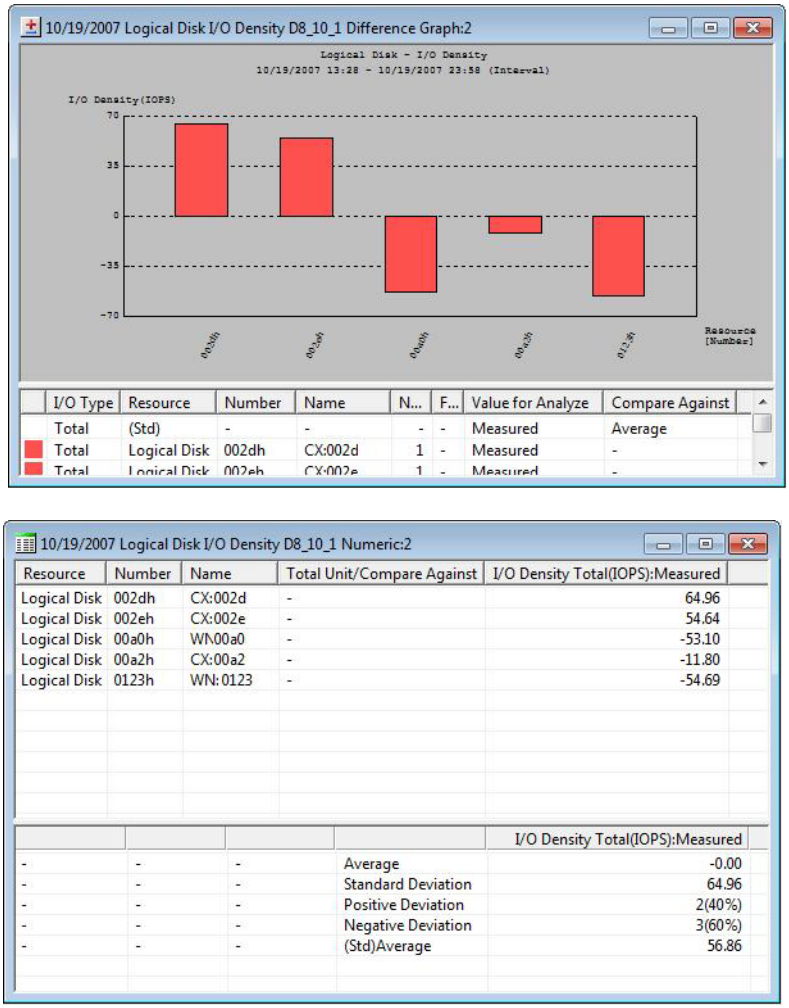


Figure 1-14: Display Differences based on Reference Values

Detailed Analysis (Associated Resources Analysis)

A disk array is composed of a wide range of resources and when doing a performance analysis, the relation of these resources must be chased. To chase the relation of the resource, it is necessary to be familiar with the composition of the disk array. Also, the labor very hangs over the chase work.

When using a related resource analysis function, the performance of the resource which relates to the analysis object resource can be analyzed at once by the simple operation. The combinations of related resources that can be analyzed are as follows.

Performance Data

Resource	Description
Logical Disk	Cache Segment/Rank or Pool/Physical Disk/Port/Director/Node/Cache
Rank	Logical Disk/Physical Disk
Pool	Logical Disk/Physical Disk/Node
Physical Disk	Logical Disk/Rank or Pool/Node

Resource	Description
Port	Logical Disk/Director/Node
Director	Port/Logical Disk/Node
Node	Logical Disk/Pool/Physical Disk/Port/Director/Cache
Cache	Cache Segment/Logical Disk /Node

Capacity Data	
Virtual Capacity Pool Total	Virtual Capacity Pool
Virtual Capacity Pool	Virtual Capacity Logical Disk
Virtual Capacity Logical Disk	Virtual Capacity Pool

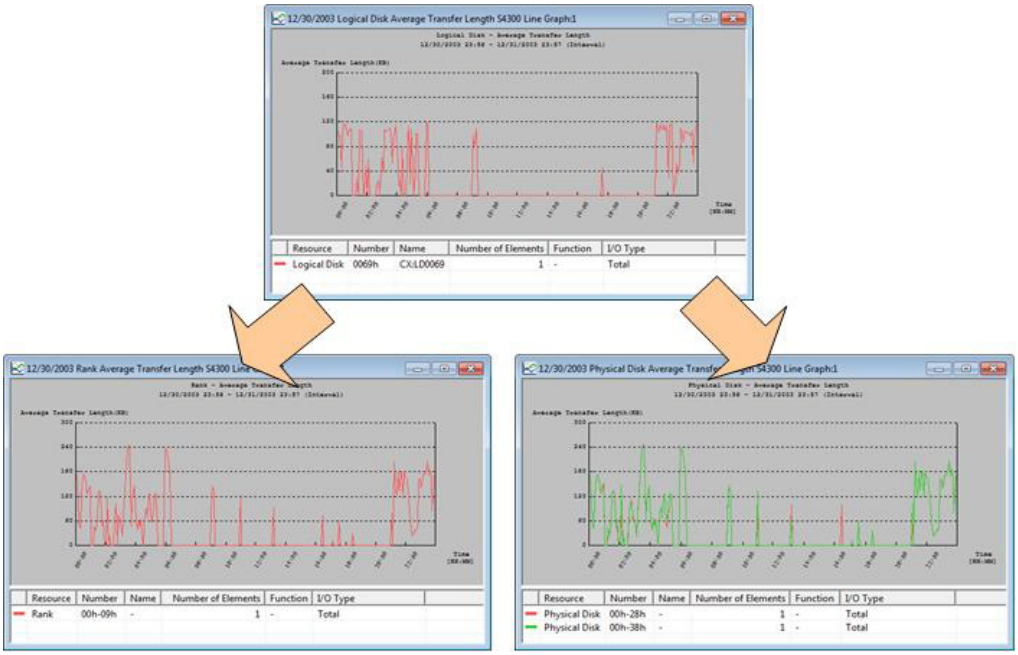


Figure 1-15: Associated Resources Analysis of Logical Disk

Before a logical disk for analysis and its related port, or a port for analysis and its related logical disk can be analyzed, however, the user must perform configuration of the port and logical disk mapping.

Saving Analysis Contents

Available Report Template

After changing analysis contents or comparative analysis contents, these can be saved as a model (the template). When implementing a similar analysis, when utilizing a template, the labor of the analysis can be substantially reduced. Templates can also be added to the object of quick analysis.

The following information can be added in a template so that you can easily manage templates.

- Name of template
- Description of analysis contents
- The Creator

As occasion demands, the contents of the template are updated and the template can be deleted.

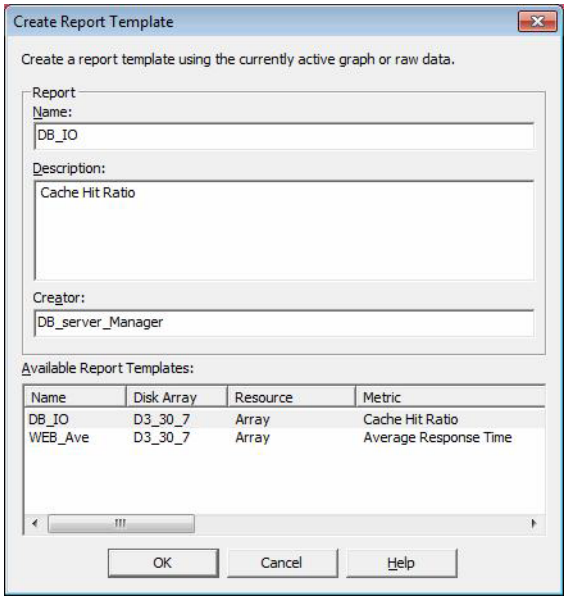


Figure 1-16: Create Report Template

TemplateSet

The settings for quick analysis (the default template and user-defined template) can be saved as a model (a TemplateSet). When implementing a similar analysis, using a template set substantially reduces the analysis work.

The following information can be added to TemplateSets to make them easier to manage:

- The name of the template set
- A description of what is analyzed
- The creator

A registered TemplateSet can be updated or deleted as necessary.

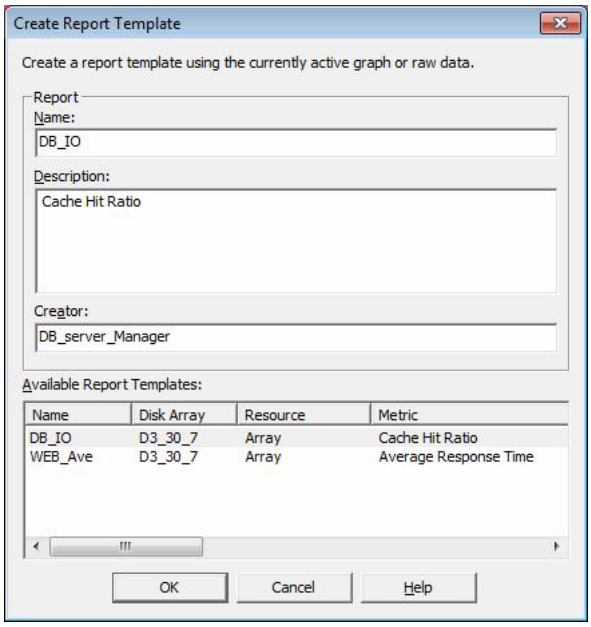


Figure 1-17: Create Report Template

Downloading and Importing Analysis Information

The performance analysis function needs metrics (metric log file) that has been accumulated by the performance monitoring function on the SnapSAN S5000 server machine. Also, by capturing the volume list table (the execution result of SnapSAN S5000 vollist) of the application server, which is connected to the disk array to be analyzed, the relation between the volume on the application server and the logical disk of the disk array is established for analysis. Metrics on the SnapSAN S5000 server machine and the volume list table of the application server can be downloaded easily by operations from a screen

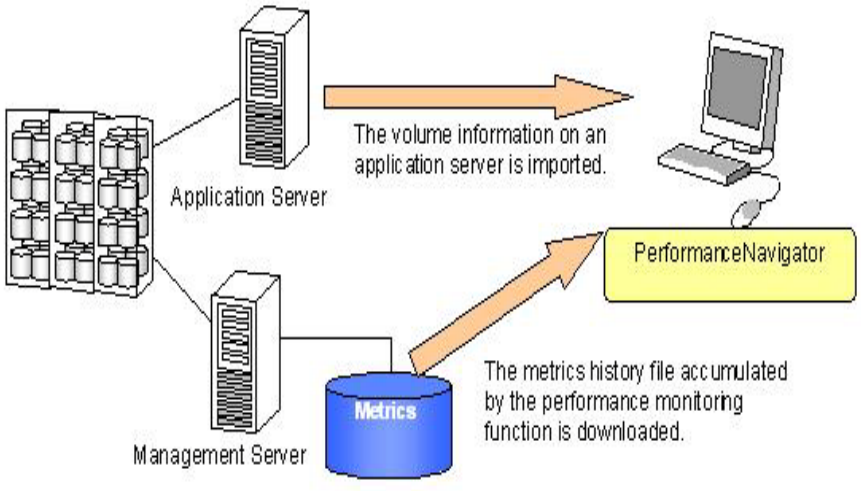


Figure 1-18: Information Acquisition

Metrics on the SnapSAN S5000 server machine and the volume list of application server can also be obtained using removable media or FTP function and so on.

Before executing an analysis, the metrics must be converted to an internal form which can be analyzed. This conversion is called importing. When executing importing, data summarized by hour, day, and month is automatically generated. The downloading and the importing can be executed by simple operations from a screen. Depending on settings, importing can be executed automatically after downloading metrics.

NOTE: Before using the performance analysis function, it is necessary to import metrics. If necessary, import the volume list.. Metrics of NV series disk arrays accumulate on the NAS controller, from which they must be downloaded.

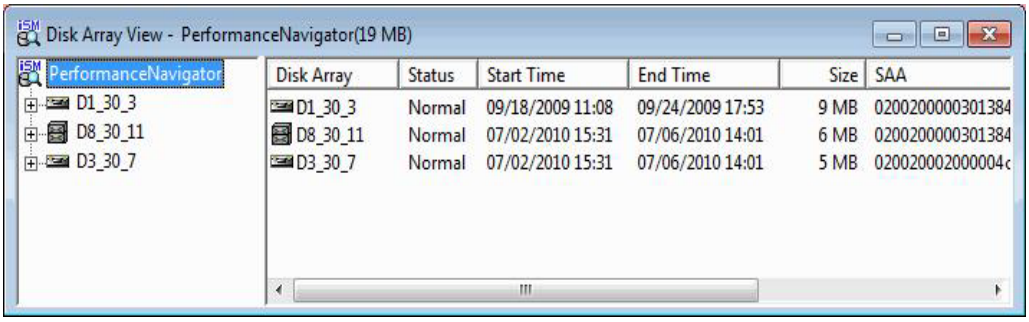


Figure 1-19: Disk Array List

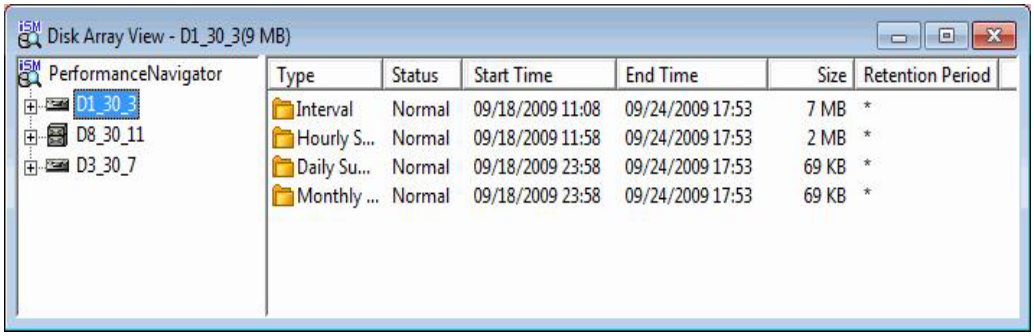


Figure 1-20: Selected Disk Array Available Data

When metrics increases, it overloads disk capacity finally. Therefore, it is required to change the folder (data location) which analysis information such as metrics or configuration information is stored, or delete metrics as appropriate.

The data location can be changed by operation on the screen.

Metrics can be deleted by operation on the screen and configuring of data retention. In the deletion by the operation from the screen, the information about the specific day, the day of the week, the month on the specific year can be deleted.

In the deletion by the configuring of data retention, it sets a retention period for every metrics item and the information with passing the keep period can be automatically deleted.

Saving Analysis Results

The graphs and raw data displayed in quick analysis and detailed analysis can be saved as files or printed. Graphs are saved in bitmap format file and raw data are saved in text or CSV format file.

Saved files and printed results can be used in creating reports.

Chapter 2

Installation

Overview

This chapter describes how to install AutoTune.with any of the following operating systems running:

Target hardware	Personal computers with the following operating systems installed.
Supported Operating Systems	Microsoft Windows XP Professional Edition (no SP to SP3) Microsoft Windows XP Professional x64 Edition (no SP and SP2) Microsoft Windows Vista Business (no SP to SP2) Microsoft Windows 7 Ultimate (no SP and SP1) Microsoft Windows 7 Ultimate x64 (no SP and SP1) Microsoft Windows 7 Enterprise (no SP and SP1) Microsoft Windows 7 Enterprise x64 (no SP and SP1) Microsoft Windows 7 Professional (no SP and SP1) Microsoft Windows 7 Professional x64 (no SP and SP1)

Target hardware	Personal computers with the following operating systems installed.
Supported Operating Systems cont'.	Microsoft Windows Server 2003, Standard Edition (no SP to SP2) Microsoft Windows Server 2003, Enterprise Edition (no SP to SP2) Microsoft Windows Server 2003, Standard x64 Edition (no SP and SP2) Microsoft Windows Server 2003, Enterprise x64 Edition (no SP and SP2) Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems (no SP to SP2) Microsoft Windows Server 2003 R2, Standard Edition (no SP and SP2) Microsoft Windows Server 2003 R2, Enterprise Edition (no SP and SP2) Microsoft Windows Server 2003 R2, Standard x64 Edition (no SP and SP2) Microsoft Windows Server 2003 R2, Enterprise x64 Edition (no SP and SP2) Microsoft Windows Server 2008 Standard (no SP and SP2) (*1) Microsoft Windows Server 2008 Enterprise (no SP and SP2) (*1) Microsoft Windows Server 2008 for Itanium-based Systems (no SP and SP2) Microsoft Windows Server 2008 R2 Standard (no SP and SP1) Microsoft Windows Server 2008 R2 Enterprise (no SP and SP1) Microsoft Windows Server 2008 R2 Datacenter (no SP and SP1) (*1) The product without Hyper-V function is also supported. The Server Core install option is not supported.
Software	Storage Manager (Ver7.4 or later version) PerformanceMonitor (permanent connection not required)
Memory	OS-required memory + 65 (81) MB or more *The value in the parenthesis is the memory size required to run AutoTune on a 64-bit OS version.
Disk capacity	20 MB or more

Installation

To install AutoTune, follow the procedure below.

NOTE: The installation procedure must be performed by a System Administrator.

Execute the following installation program to install AutoTune.

CD drive:\PERFRNV\SETUP.EXE

In the case of Windows Vista or later or Windows Server 2008 or later, the [User Account Control] dialog box might be displayed when the installation program is executed.

Select [Continue] or [Yes] to execute the installation program.

When AutoTune is installed in an environment where Windows Firewall is set to ON, it is automatically added to the Exceptions list. Similarly, AutoTune is deleted from the Exceptions list when it is uninstalled.

To upgrade Windows XP to Windows Vista or later or Windows Server 2008 or later when AutoTune has been installed, it is necessary to re-install a version of AutoTune supporting Windows Vista or later or Windows Server 2008 or later.

Uninstallation

To uninstall AutoTune, follow the procedure below.

Go to the Control Panel and select [Programs and Features] ([Add or Remove Programs] for Windows Server 2003 and Windows XP), then select AutoTune.

By selecting "Yes" when the "Do you want to take over the license information?" dialog box is displayed during uninstallation, the license information will be inherited at re-installation. The following folders and files will not be deleted, so setting-related information will also be inherited at re-installation.

- Files under the TMP folder
- Files under the DATA folder
- Prfnavi.ctl
- Prfnavi.dlf
- Prfnavi.ini
- Prfnavi.lcs
- Prfnavi.tpl
- Prfnavi.vol
- PrfnaviTplset.tpl

The above-mentioned folders and files are under both the installation folder and work folder.

To inherit the existing operation settings when re-installing AutoTune after OS re-installation, back up all of the above folders and files beforehand and restore them after AutoTune re-installation.

Update AutoTune

1. To update AutoTune, uninstall the existing AutoTune before installing the updated program.
2. Be sure to update AutoTune according to the following procedure when upgrading a PC OS where AutoTune has been installed to Windows Vista or later or Windows Server 2008 or later. This update procedure is mandatory even if the version of the upgraded AutoTune is the same as that of the previously installed AutoTune.
3. Upgrade the PC OS where AutoTune has been installed to Windows Vista or later or Windows Server 2008 or later.
4. After upgrading to Windows Vista or later or Windows Server 2008 or later is complete, uninstall the installed AutoTune.

Re-install AutoTune

5. Display the properties of the AutoTune shortcut created on the desktop or the properties of Prfnavi.exe in the AutoTune installation folder.
6. Check [Run this program as an administrator] on the [Compatibility] tab and click the [OK] button.

Environment Settings

NOTE: To collect performance information and volume lists using download functions, you must have the right to access the directory containing performance information and volume lists via an ftp command.

For creation of the FTP site environment, follow the environment setting method of the FTP server in use (IIS FTP Publishing or other FTP daemons).

Operations

Starting AutoTune

Login as an administrative user (Administrators group), and select the [Start] menu [All Programs] ([Programs] for Windows 2000) [AutoTune] [AutoTune] to start AutoTune. For Windows Vista or later and Windows Server 2008 or later, the [User Account Control] dialog box is displayed when you start [AutoTune]. Select [Yes] (for Windows Vista and Windows Server 2008, [Continue]) and run [AutoTune]. In addition, you can also start the AutoTune by double-clicking the shortcut icon on the desktop.

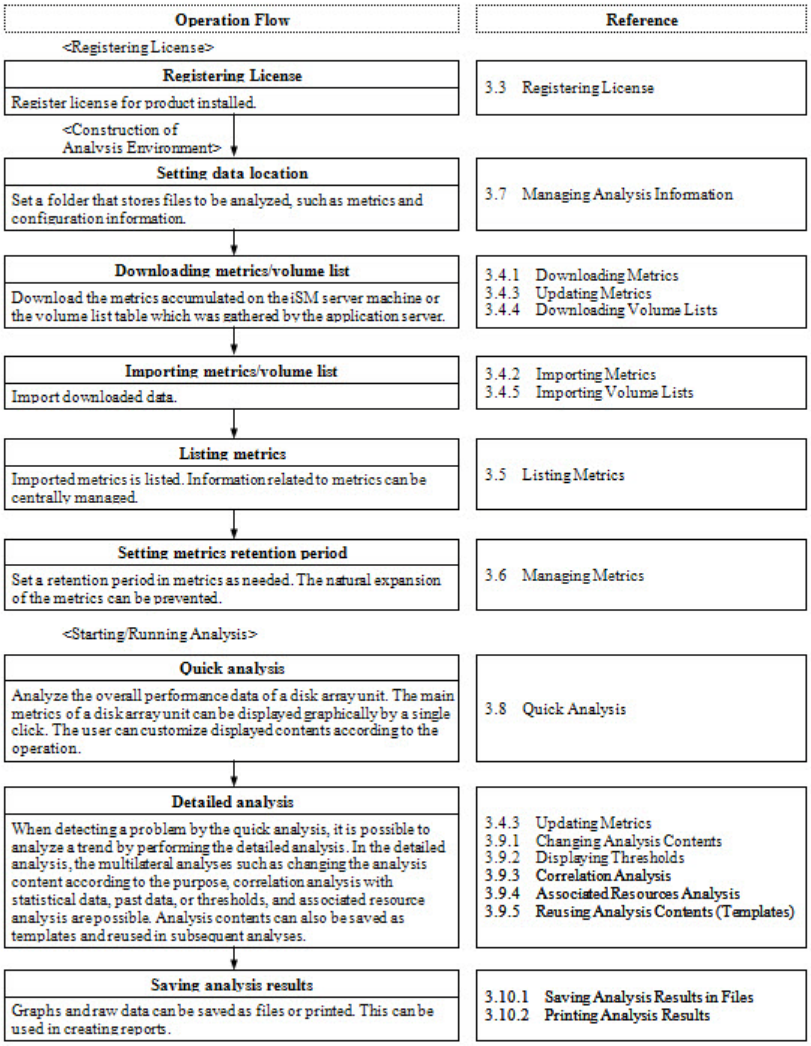


Figure 3-1: Workflow

Registering License

In order to perform performance analysis, register the license for the purchase product.

Displaying the Register License screen

Display the Register License screen by the procedure shown below.

- From the menu bar, select [Help] [Register License]

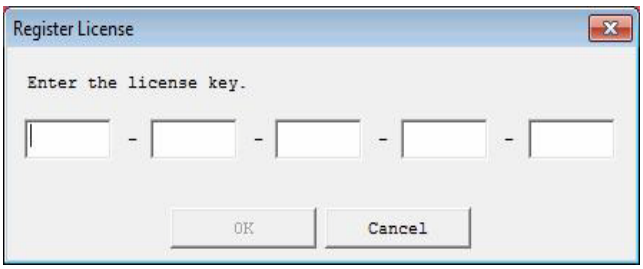


Figure 3-2: Register License

Enter the license key -> Input the license key attached to the purchase product in 30 characters (6-6-6-6-6).

A license is registered when clicking the [OK] button. When subscribing more than one license, repeat this operation.

Performance analysis does not become possible just by registering the license. By applying a subscribed license for each of the disk arrays, the analysis becomes possible.

Perform license application from the metrics import screen or the Disk Array View screen.

Displaying the Display License Screen

A list of registered licenses is displayed in the Display License screen.

The procedure which displays the Display License screen is as follows.

- From the menu bar, select [Help] [License list].

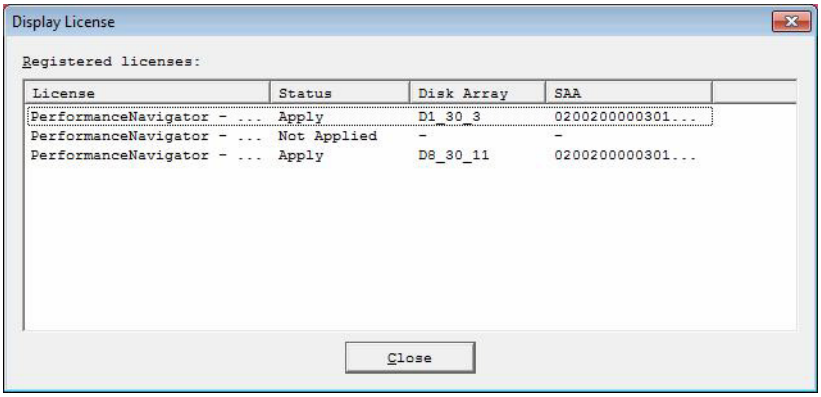


Figure 3-3: Display License

Display Item	Explanation
Product	A list of registered licenses is displayed.

Display Item	Explanation
Status	• Apply The license already has been applied. • Not Applied The license has not been applied.
Disk Array	The name of the disk array to which the license applies is displayed.
SAA	The Subsystem Absolute Address (56 hexadecimal places) that identifies the disk array to which the license applies is displayed.

NOTE: Register as many licenses as the number of disk arrays to be analyzed. The license once applied to a disk array cannot be applied to another disk array even if all metrics is deleted.Register one license for each disk array controller in an NV series disk array when analyzing the metrics of such an array.

Construction of Analysis Environment

Construct an environment to analyze the performance by performing the tasks below.

- Downloading metrics
- Importing metrics
- Downloading volume list
- Importing volume list
- Performing configure ports and logical disks mapping

Downloading Metrics

The metrics of Performance Monitor is downloaded by the download function to a machine that makes analysis or provided offline for the machine by CD-R. If the environment of an FTP site is built on the SnapSAN S5000 server machine, metrics can be collected directly from the SnapSAN S5000 server with the download function for metrics.

To collect metrics directly from the SnapSAN S5000 server using the download functions for metrics, it is necessary to have the access right to the directories and files under the directory containing metrics with the FTP command.When building the environment of the FTP site, follow the setting method specified by your FTP server (IIS FTP Publishing Service or other FTP daemons).If a network is disconnected during downloading, make a network connection again and then perform the same operation.

To save the collected metrics to CD-R or other media, store a metrics file (the default location is "\SnapSAN S5000 svr-installation-folder\etc\mon") which retains the metrics of the SnapSAN S5000 server.If using FTP to download NV Series Metric from the NAS controller, settings of the system maintenance administrator and FTP settings for the NAS controller management LAN must be enabled in advance.

Application Settings of Download Function

Before downloading the metrics cumulated on the SnapSAN S5000 server machine, environment must be set. In application settings, information about the server from which to download, the method of selecting the metrics to be downloaded, and other information can be set. Download environment settings are explained here.

Displaying the Configure Download Data screen

Display the Configure Download Data screen by either of the procedures below.

- From the menu bar, select [Operation] [Download Data] [Set Up].
- Click the [Configure Download Data] button in the toolbar.

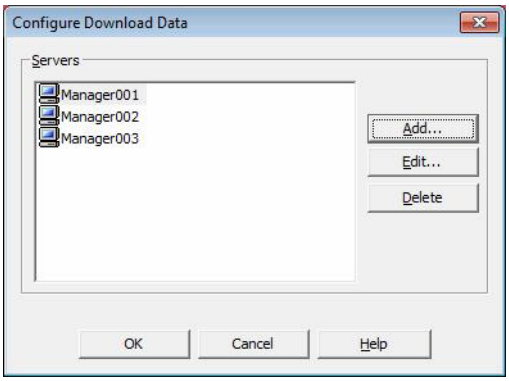


Figure 3-4: Configure Download Data

Display Item	Explanation
Servers	The list of connection servers (up to 512) which become a download original is displayed. Multiple items cannot be selected.
[Add] button	Adds the connection information. The Server Settings screen (Figure 3-4) is displayed. Up to 512 servers can be registered.
[Edit] button	Changes the selected connection information. The Server Settings screen (Figure 3-4) is displayed.
[Delete] button	The selected connection information is deleted.

Click the [Add] or [Edit] button to display”

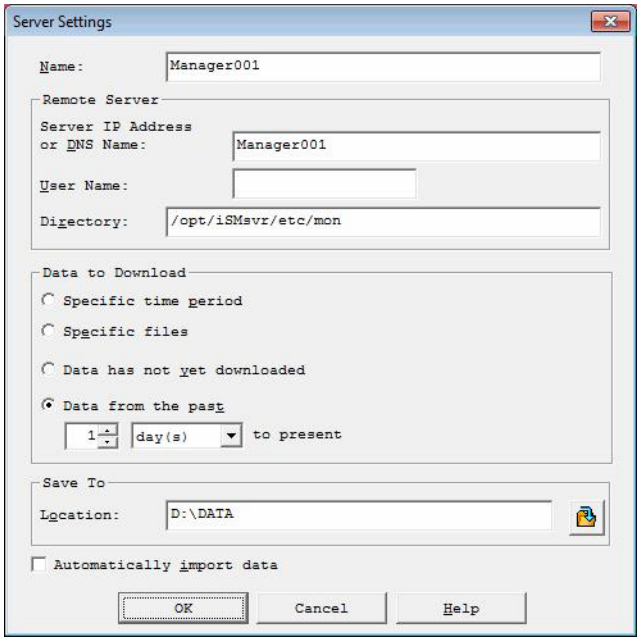


Figure 3-5: Server Setup

Display Item	Description
Name	Enter the nickname which identifies a connection place within 32 characters. An initial value is displayed in “SERVERnnn” (nnn is a sequential number from 001 to 512) is displayed.
Server IP Address or DNS Name (Required)	Input the IP Address or DNS Name of the FTP site. If specifying a DNS Name, set it within 256 characters. * AutoTune supports the IPv4 and IPv6 communication protocols.
User Name	Input the user name for the FTP site within 32 characters.
Directory	Input the directory that is the download origin within 256 characters. If input is omitted, the home directory of the login user is referenced. The metrics file is stored in “\SnapSAN S5000 svr-installation-folder\etc\mon” (if SnapSAN S5000 svr is installed at the default path).
Data to Download	Be sure to choose the selection method for metrics to be downloaded. However, this selection cannot be made for a volume list. • [Specific time period]: Downloads files gathered in specified period • [Specific files]: Downloads the selected files • [Data has not yet downloaded]: Downloads metrics except for metrics files already downloaded • [Data from the past “days” to present]: Downloads metrics of specified number of day(s) or month(s) past

Display Item	Description
Location	Input the folder that is the download destination within 256 characters. If entry is omitted, "\installation-folder\TMP" is the download destination.
[Automatically import data] checkbox	Put a check in the checkbox when starting import upon completion of downloading. At this time, when import completes and deletion confirmation message appears, the import origin file is deleted by clicking [OK] on the message.

When multiple users share the data location, import is not performed upon completion of downloading.

Connection to Server

The download environment settings must be done before using download function.

The display procedure for the Download screen is explained here.

Displaying the Download screen

Follow the procedure below to display the Download screen.

- From the menu bar, select [Operation] [Download Data] [Run].
- Click the [Download Data] button in the toolbar.

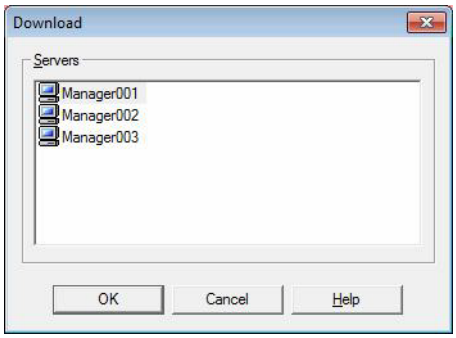


Figure 3-6: Download

Servers: The list of the connection server names which become a download original is displayed. Multiple servers cannot be selected.

Displaying the Connection screen

The following connection screen is displayed when choosing a connection name in the Download screen and clicking the [OK] button.

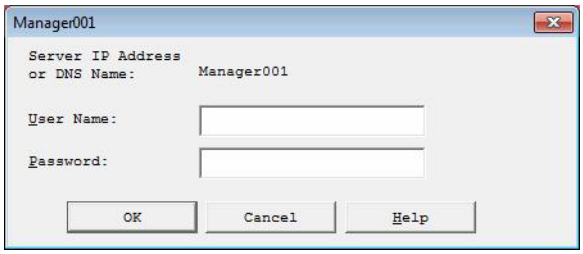


Figure 3-7: Connection

Display Item	Explanation
Server IP Address or DNS Name	The IP Address or DNS Name of the FTP site that was set in the Configure Download Data screen is displayed. * When an IPv6 address is specified, the IP address is displayed according to the rules below: • The leading zeros of each block are omitted. • 0000 is displayed as 0. • When multiple 0000 blocks continue, it is possible to replace a series of those blocks with: • When there are multiple sections of 0000 blocks that can be replaced with: the longest section is replaced with: If the length of the sections are the same, the first section is replaced with:
User Name	Input the user name for the FTP site within 32 characters.
Password	Input the password for the FTP site within 58 characters.

Download

After connecting to the FTP server, download metrics to the machine. There are following four ways to download.

- Download metrics in specific time period

This section explains the download procedure when [Specific time period] is selected in [Data to Download] in the Server Settings screen.

1. From the menu bar, select [Operation] [Download Data] [Run].
2. Click the [Download Data] button in the toolbar.

After connecting to the server, the Configure Download Period screen is displayed.

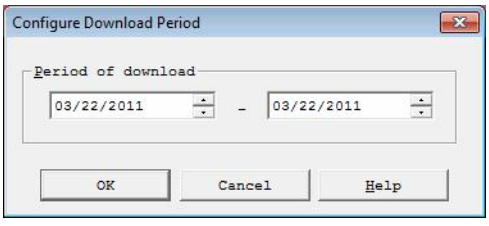


Figure 3-8: Configure Download Period

Period of download: Specify the year, month, and day of the period for which to download metrics maintained on the server. An error message is output if the year, month, and day of the period to be downloaded are reversed.

An error message also appears when there is no metrics to be downloaded.

Clicking the [OK] button begins the download and displays a dialog box that shows its progress. The download is complete when "Download finished" is displayed over the dialog box.

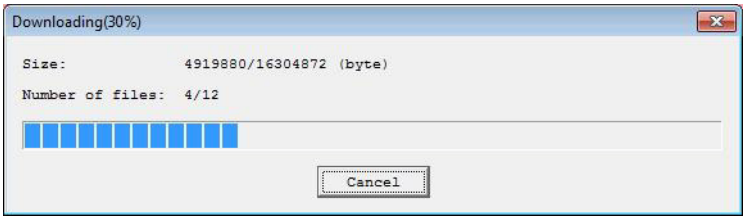


Figure 3-9: Downloading

If the [Cancel] button is clicked in the [Downloading] dialog box while downloading, the download is canceled. If the download is canceled, the metrics files must be downloaded again.

Download specific files

This section explains the download method when [Specific files] is selected in [Data to Download] in the Server Settings screen.

- From the menu bar, select [Operation] [Download Data] [Run].
- Click the [Download Data] button in the toolbar.

After connecting to the server, the Download Data File screen is displayed.

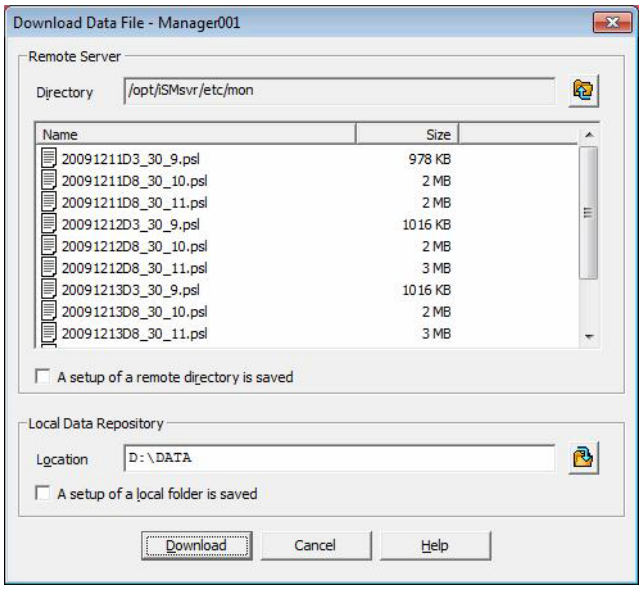


Figure 3-10: Download Data File

Display Item	Explanation
Remote Server	Information for the directory that is the download origin is displayed. Directory: As the initial value, the directory set on the Server Settings screen is displayed. If not set, the user's home directory is displayed. File list: Metrics (Extensions: psl, psa) and folders that exist in the specified directory are displayed in list form. Multiple files can be selected. [A setup of a remote directory is saved] checkbox: Put a check in the checkbox when the specified directory information is recorded and it is used as the initial value at the next startup. A directory can be set under [Remote Server] on the Server Settings screen.
Local Data Repository	Information for the folder that is the download destination is displayed. Location: As the initial value, the directory set on the Server Settings screen is displayed. If not set, "\installation-folder\TMP" is displayed. [A setup of a local folder is saved] checkbox: Put a check in the checkbox when recording the specified folder information to make it the initial value at the next startup. A folder can be set under [Save To] on the Server Settings screen.

Clicking the [Download] button begins downloading and displays a dialog box that shows its progress. Downloading is complete when "Download finished" is displayed over the dialog box. If the [Cancel] button is clicked in the [Downloading] dialog box while downloading, the download is canceled. If the download is canceled, the metrics must be downloaded again.

In addition, if the file already exists in the local folder, the following dialog box is displayed.

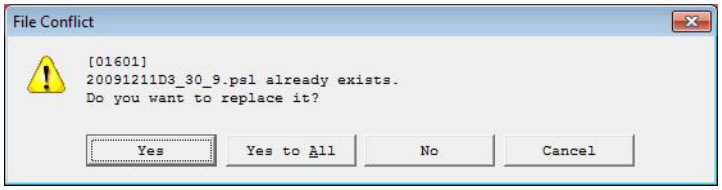


Figure 3-11: File Conflict

By clicking the [Yes] button in the [File Conflict] dialog box, overlapped file is overwritten. In addition, by clicking the [Yes to All] button, all overlapped files are overwritten.

Download all files that have not been downloaded

This section explains the download method when [Data has not yet downloaded.] is selected in [Data to Download] in the Server Settings screen.

- From the menu bar, select [Operation] [Download Data] [Run].
- Click the [Download Data] button in the toolbar.

After connecting to the server, downloading is begun and a dialog box that shows its progress is displayed. Downloading is complete when "Download finished" is displayed over the dialog box. If the [Cancel] button is clicked in the [Downloading] dialog box while downloading, the download is canceled. If the download is canceled, the metrics must be downloaded again.

Download files from specified past date to present

This section explains the download method when [Data from the past "days" to present] is selected in [Data to Download] of the Server Settings screen.

- From the menu bar, select [Operation] [Download Data] [Run].
- Click the [Download Data] button in the toolbar.

After connecting to the server, downloading is begun and a dialog box that shows its progress is displayed. Downloading is complete when "Download finished" is displayed over the dialog box. If the [Cancel] button is clicked in the [Downloading] dialog box while downloading, the download is canceled. If the download is canceled, the metrics must be downloaded again.

When metrics is downloaded directly from the SnapSAN S5000 server, threshold information set for performance monitoring is also downloaded at the same time. The downloaded threshold information is imported to all disk arrays when the metrics is imported. If a disk array has threshold information already imported, the information is overwritten.

Importing Metrics

Import Metrics downloaded to the machine or obtained offline by converting it to a format in which it can be analyzed. A file name of metrics to be imported needs to follow the naming rule for metrics files.

- When AutoTune is installed to the same machine as the management server, the metrics file cannot be imported directly from the folder where the SnapSAN S5000 server metrics is saved, with accumulating performance data in the corresponding SnapSAN S5000 server. Import the metrics file after copying the metrics file to be analyzed to a local folder from the folder where the SnapSAN S5000 server metrics is saved.
- When the time zone of the performance analysis execution-machine is different from that of the SnapSAN S5000 server execution-machine and statistical data of SnapSAN S5000 V6.3 or earlier is imported, an incorrect time is displayed.
- In statistical data imported by using AutoTune V6.3 or earlier, the daylight saving time is displayed without indicating it as such. To display the daylight saving time as is, delete the statistical data including the daylight saving time, imported by using AutoTune V6.3 or earlier, and then import the data again.

Displaying the Import Data screen

Display the Import Data screen by either of the procedures shown below.

- From the menu bar, select [Operation] [Import Data].
- Click the [Import Data] button in the toolbar.

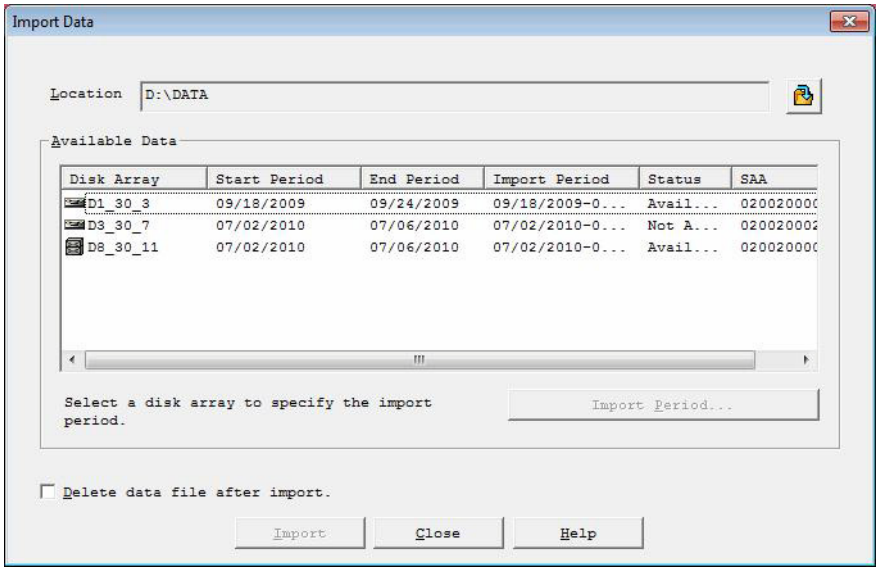


Figure 3-12: Import Data

Display Item	Explanation
Location	As for the initial setting, the folder which becomes import original is displayed.
Metrics	Files that exist in the directory are displayed. Disk Array: The disk array name and icon that indicate series of disk array are displayed. Start Period/End Period: The period for which disk array metrics is maintained is displayed. Import Period The beginning and ending date of metrics to import are displayed. Status: Whether or not the disk array can be analyzed is displayed. Available: Can be analyzed Not available(No license key): Cannot be analyzed because license is not applicable SAA: The Subsystem Absolute Address (56 digits of hexadecimals) that is the disk array's identification information is displayed.
[Import Period]	Displays the Configure Import Period screen (see Figure 3-13) to specify the period for which to import metrics.
[Delete data file after import] checkbox	Put a check in the checkbox when deleting the import source file upon completion of import. At this time, when import completes and deletion confirmation message appears, the import origin file is deleted by clicking [OK] on the message.

When multiple users share the data location, the metrics cannot be imported.

Clicking the [Import] button starts importing and displays a dialog box that shows its progress.

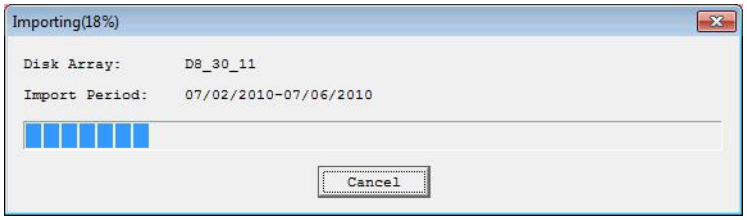


Figure 3-13: Importing Progress

If the [Cancel] button is clicked in the [Importing] dialog box while importing, importing is canceled. If importing is canceled, the metrics must be imported again.

Displaying the Configure Import Period screen

Clicking the [Import Period] button in the Import Data screen displays the Configure Import Period screen. The metrics in the specified period is imported.

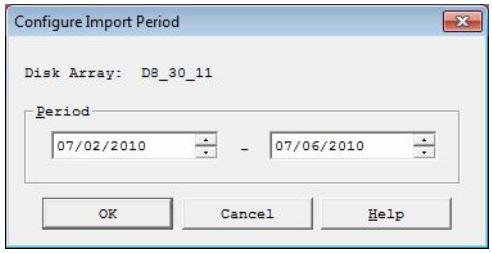


Figure 3-14: Configure Input Period

Disk Array: The name of a target disk array is displayed.

Period: Specify the period for which to import metrics maintained by the selected disk array. An error message is output if the dates of the information to import are reversed.

An error message also appears when there is no metrics to be imported.

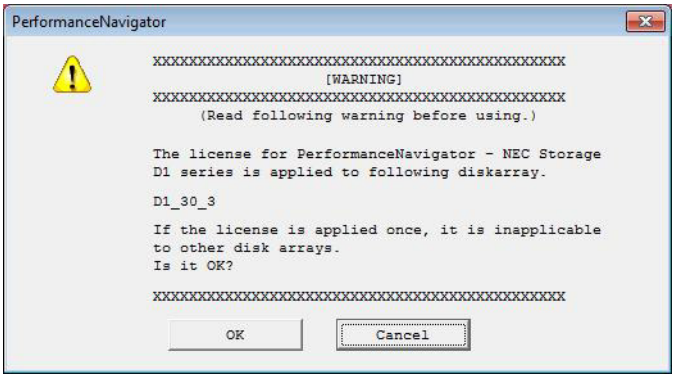


Figure 3-15: Warning

Clicking the [OK] button starts importing the metrics. After the importing is completed, the display of the [Status] field in the Import Data screen changes to "Available".

The license applied here cannot be applied to another disk array.

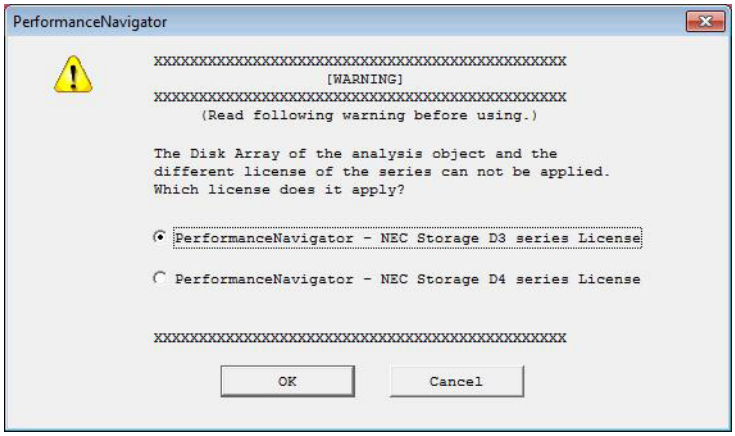


Figure 3-16: License Choice Warning

Choose the series of the license to apply and click the [OK] button. When clicking the [OK] button, the dialog box of Figure 3-14 is displayed.

Choose the one which the disk array of the analysis object and the series of the license to apply are the same.

Updating Metrics

The latest metrics of the selected disk array can be imported in simple operation.

Metrics of the selected disk array is updated.

There are four procedures for updating metrics. Select one procedure to run an update of metrics.

This function can be used only when a disk array is selected on the Disk Array View screen.

When multiple users share the data location, metrics cannot be updated.

- Select the target disk array on the Disk Array View screen and select [Operation] [Update Data] [Run]? on the menu bar.
- Select the target disk array on the Disk Array View screen and click the [Update Data] button on the toolbar.
- Select the target disk array on the Disk Array View screen and right-click to display a shortcut menu.
- Select [Update Data] [Run] on the shortcut menu that appears.
- Select the target disk array on the Disk Array View screen and press the Shift key and F5 key at the same time.

After an update of metrics is executed, metrics is downloaded and imported.

Configure Metrics

This section describes how to set an update of metrics.

The procedure for displaying the Configure Update Data screen is described here.

There are three procedures for displaying the Configure Update Data screen. Select one procedure to display the screen.

This function can be used only when a disk array is selected on the Disk Array View screen.

- Select the target disk array on the Disk Array View screen and select [Operation] Update Data] [Set Up] on the menu bar.
- Select the target disk array on the Disk Array View screen and click the [Configure Update Data] button on the toolbar.
- Select the target disk array on the Disk Array View screen and right-click to display a shortcut menu. Select [Update Data] [Set Up] on the shortcut menu that appears

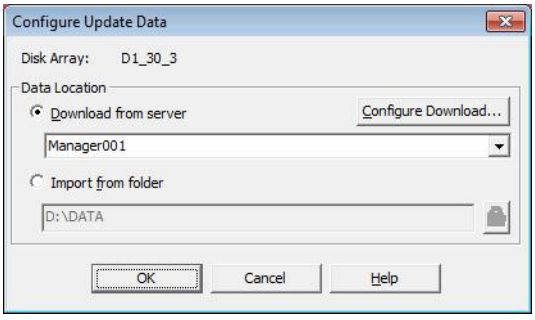


Figure 3-17: Configure Update Data

Display Item	Explanation
Disk Array	The name of a target disk array is displayed.
[Download from server] radio button	From the connection destination specified in the connection destination combo box, only the metrics that has not been imported yet is downloaded and imported.
[Configure Download Data] button	The Configure Download Data screen is displayed to add or change a connection destination.
[Import from folder] radio button	Only the metrics in the specified folder not yet imported is imported.

If the following settings are made on the Configure Update Data screen, the metrics that was accumulated in the SnapSAN S5000 server during an update of metrics can be collected directly.

- When the SnapSAN S5000 server operates on a different machine:

Select [Download from server] on the Configure Update Data screen and, on the Server Settings screen, set the directory in which the SnapSAN S5000 serveraccumulates metrics as the initial directory on the remote side to be connected.

- When the SnapSAN S5000 server operates on the same machine:

Select [Import from folder] on the Configure Update Data screen, copy the files to the local folder from the folder in which the SnapSAN S5000 server accumulates metrics, and then specify the local folder that is the copy destination.

By default, metrics of the SnapSAN S5000 server is stored in \SnapSAN S5000 svr-installation-folder\etc\mon.

Downloading Volume Lists

Put the volume list picked on the application server into the machine that performs analysis by using the download function or offline saved on CD or other media. To use the volume list download function, an FTP site environment must be constructed on the application server.

The volume list is what is redirected to a text file as a result of executing a SnapSAN S5000 vollist command on the application server. The commands to execute are as follows.

- If application server is running Windows: "SnapSAN S5000 vollist -ax" or "SnapSAN S5000 vollist -a"
- If application server is running UNIX: "SnapSAN S5000 vollist -ax" or "SnapSAN S5000 vollist -l"

To collect the volume list from the application server by using the volume list download function, it is necessary to have the access right to the directories and files under the directory containing the volume list using the FTP command.

When building the environment of the FTP site, follow the setting method specified by your FTP server (IIS FTP Publishing Service or other FTP daemons).

If a network is disconnected during downloading, make a network connection again and then perform the same operation.

To save a volume list to CD-R or other media, store the redirected volume list.

Application Settings of Download Function

Before downloading the volume list that was picked on the application server, download environment must be set. In download environment settings, information about the server from which to download and other information can be set. Download environment settings are explained here.

Displaying Configure Download Volume List screen

Display the Configure Download Volume List screen by the procedure shown below.

"From the menu, select [Operation] [Download Volume List] [Set Up].

Connection to server

The download environment settings must be done before using download function.

The display procedure for the Download screen is explained here.

Displaying the Download screen

Follow the procedure below to display the Download screen.

- From the menu, select [Operation] [Download Volume List] [Run].

Download

After connecting to the application server, download the volume list.

This section describes the procedure for displaying the Download Volume List screen.

Displaying the Download Volume List screen

Follow the procedure below to display the Download Volume List screen.

- From the menu, select [Operation] [Download Volume List] [Run].

After connecting to the application server, the Download Volume List screen is displayed.

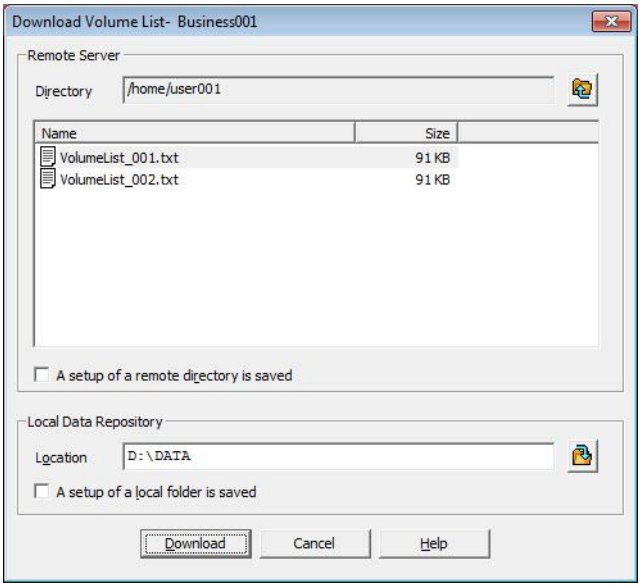


Figure 3-18: Download Volume List

Display Item	Explanation
Remote Server	Information about the directory that is the download origin is displayed. Directory: As the initial value, the directory set in the Configure Download Volume List screen is displayed. If not set, the user's home directory is displayed. File list: The files and folders that exist in the specified directory are displayed in a list form. Multiple files can be selected. A setup of a remote directory is saved] checkbox: Put a check in the checkbox when the specified directory information is recorded and it is used as the initial value at the next startup. A directory can be set under Remote Server on the Download Volume List screen.
Local Data Repository	Information for the folder that is the download destination is displayed. Location: As the initial value, the directory that was set in the Setup of Configure Download Volume List screen is displayed. If not set, "\installation-folder\TMP" is displayed. A setup of a local folder is saved] check box: Put a check in the checkbox when the specified folder information is recorded and it is used as the initial value at the next startup. A folder can be set under Local Data Directory on the Download Volume List screen.

Clicking the [Download] button begins downloading and displays a dialog box that shows its progress. Downloading is complete when "Download finished" is displayed over the dialog box. If the [Cancel] button is clicked in the [Downloading] dialog box while downloading, the download is canceled. If the download is canceled, the volume list file must be downloaded again.

If the file already exists in the local folder, a [File Conflict] dialog box is displayed. Clicking the [Yes] button in the [File Conflict] dialog box overwrites the data. In addition, clicking the [Yes to All] button overwrites all files in the local folder that is the download destination.

Importing Volume Lists

Import the volume list downloaded to the machine or obtained offline by converting it to a format in which it can be used.

Displaying the Import Volume List screen

Display the Import Volume List screen by the procedure shown below.

- From the menu bar, select [Operation] [Import Volume List].

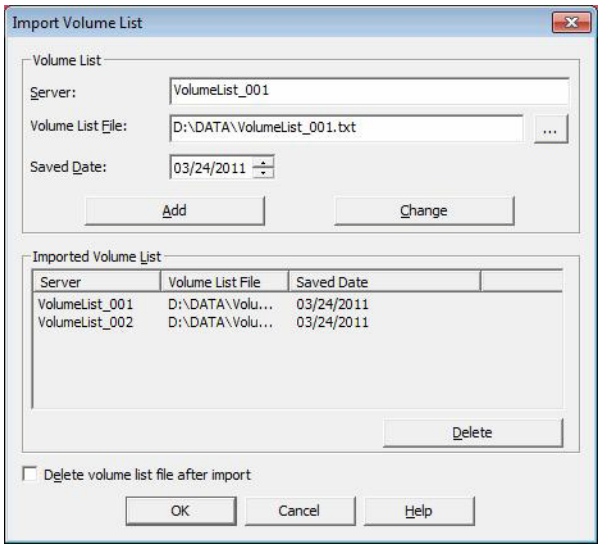


Figure 3-19: Import Volume List

Display Item	Explanation
Server	Set the host name (application server name) within 255 characters. If an item is selected in the volume list display, the host name (application server name) of the item is displayed.
Volume List File	Specify the volume list file. If an item is selected in the volume list display, the file name of the item is displayed. If an imported item is selected, “Import completed” is displayed.
Saved Date	The pick date of the volume list file is set.
[Add]	The combination of the host name (application server name), pick date, and file that are set in the Volume List is added to the volume list display. This cannot be clicked if there are 4096 records of information in the volume list.
[Change]	A volume list selected in the volume list display is changed to values set in the Volume List. This cannot be clicked if no items have been selected in the volume list display.

Display Item	Explanation
Imported Volume List	A volume list display is displayed. Server: The host name (application server name) that obtained the volume list is displayed. Volume List File: The file name of the item is displayed. For those that have been imported, “Import completed” is displayed. Saved Date The pick time of the volume list file is displayed. If “Import completed” is displayed in the volume list file display, the pick time of that volume list is displayed. If there is pick information in the SnapSAN S5000 vollist execution results: That information is used. If there is no pick information in SnapSAN S5000 vollist execution results: That creation date of that file is displayed.
[Delete]	Volume lists that are selected in the volume list display are deleted. This cannot be clicked if no items are selected in the volume list display.
[Delete volume list file after import] checkbox	Put a check in the checkbox when deleting the import source file upon completion of import.

When multiple users share the data location, a volume list cannot be added, changed, or deleted.

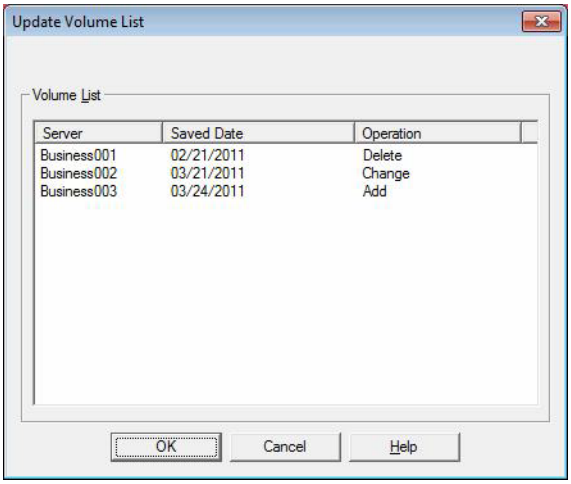


Figure 3-20: Update Volume List

Volume List: A list of the volume lists that have been added, changed, or deleted in the Import Volume List screen is displayed.

- Server: The host name (application server name) from which the volume list has been obtained is displayed.
- Saved Date: The pick date of the volume list is displayed.
- Operation: The operation type is displayed: Add, Change, or Delete.

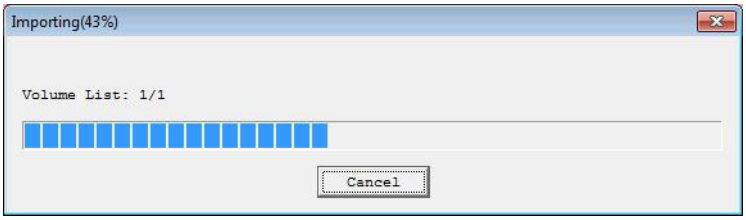


Figure 3-21: Importing Progress

Importing is canceled by clicking the [Cancel] button in the [Importing] dialog box while importing. If the importing is canceled, the volume list files must be imported again.

Configure Ports and Logical Disks Mapping

Set relationship between ports and logical disks.

This section describes how to set relationship between ports and logical disks.

Displaying the Configure Port and Logical Disk Mapping screen

Since there are two ways to display the Configure Port and Logical Disk Mapping screen, take either way to display.

This is available only when a disk array is selected in the Disk Array View screen.

- From the menu bar, select [Operation] [Configure Port and Logical Disk Mapping].
- After selecting a disk array to be analyzed in the Disk Array View screen, right-click to display a shortcut menu. Select [Configure Port and Logical Disk Mapping] from the shortcut menu that is displayed.

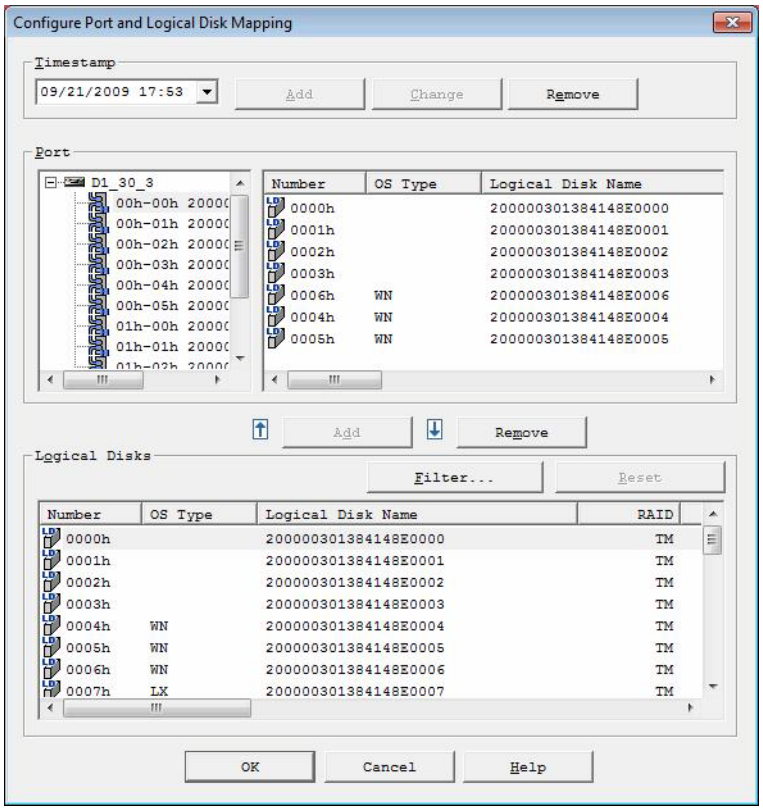


Figure 3-22: Configure Port and Logical Disk Mapping

Display Item	Explanation
Timestamp	In the combo box, select or enter an environmental construction time (in the format of mm/dd/yyyy hh:mm). The resource, port, and logical disk information at the specified time is displayed in the port list and logical disk list. • [Add]: The history information on a new environmental construction time is added to the combo box and selected. • [Change]: A previous environmental construction time selected in the combo box is changed. • [Remove]: An environmental construction time selected in the combo box is deleted.
Port	The port list display contains a tree view and list view. The root of the tree view displays a target disk array, under which host ports are listed. The list view displays a list of ports or a list of logical disks related to the selected port according to items selected in the tree view.
[Add]	A logical disk selected in [Logical Disks] is related to a port selected in [Port].
[Remove]	The relationship between a logical disk selected in [Port] and a port is canceled.

Display Item	Explanation
Logical Disks	A list of logical disks is displayed. • [Filter]: The Filter Logical Disk screen is displayed. • [Reset]: A filtering condition is canceled. If no filtering condition has been set, this button cannot be clicked.

When multiple users share the data location, the port configuration and logical disk mapping cannot be added, changed, or deleted.

The Confirm Update Port and Logical Disk Mapping screen is displayed as shown below by clicking the [OK] button in the Configure Port and Logical Disk Mapping screen

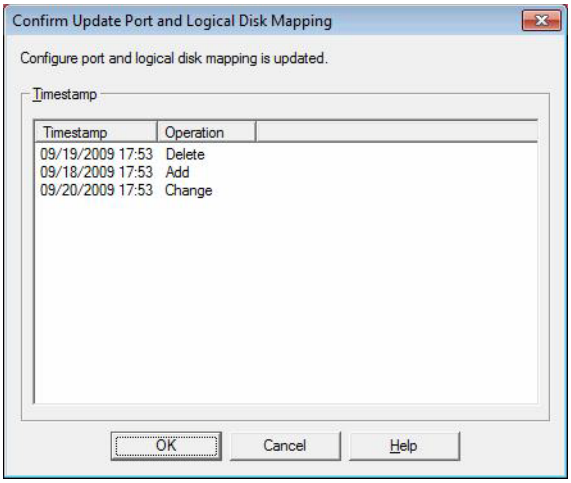


Figure 3-23: Confirm Update Port and Logical Disk Mapping

Timestamp: A list of the environmental construction times that have been added, changed, or deleted in the Configure Port and Logical Disk Mapping screen is displayed.

- Timestamp: The environmental construction times that have been added, changed, or deleted in the Configure Port and Logical Disk Mapping screen are displayed.
- Operation: The operation type is displayed: Add, Changed, or Deleted.

Clicking the [OK] button adds, changes, or deletes the environmental construction times. Clicking the [Cancel] button returns to the Configure Port and Logical Disk Mapping screen, without adding, changing, or deleting the environmental construction times.

Listing Metrics

The metrics display function lists imported metrics to realize central management of metrics. The Disk Array View screen is explained here.

Displaying the Disk Array View screen

Display the Disk Array View screen by either of the procedures shown below.

- From the menu bar, select [View] [Disk Array View].
- Click [Disk Array View] in the toolbar.

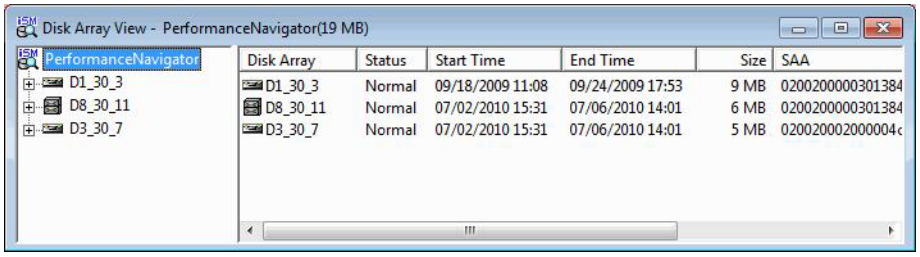


Figure 3-24: Disk Array View

Display item	Explanation
Metrics display area	A list of metrics is displayed in tree view form. • AutoTune: The function is displayed by an icon. • Disk array layer: Displays icons and disk array names of disk arrays being managed. If nickname has been changed, the most recent nickname is displayed. • File layer: Icons and metrics types of files being managed are displayed for each disk array. Interval information • :Metrics in units of metric gathering intervals. A metric gathering interval is a logging interval specified by the SnapSAN S5000 server. • Hourly summary:: Metrics summarized in 1-hour units • Daily summary:: Metrics summarized in 1-day units • Monthly summary:: Metrics summarized in 1-month units
Available metrics display area	A summary of properties and metrics of disk arrays being managed is displayed in the form of a list view. • Disk Array: The icon and disk array name of a disk array being managed are displayed. • Status: The storage state of metrics is displayed. Normal: All metrics can be analyzed. Abnormal: Some metrics of the corresponding disk array has been destroyed. • Start Time: The output time of the oldest metrics being maintained for analysis is displayed (format: mm/dd/yyyy hh:mm). • End Time: The output time of the most recent metrics being maintained for analysis is displayed (format: mm/dd/yyyy hh:mm). • Size: The total file capacity is displayed. (Unit: KB, MB, or GB) • SAA: The Subsystem Absolute Address (56 • digits of hexadecimal) that is the disk array's identification information is displayed.

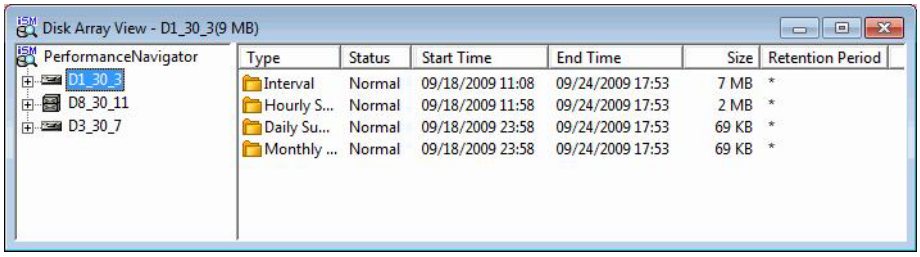


Figure 3-25: Disk Array View (Disk Array Selected)

Display Item	Explanation
Metrics summary display area	A summary of metrics for the disk array selected in the tree view is displayed in the form of a list view. • Type: The classification of the metrics is displayed. • Status The state of the metrics is displayed. Normal: All metrics can be analyzed. Abnormal: The relevant type of metrics may have been destroyed. • Start Time: The output time of the oldest metrics being maintained for analysis is displayed (format: mm/dd/yyyy hh:mm). • End Time: The output time of the most recent metrics being maintained for analysis is displayed (format: mm/dd/yyyy hh:mm). • Size: The total file capacity is displayed. (Unit: KB, MB, or GB) • Keep Period: The period for which metrics can be stored is displayed. If an asterisk (*) is displayed, it indicates that a keep period has not been set.

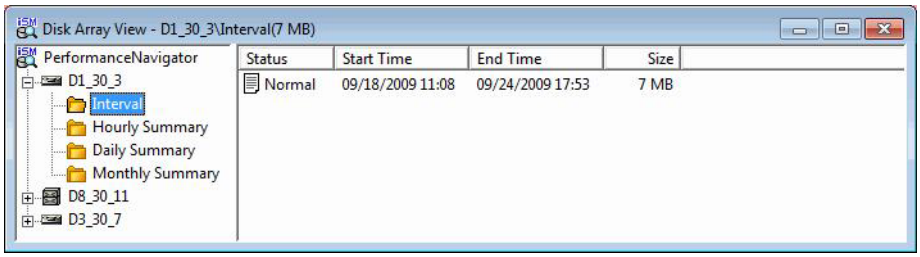


Figure 3-26: Disk Array View (File is selected)

Metrics detailed display area

Details of the metrics of the disk array selected in the tree view are displayed in the form of a list view.

- Status: The state of the metrics is displayed.

  Normal: All metrics can be analyzed.

  Abnormal: The relevant type of metrics may have been destroyed.
- Start Time: The beginning time of the period for which it is maintained is displayed (format: mm/dd/yyyy hh:mm).
- End Time: The ending time of the period for which it is maintained is displayed (format: mm/dd/yyyy hh:mm).
- Size: The total file capacity is displayed. (Unit: KB, MB, or GB)

License application

If a license has not been applied when analysis is performed, a dialog box like the following is displayed

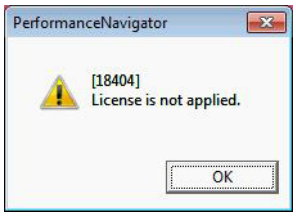


Figure 3-27: License Inapplicable

Since there are two ways to apply a license, take either way to apply.

This is available only when a disk array is selected in the Disk Array View screen.

- After selecting the disk array or metrics to analyze in the Disk Array View screen, select [Help] [Apply License] from the menu bar.
- After selecting the disk array or metrics to analyze in the Disk Array View screen, right-click it to display a shortcut menu.

Select [Apply License] from the shortcut menu that is displayed.

By selecting [Apply License], the warning dialog box is displayed. Figure 3-27 shows the warning dialog box.

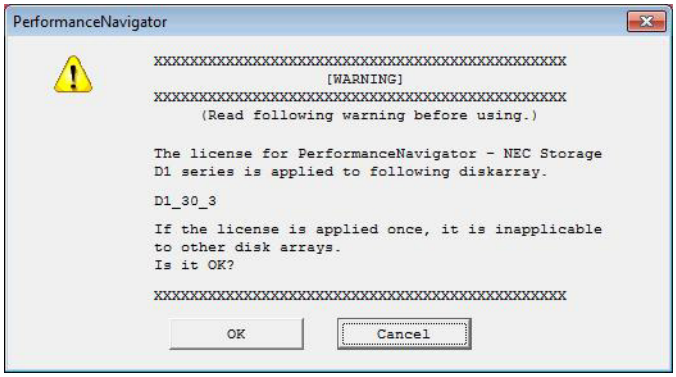


Figure 3-28: Warning Message

Clicking the [OK] button applies the license.

The license applied here cannot be applied to another disk array.

When applying the license of the D3 series or the D4 series, [License choice warning] dialog box of Figure 3-15 is displayed before the dialog box of Figure 3-27 is displayed.

Managing Metrics

When metrics that is analyzed continually increases, it oppresses the disk capacity and could impede operations. To prevent the occurrence of such a situation, a function that regulates unneeded metrics periodically or as needed is provided. File capacity can be confirmed in the Disk Array View screen (Figure 3-23). The types of files that can be managed are as follows.

- Interval information files

- Hourly summary files
- Daily summary files
- Monthly summary files

A Configure Data Retention function is provided as a function that periodically deletes metrics files. The user can set any data retention in days, months, or years for each file type on a per disk array basis. Files for which the number of days, months, or years that have elapsed since the day that the metrics was obtained exceeds the keep period are made subject to deletion. The presence of deletion subjects is determined at the following two times.

- On booting the performance analysis function
- When setting retention periods

A metrics deletion function is also provided as a function that deletes metrics files on no schedule. The metrics deletion function, which a user can execute by disk array, file type, year, month, or day at any time, makes it possible to delete all files for which conditions are met. It maintains the data retention even when it deletes metrics.

Displaying the Configure Data Retention screen

Set the period for which to keep metrics.

Displaying the Configure Data Retention screen

Display the Configure Data Retention screen by either of the procedures shown below.

- After selecting a disk array or metrics type in the Disk Array View screen, select [Operation] [Configure the Data Retention Period] from the menu bar.
- After selecting a disk array or metrics to be analyzed in the Disk Array View screen, right-click to display a shortcut menu.

  Select [Configure the Data Retention Period] from the shortcut menu that is displayed.

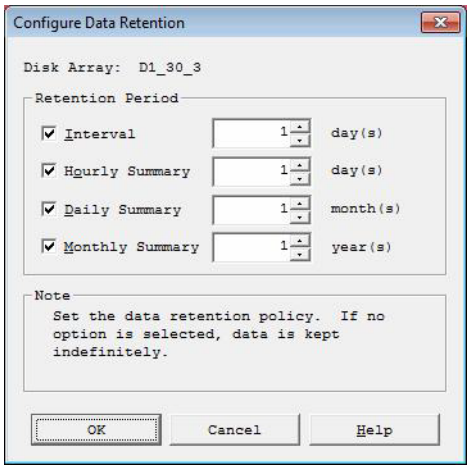


Figure 3-29: Configure Data Retention

Display Item	Explanation
Disk Array	The name of a target disk array is displayed.

Display Item	Explanation
Retention Period	Set the data retention by metrics classification. These can be set even if no metrics files are being kept. If no checkbox is checked, information is kept indefinitely. Interval Set the data retention of interval information in days. (Setting range: 1 to 31, Initial value: 1) Hourly Summary Set the data retention of hourly summary files in days. (Setting range: 1 to 186, Initial value: 1) Daily Summary Set the data retention of daily summary files in months. (Setting range: 1 to 12, Initial value: 1) Monthly Summary Set the data retention of monthly summary files in years. (Setting range: 1 to 2, Initial value: 1)
Note	A description of the Configure Data Retention screen is displayed.

When multiple users share the data location, data retention may not be set.

When there are files for which the data retention is exceeded, the Delete Data screen below is displayed to prompt for deletion confirmation.

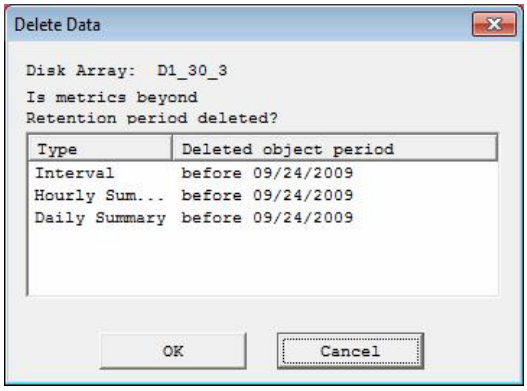


Figure 3-30: Delete Data

Disk Array: The name of a target disk array is displayed.

Type: The types of metrics to be deleted are displayed. The items that are displayed are as follows.

- Interval
- Hourly summary
- Daily summary
- Monthly summary

Deleted object period: Periods to be deleted are displayed.

When multiple users share the data location, metrics is not deleted.

Displaying the Delete Data Screen

Set the metrics to delete.

Displaying the Delete Data screen

Display the Delete Data screen by either of the procedures shown below.

- After selecting a disk array or metrics type in the Disk Array View screen, select [Operation] [Delete Metrics] from the menu bar.
- After selecting a disk array or metrics to be analyzed in the Disk Array View screen, right-click to display a shortcut menu. Select [Delete Data] from the shortcut menu that is displayed.

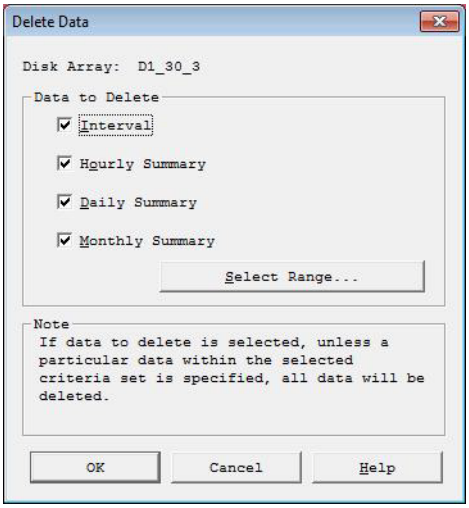


Figure 3-31: Delete Data (1)

Disk Array: The name of a target disk array is displayed.

Data to Delete: Select the class of metrics to delete.

- Interval
- Hourly Summary
- Daily Summary
- Monthly Summary

[Criteria]: Criteria screen filters the information to delete.

Note: A description of the Delete Data screen is displayed.

When multiple users share the data location, metrics cannot be deleted.

When the [OK] button in the Delete Data screen is clicked, the following Delete Data screen is displayed.

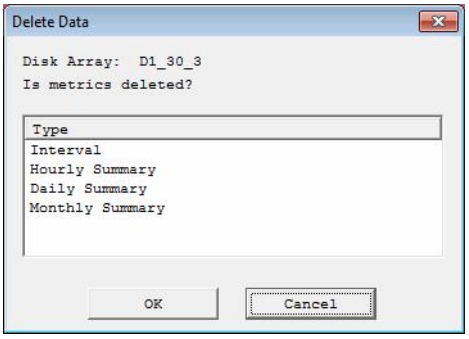


Figure 3-32: Delete Data (2)

Disk Array: The name of a target disk array is displayed.

Type: The classes of metrics files to be deleted are displayed. The items that are displayed are as follows.

- Interval
- Hourly summary
- Daily summary
- Monthly summary

If the [Cancel] button in the above Delete Data screen is clicked, the metrics is not deleted.

If the [Set Range] button in the Delete Data screen is clicked, the Criteria screen like the one shown below is displayed.

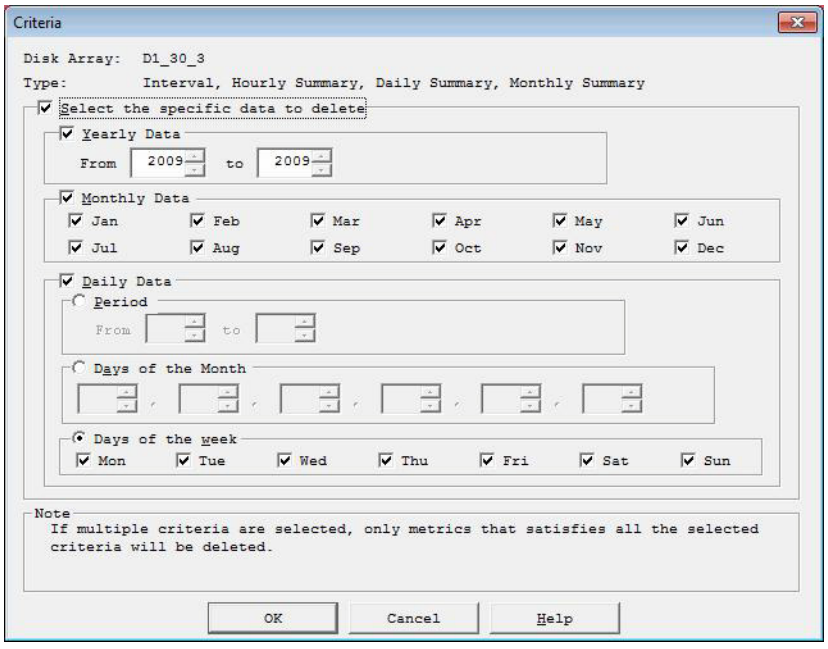


Figure 3-33: Criteria

Display Item	Explanation
Disk Array	The name of a target disk array is displayed.
[Select the specific data to delete] checkbox	Put a check in the checkbox when filtering the deletion target. If not checked, all metrics of the type selected in the Delete Data screen will be deleted.
Yearly Data	Set the year that is to be deleted. A range can be specified.
Monthly Data	Set the month that is to be deleted. Multiple months can be selected. However, this cannot be set for “Monthly information”.
Daily Data	Set the date to be deleted for “Interval information” or “Hourly summary”. However, this cannot be set for “Monthly summary” or “Daily summary”. • Period: Specify a period to delete. • Days of the Month: Specify dates to delete. Up to 6 dates can be specified. • Days of the week: Specify a day of the week to delete. Multiple days can be specified.
Note	A description of the Criteria screen is displayed.

Managing Analysis Information

The data location can be changed.

Displaying the Data Location screen.

Follow the procedure below to display the Data Location screen.

- Select [File] [Data Location] on the menu bar.

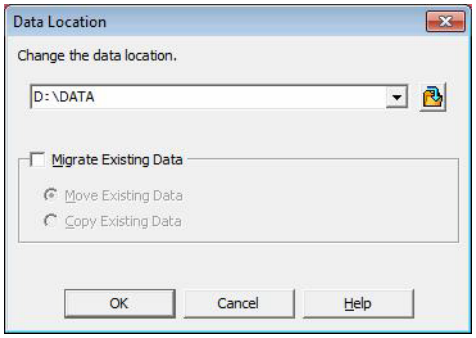


Figure 3-34: Data Location

[Data Location] combo box:

- Specify a data location.
- The data locations that were specified before can be listed.
- The initial value is the installation folder.

[Migrate Existing Data] checkbox:

- Put a check in the checkbox when using the analysis information stored in the current data location after changing the data location.

- Move Existing Data: The files in the current data location are moved to the new data location. The files in the current data location are deleted.
- Copy Existing Data: The files in the current data location are copied to the new data location. The files in the current data location are not deleted but left.

When multiple users share the data location, the imported information cannot be inherited.

If you click the [OK] button, the data location is changed. When the [Migrate Existing Data] checkbox is selected, a dialog box indicating the progress of movement or copy appears. If a message indicating "Move finished" or "Copy finished" is displayed on the dialog box, movement or copy has been finished. Figure 3-34 shows an example of the [Moving] dialog box.

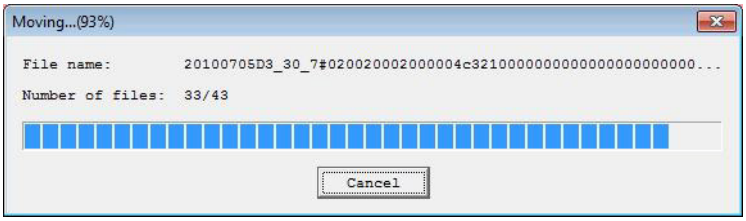


Figure 3-35: Moving File Progress

If you click the [Cancel] button on the [Moving] dialog box during movement or copy, the movement or copy is canceled. If the operation is canceled, it is necessary to set the data location again.

When the data location is set as a shared folder, some functions are restricted.

If a network is disconnected during operation of the performance analysis function, make a network connection again and then perform the same operation.

Quick Analysis

Quick analysis is a function that makes it possible to grasp the overall performance situation of a disk array unit at a glance.

It makes it possible to display the main metrics of a disk array unit in a block by simple operations and analyze general conditions from the display contents.

Displaying Main Metrics

This section explains the procedure for running quick analysis for a disk array selected in the Disk Array View.

Run "Quick analysis"

Since there are three ways to run "Quick analysis", take either way to run.

This is available only when a disk array has been selected in the Metrics View screen.

- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, select [Analysis] [Quick Analysis] [Run] from the menu bar.
- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, click the [Run Quick Analysis] button in the toolbar.
- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, right-click to display a shortcut menu. Select [Quick Analysis] [Run] from the shortcut menu that is displayed.
- Quick analysis can be used to analyze performance and capacity.

- The capacity can be analyzed by loading the default capacity TemplateSet or changing the default template settings.
- When metrics contain capacity information, a message dialog box indicates that the capacity can be analyzed.
- The electric power can be analyzed by selecting the default template of the cabinet.

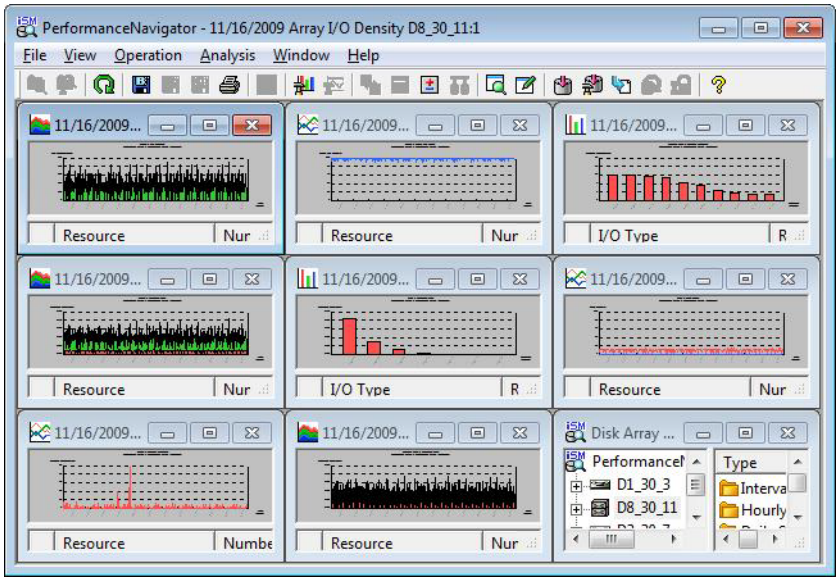


Figure 3-36: Quick Analysis

3.8.2Configuring Quick Analysis

Configure quick analysis settings. This section explains the display procedure for the Configure Quick Analysis screen.

Displaying Configure Quick Analysis screen

Since there are three ways to display the Configure Quick Analysis screen, take either way to display.

This is available only when a disk array has been selected in the Disk Array View screen.

- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, select [Analysis] [Quick Analysis] [Set Up] from the menu bar.
- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, click the [Configure Quick Analysis] button in the toolbar.
- After selecting the disk array or metrics to be analyzed in the Disk Array View screen, right-click to display a shortcut menu. Select [Quick Analysis] [Set Up] from the shortcut menu that is displayed.

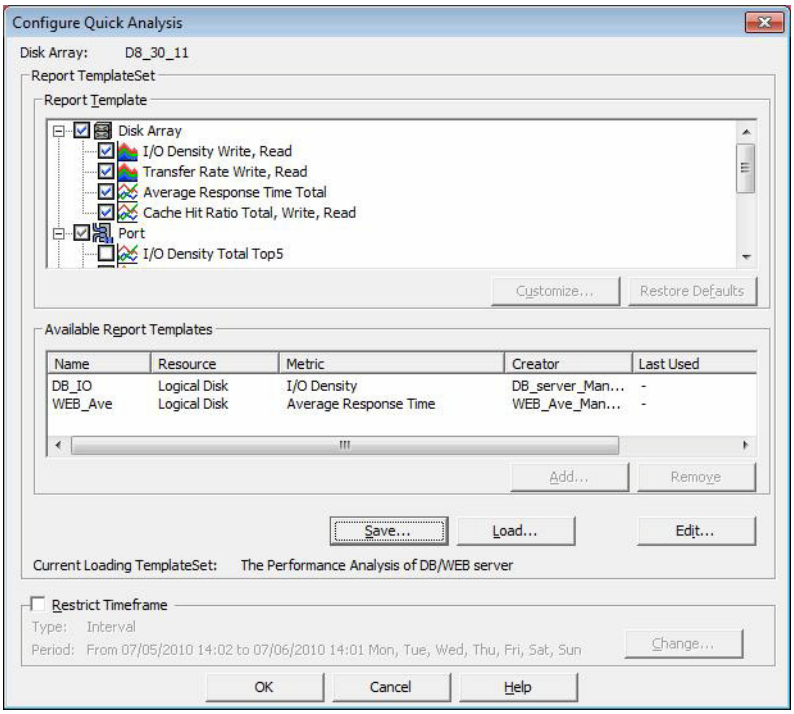


Figure 3-37: Configure Quick Analysis

Display Item	Explanation
Disk Array	The name of the operation target disk array is displayed.
Report Template	A list of templates that apply to the disk array is displayed.
[Customize]	The Configure Report Template screen (Figure 3-37) is displayed for setting report template display conditions.
[Restore Defaults]	The report template display conditions are returned to the initial settings.
Available Report Templates	A list of templates among the user-defined templates that become subject to quick analysis by making the disk array in question the subject of analysis is displayed.
[Add]	The Add Report Template screen (Figure 3-38) is displayed and a user-defined template is added to the quick analysis.
[Remove]	The user-defined template is deleted from the quick analysis.
Current Loading TemplateSet	The name of the currently loaded TemplateSet is displayed. If no TemplateSet is loaded, “No Load TemplateSet” is displayed. If some settings in the default template or available report template have been changed on the quick analysis configuration screen, “(Updated)” is displayed at the beginning.
[Save]	The “Create Report TemplateSet” screen (Figure 3-42) is displayed and the settings in the currently specified default template and available report template are saved as a TemplateSet.
[Load]	The “Load Report TemplateSet” screen (Figure 3-45) is displayed and the settings in the registered TemplateSet are applied to the default template and available report template.

Display Item	Explanation
[Edit]	The “Edit Report TemplateSet” screen (Figure 3-46) is displayed, the registered TemplateSet is deleted, and the TemplateSet Name, TemplateSet explanation, and creator name for the TemplateSet are changed.
[Restrict Timeframe] checkbox	Put a check in the checkbox when setting the timeframe for quick analysis. Uncheck to select the data to be analyzed in the Disk Array View screen when executing the quick analysis.
[Change]	The Restrict Timeframe screen (Figure 3-39) is displayed and the quick timeframe for quick analysis of the subject disk array is changed.

Displaying the Configure Report Template screen

Clicking the [Customize] button displays the Configure Report Template screen.

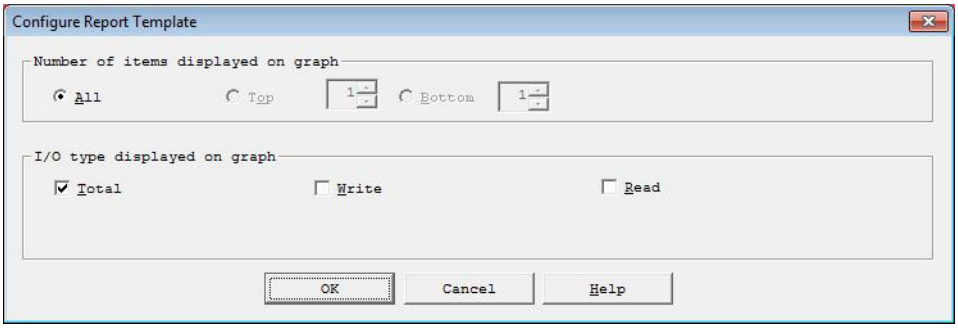


Figure 3-38: Configure Report Template

Number of items displayed on graph: Specify the display conditions (All/Top/Bottom) to set in the template. If [All] is selected, all subject resources are displayed in graphs. If [Top] or [Bottom] is selected, 1-64 resources ranking above or below the average value of the period being analyzed are displayed in graphs. This cannot be set greater than the total number of resources of metrics being analyzed.

I/O and capacity types displayed on graph: Specify the type of I/O (such as Total/Write/Read) or the capacity type (such as Actual Used Capacity) to set in the template.

Displaying the Add Report Template screen

Clicking the [Add] button displays the Add Report Template screen.

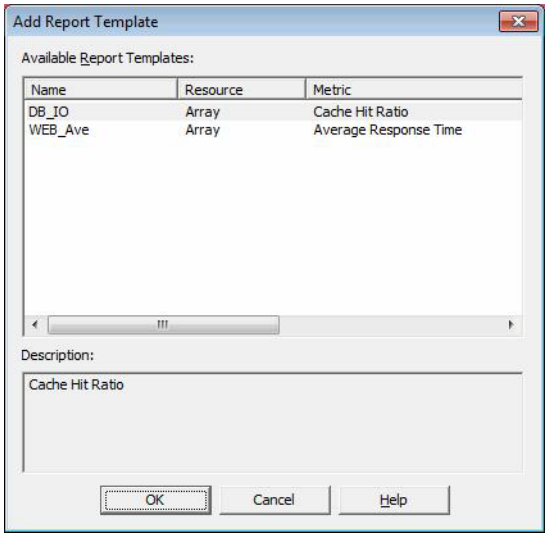


Figure 3-39: Add Report Template

Available Report Templates: A list of user-defined templates by which the disk array that is the subject of quick analysis can be analyzed is displayed.

Description: A description of the template that is selected is displayed.

In order to add a report template with the screen of Configure Quick Analysis, the report template must be created and registered in advance.

Displaying the Create Report TemplateSet screen

Clicking the [Register] button displays this screen.

Displaying the Load TemplateSet screen

Clicking the [Load] button displays this screen.

Displaying the Edit Report TemplateSet screen

Clicking the [Edit Information] button displays this screen.

Displaying the Restrict Timeframe screen

Clicking the [Change] button displays the Restrict Timeframe screen.

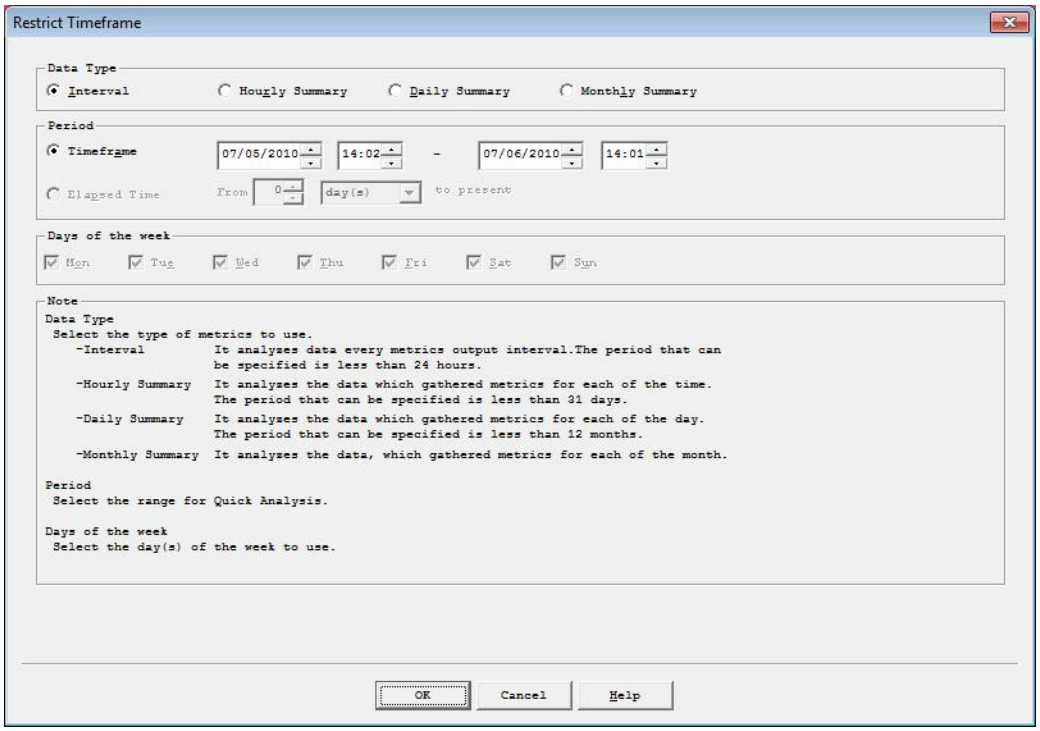


Figure 3-40: Restrict Timeframe

TemplateSet

A TemplateSet is used to save quick analysis settings (the display setting of the default template and available report template). These settings which were set in the past can be changed at the same time by loading the saved template set. That is, you can easily change the settings without selecting statistics in the default template.

There are two types of template sets: default template sets and available report TemplateSets.

In addition, two types of default template sets (for performance analysis and capacity analysis) are provided to easily analyze the main statistics. The user cannot change the settings for these sets.

An available report template set allows you to freely specify the quick analysis display information. You can create, delete, and update this type of template.

Resource	Display Contents	Graph Type	Unit of Traverse
Disk Array	I/O Density (Write/Read)	Stacked Area graph	A time
Disk Array	Transfer Rate (Write/Read)	Stacked Area graph	A time
Disk Array	Average Response Time (Total)	Line graph	A time
Disk Array	Cache Hit Ratio (Total/Write/Read)	Line graph	A time
Port	Transfer Rate (Total)	Column graph	The resource

Resource	Display Contents	Graph Type	Unit of Traverse
Logical Disk	Transfer Rate (Total)	Stacked Area graph	A time
Logical Disk	Average Response Time (Total)	Column graph	The resource
Rank/Pool	Busy Ratio	Line graph	A time

Resource	Display Contents	Graph Type	Unit of Traverse
Logical Disk	Current Capacity Value (Differential Logical Disk Capacity)	Column graph	The resource
Logical Disk	Current Capacity Value (Differential LD Capacity Threshold)	Column graph	The resource
Logical Disk	Current Capacity Value (Differential LD Capacity Quota)	Column graph	The resource
Pool	Current Capacity Value (Differential Actual Capacity)	Column graph	The resource
Pool	Current Capacity Value (Differential Actual Capacity Threshold)	Column graph	The resource
Pool	Current Capacity Value (Differential Actual Capacity Threshold (Pre))	Column graph	The resource
Virtual Capacity Pool Total	Current Capacity Value (Actual Used Capacity)	Line graph	A time
Virtual Capacity Pool Total	Current Capacity Value (Actual Capacity, Actual Used Capacity)	Stacked column graph	The resource

Using a TemplateSet

This section describes how to use a TemplateSet.

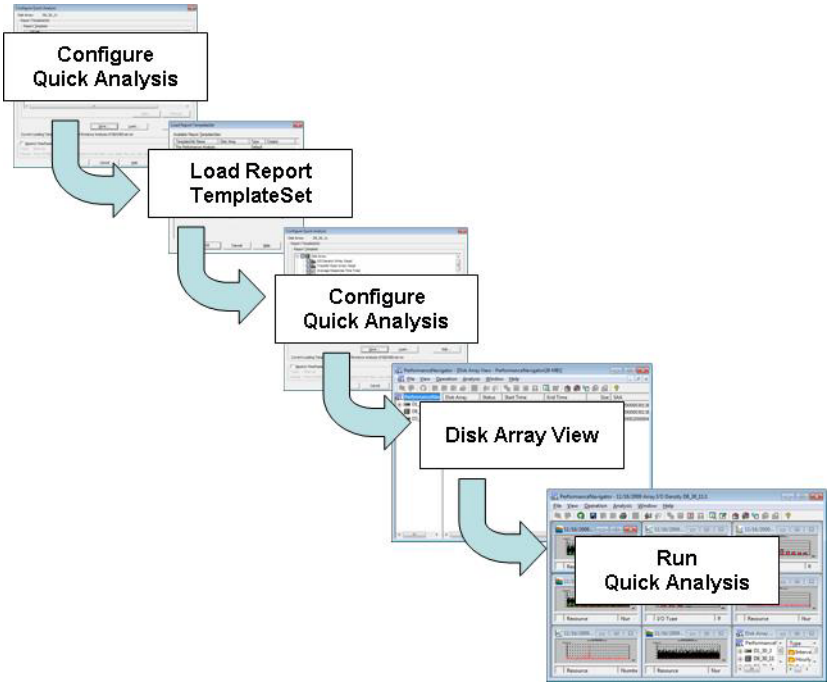


Figure 3-41: TemplateSet

1. Open the Configure Quick Analysis screen, and then click the [Load] button.
2. When the Load Report TemplateSet screen is displayed, select the report template set for capacity analysis, and then clicks the [OK] button.
3. Click the [OK] button with the Configure Quick Analysis screen to execute the Quick Analysis.

The graph which was registered to the default TemplateSet of capacity analysis is displayed.

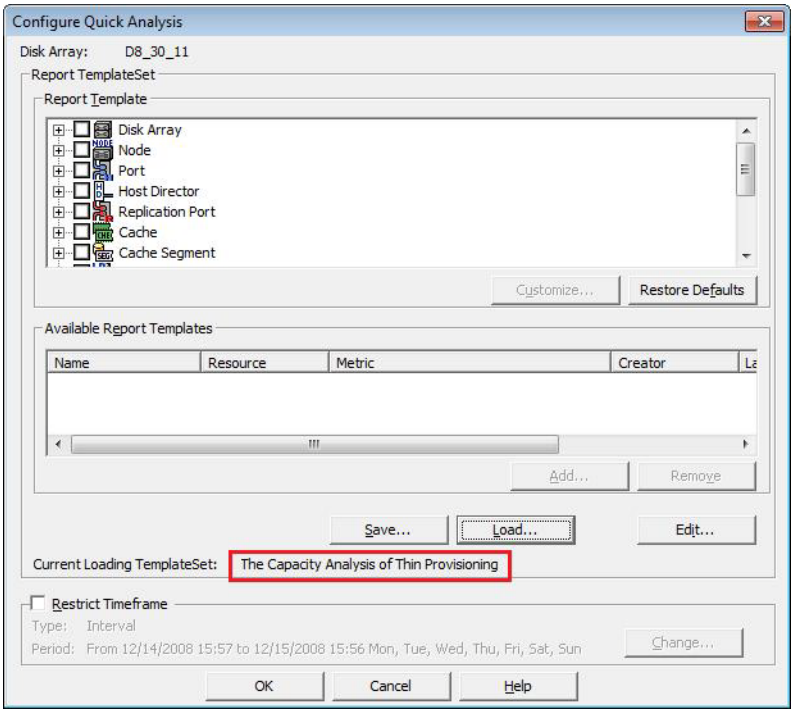


Figure 3-42: Configure Quick Analysis (After Loading TemplateSet)

Creating a Report TemplateSet

The Create Report TemplateSet screen is used to save the currently specified default template and Available Report template as a TemplateSet. This section describes how to display the Create Report TemplateSet screen.

Displaying the Create Report TemplateSet screen

Follow the procedure below to display the Create Report TemplateSet screen:

- Click the [Register] button on the Configure Quick Analysis screen.

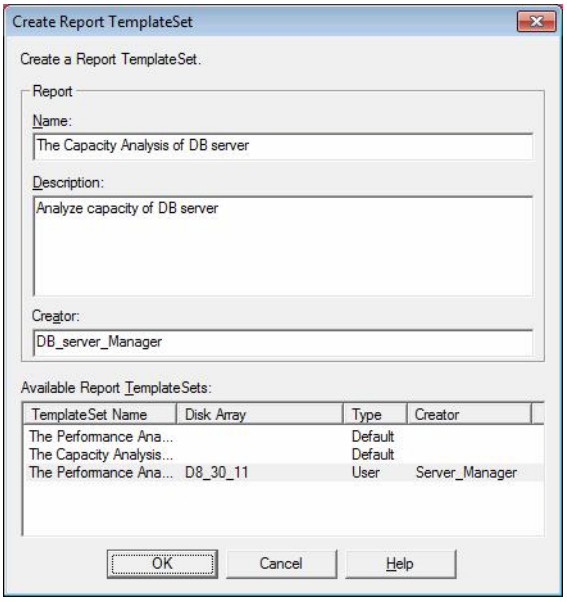


Figure 3-43: Create Report TemplateSet

Display Item	Explanation
TemplateSet Name	Input the TemplateSet name by using up to 64 characters. If a TemplateSet has been selected from the TemplateSet list, the name of the set is displayed.
Description	Input a description of the TemplateSet by using up to 512 characters. If a TemplateSet has been selected from the TemplateSet list, the explanation of the set is displayed.
Creator	Input the TemplateSets creator by using up to 64 characters. If a TemplateSet has been selected from the template set list, the set's creator is displayed.
Available Report TemplateSets	The registered TemplateSets are listed.

If a TemplateSet that has the same name already exists, the following Overwrite Confirmation dialog box is displayed.

Figure 3-44: Overwrite Confirmation

Click the [OK] button to overwrite the existing TemplateSet. Click the [Cancel] button to return to the Create Report TemplateSet screen without overwriting the TemplateSet.

If a default TemplateSet that has the same name already exists, the TemplateSet cannot be registered. When trying to register such a TemplateSet, the following message dialog box is displayed.

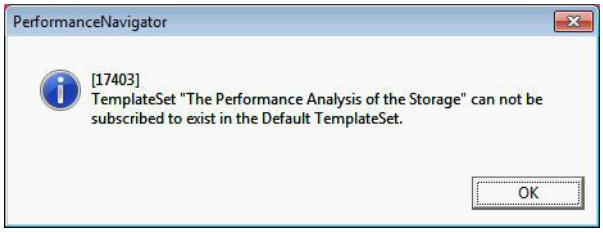


Figure 3-45: Message

Loading a Report TemplateSet

The Load Report TemplateSet screen is used to load a registered template set and apply the settings to the default template and Apply Report template. This section describes how to display the Load Report TemplateSet screen.

Displaying the Load Report TemplateSet screen

Follow the procedure below to display the Configure Quick Analysis screen:

- Click the [Load] button on the Configure Quick Analysis screen.

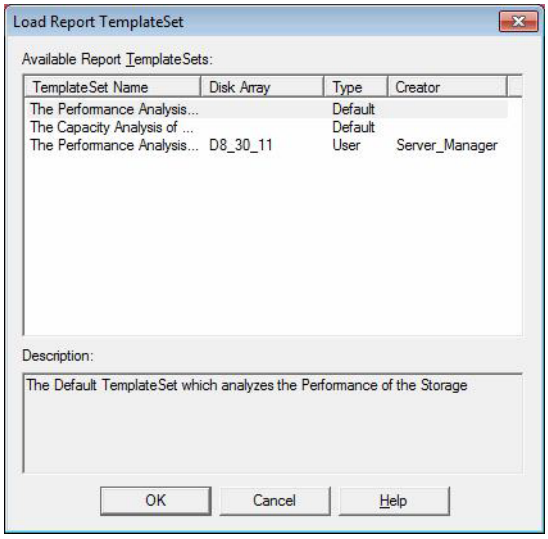


Figure 3-46: Load Report TemplateSet

Available Report TemplateSets: The registered TemplateSets are listed with the following information displayed:

- TemplateSet Name
- Disk Array
- Type
- Creator

Description: A description of the selected TemplateSet is displayed.

If a TemplateSet that has the same name already exists, the following Overwrite Confirmation dialog box is displayed.

- The report TemplateSet of the capacity analysis is displayed only when importing the metrics which contain the capacity data of the Thin Provisioning function.
- The available report TemplateSet which was registered to other disk arrays is not displayed.

Editing a Report TemplateSet

The Edit Report TemplateSet screen is used to change the TemplateSet name, explanation, and creator settings. This screen is also used to delete the created TempleteSet. This section describes how to display the Edit Report TemplateSet screen.

Displaying the Edit Report TemplateSet screen

Follow the procedure below to display the Edit Report TemplateSet screen.

- Click the [Edit] button on the Edit Report TemplateSet screen.

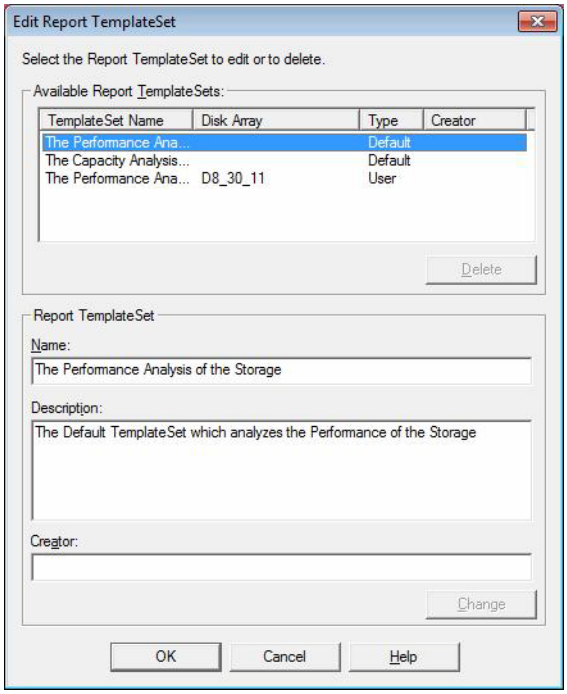


Figure 3-47: Edit Report TemplateSet

Display Item	Explanation
Available Report TemplateSets	The TemplateSets are listed.
[Delete]	Deletes the selected template set from the TemplateSet list. However, note that the default TemplateSet cannot be deleted.
TemplateSet Name	Input the TemplateSet name by using up to 64 characters. If a TemplateSet is selected from the TemplateSet list, the name of the set is displayed.

Display Item	Explanation
Description	Input a description of the TemplateSet by using up to 512 characters. If a TemplateSet is selected from the TemplateSet list, the explanation of the set is displayed.
Creator	Input the TemplateSets creator by using up to 64 characters. If a TemplateSet is selected from the TemplateSet list, the set's creator is displayed.
[Change]	Applies TemplateSet changes to the template set list. If a TemplateSet not to be deleted has the same name as another TemplateSet, an error message is displayed.

When the [OK] button is clicked after deleting or changing a TemplateSet, the Confirm Edit Report TemplateSet screen is displayed. When the [Cancel] button is clicked, the process is interrupted and the TemplateSet is not overwritten.

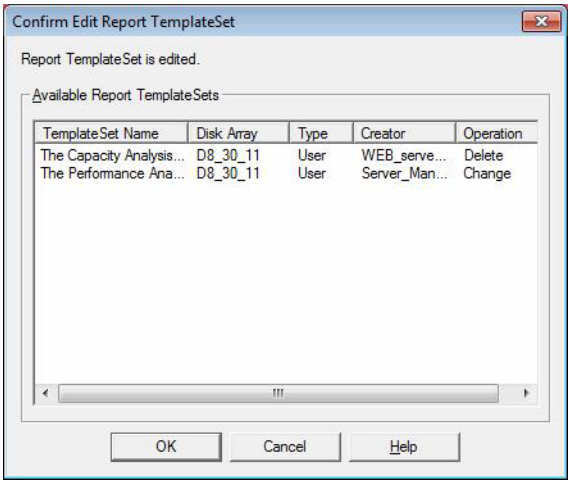


Figure 3-48: Confirm Edit Report TemplateSet

Click the [OK] button on the Confirm Edit Report TemplateSet Screen to finalize the changed TemplateSet information. Click the [Cancel] button to cancel the changes. If you do this, the TemplateSet must be changed again.

Detailed Analysis

Execute detailed analysis if problems are detected in quick analysis or to carry out trend analysis. Change of analysis contents to suit objectives, comparative analysis with statistic data or with previous data, and related resource analysis can be performed. Analysis contents can be saved as templates and reused in subsequent analyses. This section explains each analysis and the reuse of analysis contents.

Changing Analysis Contents

Change the analysis contents displayed in graphs/raw data to suit objectives. Analysis contents can be modified by making changes as follows.

- Changing timeframe
- Changing constituent resources
- Changing metrics

- Changing display format
- Filtering display information
- Configure graph
- Configure display order of resources
- Changing analysis ranges

Changing Timeframe

Change the period for which to analyze metrics that is graphed or tabulated. This section explains how to change the timeframe to the latest one and to the arbitrary one.

Updating the selected graph/raw data

The timeframe of the selected graph/raw data is updated to the one of the latest metrics of all held metrics to be analyzed. There are four update procedures. Select one of these to update the timeframe to the latest information.

- After selecting a particular graph/raw data, select [Refresh] [Current Window] on the shortcut menu that appears.
- After selecting a particular graph/raw data, select [View] [Refresh] [Current Window] on the menu bar.
- After selecting a particular graph/raw data, select the [Current Window] button on the toolbar.
- After selecting a particular graph/raw data, press the F5 key.

Updating all graphs/raw data

The timeframes of all displayed graphs/raw data are updated to the timeframe of the latest metrics of all held metrics to be analyzed. There are two update procedures. Select one of these to update the timeframe to the latest information.

- After selecting an arbitrary graph/raw data, select [Refresh] [All Windows] on the shortcut menu that appears.
- After selecting an arbitrary graph/raw data, select [View] [Refresh] [All Windows] on the menu bar

Displaying Configure Settings screen ([Timeframe] tab)

Since there are three ways to display the Configure Settings screen ([Timeframe] tab), take either way to display.

- After selecting a graph/raw data, select [Configure Settings] from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [Analysis] [Configure Settings] from the menu bar.
- After selecting a graph /raw data, click the [Configure Settings] button in the toolbar.

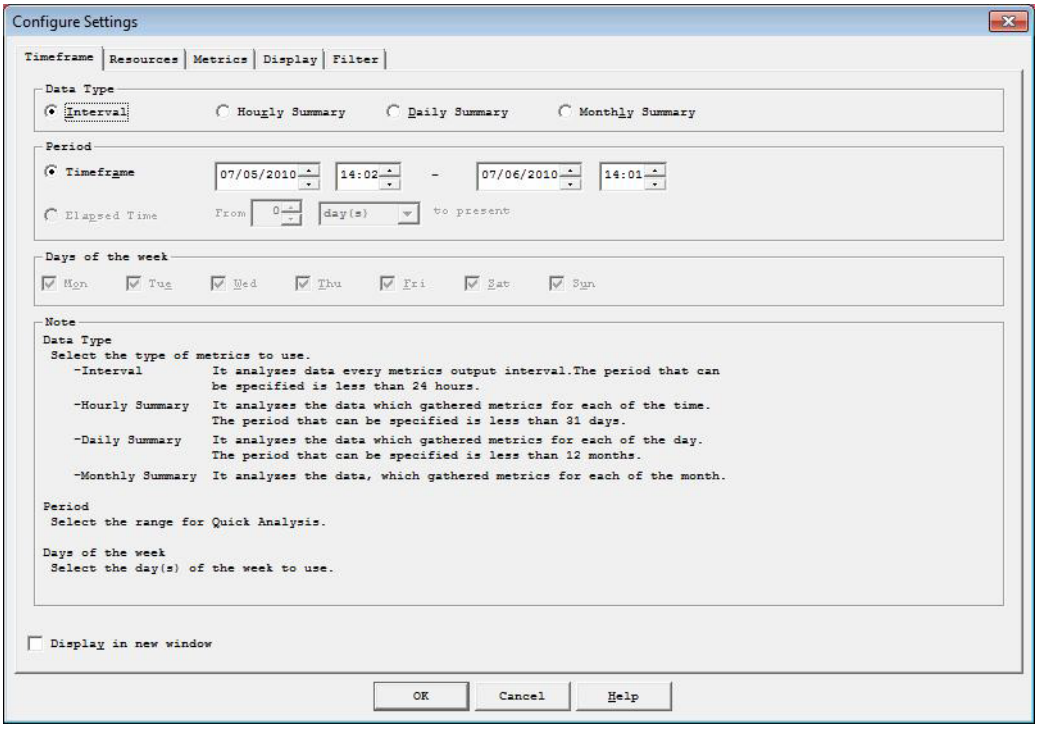


Figure 3-49: Configure Setting (Timeframe)

Display Item	Explanation
Data Type	Select the kind of metrics to be analyzed. The following are the kind of metrics. Interval Hourly Summary Daily Summary Monthly Summary
Period	Specify the timeframe in days (Date specification or Elapsed Time). Timeframe Specify the start date and end date of the timeframe in year/month/day/hour/minute format. Elapsed time Specify the timeframe in the form “From n days to present”, “From n Months to present”, or “From n Years to present”.
Days of the week	To make specific days subject to analysis, check the checkboxes of days to be analyzed.
[Displays in new window.] checkbox	Put a check in the checkbox when using another screen to display a graph whose timeframe setting was changed.

Timeframe setting procedure

The procedure for timeframe change in the Configure Settings screen ([Timeframe] tab) is explained here.

Specify to data type

Select the type of data in response to objectives.

- Interval
  Analyze data for each gathering interval.
- Hourly Summary
  Analyze data for each hour.
- Daily Summary
  Analyze data for each day.
- Monthly Summary
  Analyze data for each month.

Specify to period

Specify the period by selecting [Timeframe] or [Elapsed Time]. The uses of [Timeframe] and [Elapsed Time] are as follows. Choose one according to the purpose.

- [Timeframe]
  Set "start and end dates" and "start and end times".
  "start and end dates": Specify the dates of the beginning and end of the timeframe ("mm/dd/yyyy" format). The displayed range is from the oldest date to the most recent date of the data in question.
  "start and end times": Set the starting and ending times of the timeframe (hh:mm format).
- [Elapsed Time]
  Specify a time in the past relatively by reckoning from the present time.
  If the summarization level of the data to be analyzed is "Interval", only "Day" of the combo box is specifiable and up to 1 day before can be specified.
  If the summarization level of the data to be analyzed is "Hourly", only "Day" of the combo box is specifiable and from 1 day before to 31 days before can be specified.
  If the summarization level of the data to be analyzed is "Daily", "Day" and "Month" of the combo box are specifiable and the range of data that is maintained can be specified.
  If the summarization level of the data to be analyzed is "Monthly", "Month" and "Year" of the combo box are specifiable and the range of data that is maintained can be specified.
  The width of the period that can be specified in the timeframe varies according to the class of metrics of the data being analyzed. It is less than 24 hours for interval information, up to 31 days for hourly summary, and up to 12 months for daily summary. There is no specific limit for monthly summary.

Specify to days of the week

Specify days of the week to be analyzed.

Setting of timeframe

After the data type, period, and days of the week are specified, clicking the [OK] button in the Set Up The Configure Settings screen ([Timeframe] tab) changes the setting to the specified timeframe. Clicking the [Cancel] button ignores the specified timeframe and does not change the existing timeframe.

Changing Constituent Resources

Change the resources to analyze for metrics that is graphed or tabulated. This section explains the screens that change resources and the change procedure.

Displaying the Configure Settings screen

Since there are three ways to display the Configure Settings screen ([Resources] tab), take either way to display.

- After selecting a graph/raw data, select [Configure Settings] [Resources] tab from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [Analysis] [Configure Settings] [Resources] tab from the menu bar.
- After selecting a graph/raw data, click the [Configure Settings] button in the toolbar Select [Resources] tab.

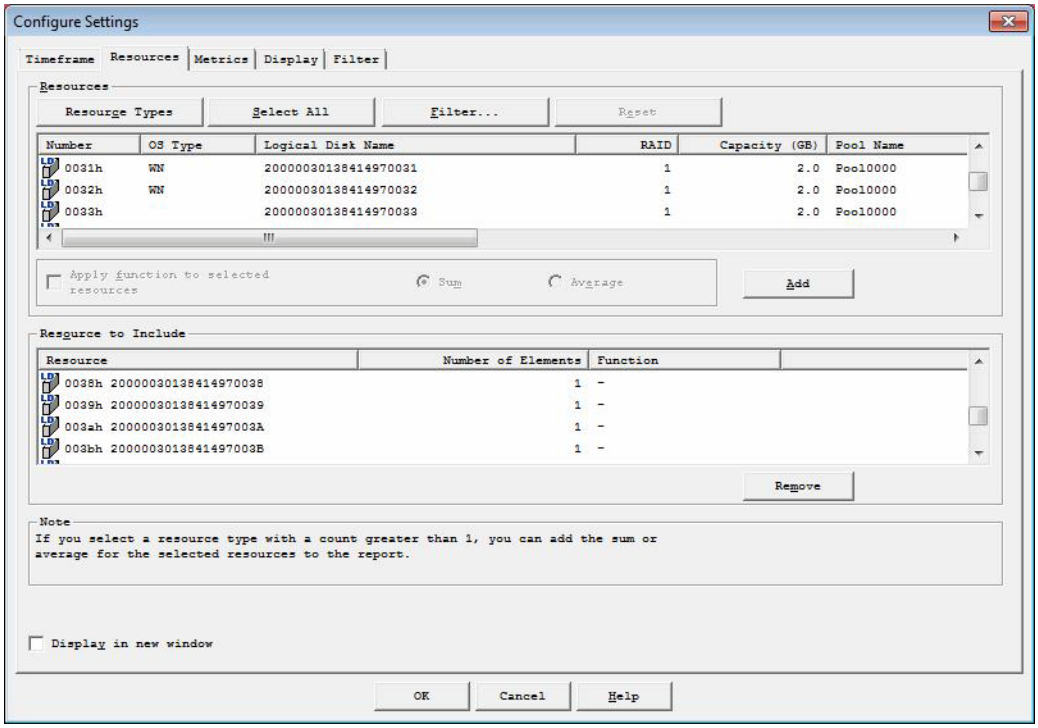


Figure 3-50: Configure Setting (Resources)

Display Item	Explanation
[Resource Types]	If a list of resource types is displayed in the Resources display area, clicking this displays the Resource Type List Display screen. If resources belonging to selected resource type are displayed in a list, clicking is not possible.
[Select All]	All items that are displayed in the list become selected. However, this is available only if at least two items are displayed.
[Filter]	The Filter Logical Disk screen is displayed. (Figure 3-50)
[Reset]	Logical Disk filtering is canceled. This button is available only when a condition for filtering logical disks has been specified.
Resources display area	A list of resource types or resources that can be selected for analysis is displayed. It is possible to switch the display to a list of resources by pressing the Enter key after double-clicking or selecting a resource type in the resource type list. A resource is not displayed if it is not specified for analysis in the Application Settings screen.

Display Item	Explanation
[Apply function to selected resources] checkbox	Put a check in the checkbox when specifying the total method (Sum/Average). The checkbox can be set only when multiple resources are selected.
[Add]	Adds the combination specified by resources selected in the resource list display area and total method checkbox to what is analyzed and displays it added to the list of resources for analysis.
Resources to Include display area	A list of the resources to be analyzed is displayed. However, replication ports and other resource types cannot be made analysis subjects simultaneously for statistics information of the S/A series.
[Remove]	Analyzed resources are deleted.
Note	A description of the Configure Settings screen ([Resources] tab) is displayed.
[Display in new window] checkbox	Put a check in the checkbox when using another screen to display a graph whose timeframe setting was changed.

Icons indicating resources are as follows:

Icon	Explanation
	Represents a disk array. (Varies according to product ID)
	Represents a node.
	Represents a port (resource type).
	Represents a port.
	Represents an iSCSI port.
	Represents a SAS port.
	Represents a host director (resource type).
	Represents a host director.
	Represents a replication port (resource type).
	Represents a replication port.
	Represents a data migration port (resource type).
	Represents a data migration port.
	Represents a disk port (resource type).
	Represents a disk port.
	Represents a disk director (resource type).
	Represents a disk director.
	Represents a cache (resource type).
	Represents a cache.
	Represents a cache segment (resource type).
	Represents a cache segment.
	Represents a logical disk (resource type).
	Represents a logical disk.
	Represents a rank (resource type).
	Represents a rank.

Icon	Explanation
	Represents a pool or Virtual Capacity Pool Total (resource type).
	Represents a pool or Virtual Capacity Pool Total.
	Represents a physical disk (resource type).
	Represents a physical disk.
	Represents a cabinet (resource type).
	Represents a cabinet. (The icon differs depending on the cabinet type.)

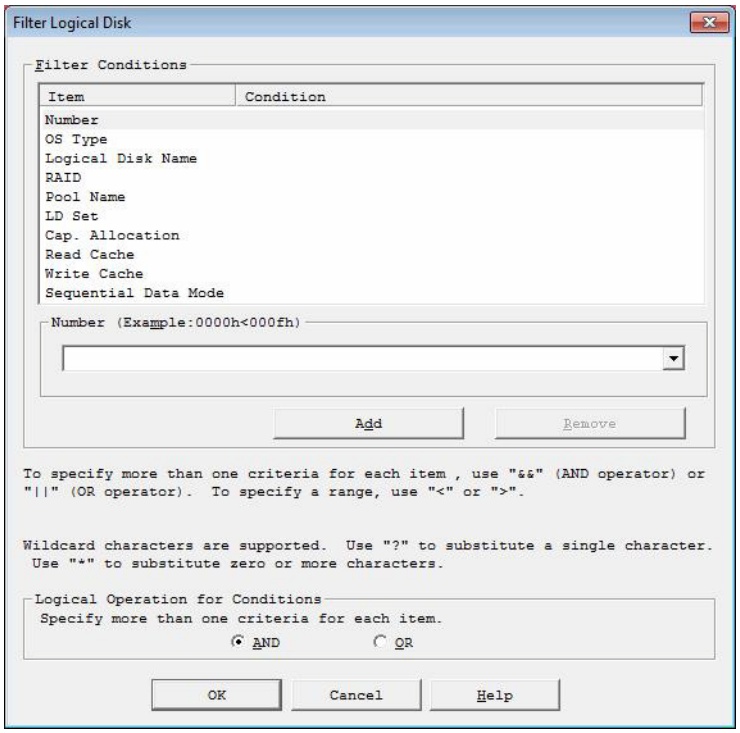


Figure 3-51: Filter Logical Disk

Display Item	Explanation
Number	Input the number of the logical disk.
OS Type	Input the OS type of logical disk. (Enter "(none)" when not specifying an OS Type.)
Logical Disk Name	Input the logical disk name.
RAID	Input the RAID type. (Only for metrics of SnapSAN S5000 V3.1 or later)
Node Number	Input the node number. (Only for disk array with node)
Port Number	Input the port number of the logical disk. (Only if the port is related to the logical disk)
Port Name	Input the port name of the logical disk. (Only if the port is related to the logical disk)

Display Item	Explanation
Rank	Input the rank number. (Only for disk array without pool)
Pool Name	Input the pool name. (Only for disk array with pool)
Logical Disk Set	Input the Logical Disk set. (Only for metrics of SnapSAN S5000 V3.3 or later)
Server / Path	Input the host name (application server name) or path name. (Only if volume list is imported)
Cache Segment Name	Input the cache segment name.
Physical Disk Type	Input the Physical Disk type. (Only for metrics of SnapSAN S5000 V3.4 or later)
Capacity Allocation	Input the logical disk capacity allocation type status (-[Actual Capacity Logical Disk]/Virtual [Virtual Capacity Logical Disk]).
Read Cache	Input the read cache state (ON/OFF).
Write Cache	Input the write cache state (ON/OFF).
Sequential Data Mode	Input the sequential data mode state (ON/OFF). This is the information for the maintenance personnel.
Add	Add the input condition in the Filet Conditions.
Remove	Remove the set condition in the Filter Conditions.
Logical Operation for Conditions	Select the combination condition. AND: Select if satisfying all specified conditions. OR: Select if satisfying any specified condition.

Changing Metrics

Change the metrics to analyze for metrics that is graphed or tabulated. This section explains the screen that changes metrics and the change procedure.

Displaying the Configure Settings screen

Since there are three ways to display the Configure Settings screen ([Metrics] tab), take either way to display.

- After selecting a graph/raw data, select [Configure Settings] [Metrics] tab from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [Analysis] [Configure Settings] [Metrics] tab from the menu bar.
- After selecting a graph/raw data, click the [Configure Settings] button in the toolbar and select [Metrics] tab.

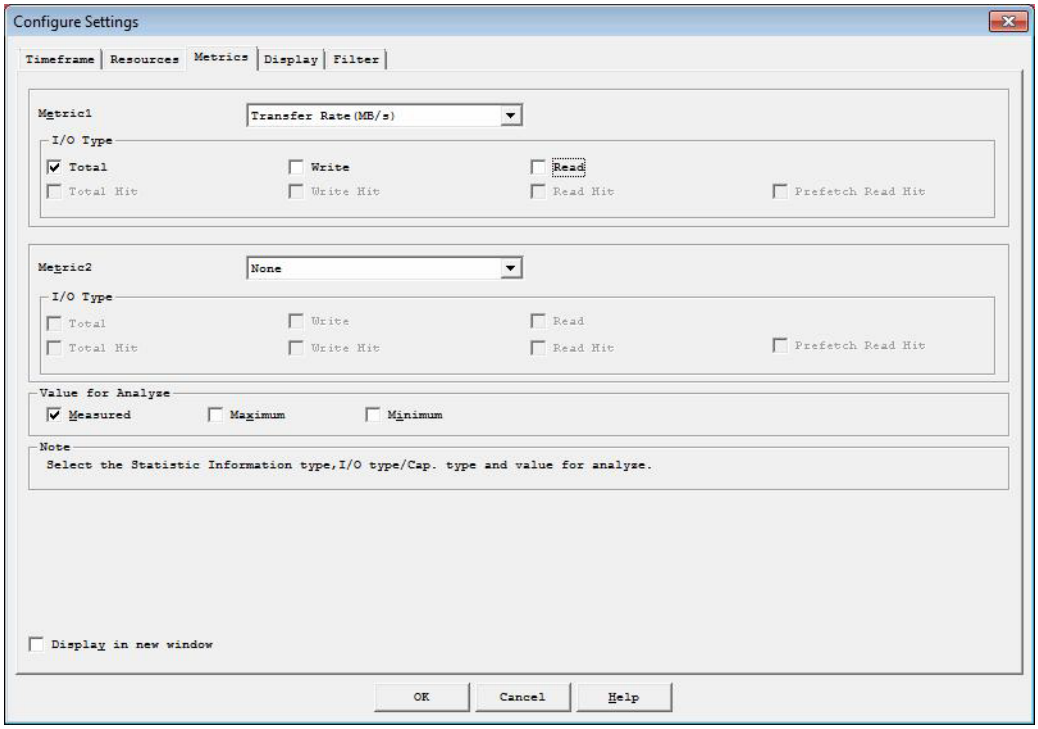


Figure 3-52: Configure Settings (Metrics)

Display Item	Explanation
Metric1	Select the types of metrics. Items that are set in Metric2 cannot be selected. • I/O Density (IOPS) • Average Transfer Length (KB) • Transfer Rate (MB/s) • Average Response Time (ms) • Max Response Time (ms) • Busy Ratio (%) • I/O Ratio (%) • Cache Hit Ratio (%) • Average Dirty Pages (%) • Max Dirty Pages (%) • Average Queue Length (I/O) • Max Queue Length (I/O) • Current Capacity Value (GB) • Capacity Fluctuation Value (GB) • Electric Power (W) • Electric Energy (Wh) • L1/L2 Cache Hit Ratio • L2 Cache Page-in Size • L2 Cache Average Dirty Pages • L2 Cache Max Dirty Pages

Display Item	Explanation
Metric2	Select the types of metrics. Items that are set in Metric1 cannot be selected. • I/O Density (IOPS) • Average Transfer Length (KB) • Transfer Rate (MB/s) • Average Response Time (ms) • Max Response Time (ms) • Busy Ratio (%) • I/O Ratio (%) • Cache Hit Ratio (%) • Average Dirty Pages (%) • Max Dirty Pages (%) • Average Queue Length (I/O) • Max Queue Length (I/O) • Current Capacity Value (GB) • Capacity Fluctuation Value (GB) • Electric Power (W) • Electric Energy (Wh) • L1/L2 Cache Hit Ratio • L2 Cache Page-in Size • L2 Cache Average Dirty Pages • L2 Cache Max Dirty Pages • None (Select when not specifying Metric2)
I/O Type/Capacity Type	Specify the I/O type or capacity type for the types of metrics.
Value for Analyze	Specify the value for analyze. If any of the following is selected as a Metric, the [Maximum] and [Minimum] check boxes cannot be selected. • Max Response Time • Average Dirty Pages • Max Dirty Pages • Average Queue Length • Max Queue Length • Current Capacity Value • Capacity Fluctuation Value • Electric Power • Electric Energy • L2 Cache Page-in Size • L2 Cache Average Dirty Pages • L2 Cache Max Dirty Pages If the Current Capacity Value or Capacity Fluctuation Value statistic is selected, the latest measurement values are displayed.
Note	A description of the Configure Settings screen ([Metrics] tab) is displayed.
[Display in new window] checkbox	Put a check in the checkbox when using another screen to display a graph whose timeframe setting was changed.

In [Metric1] and [Metric2], Metrics are not displayed in the combo boxes if it is not specified in the application settings

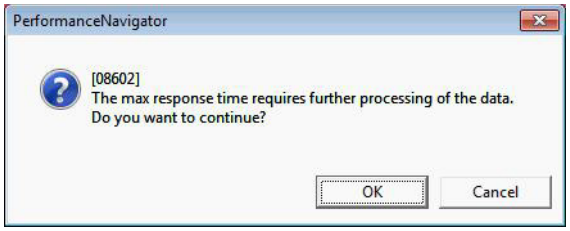


Figure 3-53: Confirm Max Response Time

Clicking the [OK] button sets the maximum response time as a Metric. The Cance] button will open the Configure Settings screen without setting the maximum response time.

Changing Display

Change the display format of metrics that is graphed or tabulated. This section explains the screen that changes display formats and the change procedure.

Displaying the Configure Settings screen

Since there are three ways to display the Configure Settings screen ([Display] tab), take either way to display.

- After selecting a graph/raw data, select [Configure Settings] [Display] tab from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [Analysis] [Configure Settings] [Display] tab from the menu bar.
- After selecting a graph/raw data, click the [Configure Settings] button in the tool column and select [Display] tab.

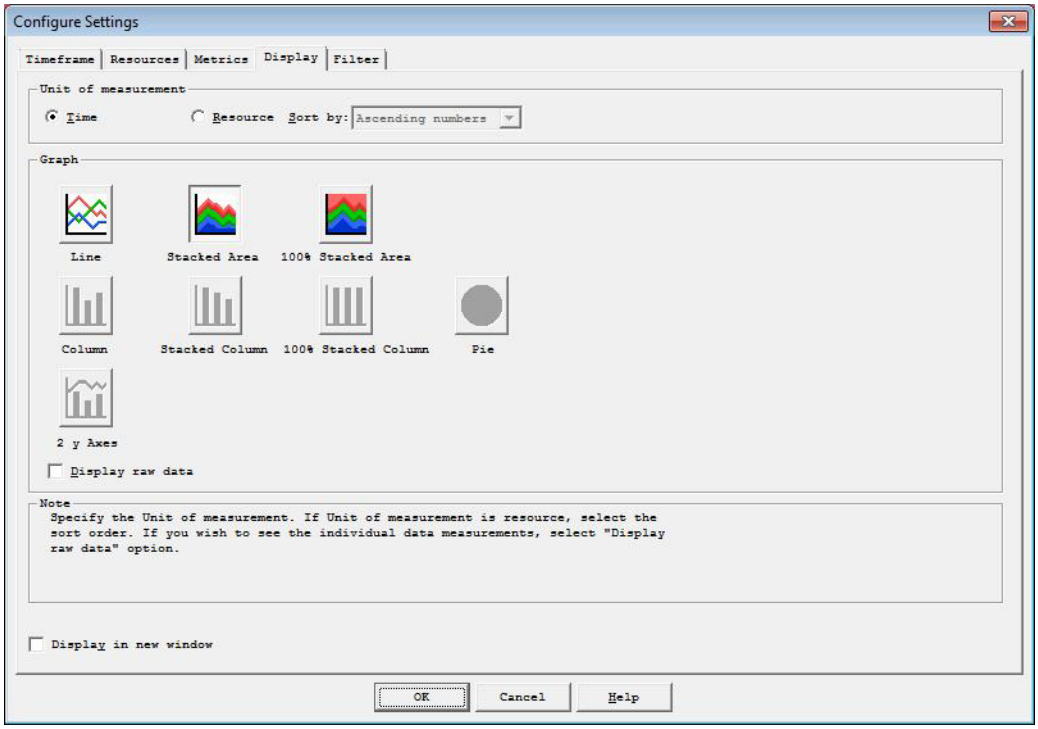


Figure 3-54: Configure Setting (Display)

Display Item	Explanation
Unit of measurement	Specify the unit of measurement. • Time • Resource The sort method (ascending/descending numbers, ascending/descending names, and ascending/descending values) can be selected.
Graph	The type of graph can be selected.
[Display raw data] checkbox	Put a check in the checkbox when using another screen to display raw data.
Note	A description of the Configure Settings screen ([Display] tab) is displayed.
Display in new window] checkbox	Put a check in the checkbox when using another screen to display a graph whose timeframe setting was changed.

An error message is output if there is a problem in the setting range of the upper and lower bounds.

Configure Graph

The graph form of the graph screen that is displayed can be modified.

Displaying the Configure Graph screen ([Scale] tab)

This section explains changing the scale and setting show or hide of scale lines. However, this information cannot be used for a circle graph.

The Configure Graph screen ([Scale] tab) is explained here.

Displaying the Configure Graph screen

Since there are two ways to display the Configure Graph screen ([Scale] tab), take either way to display.

- After selecting a graph, select [Configure Graph] from the shortcut menu that is displayed.
- After selecting a graph, select [View] [Configure Graph] from the menu bar.

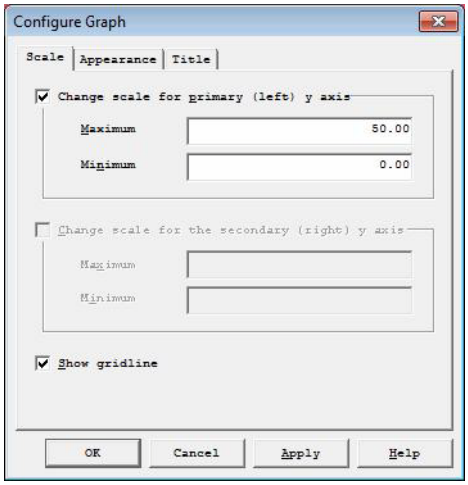


Figure 3-55: Configure Graph (Scale)

Display Item	Explanation
[Change scale for primary (left) y axis] checkbox	Set to change the maximum value or minimum value of the primary axis (left) scale.
[Change scale for the secondary (right) y axis] checkbox	Set to change the maximum value or minimum value of the second axis (right) scale.
Maximum/Minimum	The maximum value and minimum value of the selected graph are displayed.
Show gridline.	Set to display scale lines in graph.

Displaying the Configure Graph screen ([Appearance] tab)

Make the graph detail setting (coloring graph).

This section explains the Configure Graph m screen ([Appearance] tab).

Displaying the Configure Graph screen.

Since there are two ways to display the Configure Graph screen ([Appearance] tab), take either way to display.

- After selecting a graph, select [Configure Graph] [Appearance] tab from the shortcut menu that is displayed.
- After selecting a graph, select [View] [Configure Graph] [Appearance] tab from the menu bar.

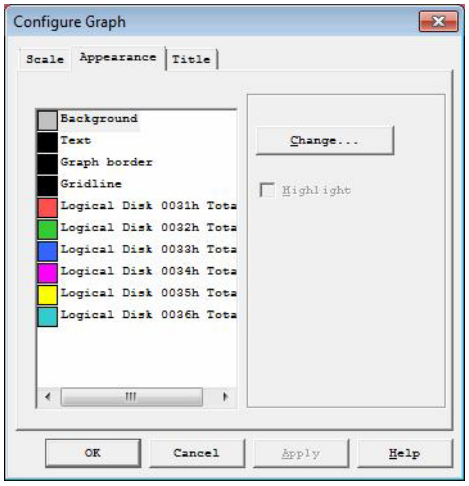


Figure 3-56: Configure Graph (Appearance)

Display Item	Explanation
Color	A list for changing colors for items is displayed.
[Change]	The Color Setting screen is displayed.
[Highlight] checkbox	Set show or hide of markers on line graph.

Displaying the Configure Graph screen ([Title] tab).

This section explains adding the graph title.

The Configure Graph screen ([Title] tab) is also explained here.

Displaying the Configure Graph screen

Since there are two ways to display the Configure Graph screen ([Title] tab), take either way to display.

- After selecting a graph, select [Configure Graph] [Title] tab from the shortcut menu that is displayed.
- After selecting a graph, select [View] [Configure Graph] [Title] tab from the menu bar.

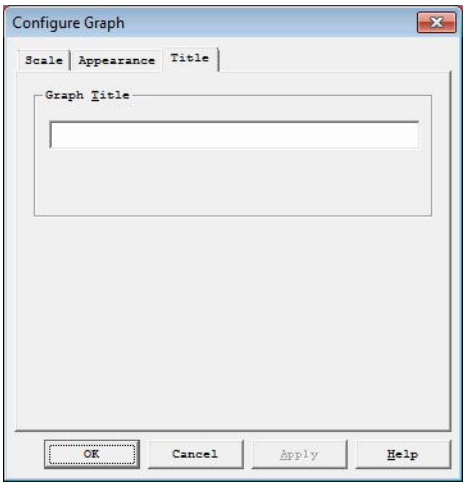


Figure 3-57: Configure Graph (Title)

Graph Title: Input a comment line to add to the title displayed in the graph.

Configure Display Order of Resources

Configure the display order of resources. Select either a numerical order view or a nickname order view. The column order when resources that have nicknames are displayed is replaced according to this setting.

The Configure Display Order screen is explained here. Display the Configure Display Order screen by the procedure below.

- Select [View] [Configure Display Order] from the menu bar.

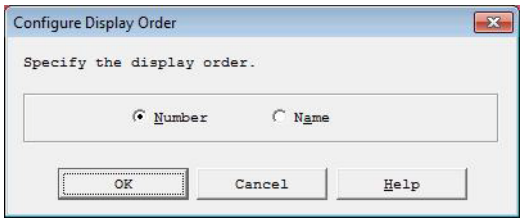


Figure 3-58: Configure Display (Order)

Primary Key

Select the element to be the main key (primary key).

- Number: When viewing resources, they are sorted in numerical order.
- Name: When viewing resources, they are sorted in nickname order.

Port nicknames can be displayed only for metrics of SnapSANS5000 V3.2 or later.

Changing Analysis Ranges

Change ranges in which to analyze metrics. The information types that can be changed are as follows.

- Mode
- Metric

This section describes the screen and procedure for changing analysis ranges.

Displaying the Application Settings screen ([Mode] tab)

Display the Application Settings screen ([Mode] tab) by the procedure below.

- From the menu bar, select [File] [Application Settings].

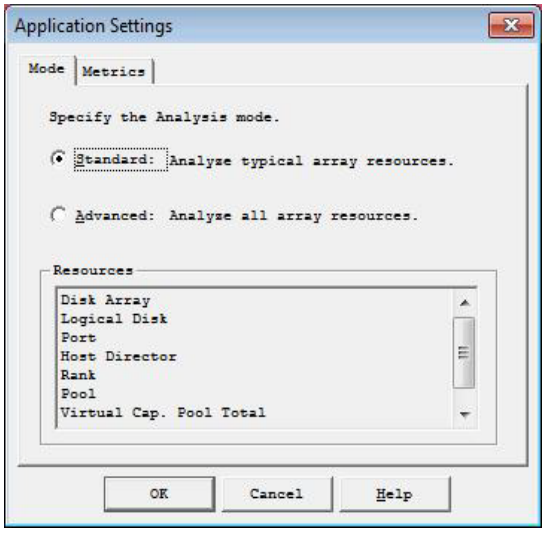


Figure 3-59: Application Settings (Mode)

Display Item	Explanation
Standard	An analysis range is set to standard mode, in which the following resource types can be analyzed. Disk Array Logical Disk Port Host Director Rank Pool Virtual Capacity Pool Total Cabinet

Display Item	Explanation
Advanced	An analysis range is set to extended mode, in which the following resource types can be analyzed. Disk Array Node Logical Disk Port Host Director Rank Pool Physical Disk Replication Port Disk Port Disk Director Cache Segment Cache Virtual Capacity Pool Total Data Migration Port Cabinet
Resources	The resource types that can be analyzed are displayed.

Standard is recommended. This mode is adequate for analyses during normal operation. Advanced is used for high-level analyses such as the analysis for resource failure that can be analyzed by analyzing all resources.

Displaying the Application Settings screen ([Metrics] tab)

Display the Application Settings screen ([Metrics] tab) by the procedure below.

- From the menu bar, select [File] [Application Settings] [Metrics] tab.

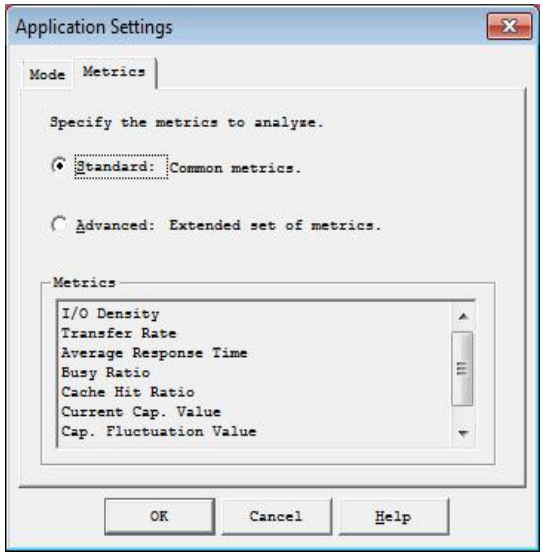


Figure 3-60: Application Settings (Metrics)

Display Item	Explanation
Standard	Analysis range is set to standard mode, in which the following metric types can be analyzed. I/O Density Transfer Rate Average Response Time Busy Ratio C ache Hit Ratio Current Capacity Value Capacity Fluctuation Value Electric Power Electric Energy L1/L2 Cache Hit Ratio
Advanced	Analysis range is set to extended mode, in which the following metric types can be analyzed. I/O Density Average Transfer Length Transfer Rate Average Response Time Max Response Time Busy Ratio I/O Ratio C ache Hit Ratio Average Dirty Pages Max Dirty Pages Average Queue Length Max Queue Length Current Capacity Value Capacity Fluctuation Value Electric Power Electric Energy L1/L2 Cache Hit Ratio L2 Cache Page-in Size L2 Cache Average Dirty Pages L2 Cache Max Dirty Pages
Metrics	The metric types that can be analyzed are displayed.

Standard is recommended. This mode is adequate for analyses during normal operation. Advanced is used for high-level analyses such as the analysis for resource failure that can be analyzed by analyzing all metrics.

A dialog box is displayed as shown below by changing an analysis range and clicking [OK] button in the Application Settings screen ([Mode] tab) or Application Settings screen ([Metrics] tab).

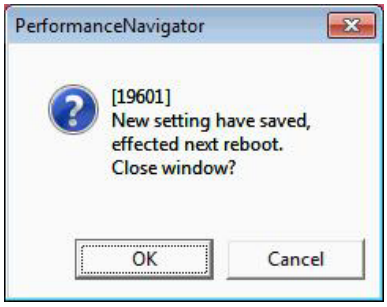


Figure 3-61: Confirm Save

Clicking the [OK] button changes the analysis range setting and closes the Application Settings screen. Clicking the [Cancel] button here closes the Application Settings screen, without changing the analysis range setting.

Displaying Thresholds

Thresholds can be displayed on graphs/raw data. The threshold display allows the user to analyze the statuses during operation, leading to early detection of a possible problem.

Setting/Displaying the Threshold (Performance Analysis)

Setting a threshold

Use the Configure Threshold screen to set thresholds on graphs/raw data. This section describes the procedures for displaying the Configure Threshold screen.

Displaying the Configure Threshold screen

Since there are three procedures to display the Configure Threshold screen, take either way to display.

- After selecting a graph/raw data, select [Configure Threshold] from the shortcut menu.
- After selecting a graph/raw data, select [Analysis] [Configure Threshold] from the menu bar.
- After selecting a graph/raw data, click the [Configure Threshold] button in the toolbar.

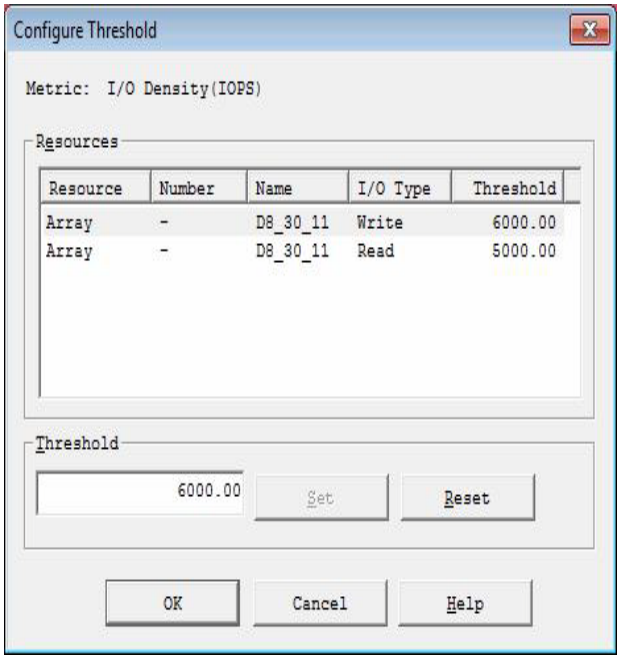


Figure 3-62: Configure Threshold

Display Item	Explanation
Metrics	The type of metrics shown on a graph/raw data is displayed.
Resources	Items are displayed for which a threshold is to be set on a graph/raw data. The threshold displayed is the same as that for a timeframe Items such as Compare Against Statistical Data(*1) , total data, and comparative data are not displayed in Resources. When more than one value for analyze is included for each of [Measured], [Maximum], and [Minimum], only one value is displayed for each setting. The same threshold is displayed for [Measured], [Maximum], and [Minimum].
Threshold	A threshold for an item selected in Resources is set. When a threshold has already been set for the selected item, that threshold is displayed.
[Set]	A value set in [Threshold] is incorporated into the resource list.
[Reset]	The default value is set for an item selected in Resources. The performance monitoring threshold is set as the default value. If the threshold is not provided, the threshold field becomes blank.

(*1) This indicates the average, maximum, and minimum values within the timeframe that can be specified on the [Metrics] tab in the Set Analysis Details dialog box.

If the entered threshold is out of range, the message dialog box [98200] is displayed as shown below.

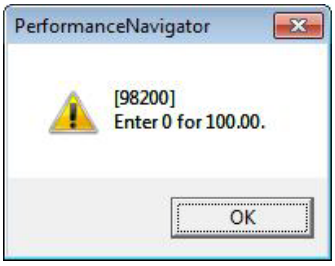


Figure 3-63: Confirm Threshold

The threshold can be set to any kind of metrics of all resources when displaying a line graph.

Displaying a threshold

Display thresholds on graphs/raw data.

Since there are two ways to display the threshold on a graph/raw data, take either way to display.

"After selecting a graph/raw data, select [Show Threshold] from the shortcut menu.

"After selecting a graph/raw data, select [View] [Show Threshold] from the menu bar.

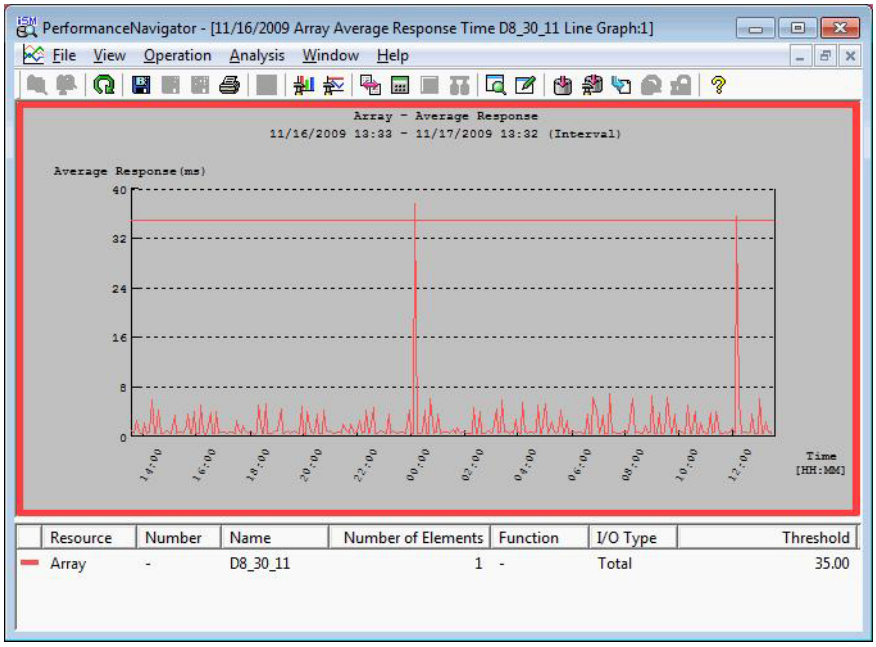


Figure 3-64: Display of Transfer Rate Threshold

- The threshold value can be displayed only in the line graph.
- Threshold excess occurs when the value of metrics exceeds the threshold. For a Cache Hit Ratio or L1/L2 Cache Hit Ratio, however, threshold excess occurs when the value of metrics falls below the threshold.

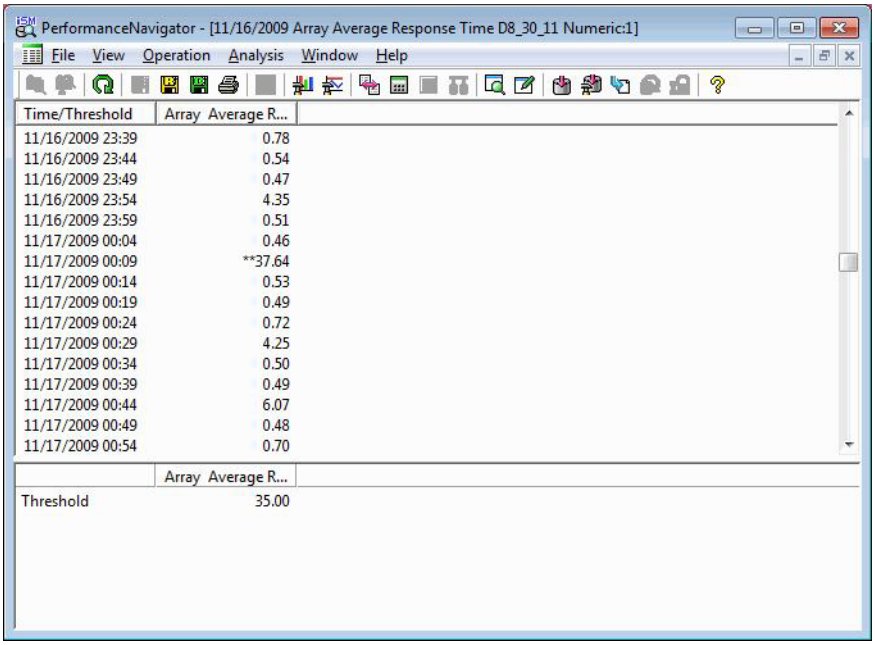


Figure 3-65: Transfer Rate Threshold (Raw Data)

Displaying the Threshold (Capacity Analysis)

The threshold specified for the virtual capacity pool or logical disk can be displayed in a graph or raw data from [Conf.Setting]. This section describes how to do so.

You can display the threshold in a graph or raw data in any of the following four ways:

- Click the [Property] button on the Configure Quick Analysis screen, and then select the threshold to display from the default template property.
- After selecting a graph or raw data, select [Set Analysis Details] from the displayed shortcut menu, click the [Metrics] tab, and then select the threshold to display.
- After selecting a graph or raw data, select [Analysis] from the menu bar followed by [Set Analysis Details], click the [Metrics] tab, and then select the threshold to display.
- After selecting a graph or raw data, select [Set Analysis Details] from the toolbar, click the [Metrics] tab, and then select the threshold to display.
- Thresholds can be displayed only if [Actual Used Capacity] is selected for [Capacity Type].
- The warning of the graph which shows to have exceeded a threshold and a black star "**" mark is displayed for raw data only in case of the line graph.

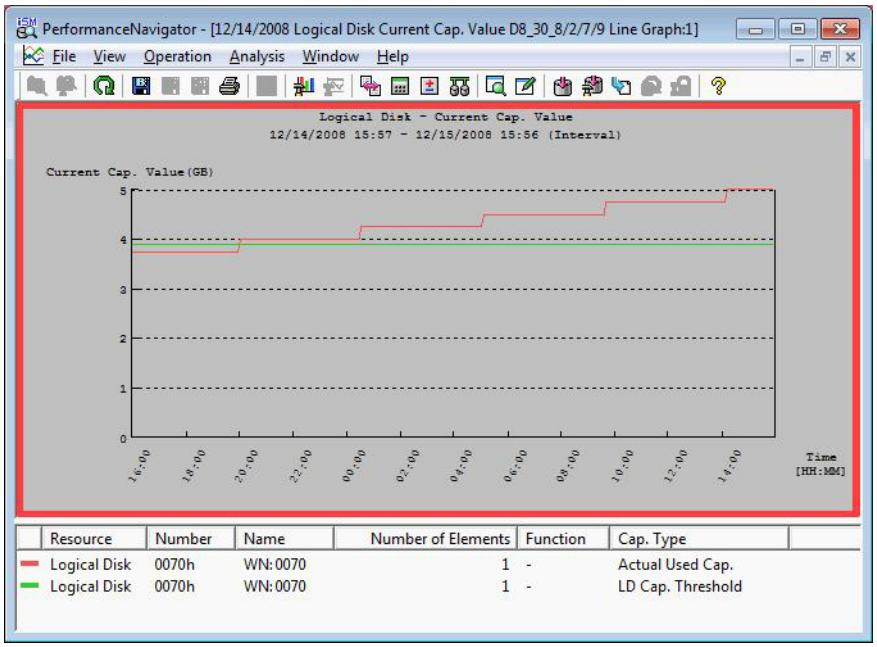


Figure 3-66: Graph of Current Capacity Value of Logical Disk (Actual Used Capacity, LD Capacity Threshold)

The threshold is exceeded if the statistical value exceeds the threshold.

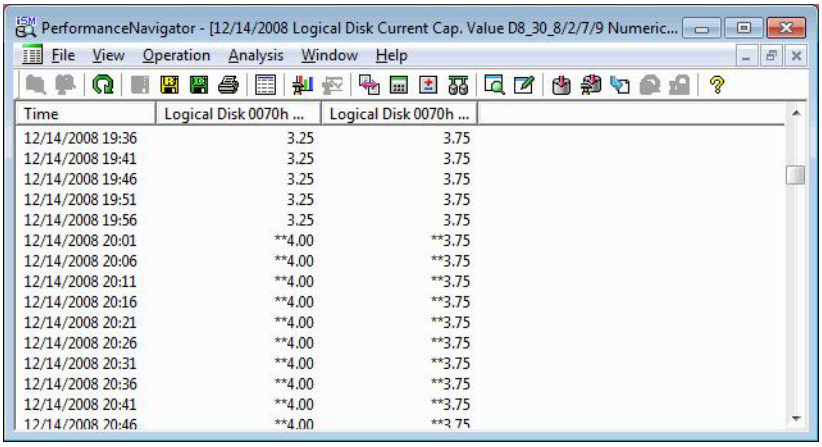


Figure 3-67: Raw Data of Current Capacity Value of Logical Disk (Actual Used Capacity, LD Capacity Threshold)

Correlation Analysis

By adding information of identical time bands in the past or statistic or other data and doing comparative analysis, it is possible to clarify differences and identify bottleneck locations (such as overloaded resources, instants when overloads occur, resources of which capacity is insufficient). Items that can be compared are as follows.

- Data of different days
- Compare Against Statistical Data

It is also possible to make differences with comparison subjects clearer by displaying the difference values in graphs/raw data.

Comparison with Another Day's Data

Register the compare against previous data. This section explains the screen for configuring compare against previous data that supplements the data to analyze and the setting procedure.

Displaying the Compare Against Previous Data screen

Since there are three ways to display the Compare Against Previous Data screen, take either way to display.

- After selecting a graph/raw data, select [Correlation Analysis] [Compare Against Previous Data] from the shortcut menu.
- After selecting a graph/raw data, select [Analysis] [Correlation Analysis] [Compare Against Previous Data] from the menu bar.
- After selecting a graph/raw data, click the [Compare Against Previous Data] button in the toolbar.

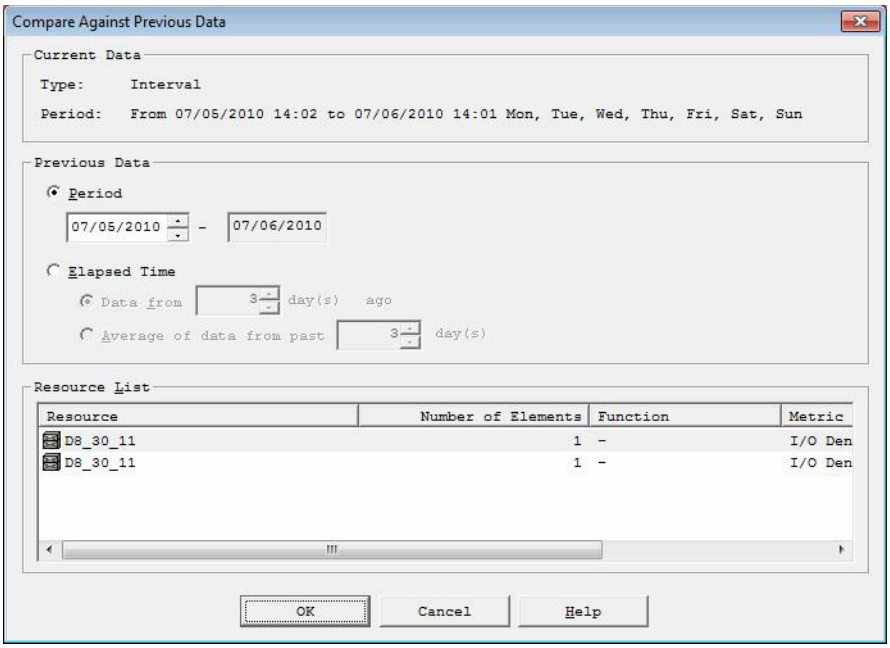


Figure 3-68: Compare Against Previous Data

Display Item	Explanation
Current Data	The current timeframe is displayed.
Period	Specify the start date of the period for comparison by year, month, and day.

Display Item	Explanation
Elapsed Time	Data from n day(s) ago.: Specify a relative period by making the timeframe the starting point in the period for comparison. Average of data from past n day(s): Specify a relative period by making the timeframe the starting point in the period for comparison. Make average values in a range delimited by the width of the timeframe the objects of comparison.
Resource List	Resource Lists displayed in the current graph are displayed in a list. If unit of measurement is time: “Resource”, “Number of Elements”, “Function”, “Metrics”, “I/O Type/Capacity Type”, and “Value for Analyze” are displayed. If unit of measurement is resources: “Metrics”, “I/O Type/Capacity Type”, and “Value for Analyze” are displayed.

In a graph/raw data on which compare against previous data is displayed, analysis settings such as the timeframe or analysis target resource cannot be changed. In a graph/raw data on which compare against previous data is displayed, the timeframe cannot be changed with the latest information using the [Refresh] menu item either.

Comparison with Compare Against Statistical Data

It is possible to add and display compare against statistical data that is displayed in a graph/raw data for analysis. This section explains the screen for setting compare against statistical data and the setting procedure.

Displaying the Compare Against Statistical Data screen

Since there are three ways to display the Compare Against Statistical Data screen, take either way to display.

- After selecting a graph/raw data, select [Correlation Analysis] [Compare Against Statistical Data] from the shortcut menu.
- After selecting a graph/raw data, select [Analysis] [Correlation Analysis] [Compare Against Statistical Data] from the menu bar.
- After selecting a graph/raw data, click the [Compare Against Statistical Data] button in the toolbar.

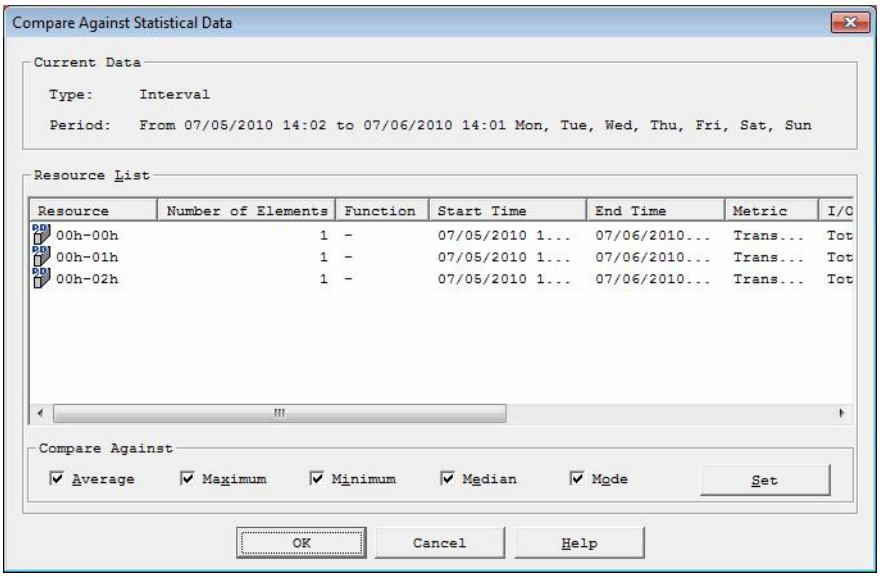


Figure 3-69: Compare Against Statistical Data (Time)

Display Item	Explanation
Current Data	The current timeframe is displayed.
Resource List	If unit of measurement is time: “Resource”, “Number of Elements”, “Function”, “Start Time”, “End Time”, “Metrics”, “I/O Type/Capacity Type”, and “Value for Analyze” are displayed. If unit of measurement is resources: “Start Time”, “End Time”, “Metrics”, “I/O Type/Capacity Type”, and “Value for Analyze” are displayed. The resource list displayed in the current graph is displayed in a list.
Compare Against	Configure compare against statistical data in the items below. If a representative value is set in listed data, “*” is displayed in the corresponding item of the resource list. [Average] checkbox: Add average to resource list selected in list of resource lists. [Maximum] checkbox: Add maximum to resource list selected in list of resource lists. [Minimum] checkbox: Add minimum to resource list selected in list of resource lists. [Median] checkbox: Add median to resource list selected in list of resource lists. [Mode] checkbox: Add mode to resource list selected in list of resource lists.
[Set]	Reflect the status of checkboxes in the selected resource list.

Difference Display

By specifying available resource data from the resource list of data displayed in a graph/raw data for analysis and its compare against statistical data, display a difference table referenced to the specified available resource data. This section explains the screen for setting a difference display for compare against previous data and the setting procedure.

Displaying Configure Difference Display Settings screen

Since there are three ways to display the Configure Difference Display Settings screen, take either way to display.

- After selecting a graph, select [Correlation Analysis] [Show Difference] from the shortcut menu.
- After selecting a graph, select [Analysis] [Correlation Analysis] [Show Difference] from the menu bar.
- After selecting a graph, click the [Show Difference] button in the toolbar.

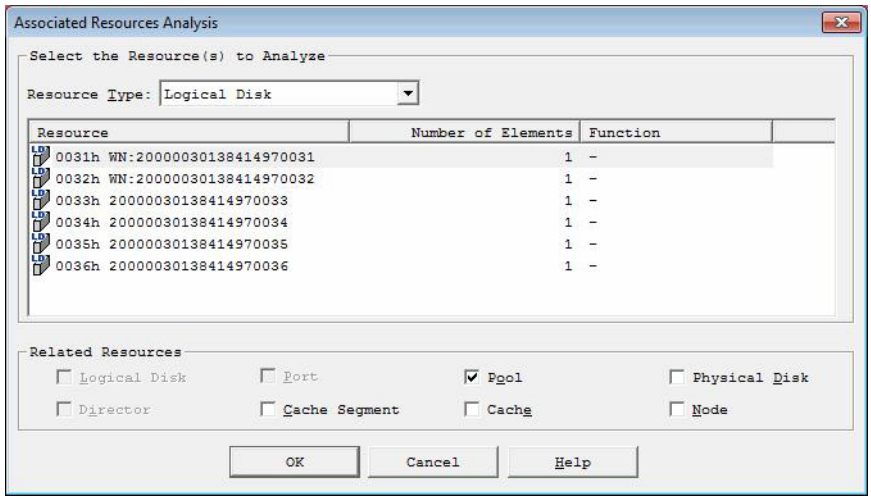


Figure 3-70: Configure Difference Display Settings (Time)

Available Resource Data: The resource list displayed in the current graph is displayed in a list.

- If unit of measurement is time: As many items as the number of combinations ("Resource", "Number of Elements", "Function", "Start Time", "End Time", "Metrics", "I/O Type/Capacity Type", "Compare Against Statistical Data", and "Value for Analyze") are displayed.
- If unit of measurement is resources: As many items as the number of combinations ("Start Time", "End Time", "Metrics", "I/O Type/Capacity Type", "Compare Against Statistical Data", and "Value for Analyze") are displayed.

In a graph/raw data that displays the difference, analysis settings such as the timeframe or analysis target resource cannot be changed. In a graph/raw data that displays difference, the timeframe cannot be changed with the latest information using the [Refresh] menu item either.

Associated Resources Analysis

For resources for analysis, it is possible to display metrics of associated resources in a graph/raw data by specifying resource types that are associated by configuration. This section explains the screen that sets the original resource to be analyzed and associated resources and the setting procedure.

Even if resources are associated in the configuration, associated resources cannot be analyzed for resources whose performance or capacity is analyzed.

Displaying the Associated Resources Analysis screen

Since there are three ways to display the Associated Resources Analysis screen, take either way to display.

- After selecting a graph/raw data, select [Associated Resources Analysis] from the shortcut menu.
- After selecting a graph/raw data, select [Analysis] [Associated Resources Analysis].
- After selecting a graph/raw data, click the [Associated Resources Analysis] button in the toolbar.

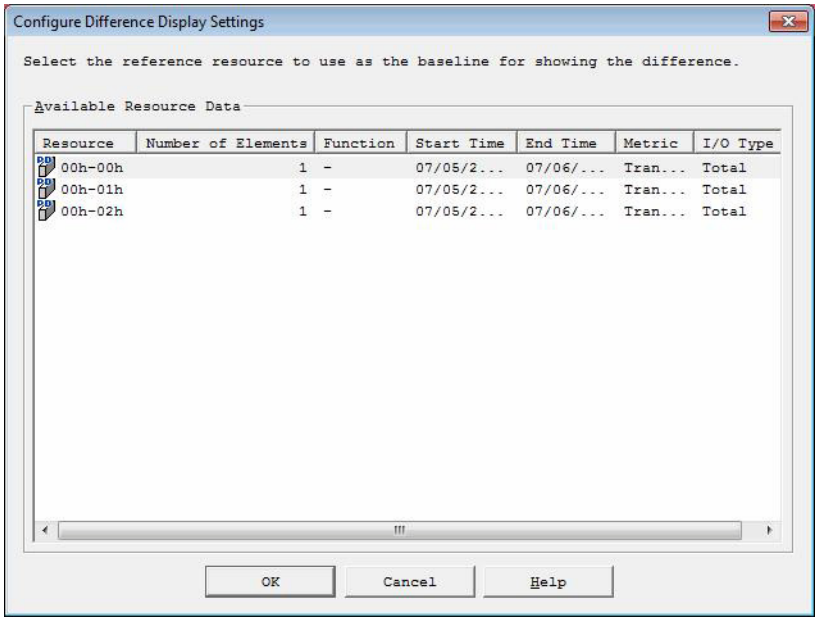


Figure 3-71: Associated Resources Analysis

Resource Type: Specify a resource type selected as a candidate for analysis.

Select the Resource(s) to Analyze: A list of resources of the resource type specified by the resource type combo box that are selected as analysis candidates is displayed.

Related Resources: Select resource types (logical disk/port/ Rank or Pool/physical disk/director/cache segment/cache/node) that can be selected as related resources.

Reusing Analysis Contents (Templates)

The contents of a detailed analysis can be registered as a template and reused in subsequent quick analysis or detailed analyses. Since previously analyzed graphs/raw data can be regenerated easily, the analysis task is made efficient. This section explains the method of reuse.

Create Report Template

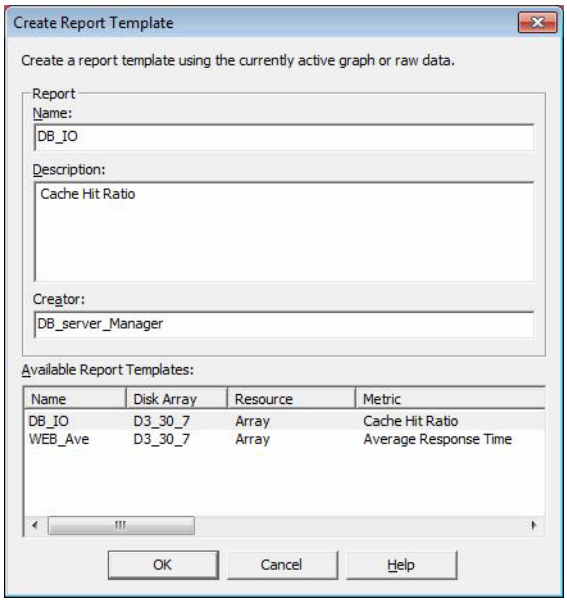
Save the display contents of a selected graph/raw data as a template using the Create Report Template screen. This section explains the display procedure for the Create Report Template screen.

Displaying the Create Report Template screen

Since there are three ways to display the Create Report Template screen, take either way to display.

- After selecting a graph/raw data, right-click to display a shortcut menu. Select [Create Report Template] from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [Analysis] [Report] [Create] from the menu bar.
- After selecting a graph/raw data, click the [Create Report Template] button in the toolbar.

Figure 3-72: Create Report Template



Display Item	Explanation
Name	Input the template name. The number of characters that can be input is 64. If a template is selected in the available report templates, the template name of the selected template is displayed.
Description	Input a description of the template. The number of characters that can be input is 512. If a template is selected in the available report templates, the explanation of the selected template is displayed.
Creator	Input the template's creator. The number of characters that can be input is 64. If a template is selected in the available report templates, the selected template's creator is displayed.

Display Item	Explanation
Available Report Templates	A list of templates is displayed.

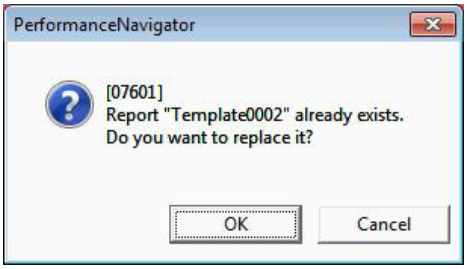


Figure 3-73: Overwrite Confirmation

Clicking the [OK] button overwrites the existing template. Clicking the [Cancel] button here returns to the Create Report Template screen without overwriting.

Apply Report Template

The Apply Report Template screen displays a list of templates that already have been registered, any of which can be executed. This section explains the display procedure for the Apply Report Template screen.

Displaying the Apply Report Template screen

Since there are two ways to display the Apply Report Template screen, take either way to display.

- Select [Analysis] [Report] [Apply] from the menu bar.
- Click the [Apply Report Template] button in the toolbar.

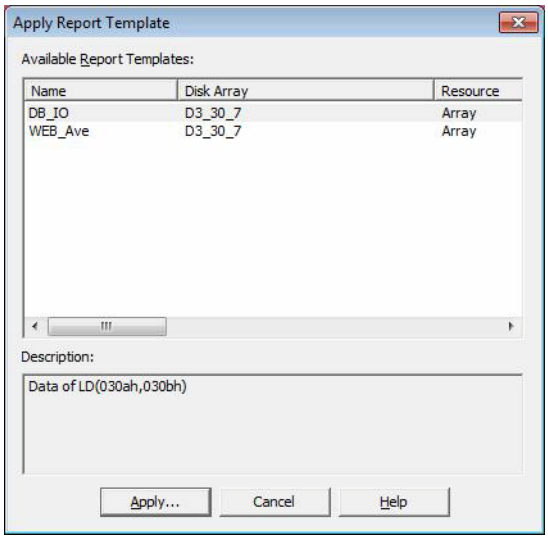


Figure 3-74: Apply Report Template

Display Item	Explanation
Available Report Templates	The list of templates is displayed sorted by the time each template was last executed. • Name • Disk • Array • Resource • Metrics • Last Used • TemplateSet Name
Description	A description of the template that is selected is displayed.
[Apply]	To apply selected template, the Configure Settings screen ([Timeframe] Tab) is displayed.

Editing Report Template

The Edit Report Template screen changes settings of template name, Description, and creator. This section explains the Edit Report Template screen display procedure.

Displaying the Edit Report Template screen

Display the Edit Report Template screen by the procedure shown below.

- Select [Analysis] [Report] [Edit] from the menu bar.

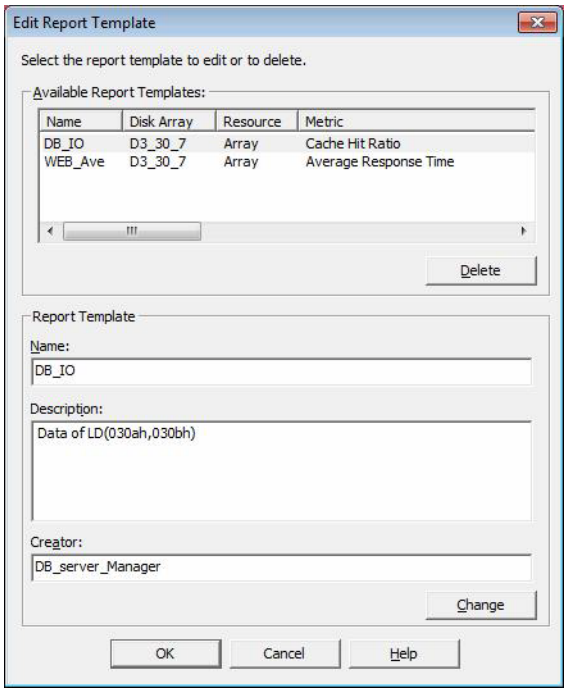


Figure 3-75: Edit Report Template

Display Item	Explanation
Available Report Templates	A list of templates is displayed. Select a template to change.
[Delete]	A selected template is deleted from the available report templates.
Name	Input the template name. The number of characters that can be input is 64. The template name of the selected template is displayed.
Description	Input a description of the template. The number of characters that can be input is 512. The explanation of the selected template is displayed.
Creator	Input the template's creator. The number of characters that can be input is 64. The creator of the selected template is displayed.
[Change]	Changed information about a template is incorporated into the available report templates. If the template has the same name as that in another template not to be deleted, however, an error message is displayed.

Clicking the [OK] button displays the Confirm Edit Report Template screen. Clicking the [Cancel] button cancels the change without overwriting the template

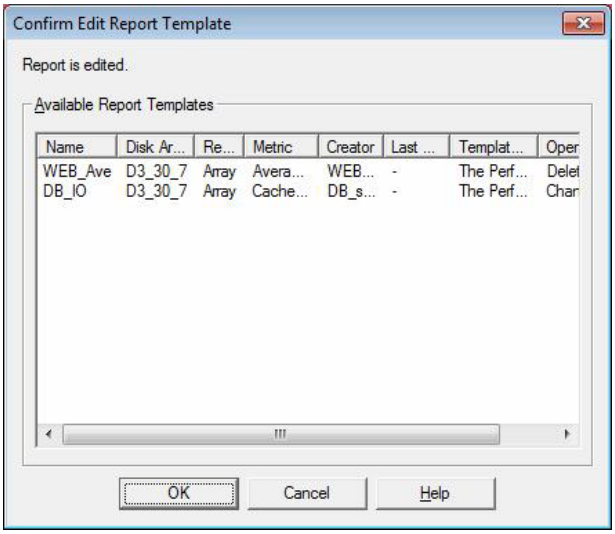


Figure 3-76: Confirm Edit Report

The processing continues and the user template is changed by clicking the [OK] button in the Confirm edit report Template screen. The change is canceled by clicking the [Cancel] button. If the change is canceled, the user must try to change the report template again.

Saving Analysis Results

Graphs and raw data can be saved in files or printed. Doing so makes it possible to use them to create reports or the like. This section explains the file saving and printing procedures.

Saving Analysis Results in Files

Save graphs and raw data in a file. The user can select graphs and raw data that are displayed in a screen and save them.

Saving graphs

Save a graph in bitmap (*.bmp) format. Invoke this by any one of the following procedures.

- After selecting a graph, select [Save Graph] from the shortcut menu that is displayed.
- After selecting a graph, select [File] [Save Graph] from the menu bar.
- After selecting a graph, click the [Save Graph] button in the toolbar.

Save Data

Raw data can be output in report form. Save them in text (*.txt) format. Invoke this by any one of the following procedures.

- After selecting raw data, select [Save Data] from the shortcut menu that is displayed.
- After selecting raw data, select [File] [Save Data] from the menu bar.
- After selecting raw data, click the [Save Data] button in the toolbar.

Save Data as CSV

Raw data can be output in CSV form. Save it in CSV (*.csv) format. Invoke this by any one of the following procedures.

- After selecting raw data, select [Save Data as CSV] from the shortcut menu that is displayed.
- After selecting raw data, select [File] [Save Data as CSV] from the menu bar.
- After selecting raw data, click the [Save Data as CSV] button in the toolbar.

Printing Analysis Results

Print graphs and raw data. This section explains the print procedure. There are three procedures for printing. Execute printing by any one of the procedures.

- After selecting a graph/raw data, select [Print] from the shortcut menu that is displayed.
- After selecting a graph/raw data, select [File] [Print] from the menu bar.
- After selecting a graph/raw data, click the [Print] button in the toolbar.

Overall Configuration of Windows

Multiple windows are displayed when executing the performance analysis function. This section explains the configuration of each window.

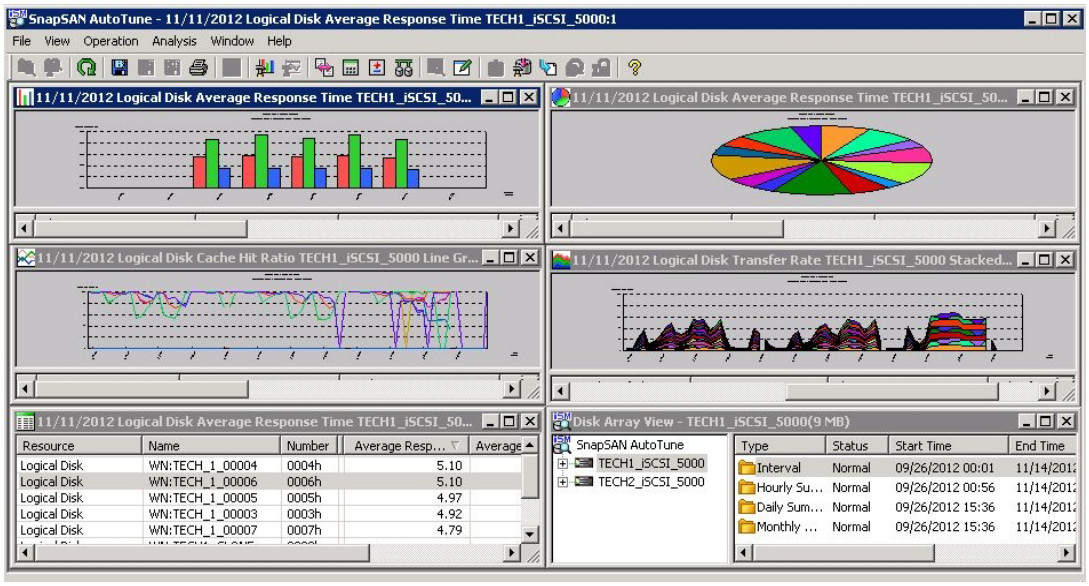


Figure 3-77: Multiple Screens

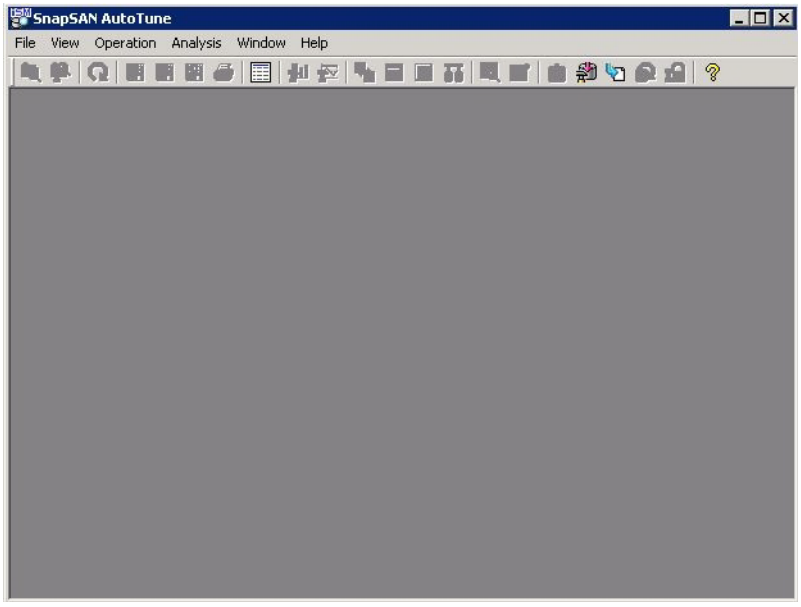


Figure 3-78: Main

Menu bar

[File] menu

[File] menu

-[Save Graph]

Saves the selected graph in a file.

-[Save Data]

Saves the selected raw data in a file in text format.

-[Save Data as CSV]

Saves the selected raw data in a file in CSV format.

-[Print]

Prints the selected graph/raw data.

-[Print Preview]

The print image of the selected graph/raw data is displayed.

-[Print Setup]

Sets the printer or printing options.

-[Application Settings]

Sets the range of items (mode or metrics) for analysis.

-[Data Location]

Changes the data location in which analysis information is saved.

-[Exit]

Terminates the application.

[View] menu

-[Disk Array View]

Detailed information about the metrics maintained is displayed.

-[Toolbar]

Selects the show or hide of the toolbar.

-[Status Bar]

Selects the show or hide of the status bar.

-[Configure Graph]

Customize the graph settings.

-[Show Data]

Display the raw data.

-[Show Legend]

Show or hide the display of the legend.

-[Show Resource Property]

Displays the properties of the resource selected from the legend list.

-[Show Threshold]

Show or hide the display of the threshold.

-[Configure Display Order]

Change the display order (Number/Name (for consistency as can't find Nickname on the UI)) for resource.

-[Show Maximum/Minimum]

Show or hide the display of minimums and maximums for the raw data.

-[Refresh]

-[Current Window]Refresh the selected graph or raw data.

-[All Windows]Refresh all graphs and raw data.

[Operation] menu

-[Download Data]

-[Run]Download metrics.

-[Set Up]Configure downloading metrics.

-[Download Volume List]

-[Run]Download the volume list information.

-[Set Up]Set the download information of Volume List.

-[Import Data]

Import metrics.

-[Import Volume List]

Imports a volume list.

-[Update Data]

-[Run]Update the metrics.

-[Set Up]Configure updating metrics.

-[Configure Port and Logical Disk Mapping]

Configure the port and logical disk mapping.

-[Configure the Data Retention Period]

Configure the data retention period.

-[Delete Data]

Deletes metrics.

[Analysis] menu

-[Quick Analysis]

-[Run]Perform quick analysis of the selected disk array.

-[Set Up]Run the quick analysis settings against the selected disk array.

-[Correlation Analysis]

-[Compare Against Previous Data]Compare data against previous periods.

-[Compare Against Statistical Data]Compare data against statistical values.

-[Show Difference]Display the difference against baseline criteria.

-[Associated Resources Analysis]

Display the metrics for an associated resource.

-[Configure Settings]

Configure the analysis settings.

-[Configure Threshold]

Configure the threshold.

-[Report]

-[Apply]Apply a report template against the selected graph or raw data.

-[Create]Create a report template using the selected graph or raw data.

-[Edit]Edit report template.

[Window] menu

-[Close All]Closes all graphs/raw data.

-[Display All]Opens all graphs/raw data.

-[Minimize All]Minimize all graphs and raw data.

-[Cascade]Displays windows overlapping.

-[Tile]Displays windows lined up.

-[Arrange All]Automatically arrange all minimized windows.

[Help] menu

-[Help]Help is displayed.

-[Error List]Display the list of possible errors.

-[About]Version information is displayed.

-[Register License]Register license key.

-[Apply License]Apply license key.

-[Display License]Display a list of applied license keys.

Toolbar

Button Image	Explanation
	Perform quick analysis of the selected disk array.
	Run the quick analysis settings against the selected disk array.
	Refresh the selected graph or raw data.
	Saves the selected graph in a file.
	Saves the selected graph/ raw data in a file in text format.
	Saves the selected graph/ raw data in a file in CSV format.
	Prints the selected graph/ raw data.
	Detailed information about the metrics that is maintained is displayed.
	Configure the analysis settings.
	Configure the threshold.
	Compare data against previous periods.
	Compare data against statistical values.
	Display the difference against baseline criteria.
	Display the metrics for an associated resource.
	Apply a report template against the selected graph or raw data.
	Create a report template using the selected graph or raw data.
	Download metrics.

Button Image	Explanation
	Configure downloading metrics.
	Import metrics.
	Update the metrics.
	Configure updating metrics.
	Help is displayed.

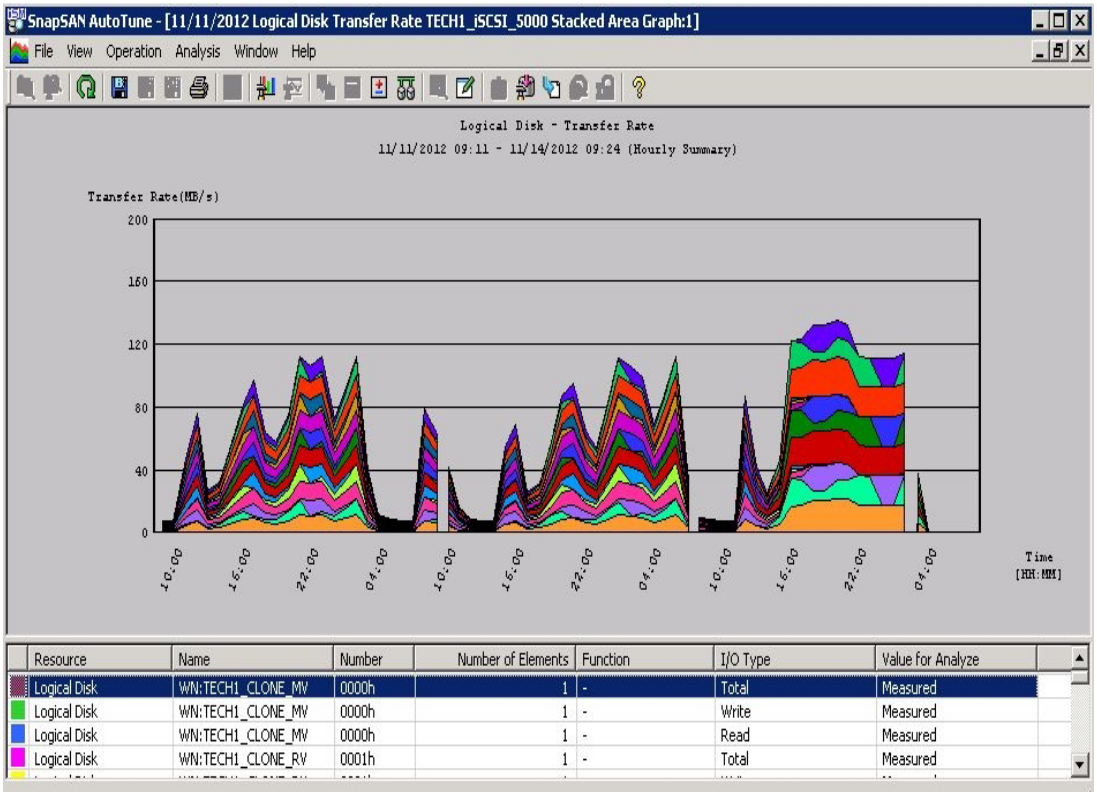


Figure 3-79: Disk Array

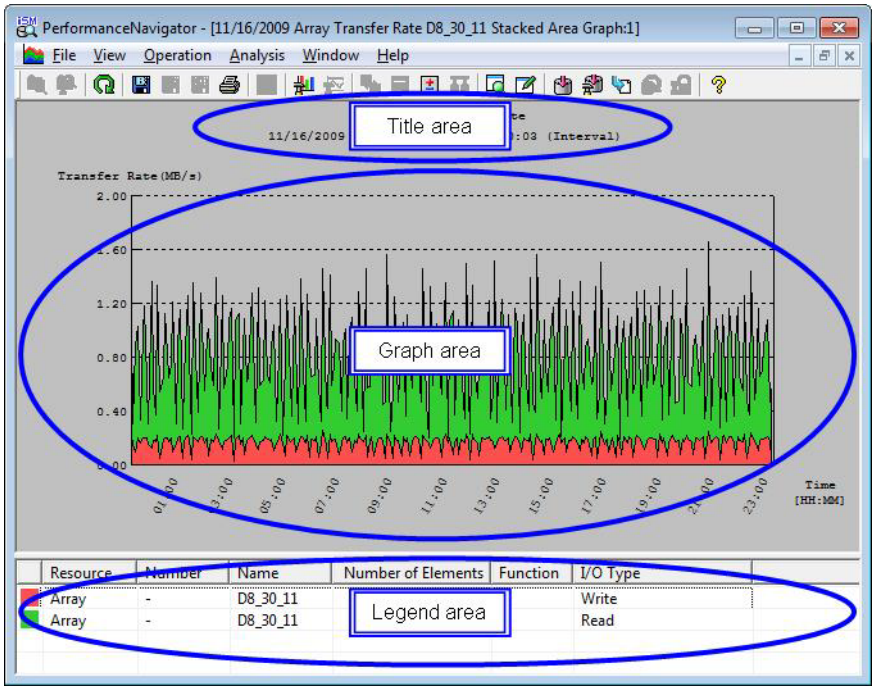
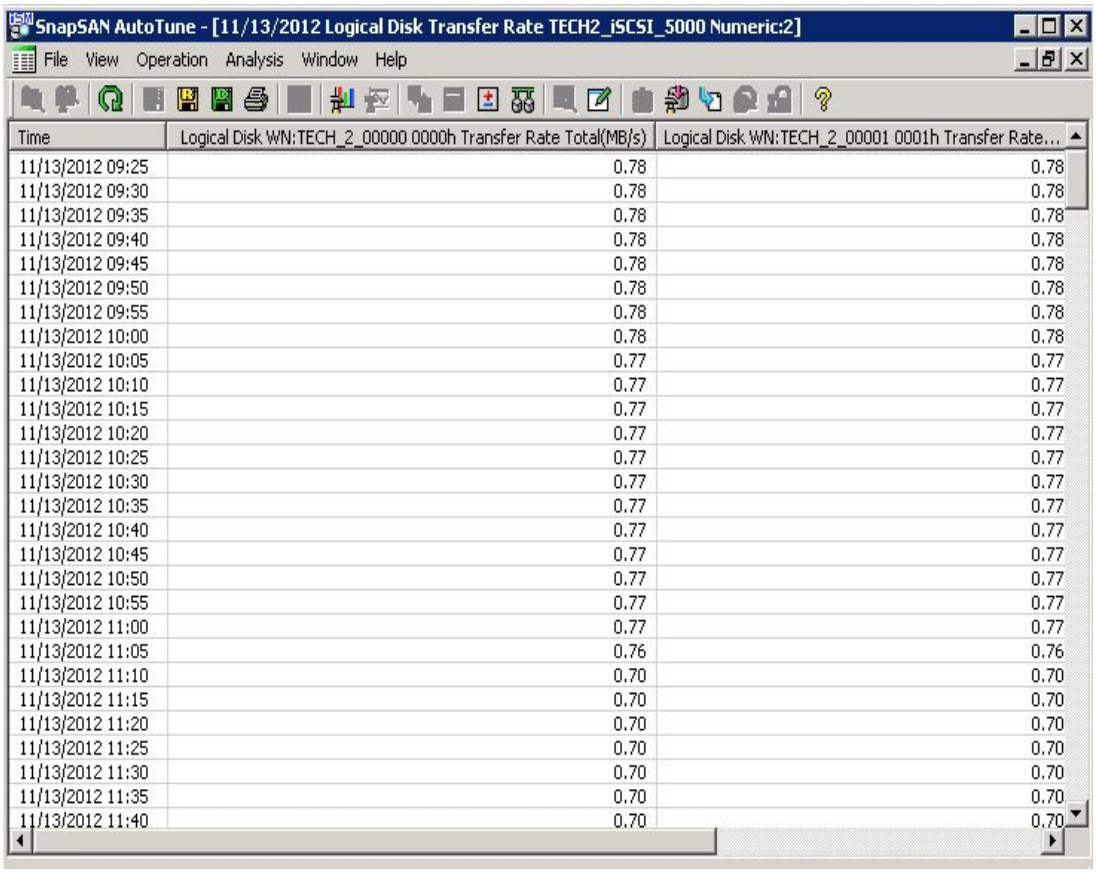


Figure 3-80: Graph

Displayed item	Explanation
Icon	Displays the graph color icon.
Resource	Displays the resource type. For available resource data of a difference graph, “(standard)” is displayed before the resource type.
Number	Displays the number for the resource displayed in the graph. For total information, up to eight resource numbers are displayed by separating with a comma. If the number of resource numbers is 9 or more, “...” is displayed after the 8th name. If the resource does not have a resource number, a hyphen (-) is displayed.
Name	Displays the nickname for the resource displayed in the graph. For total information, up to eight nicknames are displayed by separating with a comma. If the number of nicknames is 9 or more, “...” is displayed after the 8th name. If the resource does not have a nickname, a hyphen (-) is displayed.
Port Type	Displayed only when either of the host port, the replication port or the data migration port is included in the target resource for analysis. The port operation types are shown as follows (only for the statistical data of SnapSAN S5000 Ver7.1 or later): Host:Runs as a host port. Replication:Runs as a replication port. Migration:Runs as a data migration port. If one port has multiple operation types, they are displayed by separating with a slash (/). If the resource is not a host port, a replication port or a data migration port, a hyphen (-) is displayed.

Displayed item	Explanation
Number of Elements	Displays the number of elements of the total data. When resources are not totaled, “1” is displayed.
Function	The total method used to total resources is displayed.
Metrics	Displayed to distinguish the Metric only for 2 y Axes graphs.
I/O Type/ Capacity Type	The I/O Type/Capacity Type for the Metric is displayed. When there is no I/O Type/Capacity Type information, a hyphen (-) is displayed.
Threshold	Displayed only when a threshold is displayed. If no threshold is set, a hyphen (-) is displayed.
Pool Name	Displayed only when the physical disk is included in the target resource for analysis and a threshold is displayed. The name of pool to which the physical disk belongs is displayed (only for disk arrays with pool). If the resource is not a physical disk, a hyphen (-) is displayed.
Value for Analyze	Displays a value for analyze. This item is not displayed when a time series graph for interval information is displayed.
Compare Against Statistical Data	Displayed only when the representative value is displayed. For the Compare Against Statistical Data, any of the representative values (“Average”, “Maximum”, “Minimum”, “Median”, or “Mode”) is displayed. For other than the representative value, a hyphen (-) is displayed.
Start time	Displayed only when Compare Against Previous Data is displayed. For analysis data, the start time (mm/dd/yyyy hh:mm) of the timeframe is displayed. For Compare Against Previous Data, the start time (mm/dd/yyyy hh:mm) of the period for comparison is displayed.
End time	Displayed only when Compare Against Previous Data is displayed. For analysis data, the end time (mm/dd/yyyy hh:mm) of the timeframe is displayed. For Compare Against Previous Data, the end time (mm/dd/yyyy hh:mm) of the period for comparison is displayed.



Time	Logical Disk WN:TECH_2_00000 0000h Transfer Rate Total(MB/s)	Logical Disk WN:TECH_2_00001 0001h Transfer Rate...
11/13/2012 09:25	0.78	0.78
11/13/2012 09:30	0.78	0.78
11/13/2012 09:35	0.78	0.78
11/13/2012 09:40	0.78	0.78
11/13/2012 09:45	0.78	0.78
11/13/2012 09:50	0.78	0.78
11/13/2012 09:55	0.78	0.78
11/13/2012 10:00	0.78	0.78
11/13/2012 10:05	0.77	0.77
11/13/2012 10:10	0.77	0.77
11/13/2012 10:15	0.77	0.77
11/13/2012 10:20	0.77	0.77
11/13/2012 10:25	0.77	0.77
11/13/2012 10:30	0.77	0.77
11/13/2012 10:35	0.77	0.77
11/13/2012 10:40	0.77	0.77
11/13/2012 10:45	0.77	0.77
11/13/2012 10:50	0.77	0.77
11/13/2012 10:55	0.77	0.77
11/13/2012 11:00	0.77	0.77
11/13/2012 11:05	0.76	0.76
11/13/2012 11:10	0.70	0.70
11/13/2012 11:15	0.70	0.70
11/13/2012 11:20	0.70	0.70
11/13/2012 11:25	0.70	0.70
11/13/2012 11:30	0.70	0.70
11/13/2012 11:35	0.70	0.70
11/13/2012 11:40	0.70	0.70

Figure 3-81: Raw Data

Chapter 4

Types and Procedures

Performance analysis procedures vary depending on the purpose.

Type of Analysis	Purpose	Analysis Procedure
Status quo analysis	Understanding the current performance status and detecting performance problems at an early stage	The timeframe is approximately the last 24 hours to one week. Mainly for the external performance data (the overall disk array unit, port, and logical disk), determine whether there is an overloaded timeframe or resource, or whether the allocated capacity is appropriate from the operational viewpoint.
Trend analysis	Analyzing the performance tendency (increase/decrease or bias) based on the medium- to long-term performance status. The major purpose of this analysis is to performance planning.	The timeframe is approximately the last one month to one year. Analyze the load of an overall disk array unit in time series to gain an understanding of the load increase/decrease tendency. Select and analyze high-loaded resources, and make sure that resources are equally allocated from the operational viewpoint.
Problem analysis	Locating the causes of performance problems and planning solutions	The timeframe varies from several minutes to about one day at most. General procedures are as follows. Compare the external performance data with the load status during past normal operation to identify the time and resource where a performance problem occurred. Next, analyze the load of associated resources, identify the actual cause, and resolve the problem.

Although timeframes and analyzed contents vary, to begin status quo analysis, trend analysis, or problem analysis, analyze major performance data (the I/O density, transfer rate, average response time, cache hit ratio, and busy ratio) to gain an understanding of general conditions. Next, based on the results of this general analysis, identify time bands, resources, or performance data to perform detailed analysis.

This chapter describes procedures for analyzing general conditions and procedures for performing the follow-up detailed analysis by using the performance analysis function.

Analyzing General Conditions

Use the quick analysis function to analyze general conditions. This section describes procedures for analyzing general conditions by using this function.

Timeframe and Analysis Information Type

In the quick analysis settings, set the timeframe and analysis data type according to the purpose of analysis. The general settings for each analysis type are described here.

Status quo analysis

A timeframe of from one day to one week is standard. Elapsed Time makes it possible to make daily, weekly, or other regular analysis efficient, because the work of changing the timeframe as often as that can be eliminated. Specify interval information if the timeframe is less than one day or the hourly summary if it exceeds one day.

Trend analysis

A timeframe of from one month to one year is standard. Specify the daily summary if the timeframe is within one month, or specify the daily or monthly summary depending on the period length if the period exceeds one month. If the period exceeds one year, specify the monthly summary.

Problem analysis

Although it varies according to the performance problem, the timeframe is generally from several minutes to as long as one day. Because detailed analysis is necessary for problem analysis, specify interval information.

Performance Data to Analyze

To gain an understanding of general conditions, analyze major performance data for an overall disk array unit and specific resources. The major performance data is prepared in advance. For a list of major performance data items, see Table 1-1 in 1.4.1 "Quick Analysis".

Although the performance data that is seen varies according to the operation, in many cases, you can gain a fairly good understanding of general conditions by analyzing the performance data that is specified as the subject of quick analysis by default. Consider the operation, and add performance data that is not subject to quick analysis by default to the subject of quick analysis as necessary. Eight kinds of performance data are subject to quick analysis by default. This section describes what to look at when analyzing this performance data.

Disk array I/O Density (Time series)

The I/O Density of a disk array is the number of I/Os that the disk array processed in 1 second. It is representative performance data that indicates the load on the disk array for analyzing general conditions in terms of Read, Write, and Total. If the timeframe is 1 day, check whether this is generally consistent from a business processing perspective. For example, check points such as the following.

- At night, the Write rate is high, but it is due to batch processing at night and is consistent with business processing.
- Throughout the morning, the load is the highest in Total. This is consistent with the fact that the peak of online processing is in the morning.

If the timeframe is a medium term of at least 1 month, check matters such as whether the load of a specific day or month is high and whether the load is tending to increase. If the Read or Write rate or load peaks are not consistent with business processing, investigate the cause in detailed analysis.

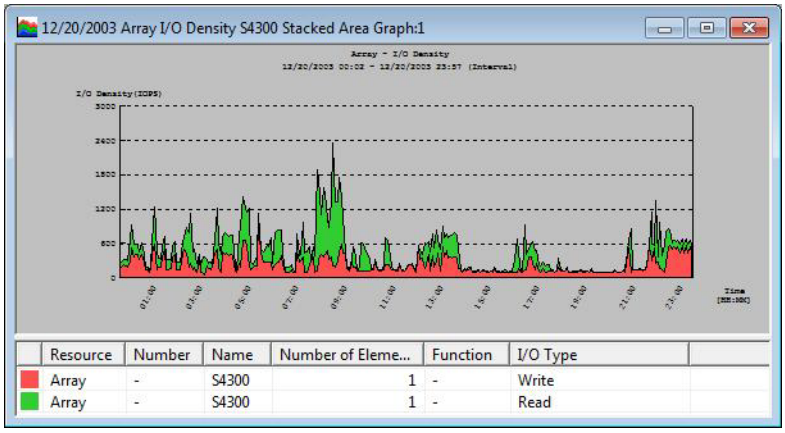


Figure 4-1: Stacked Area Graph of Disk Array I/O Density

Disk array transfer rate (Time series)

The transfer rate of a disk array is the amount of data that the disk array processed in 1 second. Like I/O Density, it is representative performance data indicating the load on the disk array for analyzing general conditions in terms of Read, Write, and Total. What to look at is nearly the same as for I/O Density. Like I/O Density, if the Read or Write rate or load peaks are not consistent with business processing, investigate the cause in detailed analysis.

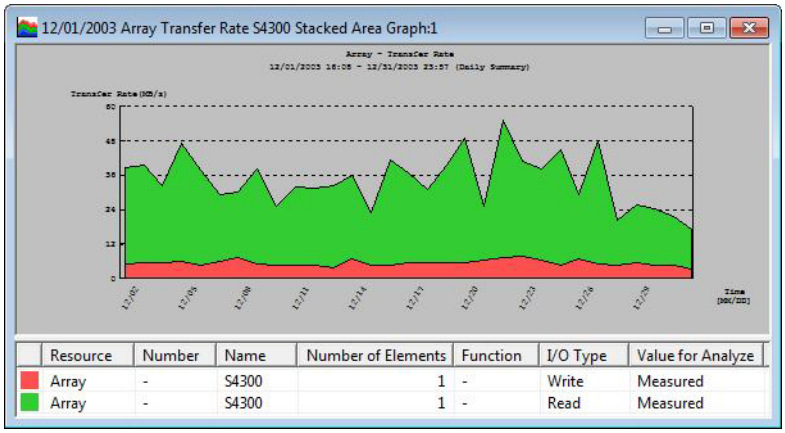


Figure 4-2: Stacked Area Graph of Disk Array/Transfer Rate

Disk Array Average Response Time (Time Series)

The average response time of a disk array is the average of the time needed until the disk array returned a response to the application server on each I/O. In general, if the load on a disk array (I/O Density, transfer rate) rises, there is a slowing trend of average response time. If the timeframe is 1 day, look at time bands in which the average response time is slow and if there are time bands in which it is abnormally slow, investigate the cause in detailed analysis. If the timeframe is a medium term of at least 1 month, check matters such as whether the average response time of a specific day or month is slow and whether the average response time is tending to become slower.

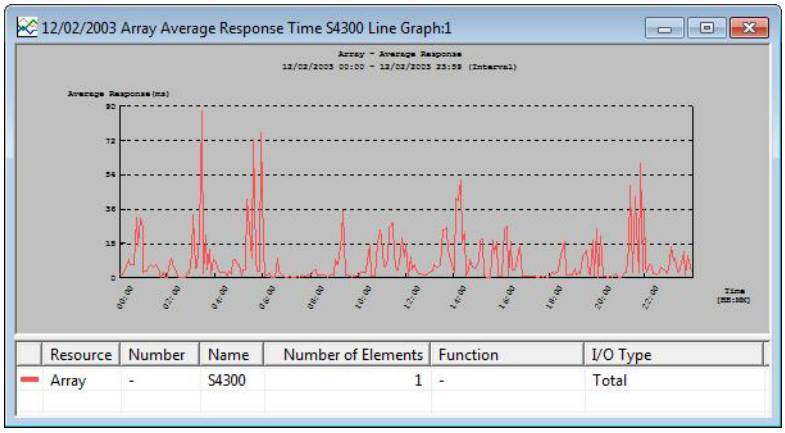


Figure 4-3: Line Graph of Disk Array/Average Response Time

Disk array cache hit ratio (Time series)

The cache hit ratio of a disk array is the proportion of I/O that hits a cache among I/O for the disk array. The cache hit ratio, which is the main factor influencing response time, analyzes general conditions in terms of Read, Write, and Total. The cache hit ratio is affected by the load on the disk array (I/O Density, transfer rate) and the means of access (sequential access, random access). If the timeframe is 1 day, look at time bands in which the cache hit ratio is low and analyze it together with the average response time to check whether it is appropriate from an operations perspective. If the timeframe is a medium term of at least 1 month, check matters such as whether the cache hit ratio of a specific day or month is low and whether cache hit ratios are tending to become lower.

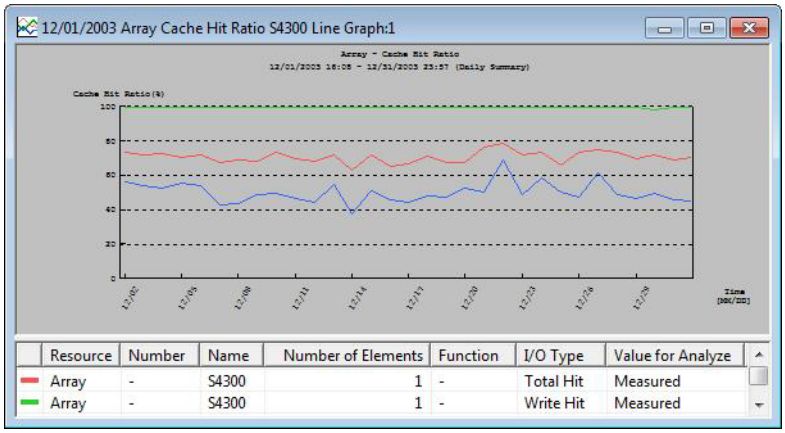


Figure 4-4: Line Graph of Disk Array/Cache Hit Ratio

Port Transfer Rate (Resource Series)

The transfer rate of a port is the amount of data processed through the port in 1 second. The default setting of quick analysis displays the 10 ports for which the transfer rate is highest in a Column graph.

Regardless of the timeframe, check whether the load balance of ports is appropriate from an operation content perspective. If the load of a specific port is high or in other cases in which there are problems with the load balance, investigate the load distribution.

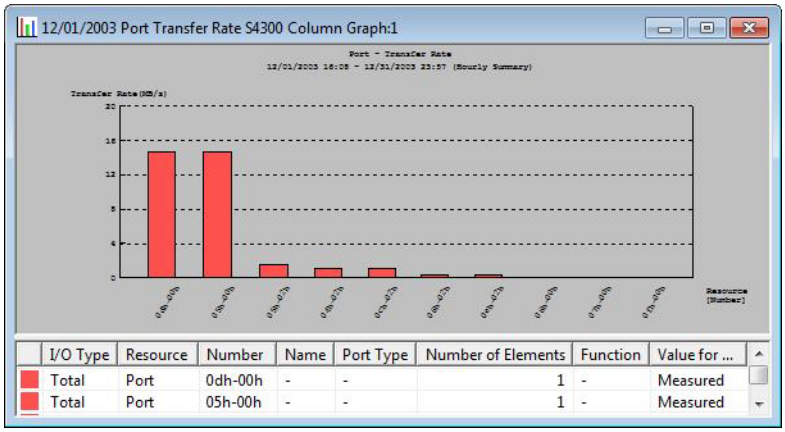


Figure 4-5: Transfer Rates by Port

Logical Disk transfer rate (Time series)

The transfer rate of a logical disk is the amount of data processed in 1 second on the logical disk. By a default value in quick analysis, the 5 logical disks for which the transfer rates are the highest are displayed in a Stacked Area graph. The transfer rate is a representative indicator that truly gets at the load. Check whether the logical disks for which transfer rates are high are proper from an operation content perspective and whether the peaks of individual logical disks are consistent with operation processing contents.

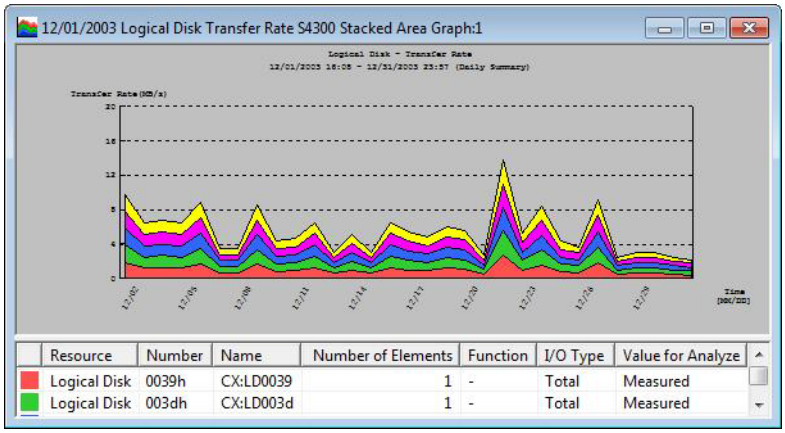


Figure 4-6: Upper 5 LD Transfer Rates

Logical Disk average response time (Resource series)

The average response time of a logical disk is the average time that is needed until I/O for the logical disk returns a response to the application server. By a default value in quick analysis, the 10 logical disks for which the average response times are slowest are displayed in a Column graph. In general, as the load rises, the average response time tends to become slower. For logical disks for which the average response time is slow, check matters such as whether the degree of load concentration is appropriate from an operation content perspective and whether processing times of operations that handle data on the logical disks in question are appropriate.

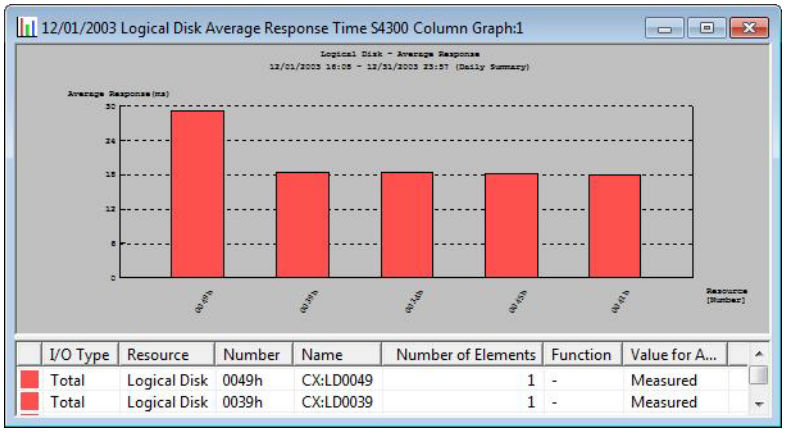


Figure 4-7: Average Response Time by Logical Disk

Rank/Pool Busy Ratio

The Rank/Pool Busy Ratio is proportion of time in the measurement interval that the rank or pool is working. When the I/O load is high for the rank or pool in question in the measurement interval, the Busy Ratio is high. By a default value in quick analysis, the 5 ranks or pools for which the busy ratio is the highest are displayed in a time series graph. A busy ratio that is less than 50% is not a problem, but if one exceeds 50%, it is necessary to check whether loads for logical disks in the rank or pool in question are appropriate. If a busy ratio exceeds 80%, devise data distribution by logical disk migration or the like.

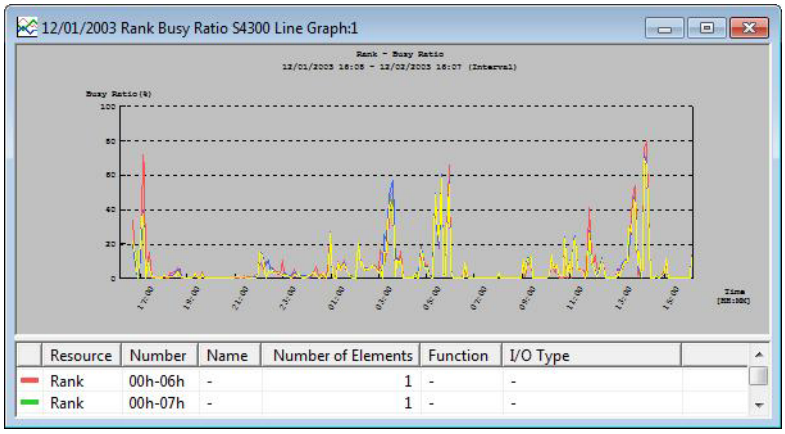


Figure 4-8: Rank Busy Rations

4.2.3Making Analysis of General Conditions Efficient

The analysis of general conditions can be made more efficient by comparing with performance data of a normal time in the past or with past averages or the like. Besides the major performance data that is prepared in advance, quick analysis has a function for adding things that a user creates (user-defined templates) to what is analyzed. Using this function makes the analysis of general conditions efficient. This section introduces four examples.

(1)Efficiently detecting problems by comparing with past normal time

Register a graph of comparison with the performance data of a normal time in the past as a user-defined template and add this to the subject of quick analysis. Setting the timeframe of the quick analysis using a relative specification is efficient when analyzing general conditions daily or weekly.

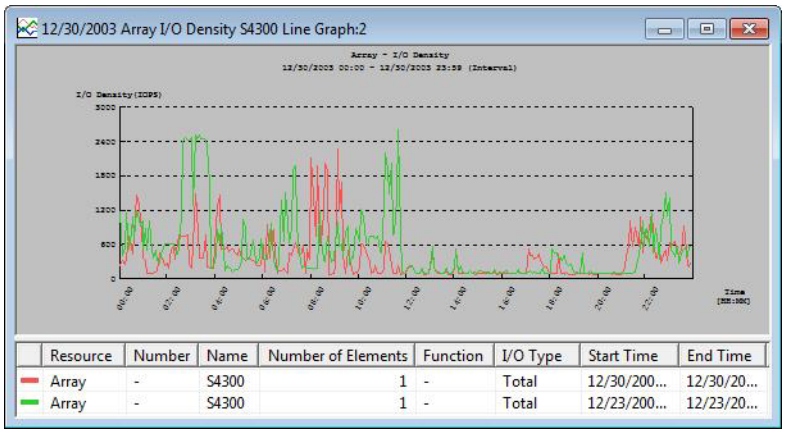


Figure 4-9: Compare Disk Array I/O Density with Normal Time

Efficiently detecting problems by comparing with past averages

Register a graph of comparison with averages in the past as a user-defined template and add this to the subject of quick analysis. Setting the timeframe of the quick analysis using a relative specification is efficient when analyzing general conditions daily or weekly.

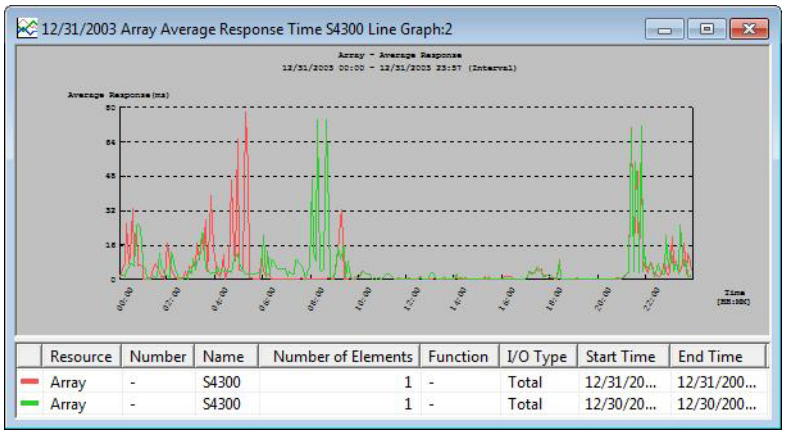


Figure 4-10: Compare Disk Array Average Response Time with Past Averages

Analyzing load bias by comparing with average of resources for analysis as a whole

When analyzing performance data in a resource series, register a graph of differences with respect to overall averages as a user-defined template and add this to the subject of quick analysis. Doing so makes it possible to efficiently detect resources for which loads are high in quick analysis.

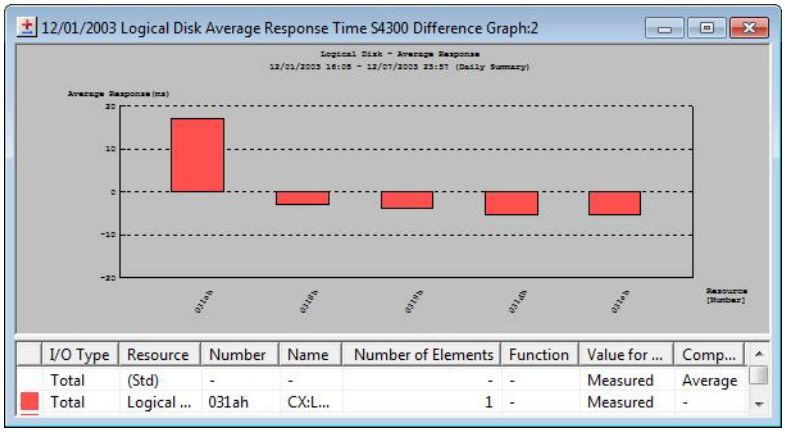


Figure 4-11: Differences from Average - 5 Highest Averages

Analyze load conditions in units of specific resources

Filter logical disks by LD set or application server name/path name and register this as a user-defined template and add it to the subject of quick analysis. Doing so makes it possible to efficiently analyze the load situation by operation in quick analysis. Since other selections than this are also possible, make the analysis of general conditions efficient by setting the units to analyze to suit operations.

Analyzing the latest performance data

After performance data accumulated in the SnapSAN S5000 server by the performance data update function is directly collected and imported, the current status of the disk array can be easily analyzed by updating the graph/raw data to the latest information.

Analyzing in Detail

Carry out detailed analysis when problems are detected as a result of analyzing general conditions and further analysis from other viewpoints is necessary.

Changing Analysis Contents

Changing timeframe

If an analysis of general conditions establishes that the load is high in a specific time band or on a specific date or day of the week, change the timeframe and analyze in detail.

In status quo analysis or problem analysis, gradually shortening the timeframe generally filters the time band in which a problem is occurring. In trend analysis, lengthening the timeframe makes the sample larger and the certainty greater.

Changing resources for analysis

Do this when analyzing resources that are not subjects of quick analysis. A disk array is made up of various resources and all of the resources basically are related.

In status quo analysis or problem analysis, if an abnormality is detected in the load of a disk array in a certain time band, investigate the cause by analyzing related resources in inward-oriented fashion (port logical disk rank/pool physical disk or other). Conversely, if an abnormality is detected in the load of a rank or pool, investigate the cause by analyzing related resources in an upward fashion toward the contact with the application server (logical disk port or other).

In trend analysis, it is necessary to examine whether there are latent problems by analyzing even for resources that are not analyzed frequently. Doing so makes it possible to perform preventive measures appropriately.

Changing metrics analyzed

It is not possible to detect performance problems and spot trends just by analyzing one statistic. The performance situation requires that metrics be analyzed in its totality. Two examples are introduced here. The examples given here, which assume certain specific cases, have different means of analysis at times.

- The transfer rate of a disk array is abnormally high over night

  In this case, analyze the I/O Density and average transfer size. If there are no extreme changes in average transfer size and the I/O Density is high, the cause is the fact that access by the application server increased. Conversely, if the I/O Density has not changed greatly and the average transfer size has lengthened, the cause is thought to be that operation content changed. Since the transfer size generally is long in backup operations, such trends can be seen.

- The response time of a disk array is slow

  In this case, analyze the I/O Density, transfer rate, and cache hit ratio. If the I/O Density and transfer rate are high, the main cause is thought to be that access by the application server increased. If there are no large changes in I/O Density or transfer rate and the cache hit ratio is declining, the main cause is thought to be that the processing content of the operation changed and the means of access (such as a greater proportion of random accesses) or the data handled changed.

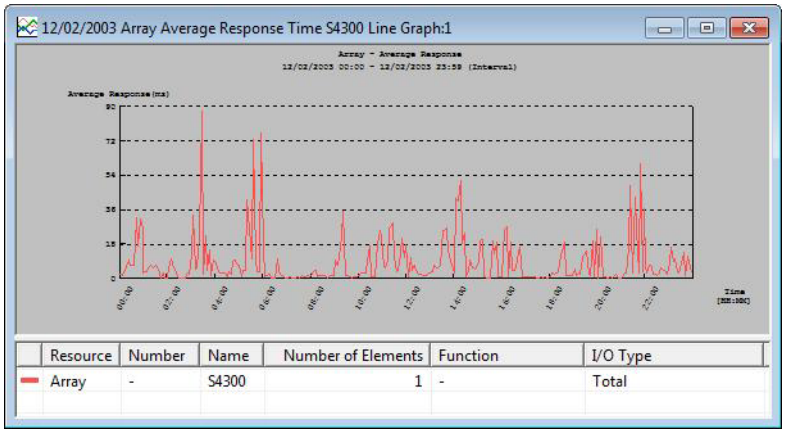


Figure 4-12: Disk Array Average Response Time

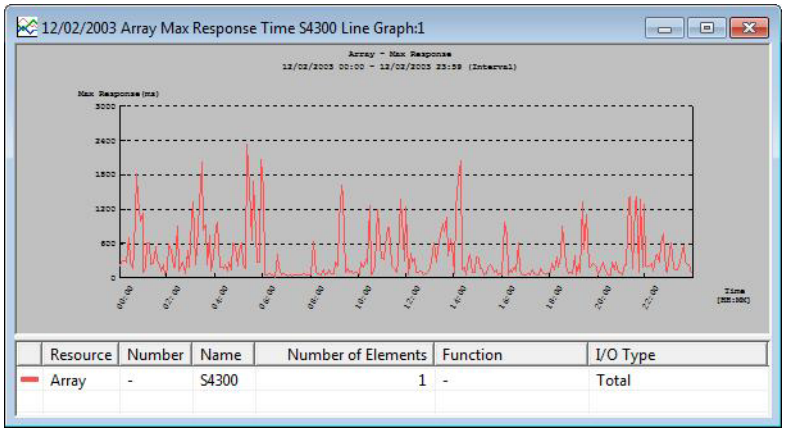


Figure 4-13: Disk Array Maximum Response Time

When analyzing summarized data or resource series data, the user can specify values for analyze. When measured values are selected, analyses can be made on smoothed values of data in a unit. When maximum or minimum values are selected, analyses can be made on peak values of data in a unit. Analyses on measured values are helpful in analyzing general load conditions, and analyses on maximum or minimum values are useful for detailed analyses and future trend analyses.

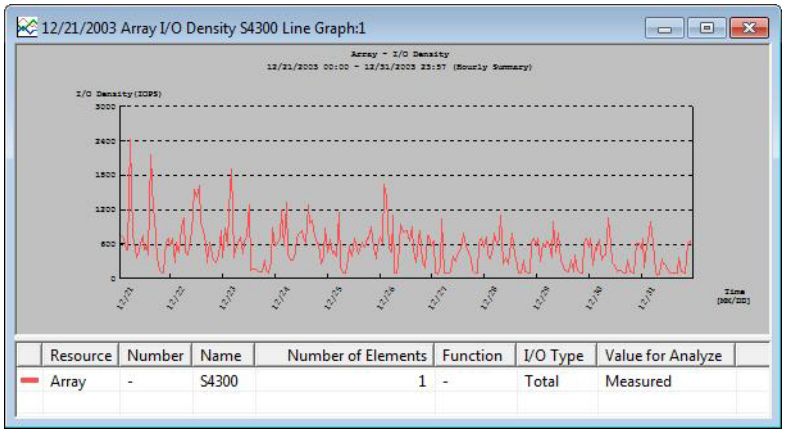


Figure 4-14: Disk Array I/O Density (Measured Value)

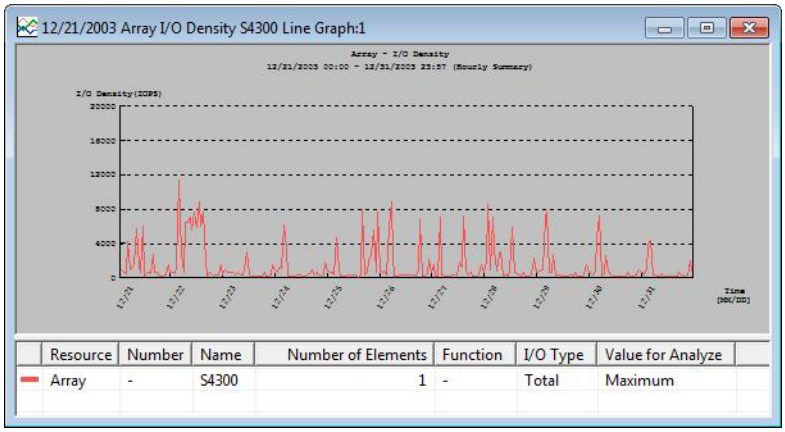


Figure 4-15: Disk Array I/O Density (Maximum Value)

Values for analyze are as follows.

- Measured value

  The values are average values in a summarized unit for a time series or average values in a timeframe for a resource series. When the maximum response time is specified, however, the values are maximum values in a summarized unit or a timeframe.

- Maximum value

  The values are maximum values in a summarized unit for a time series or maximum values in a timeframe for a resource series. Peak value analyses can be performed.

- Minimum value

  The values are minimum values in a summarized unit for a time series or minimum values in a timeframe for a resource series. Peak value analyses can be performed.

Changing display format

Analyzing metrics in a time series makes it possible to see transitions in the load of the resource. Analyzing it in a resource series makes it possible to see the load balance. In addition, even if the time series is the same, the results obtained vary with the type of graph. The same is true for a resource series.

Not always taking the same point of view and changing the display format to suit the objective of the time makes it possible to analyze effectively.

Setting and changing filtering conditions

Performance problems or trends can be made clearer by setting conditions on metrics and filtering the resources analyzed by changing conditions that are set. This is an effective procedure not only in problem analysis but in trend analysis as well. The case of analyzing Pool loads is explained by examples.

- Filtering to five Pools for which busy ratio is highest

  It is possible to extract Pools for which the load is high by total comparison. Since it is by total comparison, there may be no problem with the load according to the busy ratio.

- Filtering to Pools for which busy ratio is 80% or more

  Since it is obvious that an extracted rank is a bottleneck, examine the cause and investigate bottleneck resolution measures.

- Filtering to Pools for which busy ratio is between 50% and 79%

  An extracted Pool is a potential bottleneck. Analyze the trend and investigate the need for preventive measures.

Changing Thresholds

The user can compare performance data values with a threshold suitable for an operation mode, thereby gaining an opportunity for early detection of a possible problem.

Thresholds set with the performance monitoring function are automatically imported together with performance data. Any of the thresholds can be displayed on a graph/raw data. The thresholds can also be changed according to different purposes.

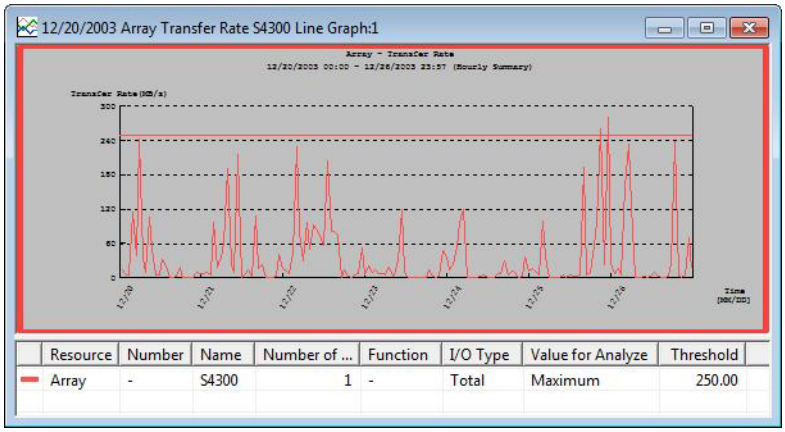


Figure 4-16: Disk Array Transfer Rate (Maximum Value)

Correlation Analysis

A problem or trend can be made clear by comparing performance data with data that is a standard. Use the comparative analysis function when a problem or trend is difficult to spot from just the performance data being analyzed.

Comparison with past performance data

When using the performance analysis function, it is easy to make comparisons with past normal time performance data or past averages. Problems can be detected efficiently by using this convenient function.

Comparison with Compare Against Statistical Data

Average, maximum, minimum, mode, and median values can be calculated as statistical representative values of a timeframe and displayed in graphs and raw data. Analyses such as the following can be performed by comparing with representative values.

- Average

  This is the average of the timeframe, from which an overall trend can be recognized. By comparing to the average, it is possible to clarify the rise and fall of loads in the main.

- Maximum

  This is the maximum in the timeframe. It can be used to identify time bands or resources for which the load is the highest (peaks). By combining this with the minimum, the breadth of values is known. For the cache hit ratio, the shade of meaning is the reverse of that for other metrics.

- Minimum

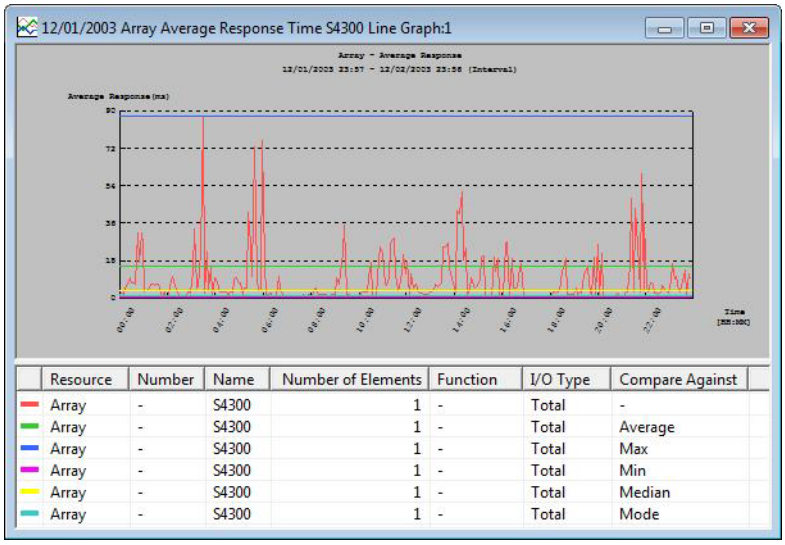
  This is the minimum in the timeframe. It can be used to identify time bands or resources for which the load is the lowest. By combining this with the maximum, the breadth of values is known. For the cache hit ratio, the shade of meaning is the reverse of that for other metrics.

- Mode

  This is the value that appears the most often in the timeframe. By comparing to the mode, it is possible to grasp features of the load.

- Median

  This is the value located at the center when values are arranged in size order. It makes it possible to grasp trends by excluding extremely large or extremely small values.



Resource	Number	Name	Number of Elements	Function	I/O Type	Compare Against
Array	-	S4300	1	-	Total	-
Array	-	S4300	1	-	Total	Average
Array	-	S4300	1	-	Total	Max
Array	-	S4300	1	-	Total	Min
Array	-	S4300	1	-	Total	Median
Array	-	S4300	1	-	Total	Mode

Figure 4-17: Comparision Disk Array Avg Response Time and Statistics

Analyzing Associated Resources

A disk array is made up of various resources and all of the resources basically are related. If an immediate performance problem is detected, analyzing related resources ascertains its true cause. The analysis procedure is explained here by giving a typical example.

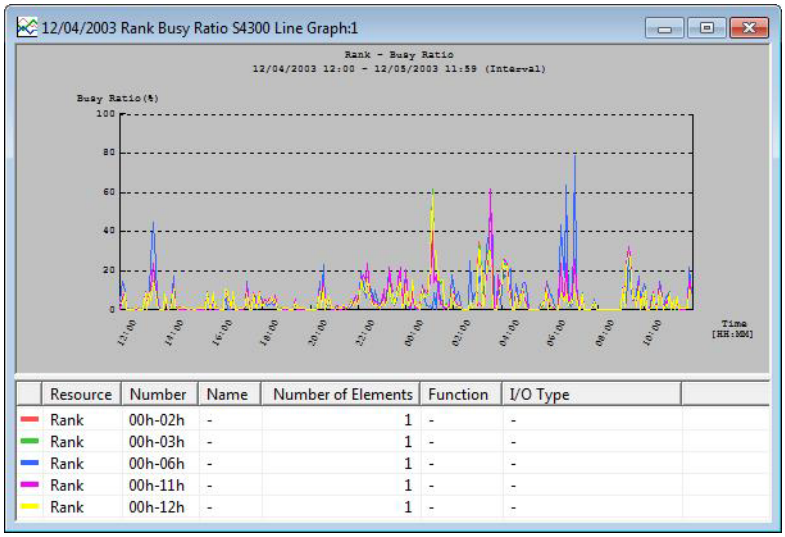


Figure 4-18: Five Highest Rank Busy Ratios

Execute the related resource analysis function to batch display the busy ratios of logical disks and physical disks in graphs.

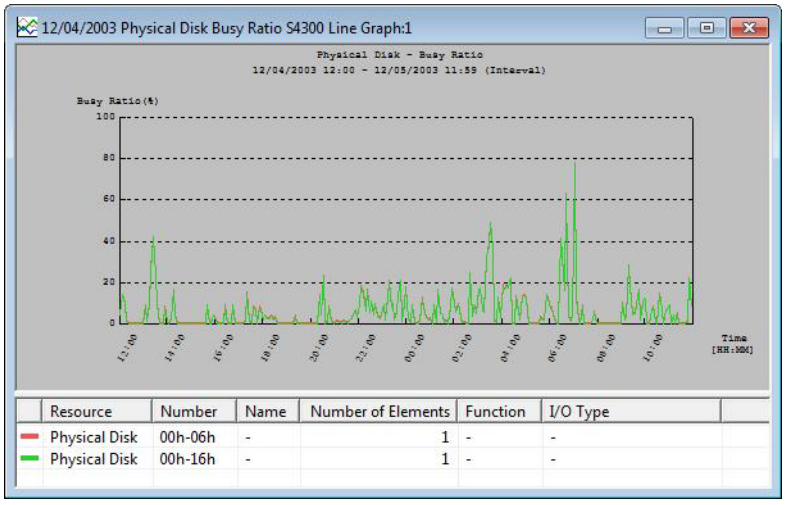


Figure 4-19: Busy Ratios of Constituent Physical Disks of Rank

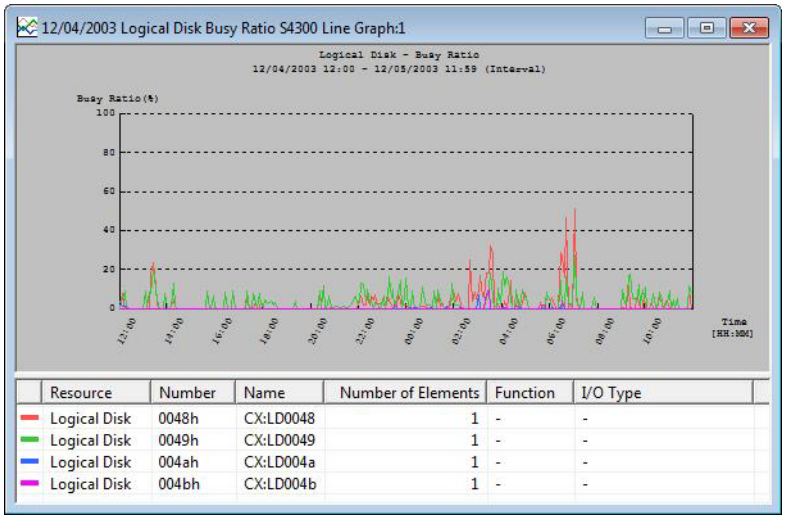


Figure 4-20: Busy Ratios of Logical Disks Constructed in Rank

The busy ratios of the physical disks that make up the Rank are both nearly the same values and it is seen that there is no problem. On the other hand, from the graph of busy ratios of the logical disks constructed in the Rank, it is seen that the busy ratio of the logical disk 0048h is extremely high.

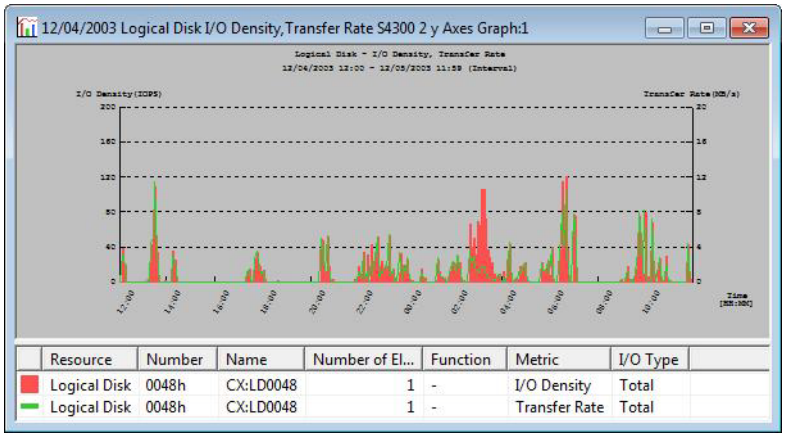


Figure 4-21: Axes Graph

From the 2 y Axes graph in Figure 4-21, it is seen that the load from the application server is extremely high at the times in which the busy ratio is high.

From the above, an extreme increase in access to logical disk 0048h is seen to be the cause of the busy ratio of the Rank being high. Check the operation processing content and examine whether there is a problem in processing.

Chapter 5

Capacity Analysis

Capacity Analysis Types and Procedures

Capacity analysis procedures vary depending on the purpose.

Type of Analysis	Purpose	Analysis Procedure
Status quo analysis	Understanding the current capacity status and detecting capacity shortages at an early stage	The timeframe is approximately the last 24 hours to one week. Check the capacity allocation status to see whether any resource is likely to run out of capacity. In addition, determine whether the allocated capacity is appropriate from the operational viewpoint.
Trend analysis	Analyzing the capacity increase/decrease tendency based on the medium- to long-term capacity status. The major purpose of this analysis is to plan capacity addition or expansion.	The timeframe is approximately the last one month to one year. Analyze the capacity allocation status in time series to gain an understanding of the capacity increase/decrease tendency. Select and analyze resources that are likely to run out of capacity or those for which the capacity increases or decreases a lot, and make sure that resources are equally allocated from the operational viewpoint.
Problem analysis	Locating the cause of capacity shortages and planning solutions	The timeframe varies from several minutes to about one day at most. General procedures are as follows. Compare the capacity allocation status with the capacity allocation status during past normal operation to identify the time and resource where the capacity ran out. Next, analyze the capacity allocation status of associated resources, identify the actual cause, and resolve the problem.

Although timeframes and analyzed contents vary, to begin status quo analysis, trend analysis, or problem analysis, analyze major capacity data (the current capacity value and capacity fluctuation value) to gain an understanding of general conditions. Next, based on the results of this general analysis, identify time bands, resources, or capacity data to perform detailed analysis.

This chapter describes procedures for analyzing general conditions and procedures for performing the follow-up detailed analysis by using the capacity analysis function.

In the capacity analysis, it is possible to analyze only the capacity information of the Thin Provisioning function.

Analyzing General Conditions

Use the quick analysis function to analyze general conditions. This section describes procedures for analyzing general conditions by using this function.

Timeframe and Analysis Information Type

In the quick analysis settings, set the timeframe and analysis data type according to the purpose of analysis. The general settings for each analysis type are described here.

Status quo analysis

A timeframe of from one day to one week is standard. Elapsed Time makes it possible to make daily, weekly, or other regular analysis efficient, because the work of changing the timeframe as often as that can be eliminated. Specify interval information if the timeframe is less than one day or the hourly summary if it exceeds one day.

Trend analysis

A timeframe of from one month to one year is standard. Specify the daily summary if the timeframe is within one month, or specify the daily or monthly summary depending on the period length if the period exceeds one month. If the period exceeds one year, specify the monthly summary.

Problem analysis

Although it varies according to the capacity shortage problem, the timeframe is generally from several minutes to as long as one day. Because detailed analysis is necessary for problem analysis, specify interval information.

Capacity Data to Analyze

To gain an understanding of general conditions, analyze major capacity data for an overall disk array unit and specific resources. The major capacity data is prepared in advance. For a list of major capacity data items, see Table 1-1 in 1.4.1 "Quick Analysis".

Although the capacity data that is seen varies according to the operation, in many cases, you can gain a fairly good understanding of general conditions by analyzing the capacity data that is specified as the subject with the default TemplateSet of capacity analysis. Consider the operation, and add capacity data that is not subject to quick analysis by default to the subject of quick analysis as necessary. Eight kinds of capacity data are subject to quick analysis by default. This section describes what to look at when analyzing this capacity data.

Current Capacity Value (Actual Capacity, Actual Used Capacity) of the Virtual Capacity Pools (Total) (Resource System)

The current capacity value (actual capacity, actual used capacity) of the virtual capacity pools total is the latest total actual capacity and total actual used capacity of all virtual capacity pools in the disk array. Check the capacity allocation status of all virtual capacity pools.

Comparison with past analysis data makes it possible to check whether the operation is performed as initially planned. If the operation is not performed as planned, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that the percentage with actual used capacity to the actual capacity with whole virtual capacity pool. If this is not expected in the initial plan, review the current operations.

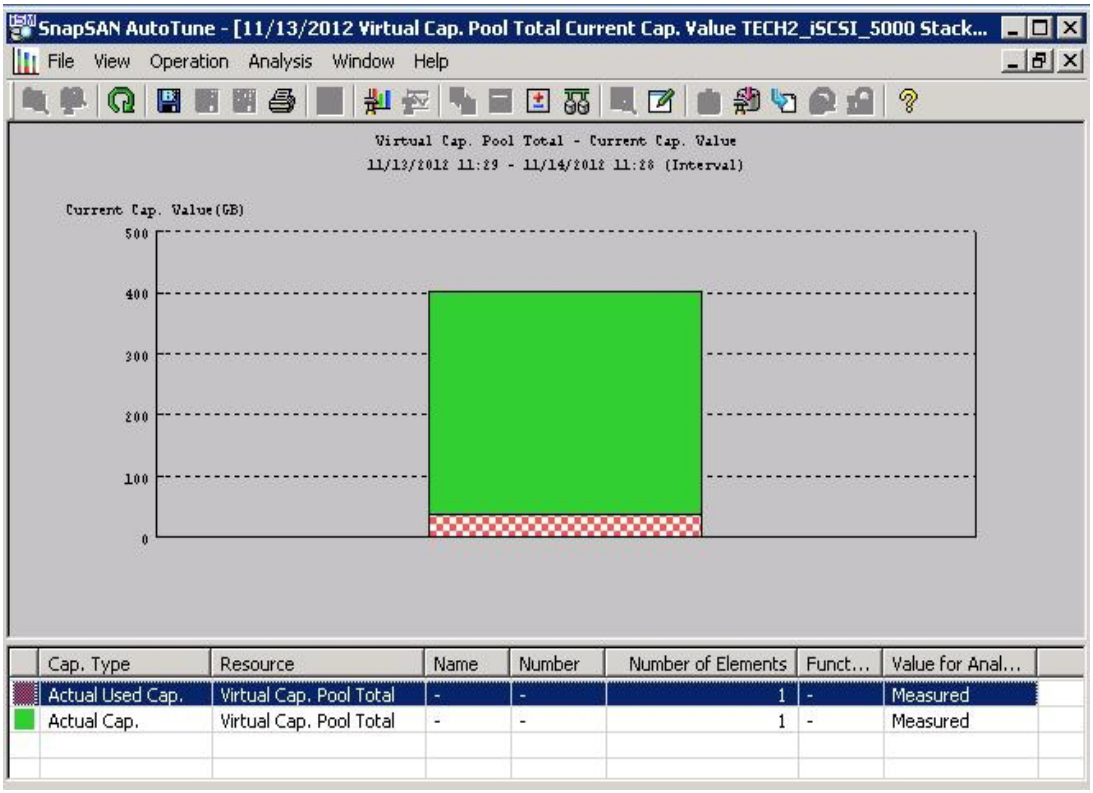


Figure 5-1: Current Capacity Value

Current Capacity Value (Actual Used Capacity) of Virtual Capacity Pool Total (Time-Series)

The current capacity value (actual used capacity) of virtual capacity pool total is the total actual used capacity of all virtual capacity pools in the disk array. Check the time variation of the actual used capacity of all virtual capacity pools.

It is possible to check whether the operation is performed as initially planned. If the actual used capacity does not fluctuate as planned, investigate the cause through detailed analysis.

Displays daily information for a month. You can see that the actual used capacity increases over time. Determine whether this increase is appropriate from the operational viewpoint.

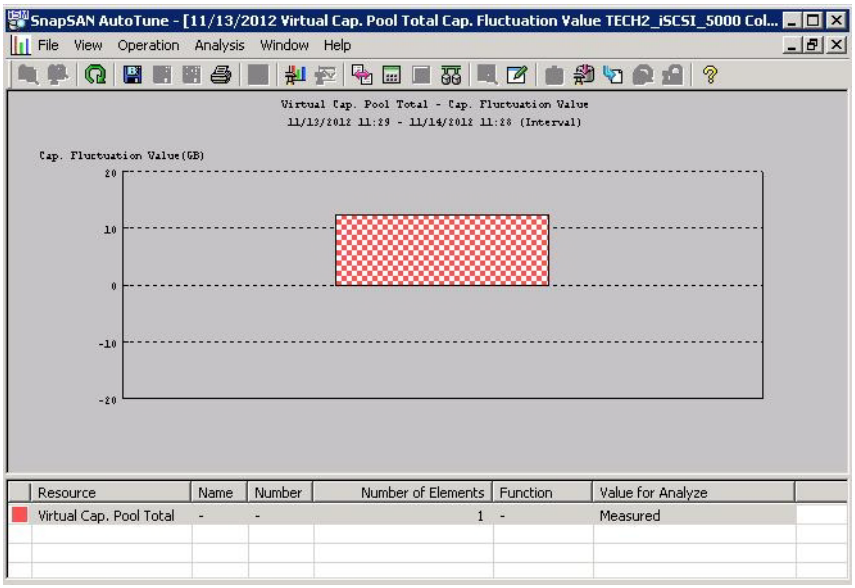


Figure 5-2: Actual Capacity Value

Current Capacity Value (Differential Actual Capacity) of Pools (Resource System)

The current capacity value (differential actual capacity) of pools is the difference between the actual capacity and the actual used capacity every pool (the actual capacity minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential actual capacity) in a bar graph.

Check any virtual capacity pool for which the actual used capacity is likely to reach the actual capacity. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a virtual capacity pool for which the actual used capacity is likely to reach the actual capacity. Because this virtual capacity pool might run out of capacity in the near future, investigate the increase tendency of the actual used capacity through detailed analysis. Next, consider whether it is necessary to expand the actual capacity of the virtual capacity pool or move the virtual capacity logical disk based on the investigation result.

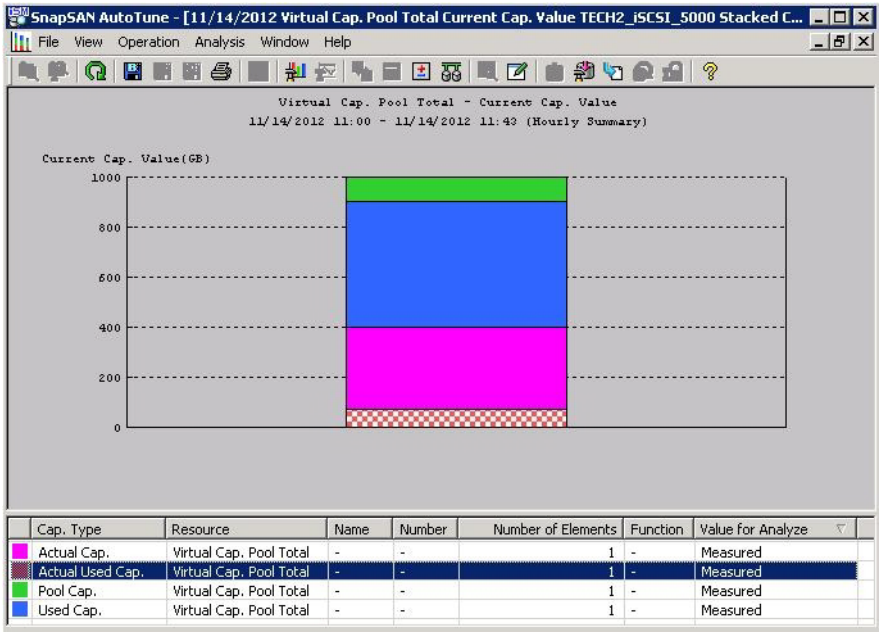


Figure 5-3: Differential Actual Capacity

Current Capacity Value (Differential Actual Capacity Threshold) of Pools (Resource System)

The current capacity value (differential actual capacity threshold) of pools is the difference between the actual capacity threshold and the actual used capacity every pool (the actual capacity threshold minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential actual capacity threshold) in a bar graph.

Check any virtual capacity pool for which the actual used capacity is likely to reach the actual capacity threshold or any virtual capacity pool for which the actual used capacity has already reached the threshold. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a virtual capacity pool for which the actual used capacity is likely to reach the actual capacity threshold. Because this pool might exceed the actual capacity threshold in the near future, investigate the increase tendency of the actual used capacity through detailed analysis. Next, consider whether it is necessary to change the actual capacity threshold of the virtual capacity pool, expand the actual capacity of the virtual capacity pool, or move the virtual capacity logical disk based on the investigation result.

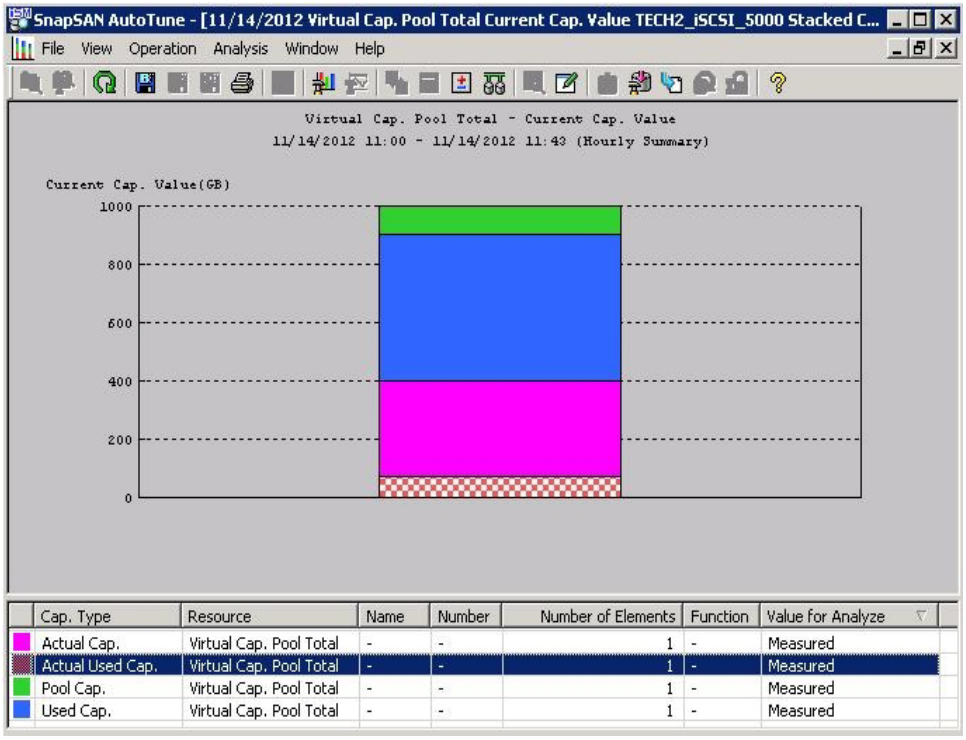


Figure 5-4: Differential Actual Capacity Threshold

Current Capacity Value (Differential Actual Capacity threshold (Pre)) of Pools (Resource System)

The current capacity value (differential actual capacity threshold (pre)) of pools is the difference between the actual capacity threshold (pre) and the actual used capacity every pool (the actual capacity threshold (pre) minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential actual used capacity (pre)) in a bar graph.

Check any virtual capacity pool for which the actual used capacity is likely to reach the actual capacity threshold (pre) or any virtual capacity pool for which the actual used capacity has already reached the threshold. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a virtual capacity pool for which the actual used capacity is likely to reach the actual capacity threshold (pre). Because this pool might exceed the actual capacity threshold (pre) in the near future, investigate the increase tendency of the actual used capacity through detailed analysis. Next, consider whether it is necessary to change the actual capacity threshold (pre) of the virtual capacity pool, expand the actual capacity of the virtual capacity pool, or move the virtual capacity logical disk based on the investigation result.

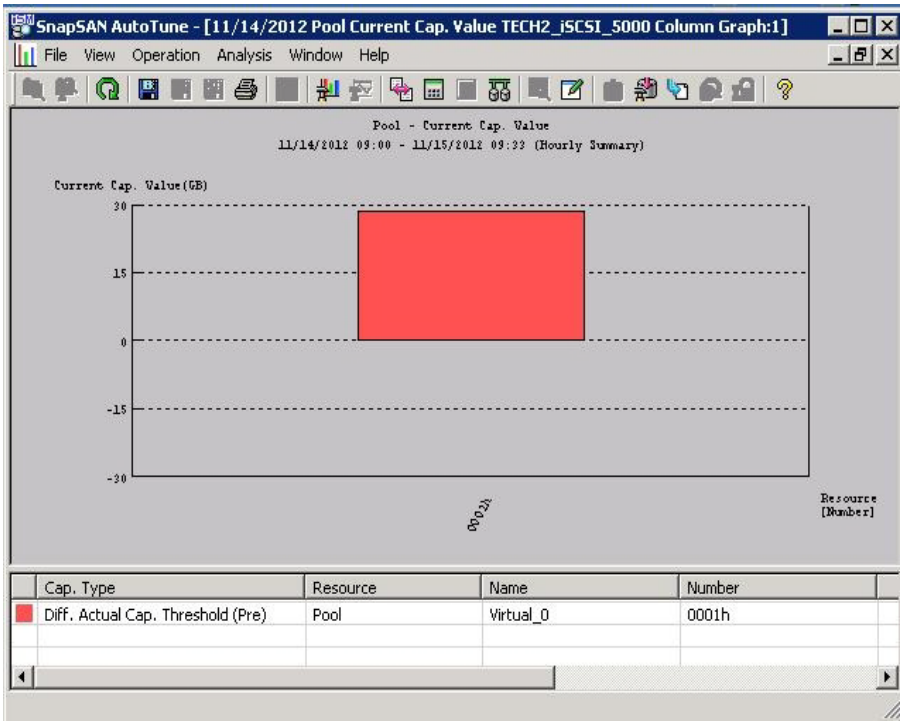


Figure 5-5: Differential Actual Capacity Threshold (Pre)

Current Capacity Value of Logical Disks (Differential Logical Disk Capacity) (Resource Column)

The current capacity value (differential logical disk capacity) of logical disks is the difference between the logical disk capacity and the actual used capacity (the logical disk capacity minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential logical disk capacity) in a bar graph.

Check any virtual capacity logical disk for which the actual used capacity is likely to reach the logical disk capacity. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a virtual capacity logical disk for which the actual used capacity is likely to reach the logical disk capacity. If this is not expected in the initial plan, review the current operations.

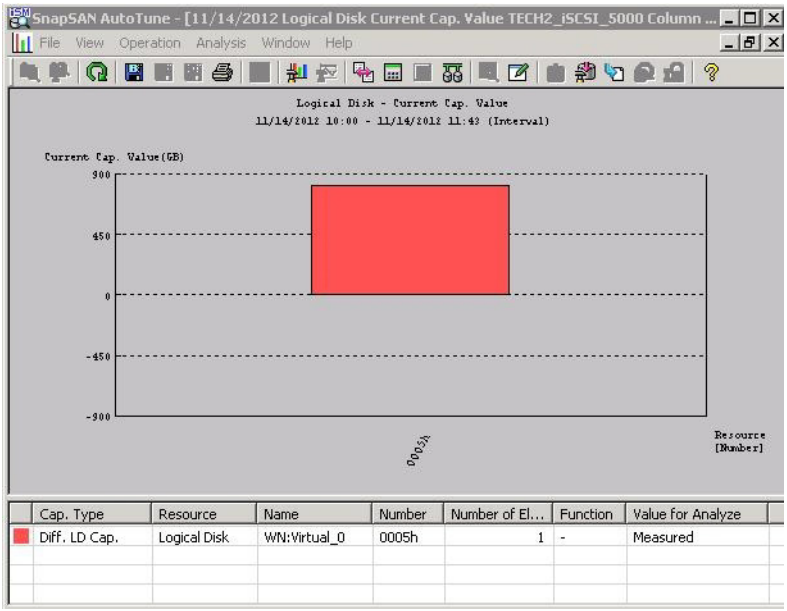


Figure 5-6: Differential Logical Disk Capacity

Current Capacity Value of Logical Disks (Differential LD Capacity Quota) (Resource System)

The current capacity value (Differential LD capacity quota) of logical disks is the difference between the LD capacity quota and the actual used capacity (the LD capacity quota minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential LD capacity quota) in a bar graph.

Check any logical disk for which the actual used capacity is likely to reach the LD capacity quota. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a virtual capacity logical disk for which the actual used capacity is likely to reach the LD capacity quota. Because this logical disk might exceed the LD capacity quota in the near future, investigate the increase tendency of the actual used capacity through detailed analysis. Next, consider whether it is necessary to change the LD capacity quota of the virtual capacity logical disk or expand the logical disk capacity based on the investigation result.

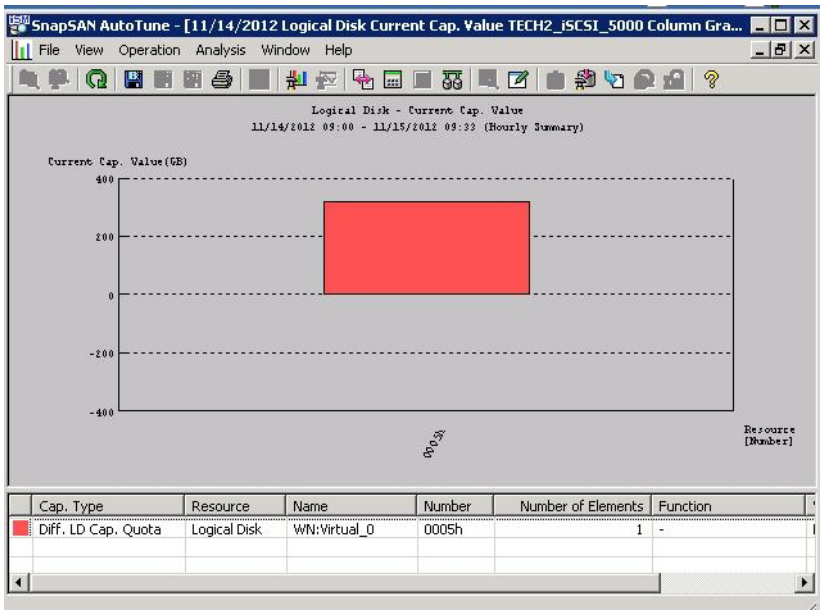


Figure 5-7: Differential LD Capacity Quota

Current Capacity Value of Logical Disks (Differential LD Capacity Threshold) (Resource System)

The current capacity value (differential LD capacity threshold) of logical disks is the difference between the LD capacity threshold and the actual used capacity (the LD capacity threshold minus the actual used capacity). The default template specified for capacity analysis displays the current ten lowest capacity values (differential LD capacity threshold) in a bar graph.

Check any virtual capacity logical disk for which the actual used capacity is likely to reach the LD capacity threshold or any virtual capacity logical disk for which the actual used capacity has already reached the threshold. If the capacity allocation status does not match the operation, investigate the cause through detailed analysis.

Graph displays the latest current capacity value. You can see that there is a logical disk for which the actual used capacity is likely to reach the LD capacity threshold. Because this logical disk might exceed the LD capacity threshold in the near future, investigate the increase tendency of the actual used capacity through detailed analysis. Next, consider whether it is necessary to change the LD capacity threshold of the virtual capacity logical disk or expand the logical disk capacity based on the investigation result.

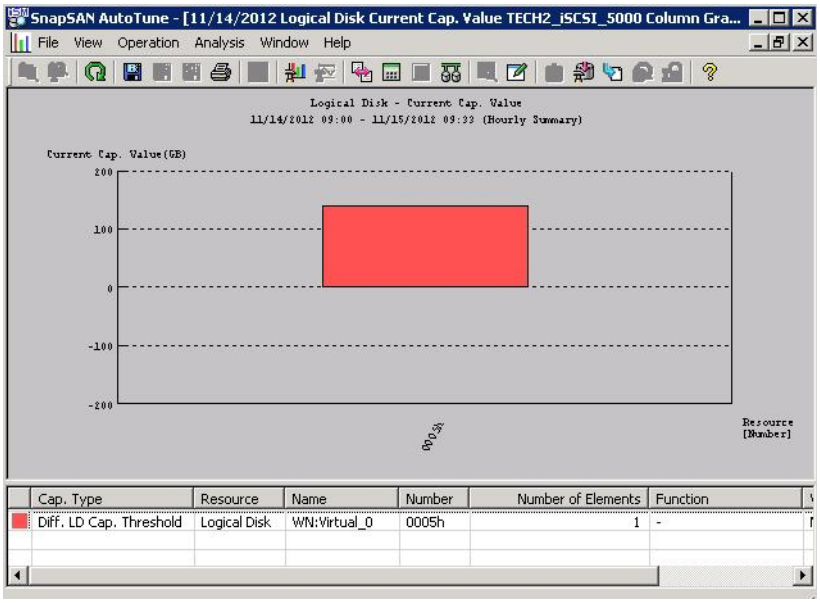


Figure 5-8: Differential LD Capacity Threshold

Analyzing in Detail

Perform detailed analysis when problems are detected as a result of analyzing general conditions and further analysis from other viewpoints is necessary.

Changing Analysis Contents

This section explains analysis procedures using an example. The example shown here assumes a certain case. Note that the analysis procedure varies depending on the situation.

- This example shows how to investigate the increase tendency of the actual used pool capacity to plan disk additions for the next half year.

In this example, the actual capacity and actual used capacity of virtual capacity pools are analyzed. If the actual used capacity of the virtual capacity pool is likely to reach the actual capacity, the virtual pool might run out of capacity, affecting operations. Therefore, it is necessary to plan disk additions in advance to prevent capacity shortages.

Analyzing the Whole Situation

Select the default template specified for capacity analysis to perform quick analysis on the Configure Quick Analysis screen.

Among the quick analysis results, focus on the graph of current pool capacity values (differential actual capacity). If the actual used capacity of a pool is likely to reach the actual capacity, analyze the pool.

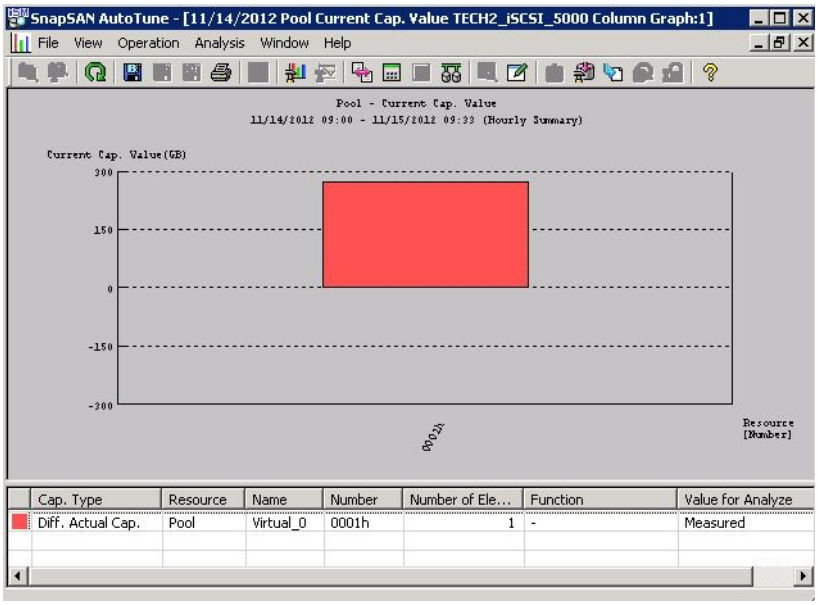


Figure 5-9: Differential Actual Capacity

Analyzing Different Resources

To perform detailed analysis, change the settings of resources to analyze for the pool for which the actual used capacity is likely to reach the actual capacity. To change the resources to analyze, specify the desired pool as the analysis target resource on the [Resource] tab in the Set Analysis Details dialog box.

Changing the Capacity Type to Analyze

To plan disk additions, analyze the time variation of actual capacity and actual used capacity rather than the differential actual capacity. To change the capacity type to analyze, select [Actual Capacity] and [Actual Used Capacity] as [Capacity Type] on the [Metrics] tab in the Set Analysis Details dialog box.

Changing the Display Format

Time-series analysis of statistics clarifies the resource capacity's increase/decrease tendency and analyzing the resource system clarifies the capacity allocation status.

To check how long it takes for the actual used capacity to reach the actual capacity, change the graph display format from the resource system to the time-series. To change the graph display format, select [Time] as [Traverse] on the [Display Format] tab in the Set Analysis Details dialog box.

Planning disk additions

The current pool capacity value (actual capacity, actual used capacity) graph in Figure 5-10, for which settings are changed in the Set Analysis Details dialog box, shows that the actual used capacity increases due to capacity allocation by operations and approaches the actual capacity. If capacity allocation continues at this rate, the actual used capacity is expected to reach the actual capacity in several months, causing a capacity shortage. Therefore, before the pool runs out of capacity, analyze the tendency of capacity allocation during operation based on past data, and plan disk additions by considering how many physical disks should be added for the next half year.

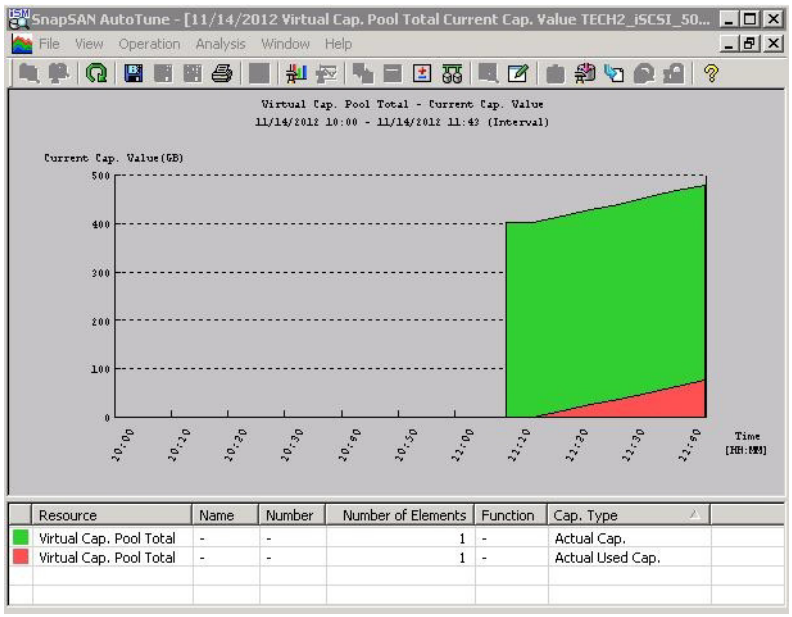


Figure 5-10: Actual Capacity, Actual Used Capacity

Analyzing Capacity Using Thresholds

The threshold specified for the virtual capacity pool or logical disk can be displayed in a graph or raw data from [Conf.Setting]. The following thresholds can be displayed during capacity analysis:

- Virtual capacity pool:Actual capacity threshold, actual capacity threshold (pre)
- Virtual capacity logical disk:LD capacity quota, LD capacity threshold

This section uses an example to describe how to display the threshold.

- To display the threshold in a graph and prevent capacity shortages

Line graph of the logical disk's current capacity value (the actual used capacity). In this graph, it is not clear whether the logical disk is likely to run out of capacity, exceeding the LD capacity threshold. Therefore, it is necessary to additionally select [LD Capacity Threshold] as [Capacity Type].

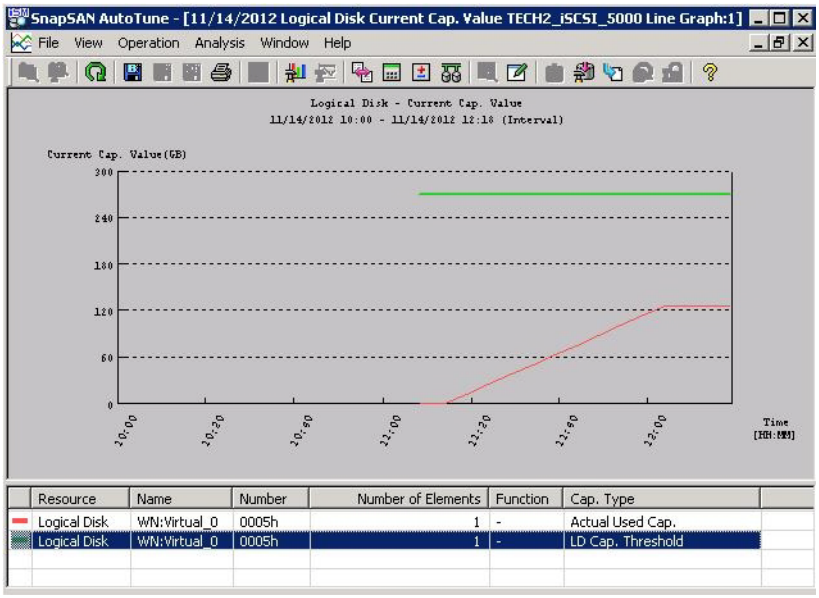


Figure 5-11: Actual Used Capacity

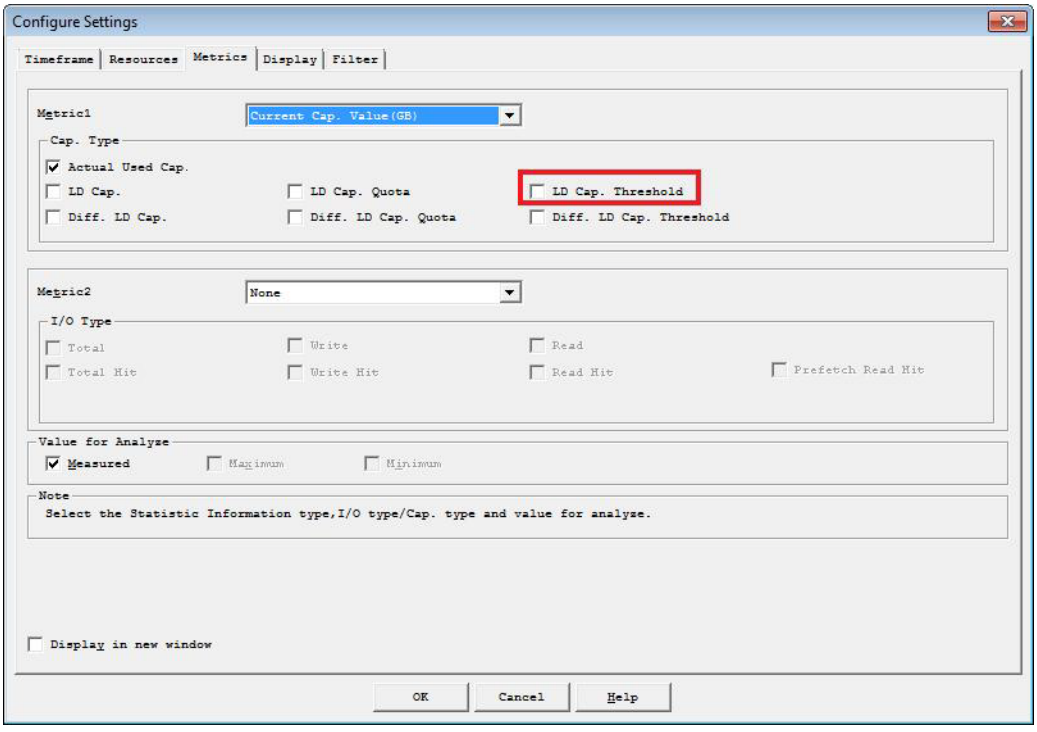


Figure 5-12: Set Analysis Details

Select [LD Capacity Threshold] in [Capacity Type], and then click the [OK] button. Note that the LD capacity threshold is selectable only when [Actual Used Capacity] is selected.

Figure 5-13 shows a line graph of the logical disk's current capacity value (actual used capacity, LD capacity threshold). If the actual used capacity exceeds the LD capacity threshold, the graph is framed in red and a warning is displayed.

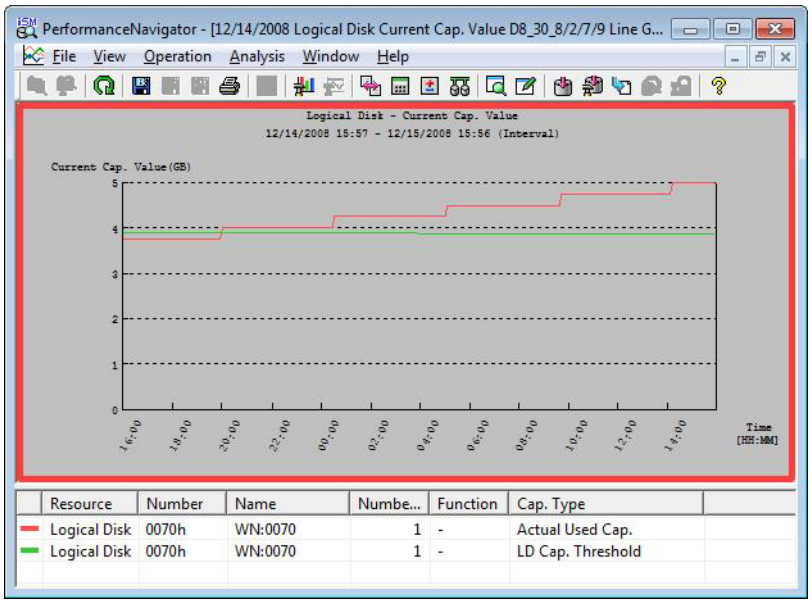


Figure 5-13: Actual Used Capacity, LD Capacity Threshold

The graph shows that a logical disk exceeds the LD capacity threshold. By being aware of the exceeded LD capacity threshold, you can see the possibility of a capacity shortage and therefore prevent it.

Analyzing Associated Resources

If a capacity problem occurs, locate the actual cause by analyzing associated resources. The following resources are associated with the virtual capacity pool total, virtual capacity pool, and virtual capacity logical disk, respectively:

- Virtual capacity pool total-> Virtual capacity pool
- Virtual capacity pool-> Virtual capacity logical disk
- Virtual capacity logical disk-> Virtual capacity pool

This section uses a typical example to describe the analysis procedures.

- The actual used capacity has reached the actual capacity and the pool runs out of capacity.

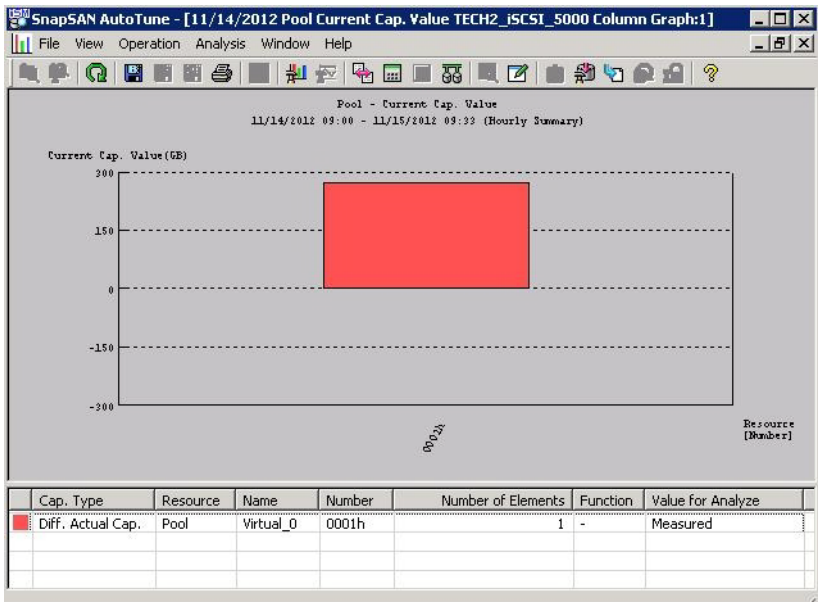


Figure 5-14: Differential Actual Capacity

Check the actual used capacity of each logical disk in the pool for which the capacity ran out by performing the following procedure:

1. Right-click the graph.
2. Select [Associated Resources Analysis] from the shortcut menu.
3. When the Associated Resources Analysis screen is displayed, select the pool for which the capacity ran out by using [Select the Resource(s) to Analysis].
4. Select the [logical disk] check box of [Related Resources], and then click the [OK] button. A graph showing the actual used capacity of all the logical disks in the pool for which the capacity ran out is displayed.

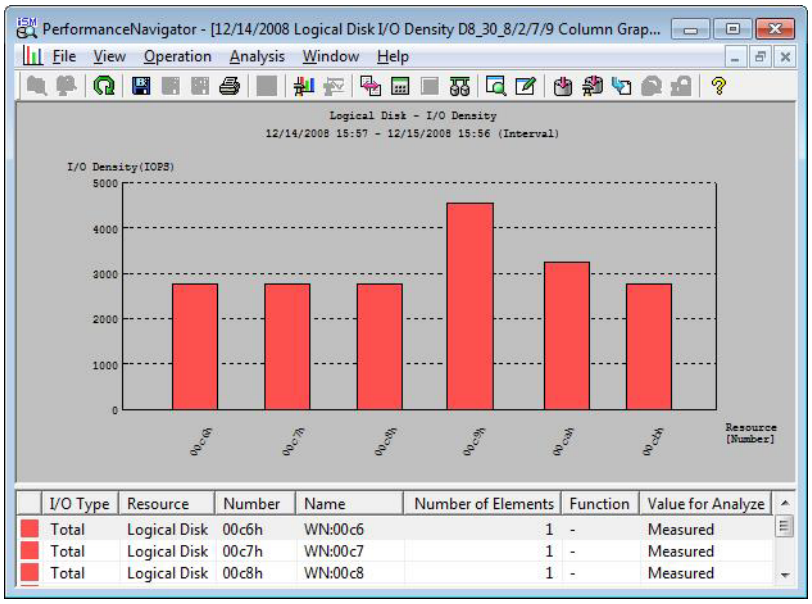


Figure 5-15: Actual Used Capacity

In this graph, which shows the current capacity values (actual used capacities) of logical disks set up in the pool, you can see that the actual used capacity of logical disk 00c9h is extremely high.

Next, check the changes over time of the actual used capacity of each logical disk in the pool for which the capacity ran out by performing the following procedure.

1. Right-click the graph.
2. Select [Configure Settings] from the shortcut menu.
3. When the Configure Settings screen is displayed, on the [Metrics] tab, clear the [actual used capacity] check box, and then select the [Differential logical disk capacity] check box.
4. On the [Display] tab, change the horizontal axis from [Resource] to [Time].
5. Click the [OK] button to display a time series graph of how the capacity of the logical disks in the pool for which the capacity ran out changed.

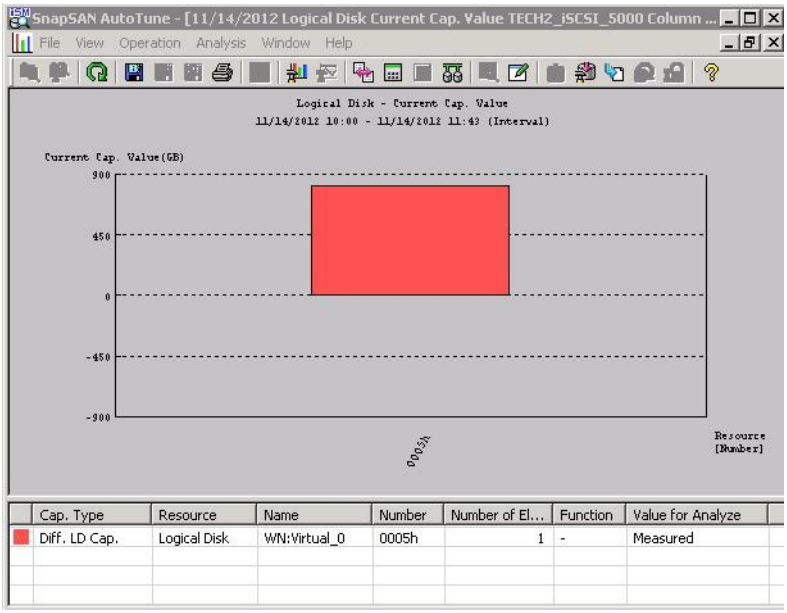


Figure 5-16: Differential LD Capacity

Graph shows the logical disks' current capacity values (differential logical disk capacity), you can see that allocation to 00c9h was performed when the capacity ran out.

This means that an unexpected allocation to logical disk 00c9h caused a capacity shortage. Make sure that the processing was properly performed

Appendix A

Troubleshooting

Procedures for Handling

When a message is displayed, perform the appropriate handling as needed. Messages and their handling are explained below.

An item with angle brackets, such as <aaa> or <bbb...b>, indicates an output of a variable parameter value (angle brackets "<>" are not included in an actual output).

Message No.	Top:Message Image Bottom:Explanation and Handling
00001	Failed to open file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that a file Open failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00002	Failed to write to file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that a write to a file failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00003	Failed to read from file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that reading a file failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00004	Failed to delete file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that deleting a file failed. aaa...a: File name bbbbb: Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
00005	Invalid file format. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that wrong of the format of a file was detected. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file contents then perform the operation again.
00006	Processing stopped due to insufficient memory. Phase = <aaaaa> Explanation: Indicates that memory needed during processing could not be obtained. aaaaa: Phase number Handling: Check memory utilization and other environmental variables and then perform the operation again.
00007	Analysis has already been completed. Explanation: Multiple performance analysis functions cannot be started concurrently.
00008	Failed to overwrite file. File = <*aaa..a*>, detail = <*bbbbb*>. Explanation: Indicates that file overwriting failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00009	Failed to copy file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that file copy failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00010	Unknown error occurred. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that an error of which the cause cannot be identified occurred during file operation. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00011	Insufficient permissions to delete file. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that file deletion failed. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
00012	Hardware error occurred. File = <*aaa...a*>, detail = <*bbbbb*>. Explanation: Indicates that a hardware error occurred. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the hardware status and then perform the operation again.
00013	Sharing violation occurred during file access. File = <aaa...a>, detail = <bbbbb>. Explanation: Indicates that a file being updated by another program was referred to or updated. aaa...a:File name bbbbb:Detail code 1 See References below for Detail code 1. Handling: Check the file status and then perform the operation again.
00201	<*aaa...a*> is using the current data location. Two or more users cannot simultaneously use the same data location. Explanation: There is a user who uses the specified data location. aaa...a: User name
00202	<*aaa...a*> is using the current data location. Explanation: There is a user who references the specified data location. aaa...a: User name
01201	Enter the IP Address or DNS name for the server. Explanation: The IP Address or DNS Name of the connected server must be specified. Handling: Input the IP Address or DNS Name of the connected server and then perform the operation again.
01202	Cannot resolve the specified DNS name. Explanation: The DNS Name must be specified correctly. Handling: Correct the specification of the DNS Name and then perform the operation again.
01203	Enter the user name. Explanation: A user name must be specified. Handling: Specify a user name and then perform the operation again.
01204	Fail to connect to server. Code = <*aaaaa*>. Explanation: A server environment setting is not correct. aaaaa: Detail code 2 See References below for Detail code 2. Handling: Check whether there is an error in the (FTP-related) server environment settings, eliminate the fault, and then perform the operation again.
01205	Invalid server directory. Code = <*aaaaa*>. Explanation: The server's directory specification is in error. aaaaa: Detail code 2 See References below for Detail code 2. Handling: Execute again after checking the directory specification.

Message No.	Top:Message Image Bottom:Explanation and Handling
01206	Cannot get the metrics files. Code = <*aaaaa*>. Explanation: An error occurred in downloading. aaaaa: Detail code 2 See References below for Detail code 2. Handling: Check whether there is a problem in the state of the server network and then execute again.
01207	Specify the location to download from. Explanation: The download destination must be specified. Handling: Check whether or not a download destination is specified.
01208	Specified folder does not exist or insufficient permissions to access the folder. Explanation: The download destination must be specified correctly. Handling: Execute again after checking the download destination specification.
01209	Insufficient storage on the disk or disk is not available. Explanation: The disk status must be checked. Handling: Execute again after checking whether there is sufficient disk capacity.
01210	Downloading metrics. Do you want to interrupt downloading? Explanation: This is a check of whether or not to suspend a metrics file download.
01211	Failed to download file. Code = <*aaaaa*>. Explanation: An error occurred in downloading. aaaaa: Detail code 2 See References below for Detail code 2. Handling: Check whether there is a problem in the state of the server network and then execute again.
01212	Specify a valid name. Explanation: The setting name specification must be corrected. Handling: Check whether a setting name is specified and whether the setting name is a duplicate.
01213	Enter data from <*aa*> to <*bb*>. Explanation: A value is outside the range in which it can be set. aa:Lower bound on values that can be set bb:Upper bound on values that can be set Handling: Reset it within the range and then perform the operation again.
01214	Invalid download period. Explanation: The specification of the period of download is incorrect. Handling: Correctly specify the period of download and then perform the operation again.
01215	Name already exists. Explanation: The connection destination must be uniquely specified. Handling: Re-enter the destination and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
01601	<*aaa...a*> already exists. Do you want to replace it? Explanation: The file being downloaded already exists. aaa...a: Name of file to overwrite When [Yes] is selected, only the selected file will be downloaded. When [Yes to All] is selected, all the selected files will be downloaded. When only one file is selected, the behavior is the same as when [Yes] is selected. When [No] is selected, the selected file will not be downloaded. When [Cancel] is selected, none of the selected files will be downloaded. When only one file is selected, the behavior is the same as when [No] is selected.
01602	Import already exists. Do you want to replace it? Explanation: The file being imported already exists. When [Yes] is selected, only the selected file will be imported. When [Yes to All] is selected, all the selected files will be imported. When only one file is selected, the behavior is the same as when [Yes] is selected. When [No] is selected, the selected file will not be imported. When [Cancel] is selected, none of the selected files will be imported. When only one file is selected, the behavior is the same as when [No] is selected.
01603	Delete server entry? Explanation: Message to confirm whether to delete the information about the connection destination.
02201	Invalid period specified. Explanation: The specification of the date for importing must be corrected. Handling: Re-enter the date for importing and then perform the operation again.
02202	No available metrics to import for the specified period. Explanation: There is no metrics in the Import Period. Handling: Re-enter the date for importing and then perform the operation again.
02601	Delete original data files? Explanation: Specify whether to delete the original file for importing after the import processing completed.
03201	Metrics may be destroyed. The format of metrics is performed. Explanation: Because file wrong was detected in the metrics file. File formatting is performed.
03202	Metrics found which cannot be analyzed by the current version. Explanation: There are metrics which cannot be analyzed. Handling: Check the version of the iSM server. You need to upgrade this program to analyze these metrics.
04202	Select the metrics to delete. Explanation: Metrics to be deleted have not been selected. Handling: Select the type of metrics to delete.

Message No.	Top:Message Image Bottom:Explanation and Handling
04203	Enter data from <*aa*> to <*bb*>. Explanation: The specified value is outside the allowed range. aa:Lower bound on values that can be set bb:Upper bound on values that can be set Handling: Specify the value within the allowed range and then perform the operation again.
04204	Select the month. Explanation: A month must be specified. Handling: Specify the month and then perform the operation again.
04205	Select the day of the week. Explanation: Days of the week must be specified. Handling: Specify the days of the week and then perform the operation again.
04206	Specify a filter condition. Explanation: Filtering conditions must be set. Handling: Set filtering conditions and then perform the operation again.
04207	Select the day. Explanation: A date specification is incorrect. Handling: Correctly specify the date and then perform the operation again.
04208	Specify the data retention period. Explanation: The keep period must be specified. Handling: Specify the keep period and then perform the operation again.
05201	Enter the host name. Explanation: A server name must be input. Handling: Input the server name and then perform the operation again.
05202	Specify the file. Explanation: A file must be specified. Handling: Specify the file and then perform the operation again.
05204	Host name already exists. Explanation: The Server Name and Saved Date must be uniquely specified. Handling: Set the Server Name or Saved Date and then perform the operation again.
05205	Volume list file has already been specified. Explanation: The value list to import is specified doubly.
05207	Cannot find the specified file. Explanation: The specified file was not found. Handling: Check the file specification and then perform the operation again.
05208	Cannot get volume information from all files. Explanation: The specified Volume List files could not be read. Handling: Eliminate the cause for each file and then perform the operation again.
05601	Delete the original files? Explanation: Specify whether to delete the original file for importing after the import processing completed.

Message No.	Top:Message Image Bottom:Explanation and Handling
06201	If all the selected reports are applied, the number of windows will exceed <*aa*>. Reduce the number of active reports. Explanation: All templates cannot be executed. aa: Number of windows that can be displayed
06404	Cannot display <*aa*> graphs/raw data in the report. Change the timeframe. Explanation: All graphs or raw data registered in templates could not be displayed. aa: Number of templates that could not be displayed Handling: Change the timeframe and then perform the operation again.
06405	No available report to apply. Explanation: There are no executable templates.
06601	Disk array associated with the report template has not been imported. Apply the template(s) for disk arrays that have already been imported. Explanation: A template for analyzing a disk array for which metrics have not been imported is selected. Handling: Reselect templates to execute and then perform the operation again or click the [OK] button in the dialog box.
07201	Enter the name for report. Explanation: A template name must be specified. Handling: Specify the template name and then perform the operation again.
07401	Report "<*aaaa*>" already exists. Explanation: An existing template name is specified. aaaa: Template name Handling: Review the settings and then perform the operation again.
07601	Report "<*aaaa*>" already exists. Do you want to replace it? Explanation: A template of the same name already exists. aaaa: Template name Handling: To overwrite an available template, click the [OK] button in this dialog box.
07602	The Available Report Templates which is subscribed to the TemplateSet is included in the deletion object. Does it delete really? Explanation: The selected template to delete is an available report template registered in the TemplateSet. Handling: When deleting an available report template, click the [OK] button in this dialog box.
08201	Invalid start period and end period. Explanation: The start time and end time are reversed. Handling: Set the start time or end time and then perform the operation again.
08202	Select a day of the week. Explanation: Days of the week must be specified. Handling: Specify days of the week and then perform the operation again.
08203	Enter a number for the value. Explanation: A numeric value must be input in an index value. Handling: Input a numeric value in the index value and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
08204	The maximum value and the minimum value are reversed. Explanation: The range specification is reversed. Handling: Correctly specify numeric values and then perform the operation again.
08206	Select the resource for analysis. Explanation: Resources for analysis have not been set. Handling: Set the resources for analysis and then perform the operation again.
08207	Enter from <*aa*> to <*bb*>. Explanation: A value is outside the range in which it can be set. aa:Lower bound on values that can be set bb:Upper bound on values that can be set Handling: Reset it within the range and then perform the operation again.
08208	Only <*aa*> can be entered. Explanation: A value differs from what can be set. aa: Value that can be set Handling: Reset the value and then perform the operation again.
08209	Specify the “Value for Analyze”. Explanation: A value for analyze is not specified. Handling: Specify a value for analyze and then perform the operation again.
08402	No metrics found in the specified timeframe. Select a different timeframe. Explanation: There are no metrics within the timeframe that was specified. Handling: Correct the timeframe setting or collect metrics and then perform the operation again.
08403	No resources found with the matching filtering condition. Explanation: There are no resources that coincide with analysis content settings. Handling: Change the analysis content settings and then perform the operation again.
08404	The number of selected criteria exceeds the maximum of 64 resources. Explanation: No more than 64 data series can be displayed in a graph/raw data. Handling: Filter the data series by specifying display conditions. If horizontal axis is time Number of data series = (Number of resources ∗ Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count + Number of compare against statistical data If horizontal axis is constituent series Number of data series = (Number of resources ∗ ((Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count)) + Number of compare against statistical data Review the settings and then perform the operation again.
08405	Change the graph type to <*aaaa*>. Explanation: The graph type changes because the Metric setting was changed. aaaa: “Line graph”, “Column graph”, or “2 y axes graph”

Message No.	Top:Message Image Bottom:Explanation and Handling
08406	Cannot apply the filtering condition. Explanation: Filtering conditions could not be applied because resources for analysis were changed.
08407	Cannot display the specified Metric, I /O Type, or Cap.Type. Explanation: Because resources for analysis were changed, display using a Metric, I/O type, or Capacity type that is specified is impossible.
08408	Available resource data has been deleted. Can not delete available resource data Explanation: Available resource data was deleted.
08409	Cannot display <*bbbb*> in <*aaaaa*>. Explanation: Data other than I/O density, transfer rate, and average queue length cannot be displayed in a Stacked Area graph or Stacked Column graph. aaaaa:“Stacked Area graph”, “100% Stacked Area graph”, “Stacked Column graph”, or “100% Stacked Column graph” bbbb:“Average Transfer Length”, “Average Response Time”, “Max Response Time”, “I/O Ratio”, “Cache Hit Ratio”, “Busy Ratio”, “Average Dirty Pages”, “Max Dirty Pages”, or “Max Queue Length”
08410	Cannot display sum from the specified metric. Explanation: If Total is specified as the total method, data other than I/O density, transfer rate, current capacity value, capacity fluctuation value, electric power or electric energy cannot be displayed.
08411	Cannot choose maximum or minimum value for “Value for Analyze” when sum or average value is specified. Explanation: When a sum value or average value is specified for a resource for analysis, a maximum or minimum value cannot be selected as a value for analyze. Handling: Review the settings and then perform the operation again.
08412	Cannot choose maximum or minimum value for “Value for Analyze” when the unit of horizontal axis is time. Explanation: When the kind of data is interval information and the horizontal axis is specified as a time axis, a maximum or minimum value cannot be selected as a value for analyze. Handling: Review the settings and then perform the operation again.
08413	If two or more “Value for Analyze” are chosen, you can only choose a line graph, a column graph, or a 2 y axes graph. Explanation: When two or more values for analyze are selected, graphs such as an area chart, Stacked Column graph, and pie graph cannot be displayed. Handling: Review the settings and then perform the operation again.
08414	The time zone which is output with the time of the metrics overlapping in the timeframe exists. <*aaa...a*> On the graph, the metrics which was earlier accumulated in the time series shows. Explanation: There is a time zone in which the duplicated time of the statistical data is output during analysis. Information that was accumulated earlier is displayed in the graph. Information that was accumulated later can be checked by referencing row data. aaa...a: Time zone in which the duplicated time of the statistical data is output

Message No.	Top:Message Image Bottom:Explanation and Handling
08415	Time included in metrics of the following diskarray(s) is displayed with ignorance of Summer time. For display time in Summer time period, please delete metrics in Summer time period and then import them again. <*aaa...a*>:<*bbb...b*> Explanation: The statistical data imported by using PerformanceNavigator V6.3 or earlier includes daylight saving times. In statistical data imported by using PerformanceNavigator V6.3 or earlier, the daylight saving time is displayed without indicating it as such. aaa...a: Name of an appropriate disk array bbb...b: SAA of an appropriate disk array To display the daylight saving time as is, delete the statistical data including the daylight saving time, imported by using PerformanceNavigator V6.3 or earlier, and then import the data again.
08416	The Electric Energy of the interval information shows power consumption every the logging interval of the metrics. When the logging interval is 5 minutes, the Electric Energy(Wh) becomes the value to have multiplied 5/60(hour) to the Electric Power(W). Explanation: The Electric Energy of the interval information shows power consumption every the logging interval of the metrics. When the logging interval is 5 minutes, the Electric Energy (Wh) becomes the value to have multiplied 5/60 (hour) to the Electric Power (W).
08602	The max response time requires further processing of the data. Do you want to continue? Explanation: Use the maximum response time only when making an analysis in which a momentary drop in response speed is regarded as a problem.
08605	Threshold and statistical data cannot be displayed on <*aaa..a*>. Display <*aaa..a*> without displaying the threshold and statistical data. Explanation: Threshold or compare against statistical data cannot be displayed in the specified graph. aaa...a:“Stacked Area graph”, “100% Stacked Area graph”, “Stacked Column graph”, or “100% Stacked Column graph”, or “Pie graph”
08606	Cannot display threshold on a 2 y axes graph. Do you want to display the 2 y axes graph without a threshold? Explanation: A threshold cannot be displayed on a 2 y axes graph.
08607	In the specified timeframe, it is impossible to set. When the Data Type is <*aaa...a*>, timeframe must be specified <*bbb...b*>. Does it revise timeframe automatically? Explanation: The specified timeframe cannot be set. aaa...a: Type of the specified data bbb...b: Specifiable timeframe range
09201	Cannot specify a wild card and a range at the same time. Explanation: Wildcards and range specifications cannot be used at the same time. Handling: Review condition specifications and then perform the operation again.
09202	Invalid condition specified. Explanation: The range specification is reversed.

Message No.	Top:Message Image Bottom:Explanation and Handling
09203	Invalid condition. Only numbers can be specified. Explanation: Range specification cannot be performed except in conditions on numbers. Handling: Remove range specifications in places other than conditions on numbers and then perform the operation again.
09204	Invalid characters found. Valid characters that can be entered are wild card character (*), numbers, "a", "b", "c", "d", "e", "f", "h", and "-". Explanation: A string that cannot be input is being used. Handling: Correct the input filtering conditions and then perform the operation again.
09205	Invalid characters found. Valid characters that can be entered are wild card character (*), numbers, "a", "b", "c", "d", "e", "f", and "h". Explanation: A string that cannot be input is being used. Handling: Correct the input filtering conditions and then perform the operation again.
09401	No resource found matching the specified filtering condition. Explanation: Resources coinciding with the filtering conditions on logical disks were not found. Handling: Correct the setting of the filtering conditions and then perform the operation again.
10201	Specify the connection information. Explanation: No connection destination is specified. Handling: Specify the destination and then perform the operation again.
10202	Specify the folder. Explanation: No folder is specified. Handling: Specify the folder and then perform the operation again.
10203	Invalid connection. Change the settings for update data. Explanation: The connection destination specified in [Configure Update Data] is invalid. Handling: Execute the Configure update data and set the connection destination again.
10204	Specified connection information does not exist. Explanation: The specified connection destination does not exist in the connection list. Handling: Add it on the Configure Download Data screen or specify other connection destination.
10205	Specified folder does not exist or insufficient permissions to access the folder. Explanation: The specified import source folder does not exist or there is no access permission for the folder. Handling: Specify another import source folder and then execute the operation again.
10206	Specified folder does not exist or insufficient permissions to access the folder. Change the settings for update data. Explanation: The specified import source folder does not exist or there is no access permission for the folder. Handling: Display [Configure Update Data] and specify another import source folder.

Message No.	Top:Message Image Bottom:Explanation and Handling
10207	The metrics are possibly destroyed. Please display the available data again. Explanation: The metrics might be corrupted. Handling: Delete the relevant files in the saving destination of metrics files and import them again.
10401	Metrics do not exist. Explanation: The latest metrics have already been imported.
11202	Cannot find the starting day in the specified range. Specify the correct day of the week in the timeframe. Explanation: The range of start dates specified does not contain days of the week specified in the timeframe. Handling: Check the days of the week specification of the timeframe, correct the specification of the range of start dates, and then perform the operation again.
11203	Specify a resource. Explanation: A data series must be specified. Handling: Specify the data series and then perform the operation again.
11204	Specified comparison period overlaps with the current timeframe. Specify a period that does not overlap with the current timeframe. Explanation: The period for comparison and the timeframe are the same period. Handling: Correct the setting of the period for comparison and then perform the operation again.
11205	Enter from <*aa*> to <*bb*>. Explanation: A value is outside the range in which it can be set. aa:Lower bound on values that can be set bb:Upper bound on values that can be set Handling: Reset it within the range and then perform the operation again.
11206	Only <*aa*> can be entered. Explanation: A value differs from what can be set. aa: Value that can be set Handling: Reset the value and then perform the operation again.
11402	The number of selected criteria exceeds the maximum of 64 resources. Explanation: No more than 64 data series can be displayed in a graph/raw data. Handling: Filter the data series by specifying display conditions. If unit of measurement is time Number of data series = (Number of resources ∗ Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count + Number of compare against statistical data If unit of measurement is constituent series Number of data series = (Number of resources ∗ ((Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count)) + Number of compare against statistical data Review the settings and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
11403	No metrics found in the specified comparison period. Specify a different comparison period. Explanation: There are no metrics within the period for comparison that was specified. Handling: Change the period for comparison and then perform the operation again.
11404	No metrics on the selected criteria can be found in the specified comparison period. Configure the compare against previous data settings again. Explanation: There are no metrics for the specified resource list within the period for comparison that was specified. Handling: Change the period for comparison or the target resource list setting and then perform the operation again.
11405	Available resource data has been deleted. Can not delete available resource data. Explanation: Available resource data was deleted. Handling: Make the compare against previous data setting again.
12201	Please specify the resource list. Explanation: A data series must be specified. Handling: Specify the data series and then perform the operation again.
12401	The number of selected resources exceeds the maximum of 64 resources. Explanation: No more than 64 data series can be displayed in a graph/raw data. Handling: Filtering the data series by specifying display conditions. If horizontal axis is time Number of data series = (Number of resources ∗ Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count + Number of compare against statistical data If horizontal axis is constituent series Number of data series = (Number of resources ∗ ((Number of Metrics or I/O types or Capacity types * Number of values for analyze) + Compare against previous data count)) + Number of compare against statistical data Review the settings and then perform the operation again.
12402	Available resource data has been deleted. Can not delete available resource data. Explanation: Available resource data was deleted. Handling: Change the metric setting and then perform the operation again.
14201	Select a resource to analyze. Explanation: Resources for analysis must be specified. Handling: Specify resources for analysis and then perform the operation again.
14202	The Related Resource Type is not set up. Explanation: The type of related resource must be specified. Handling: Specify the related resource type and then perform the operation again.
14203	There is no Related Resource does not exit. Explanation: There are no resources that can be analyzed as related resources.

Message No.	Top:Message Image Bottom:Explanation and Handling
14401	Number of <*aaa...a*> is over 64. Only top 10 <*bbb...b*><*ccc...c*><*ddd...d*> will be displayed. Explanation: The data series of related resources exceed 64. aaa...a:Resource type of related resource bbb...b:Metric in display condition ccc...c:I/O type in display condition ddd...d:Target Value in display condition
14402	Cannot display graph of <*aaaa*>. Explanation: A graph of related resources cannot be displayed. aaaa: Resource type of related resource
15201	Enter a number. Explanation: A numeric value must be input. Handling: Input the maximum or minimum and then perform the operation again.
15202	Specify a value which is greater than the minimum value. Explanation: A value that is greater than the minimum must be input in the maximum. Handling: Specify a value that is greater than the minimum in the maximum and then perform the operation again
15203	Specify a value greater than 0. Explanation: A value greater than 0 must be specified in Maximum breadth. Handling: Set a value greater than 0 and then perform the operation again.
16201	Enter data from <*aa*> to <*bb*>. Explanation: The specified value is outside the range in which it can be set. aa:Lower bound on values that can be set bb:Upper bound on values that can be set Handling: Reset it within the range and then perform the operation again.
16202	Only <*aa*> can be entered. Explanation: The specified value differs from what can be set. Handling: Reset the value and then perform the operation again. aa: Value that can be set
16401	No metrics to download. Explanation: Metrics to be downloaded could not be found.
17201	Cannot display <*aa*> graph. Change the Quick Analysis settings. Explanation: Graphs or raw data that were set in quick analysis could not be displayed. Change quick analysis settings and then perform the operation again. aa: Number of graphs or raw data that could not be displayed
17202	Number of windows exceeds <*aaa*> if all the selected reports are applied. Explanation: No templates can be executed. aaa: Number of windows that can be displayed
17203	Cannot display all graphs. Change the Quick Analysis settings. Explanation: Graphs or raw data that were set in quick analysis could not be displayed. Change the timeframe of quick analysis and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
17204	Cannot display all graphs. Explanation: No graphs can be displayed. Handling: Ensure that the name of a metrics file follows the naming convention, and then download or import the file again.
17205	Enter a TemplateSet name. Explanation: The TemplateSet name must be specified. Handling: Specify the TemplateSet name and then perform the operation again.
17401	Specify the report template for Quick Analysis. Explanation: There is no template to execute in quick analysis. Handling: Specify a template.
17402	TemplateSet <aa> exists already. Explanation: There is a duplicated template name. aa: TemplateSet name Handling: Review the settings and then perform the operation again.
17403	TemplateSet <aa> can not be subscribed to exist in the Default TemplateSet. Explanation: The specified TemplateSet name cannot be registered because it is the same as the name of the default template other than the templates being read. aa: TemplateSet name Handling: Review the settings and then perform the operation again.
17404	The Report TemplateSet isn't possible to subscribe, because the Available Report TemplateSet number of the subscription exceeded 128. Explanation: The number of user-defined TemplateSets has exceeded the maximum that can be registered, so registration is not possible. . Handling: Delete unnecessary TemplateSets and then perform the operation again.
17405	The set Timeframe was canceled because the Metrics in the set Timeframe didn't exist. Explanation: This indicates that, because the statistic information for the specified analysis period was deleted, the analysis period settings are no longer fixed. Handling: Revise the analysis period settings as necessary.
17600	Capacity Data is included in the Metrics on the chosen disk array. When doing a capacity analysis, do it continue an overview analysis of Capacity analysis TemplateSet having to be read by the setting of a Quick analysis just as it is? Explanation: The information about the selected disk array includes capacity data. Handling: To analyze the capacity, read a default template for capacity analysis from the quick analysis setting, or select a capacity graph by using a default template.
17601	TemplateSet <aa> already exists. Does it overwrite? Explanation: The TemplateSet whose name is the same as the specified one already exists. aa: TemplateSet name to overwrite

Message No.	Top:Message Image Bottom:Explanation and Handling
18201	<*aa*> days left for evaluation period. Explanation: This is the number of days remaining in the trial period. aa: Number of days remaining in trial period
18202	Evaluation period has expired. Explanation: The trial period has ended. Install the official edition and then perform the operation again.
18203	Invalid license key. Explanation: The license key specification is incorrect. Correctly specify the license key and then perform the operation again.
18204	License key <*aaaa*> was registered. Explanation: The specified license key was registered. aaaa: Disk array series
18205	Register license key <*aaaa*>. Explanation: License is insufficient to apply the upgrade license. aaaa: Disk array series Handling: register the insufficient license key.
18206	Register license key of the diskarray before upgrading. Explanation: The license key of the disk array before upgrading is not registered. Handling: Register the license key of the disk array before upgrading.
18401	Number of windows exceed <*aaaa*>. Explanation: The number of windows that can be displayed has been exceeded. aaaa: Number of windows that can be displayed
18402	Specified license key is already registered. Explanation: A license key that has been registered was specified. Handling: Check the license key.
18403	License key is not registered. Explanation: A license has not been registered. Handling: Register the license key and then perform the operation again.
18404	License is not applied. Explanation: A license has not been applied. Handling: Apply a license and then perform the operation again.
18601	Do you want to import the metrics using the unused license key? Explanation: A license has not been applied Handling: Click the [OK] button to apply an unapplied license and import data.
19201	Specify the data location. Explanation: No data location is specified. Handling: Set a data location and then perform the operation again.
19202	Data location does not exist or insufficient permission to access the folder. Explanation: The data location does not exist or there is no access permission for the folder. Handling: Specify a data location and then perform the operation again.

Message No.	Top:Message Image Bottom:Explanation and Handling
19205	Insufficient permission to access the specified file. Explanation: There is no access permission for the specified folder. Handling: Specify a data location and then perform the operation again.
19601	New setting have saved, effected next reboot. Close window? Explanation: When the mode in the environment settings is changed, the program must be restarted. Handling: To make the new setting effective, restart the program.
19602	All graphs and raw data will be closed. Do you want to continue? Explanation: When the data location is changed, a graph/raw data is closed.
19603	Specified folder does not exist. Do you want to create it? Explanation: The specified folder does not exist.
26600	A character may overflow the range which can be printed. Does it turn up and print? Explanation: When printing a graph, the legend list may not fit into a print range. Handling: For printing the legend list, specify whether to wrap text or insert line feeds into the text.
98200	Enter 0 for <*aaa*>. Explanation: The specified value is outside the specifiable range. aaa: Upper bound on values that can be set Handling: Specify a value within the specifiable range and then perform the operation again.

* References

Code	Description
Detail code 1	
1	Another error (generic). Confirm that a network error does not occur.
2	The file you tried to access could not be found (fileNotFound).
3	The path you tried to access could not be found (badPath).
5	Access to the file you tried to access is prohibited (accessDenied).
11	The file you tried to access cannot be write-accessed (sharingViolation) by the exclusive control.
13	Free space on the disk is insufficient (diskFull).
Detail code 2	
12001	There are insufficient resources to use FTP service on the server at present.
12002	Operation timed out. The remote server did not respond within the specified time. The server may be unavailable at present.
12007	The server name or address could not be resolved. Check the TCP/IP properties of the DNS service actively being used.

Code	Description
12013	The user name is not valid. Input another name or input the name again if the name is correct.
12014	The password is not valid.
12015	The logon request was rejected. The logon account may have become void or the logon information may have been changed.
12016	An FTP session could not be established.
12017	Processing was canceled.
12029	Could not connect to server.
12030	The connection to the server ended abnormally.
Other	FTP server settings may be invalid.

Appendix B

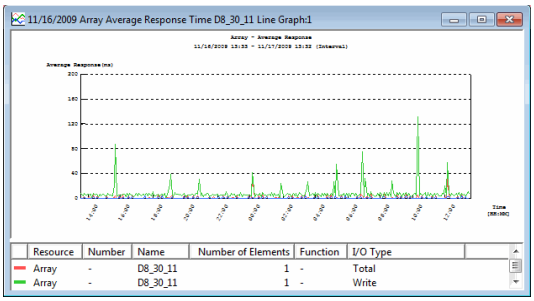
Graphs and Raw Data

Time Series Graphs

Line Graph

A Line Graph is effective for comparing shifts in Metric between different resources or in different timeframes.

These can be displayed for all resources and Metric.

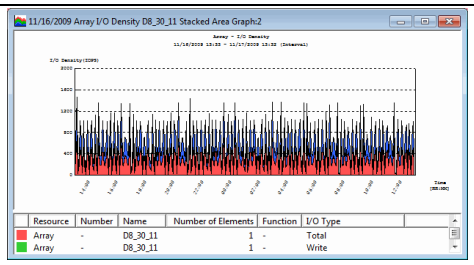


Stacked Area Graph

A Stacked Area Graph is effective for comparing shifts in the breakdown by resource of Metric of resources for analysis as a whole or shifts in the I/O / capacity ratios in the Metric of a specific resource.

For performance analysis, these can be displayed for the I/O density, transfer rate, average queue length, electric power, and electric energy of all resources.

For the capacity analysis, the current capacity value can be displayed with the following excluded: the differential actual capacity threshold, differential actual capacity threshold (pre), differential LD capacity quota, and differential LD capacity threshold.

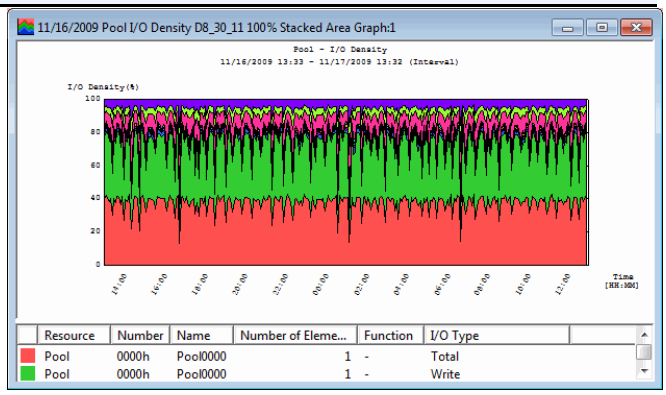


Time Series Graphs

100% Stacked Area Graph100% Stacked Area Graph is effective for comparing shifts in the breakdown by resource of Metric of resources for analysis as a whole or shifts in the I/O / capacity ratios in the Metric of a specific resource.

For performance analysis, these can be displayed for the I/O density, transfer rate, average queue length, electric power, and electric energy of all resources.

For the capacity analysis, the current capacity value can be displayed with the following excluded: the differential actual capacity threshold, differential actual capacity threshold (pre), differential LD capacity quota, and differential LD capacity threshold.

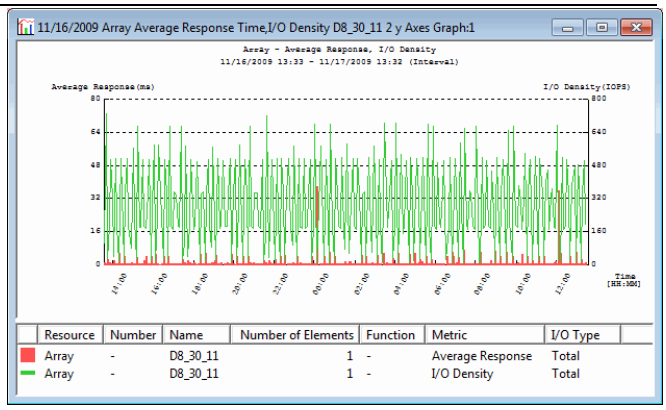


2 y Axes Graph

A 2 y Axes Graph is effective for comparing shifts in two sets of Metric.

These can be displayed for all resources and Metric.

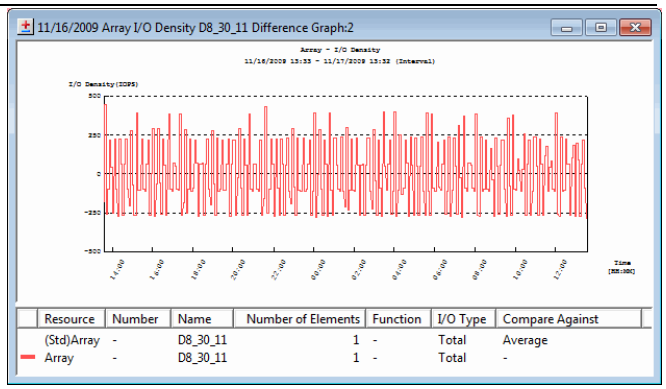
The Metric of the left axis is displayed in a Column Graph and the Metric of the right axis in a Line Graph.



Difference Graph

A Difference Graph clarifies shifts in positive deviations and negative deviations with respect to Metric of a timeframe taken as standard or resources under load conditions taken as standard.

These can be displayed for all resources and Metric.

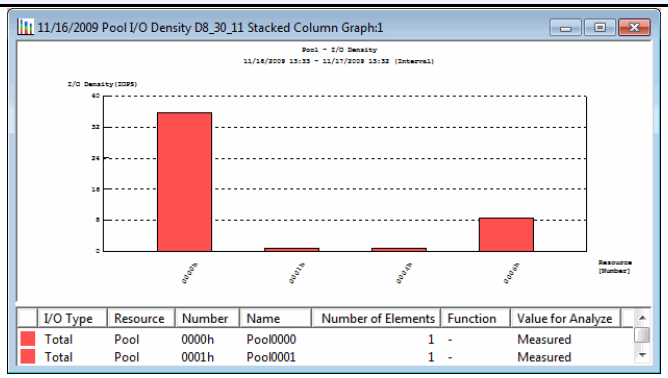


Resource Series Graphs

Column Graph

A Column Graph is effective for comparing averages of Metric (it is the latest value at the capacity analysis) between different resources or different timeframes.

These can be displayed for all resources and Metric.

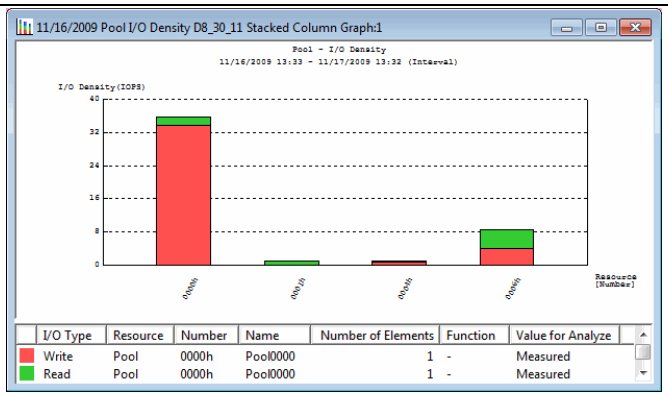


Stacked Column Graph

A Stacked Column Graph is effective for comparing averages of Metric and I/O / capacity ratios between multiple resources.

For performance analysis, these can be displayed for the I/O density, transfer rate, and average queue length of all resources.

For the capacity analysis, the current capacity value can be displayed with the following excluded: the differential actual capacity, differential actual capacity threshold, differential actual capacity threshold (pre), differential LD capacity, differential LD capacity quota, and differential LD capacity threshold. In addition, when displaying multiple capacity types at the same time, overlapping graphs of the same resource are displayed.

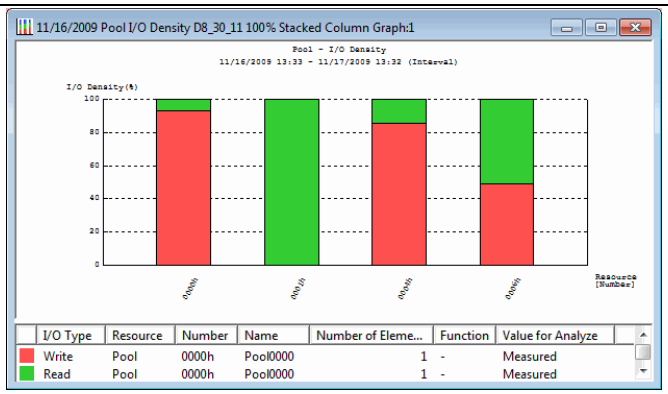


100% Stacked Column Graph

A 100% Stacked Column Graph is effective for comparing I/O / capacity ratios of Metric between multiple resources.

For performance analysis, these can be displayed for the I/O density, transfer rate, and average queue length of all resources.

For the capacity analysis, the current capacity value can be displayed with the following excluded: the differential actual capacity, differential actual capacity threshold, differential actual capacity threshold (pre), differential LD capacity, differential LD capacity quota, and differential LD capacity threshold. In addition, when displaying multiple capacity types at the same time, overlapping graphs of the same resource are displayed.



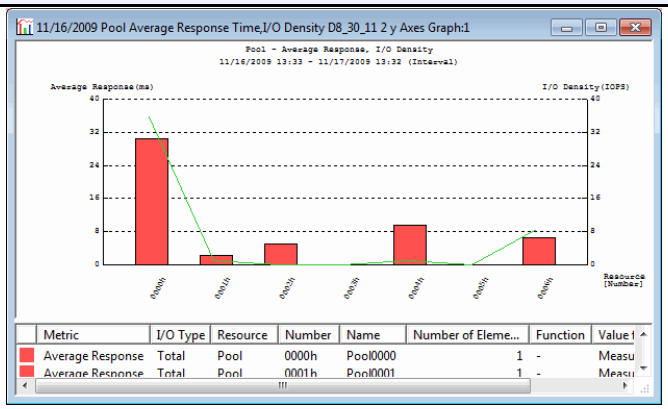
Resource Series Graphs

2 y Axes Graph

A 2 y Axes Graph is applicable to comparing averages of 2 sets of Metric (it is the latest value at the capacity analysis) between different resources.

These can be displayed for all resources and Metric.

The Metric of the left axis is displayed in a Column Graph and the Metric of the right axis in a Line Graph.

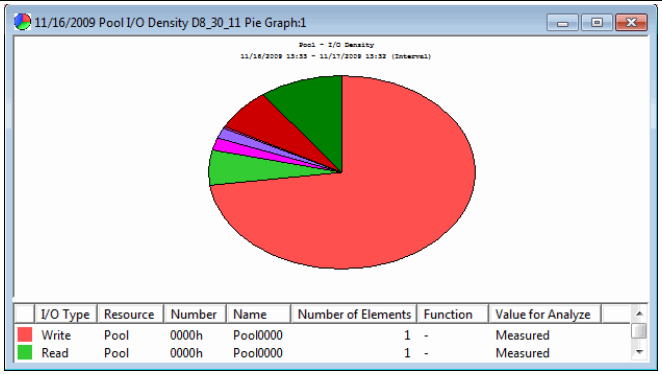


Pie Graph

A Pie Graph is applicable to comparing averages of Metric (it is the latest value at the capacity analysis) between different resources or I/O / capacity ratios of Metric of a specific resource.

These can be displayed for all resources and Metric at the performance analysis.

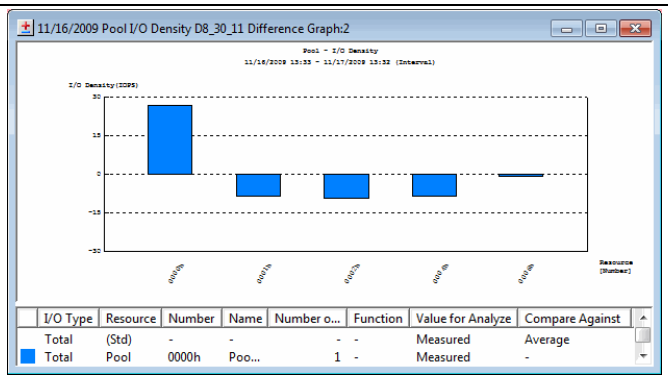
For the capacity analysis, the current capacity value can be displayed with the following excluded: the differential actual capacity, differential actual capacity threshold, differential actual capacity threshold (pre), differential LD capacity, differential LD capacity quota, and differential LD capacity threshold. In addition, when displaying multiple capacity types at the same time, overlapping graphs of the same resource are displayed.



Difference Graph

A Difference Graph clarifies positive deviations and negative deviations with respect to Metric of a timeframe taken as standard.

These can be displayed for all resources and Metric.

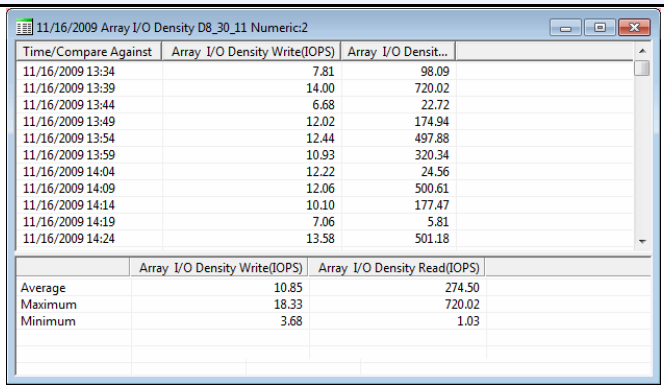


Raw Data

Raw data

The data of a graph is displayed in list form.

For a graph that displays compare against statistical data or a difference graph, the window is split. In this case, graph data is displayed at the top and compare against statistical data or difference data (average/standard deviation/positive deviation/negative deviation) are displayed at the bottom.



Metrics

The following table shows the Metric that can be analyzed for each disk array series.

For the disk arrays for which the cabinet-to-cabinet copy function has not been supported, the replication port Metric is not accumulated in the Metric history file.

For the disk arrays for which the data migration function has not been supported, the data migration port Metric is not accumulated in the Metric history file.

When the management server is not used, metrics cannot be acquired.

For the disk arrays that do not support the L2 cache, the data is not accumulated in the Metric history file.

Snapsan S5000 Series (Performance Data)

Metrics/I/O Type		Resources								
		Disk Array	Host Director	Port	Replication Port (Note 1)	Disk Port	Cache	Logical Disk	Pool	Physical Disk
I/O Density	Total	P	-	P	✓*	P	-	P	P	P
	Read	P	-		✓*	P	-	P	P	P
	Write	P	-		✓*	P	-	P	P	P
Average Transfer Length	Total	P	-	P	✓*	P	-	P	P	P
	Read	P	-		✓*	P	-	P	P	P
	Write	P	-		✓*	P	-	P	P	P
Transfer Rate	Total	P	-		✓*	P	-	P	P	P
	Read	P	-		✓*	P	-	P	P	P
	Write	P	-		✓*	P	-	P	P	P
Average Response	Total	P	-	P	✓*	P	-	P	P	P
	Read	P	-		✓*	P	-	P	P	P
	Write	P	-		✓*	P	-	P	P	P
Max Response	Total	P	-	P	✓*	P	-	P	P	P
	Read	P	-		✓*	P	-	P	P	P
	Write	P	-		✓*	P	-	P	P	P

Metrics/I/O Type		Resources								
		Disk Array	Host Director	Port	Replication Port (Note 1)	Disk Port	Cache	Logical Disk	Pool	Physical Disk
Average Dirty	-	-	-	-	-	-	P	-	-	-
Max Dirty Pages	-	-	-	-	-	-	P	-	-	-
Average Queue Length	-	-	P	-	-	-	-	-	-	-
Max Queue Length	-	-	P	-	-	-	-	-	-	-
Busy Ratio	-	-	P	P	✓*	P	-	P	P	P
I/O Ratio	Read	P	-	P	✓*	P	-	P	P	P
	Write	P	-	P	✓*	P	-	P	P	P
Cache Hit Ratio	Total	P	-	-	✓*	-	P	P	-	-
	Read	P	-	-	✓*	-	P	P	-	-
	Write	P	-	-	✓*	-	P	P	-	-
	Prefetch Read	P	-	-	-	-	P	P	-	-

Remarks: ✓: Can be analyzed ✓*: Can be analyzed (some disk arrays cannot be analyzed) -: Cannot be analyzed

For the disk array for which the cabinet-to-cabinet copy function has not been supported, the replication port Metric is not accumulated in the Metric history file.

Snapsan S5000 Series (Capacity Data)

Metrics/ Capacity Type (Note 2)		Resources		
		Virtual Capacity Pool Total (Note 1)	Pool (Note 1)	Logical Disk (Note 1)
Current Capacity Value	Actual Used Capacity	✓*	✓*	✓*
	Pool Capacity	✓*	✓*	-
	Used Capacity	✓*	✓*	-
	Actual Capacity	✓*	✓*	-
	Actual Capacity Threshold	-	✓*	-
	Actual Capacity Threshold (Pre)	-	✓*	-
	Differential Actual Capacity	✓*	✓*	-
	Differential Actual Capacity Threshold	-	✓*	-
	Differential Actual Capacity Threshold (Pre)	-	✓*	-
	LD Capacity	-	-	✓*
	LD Capacity Quota	-	-	✓*
	LD Capacity Threshold	-	-	✓*
	Differential LD Capacity	-	-	✓*
	Differential LD Capacity Quota	-	-	✓*
	Differential LD Capacity Threshold	-	-	✓*
Capacity Fluctuation Value	-	✓*	✓*	✓*

Remarks: ✓: Can be analyzed ✓*: Can be analyzed (some disk arrays cannot be analyzed)
-: Cannot be analyzed

For the disk arrays that do not support the ThinProvisioning function, the metrics of the virtual capacity pool total, pool (virtual capacity pool) , and logical disk (virtual capacity logical disk) are not accumulated in the metric history file.

The metrics of the current capacity value and capacity fluctuation value can be analyzed only when the ThinProvisioning function is used with AutoTune Ver6.2 or later.

For the server-less operations, metrics cannot be acquired.

(1) Resources

(i) Disk Array

Indicates the entire disk array.}

(ii) Node

Indicates each cabinet when the system consists of several cabinets.

(iii) Host Director

Indicates the host director of the disk array.

(iv) Disk Director

Indicates the disk director of the disk array.

(v) Port

The port for host is called a port or host port.

(vi) Replication Port

The port for replication is called a replication port.

(vii) Data Migration Port

The port for migration is called a data migration port.

(viii) Disk Port

The port for disk director is called a disk port.

(ix) Cache

Indicates a cache for the entire disk array. For a disk array with node, this resource indicates a cache in node unit.

(x) Cache Segment

For the cache partitioning function, the unit of area that a cache memory mounted in a disk array is partitioned is called a cache segment.

(xi) Logical Disk

A virtual medium which configures a RAID by binding several physical disks is called a Rank or Pool. An area that this Rank or Pool is partitioned is called a logical disk.

(xii) Rank

For a disk array without Pool, a virtual medium which configures a RAID by binding several physical disks is called a Rank.

(xiii) Pool

For a disk array with Pool, a virtual medium which configures a RAID by binding several physical disks is called a Pool.

(xiv) Physical Disk

A disk device which is mounted in a disk array is called a physical disk.

(xv) Virtual Capacity Pool Total

Indicates the total of all virtual capacity pools in a disk array for a disk array with pool.

(xvi) Cabinet

A controller cabinet and disk enclosure cabinet are called a cabinet.

(2) Metrics

(i) I/O Density

Indicates the number of input/output operations per second. The unit is IOPS (IO/sec) .

(ii) Average Transfer Length

Indicates the amount of data transfer of one input/output operation. The unit is KB.

(iii) Transfer Rate

Indicates the amount of data transfer per second. The unit is MB/sec.

(iv) Average Response

Indicates the average value of the response times of one input/output operation. The unit is msec.

(v) Maximum Response

Indicates the maximum value of the response time of one input/output operation. The unit is msec.

(vi) Busy Ratio

Indicates the level of input/output concentration. The unit is %.

(vii) I/O Ratio

Indicates the ratio of the input counts to the output counts. The unit is %.

(viii) Cache Hit Ratio

Indicates the ratio that input/output data hits the cache. The unit is %.

(ix) Average Dirty Pages

Indicates the average ratio of pages containing data that has not yet been written to the physical disk among write cache pages. The unit is %.

(x) Maximum Dirty Pages

Indicates the maximum ratio of pages containing data that has not yet been written to the physical disk among write cache pages. The unit is %.

(xi) Average Queue Length

Indicates the average value of the queue lengths for input/output requests received by the disk array from the external. The unit is the I/O count

(xii) Maximum Queue Length

Indicates the maximum value of the queue length for input/output requests received by the disk array from the external. The unit is the I/O count.

(xiii) Current Capacity Value

Indicates the statistic information on the pool and logical disk capacities. The unit is GB.

(xiv) Capacity Fluctuation Value

Indicates the statistic information on the fluctuation values of actual used capacities in the pools and logical disks. The unit is GB.

(xv) Electric Power

Indicates the electric power of a cabinet. The unit is W.

(xvi) Electric Energy

Indicates the theoretical value of the electric energy of a cabinet. The unit is Wh.

* 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.

* The Electric Energy of the interval information shows the power consumption of every logging interval of the metrics. For example, if the logging interval is 5 minutes, the Electric Energy is the product of Electric Power and 5/60.

(xvii) L1/L2 Cache Hit Ratio

Indicates the ratio of I/O data that hits the L1 or L2 cache. The unit is %.

(xviii) L2 Cache Page-in Size

Indicates the size of page-in from the L1 cache to the L2 cache. The unit is GB.

(xix) L2 Cache Average Dirty Pages

Indicates the average ratio of pages containing data that has not yet been written to the physical disk among L2 cache write cache pages. The unit is %.

(xx) L2 Cache Max Dirty Pages

Indicates the maximum ratio of pages containing data that has not yet been written to the physical disk among L2 cache write cache pages. The unit is %.

(3) I/O Type

(i) Total

Indicates the total of input and output operations. Total = Write + Read.

(ii) Write

Indicates the write requests.

(iii) Read

Indicates the read requests.

(iv) Total Hit

Indicates the total of input and output operations that hit the cache.

(v) Write Hit

Indicates the write requests that hit the cache. This number is included in Write.

(vi) Read Hit

Indicates the read requests that hit the cache. This number is included in Read.

(vii) Prefetch Read Hit

Indicates the read requests for the data which has been transferred to the cache from the physical disk by the prefetch function. This number is included in Read Hit.

(viii) Initiator Total

Indicates the total of input and output operations at the replication port to the RDR-connected disk array.

(ix) Initiator Write

Indicates the write requests at the replication port to the RDR-connected disk array.

(x) Initiator Read

Indicates the read requests at the replication port to the RDR-connected disk array.

(xi) Target Total

Indicates the total of input and output operations accepted at the replication port from the RDR-connected disk array.

(xii) Target Write

Indicates the write requests accepted at the replication port from the RDR-connected disk array.

(xiii) Target Read

Indicates the read requests accepted at the replication port from the RDR-connected disk array.

(xiv) Local Total

Indicates the total of input and output operations accepted at the host port that belongs to the relevant node.

(xv) Local Write

Indicates the write requests accepted at the host port that belongs to the relevant node.

(xvi) Local Read

Indicates the read requests accepted at the host port that belongs to the relevant node.

(xvii) Local Prefetch Read

Indicates the read requests for the data which has been accepted at the host port that belongs to the relevant node and transferred to the cache from the physical disk by the prefetch function.

(xviii) Remote Total

Indicates the total of input and output operations accepted at the host port that belongs to a node other than the relevant node.

(xix) Remote Write

Indicates the write requests accepted at the host port that belongs to a node other than the relevant node.

(xx) Remote Read

Indicates the read requests accepted at the host port that belongs to a node other than the relevant node.

(xxi) Remote Prefetch Read

Indicates the read requests for the data which has been accepted at the host port that belongs to a node other than the relevant node and transferred to the cache from the physical disk by the prefetch function.

(4) Capacity Type

(i) Actual Used Capacity

Indicates the (total of) actual capacity allocated from the pool to the virtual capacity logical disk.

(ii) Pool Capacity

Indicates the capacity of virtual capacity pool total /virtual capacity pool.

(iii) Used Capacity

Indicates the capacity of virtual capacity logical disk in the virtual capacity pool total /virtual capacity pool.

(iv) LD Capacity

Indicates the logical disk virtual capacity.

(v) Actual Capacity

Indicates the capacity actually reserved on the physical disk allocated to the pool.

(vi) Actual Capacity Threshold

Indicates the threshold set to the virtual capacity pool as the index value of the actual used capacity.

(vii) Actual Capacity Threshold (Pre)

Indicates the threshold set to the virtual capacity pool before the actual capacity threshold.

(viii) LD Capacity Quota

Indicate the quota set to the virtual capacity logical disk to prevent illegal allocation of actual capacity.

(ix) Differential LD Capacity Threshold

Indicates the threshold set to the virtual capacity logical disk as the index value of the actual used capacity.

(x) Differential Logical Disk Capacity

Indicate the difference between the logical disk capacity and the actual used capacity. This is represented by the following expression: Differential logical disk capacity = Logical disk capacity - Actual used capacity.

(xi) Differential Actual Capacity

Indicate the difference between the actual capacity and the actual used capacity. This is represented by the following expression: Differential actual capacity = Actual capacity - Actual used capacity.

(xii) Differential Actual Capacity Threshold

Indicate the difference between the actual capacity threshold and the actual used capacity. This is represented by the following expression: Differential actual capacity threshold = Actual capacity threshold - Actual used capacity.

(xiii) Differential Actual Capacity Threshold (Pre)

Indicate the difference between the actual capacity threshold (pre) and the actual used capacity. This is represented by the following expression: Differential actual capacity threshold (pre) = Actual capacity threshold (pre) - Actual used capacity.

(xiv) Differential LD Capacity Quota

Indicate the difference between the LD capacity quota and the actual used capacity. This is represented by the following expression: Differential LD capacity quota = LD capacity quota - Actual used capacity.

(xv) Differential LD Capacity Threshold

Indicate the difference between the LD capacity threshold and the actual used capacity. This is represented by the following expression: Differential LD capacity threshold = LD capacity threshold - Actual used capacity.

Output Format of Raw Data

Raw data is output in edited report format and CSV format.

Appendix D explains the output contents of edited reports. The same information is output for CSV format files. A CSV format file is a set of records in which data is comma-delimited and each record is delimited by a newline symbol. The maximum number of records is 65,536

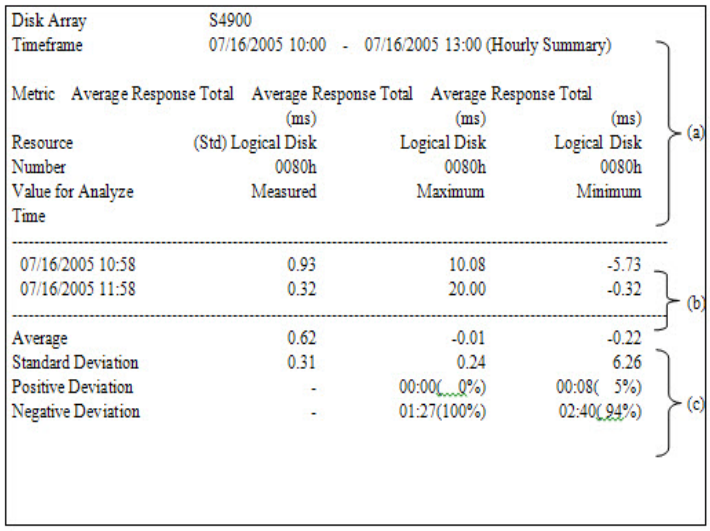
(1)Raw data of time series graphs

(i)Sample raw data (Except for difference graph)

Disk Array	S4900				
Timeframe	07/16/2005 23:58 - 07/17/2005 17:00 (Hourly Summary)				
Metric	I/O Density Total (IOPS)	I/O Density Total (IOPS)	I/O Density Total (IOPS)	I/O Density Total (IOPS)	(a) (b)
Resource	Logical Disk	Logical Disk	Logical Disk	Logical Disk	(c)
Name	CX:LD0000	CX:LD0001	CX:LD0002	CX:LD0003	(d)
Value for Analyze	Maximum	Maximum	Maximum	Maximum	(e)
Time/Compare Against/Threshold					
07/17/2005 00:57	**2340.00	2603.00	96.00	92.00	
07/17/2005 01:57	**2903.00	2944.00	12.00	8.00	
07/17/2005 02:57	1730.00	3247.00	204.00	212.00	
07/17/2005 03:57	1258.00	1543.00	611.00	613.00	
07/17/2005 04:57	**7299.00	1697.00	1155.00	1176.00	
*07/17/2005 05:57	234.00	270.00	81.00	84.00	
07/17/2005 06:57	82.00	118.00	40.00	31.00	
07/17/2005 07:57	84.00	120.00	7.00	2.00	(f)
07/17/2005 08:57	84.00	120.00	8.00	3.00	
07/17/2005 09:57	936.00	1353.00	386.00	376.00	
07/17/2005 10:57	84.00	120.00	16.00	9.00	
07/17/2005 11:57	91.00	127.00	6.00	0.00	
07/17/2005 12:57	81.00	117.00	7.00	1.00	
07/17/2005 13:57	81.00	117.00	7.00	0.00	
07/17/2005 14:57	82.00	118.00	7.00	0.00	
07/17/2005 15:57	84.00	120.00	7.00	0.00	
07/17/2005 16:57	88.00	124.00	13.00	4.00	
Average	1066.33	983.83	171.41	168.70	(g)
Maximum	7299.00	5399.00	1155.00	1176.00	
Minimum	81.00	117.00	6.00	0.00	
Median	145.98	161.97	23.10	11.76	
Mode	145.98	161.97	11.55	11.76	
Threshold	2000.00	-	-	-	(h)

Display Item	Explanation
Disk Array	This is the name of a disk array.
Timeframe	This is the period to be analyzed.
(a)	This is the Metric and I/O type to be analyzed.
(b)	This is the unit of the metrics to be analyzed.
(c)	This is the type of resource to be analyzed.
(d)	This is the number or name of resource to be analyzed. If aggregate values of metrics of multiple resources are to be analyzed. Multiple resource numbers are delimited by a “,” (comma) and up to 8 are displayed. For resources after the eighth, “...” is displayed.
(e)	This is the type of a value for analyze. For interval information, this area is not displayed.
(f)	If it is immediately after a change of the disk array configuration or a restart of the metrics accumulation, “*” (asterisk) is displayed. At the left of a value exceeding a threshold, “**” is displayed.
(g)	If compare against statistical data is added to analysis subjects, the compare against statistical data of metrics that is analyzed are displayed. If compare against statistical data is not added, this area is not displayed. • AverageThe average within the timeframe for the relevant resource, metrics, and I/O type is displayed. • MaximumThe maximum within the timeframe for the relevant resource, metrics, and I/O type is displayed. • MinimumThe minimum within the timeframe for the relevant resource, metrics, and I/O type is displayed. • MedianThe median (the numeric value at the center when values are arranged by size) within the timeframe for the relevant resource, metrics, and I/O type is displayed. • ModeThe mode (the most frequent numeric value) within the timeframe for the relevant resource, metrics, and I/O type is displayed. If a Metric was not selected for the relevant resource, metrics, and I/O type, or if a compare against is invalid, a “-” (hyphen) is displayed.
(h)	A threshold is displayed. If no threshold is displayed, this area is not displayed. If no threshold is set, “-” (hyphen) is displayed.

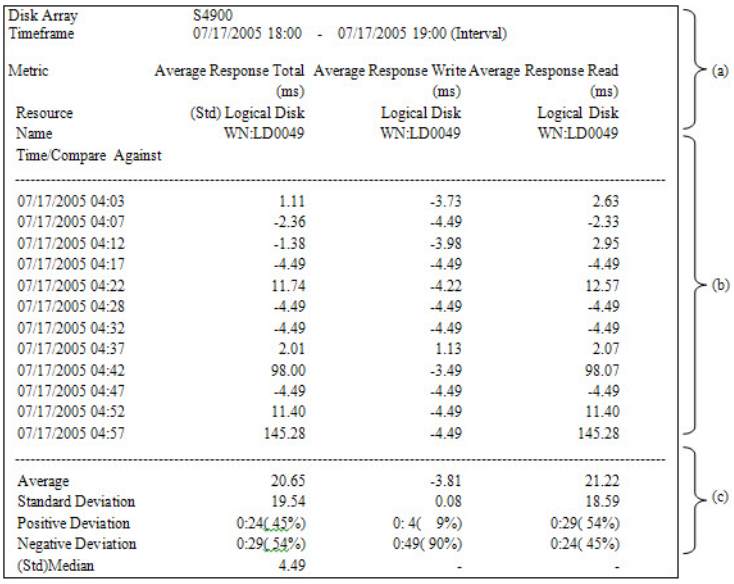
(ii)Sample raw data for difference graph (One resource for analysis made standard)



Disk Array	S4900			
Timeframe	07/16/2005 10:00 - 07/16/2005 13:00 (Hourly Summary)			
Metric	Average Response Total (Std)	Average Response Total (ms) Logical Disk	Average Response Total (ms) Logical Disk	(ms) Logical Disk
Resource Number		0080h	0080h	0080h
Value for Analyze		Measured	Maximum	Minimum
Time				
07/16/2005 10:58		0.93	10.08	-5.73
07/16/2005 11:58		0.32	20.00	-0.32
Average		0.62	-0.01	-0.22
Standard Deviation		0.31	0.24	6.26
Positive Deviation		-	00:00(0%)	00:08(5%)
Negative Deviation		-	01:27(100%)	02:40(94%)

(a) (b) (c)

Display Item	Explanation
(a)	Content is the same as in (i).
(b)	This is the information for analysis of each time. If the relevant resource, metrics, and I/O type are the available resource data, Metrics are displayed. If the relevant resource, metrics, and I/O type are other than the available resource data ... Differences from reference data are displayed.
(c)	If the raw data for difference graph, analysis target metrics are displayed. For raw data other than difference graphs, this area is not displayed. • AverageThe average of the metrics or differences within the timeframe for the relevant resource, metrics, and I/O type is displayed. • Standard DeviationThe standard deviation (the degree of variation of the average) of the metrics or differences within the timeframe for the relevant resource, metrics, and I/O type is displayed. • Positive DeviationThe sum of the time intervals in which the difference between the metrics and the available resource data is a positive value and the ratio of that total value to the timeframe for the relevant resource, metrics, and I/O type are displayed. If it is the available resource data, a "-" (hyphen) are displayed. • Negative DeviationThe sum of the time intervals in which the difference between the metrics and the available resource data is a negative value and the ratio of that total value to the timeframe for the relevant resource, metrics, and I/O type are displayed. If it is the available resource data, a "-" (hyphen) are displayed.



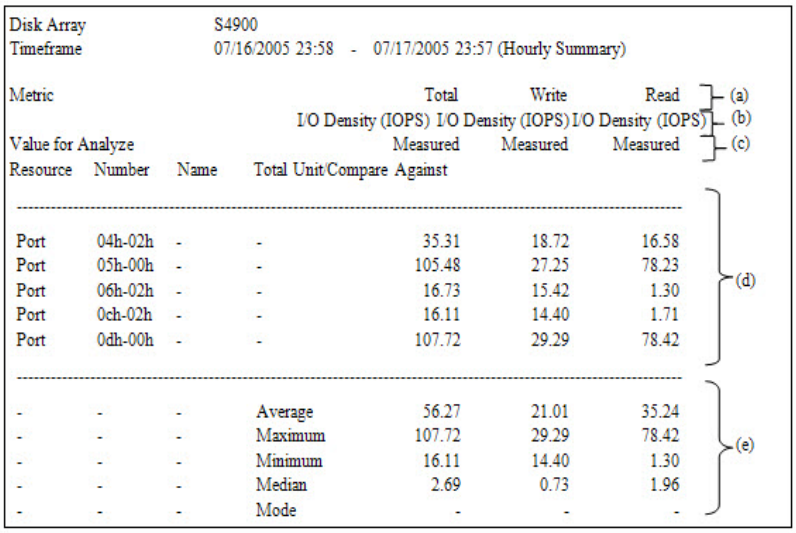
Disk Array	S4900		
Timeframe	07/17/2005 18:00 - 07/17/2005 19:00 (Interval)		
Metric	Average Response Total (ms)	Average Response Write (ms)	Average Response Read (ms)
Resource	(Std) Logical Disk	Logical Disk	Logical Disk
Name	WN:LD0049	WN:LD0049	WN:LD0049
Time/Compare Against			
07/17/2005 04:03	1.11	-3.73	2.63
07/17/2005 04:07	-2.36	-4.49	-2.33
07/17/2005 04:12	-1.38	-3.98	2.95
07/17/2005 04:17	-4.49	-4.49	-4.49
07/17/2005 04:22	11.74	-4.22	12.57
07/17/2005 04:28	-4.49	-4.49	-4.49
07/17/2005 04:32	-4.49	-4.49	-4.49
07/17/2005 04:37	2.01	1.13	2.07
07/17/2005 04:42	98.00	-3.49	98.07
07/17/2005 04:47	-4.49	-4.49	-4.49
07/17/2005 04:52	11.40	-4.49	11.40
07/17/2005 04:57	145.28	-4.49	145.28
Average	20.65	-3.81	21.22
Standard Deviation	19.54	0.08	18.59
Positive Deviation	0:24(45%)	0: 4(9%)	0:29(54%)
Negative Deviation	0:29(54%)	0:49(90%)	0:24(45%)
(Std)Median	4.49	-	-

(a) (b) (c)

Display Item	Explanation
(a)	Content is the same as in (i).
(b)	Content is the same as in (ii).
(c)	The compare against (average, maximum, minimum, median, or mode) that is the available resource data of the relevant resource, metrics, and I/O type is displayed. For a resource, metrics, and I/O type for which available resource data is not displayed, a “-” (hyphen) is displayed.

Resource series raw data

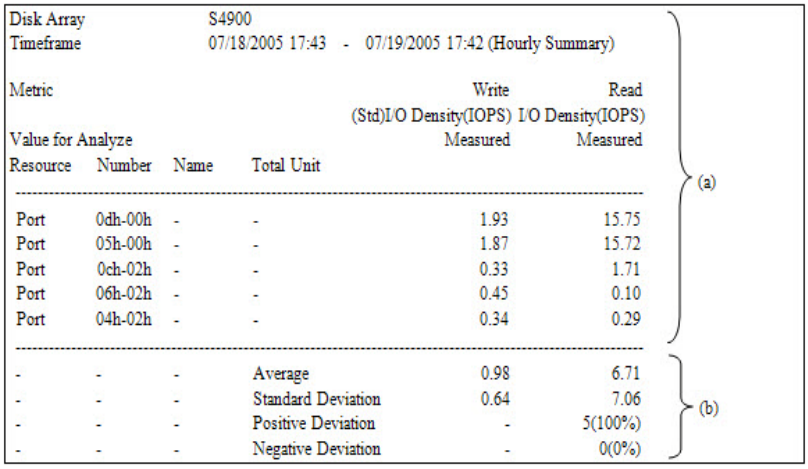
(i)Sample raw data (Except for difference graph)



Disk Array			S4900			
Timeframe			07/16/2005 23:58 - 07/17/2005 23:57 (Hourly Summary)			
Metric				Total I/O Density (IOPS)	Write I/O Density (IOPS)	Read I/O Density (IOPS)
Value for Analyze				Measured	Measured	Measured
Resource	Number	Name	Total Unit/Compare Against			
Port	04h-02h	-	-	35.31	18.72	16.58
Port	05h-00h	-	-	105.48	27.25	78.23
Port	06h-02h	-	-	16.73	15.42	1.30
Port	0ch-02h	-	-	16.11	14.40	1.71
Port	0dh-00h	-	-	107.72	29.29	78.42
-	-	-	Average	56.27	21.01	35.24
-	-	-	Maximum	107.72	29.29	78.42
-	-	-	Minimum	16.11	14.40	1.30
-	-	-	Median	2.69	0.73	1.96
-	-	-	Mode	-	-	-

(a) (b) (c) (d) (e)

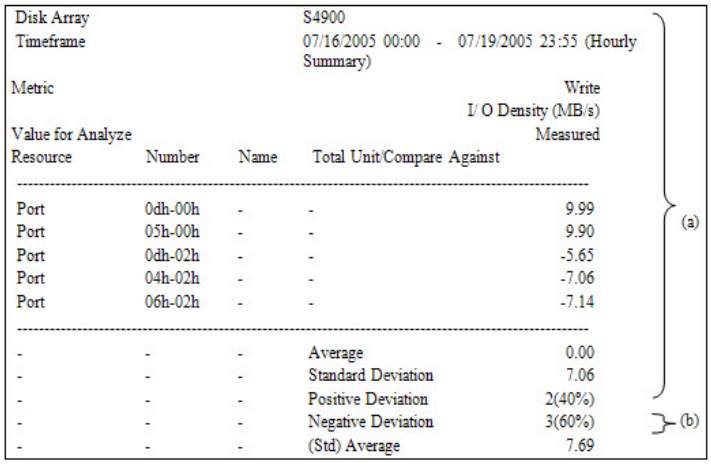
Display Item	Explanation
Disk Array	This is the name of a disk array.
Timeframe	This is the period to be analyzed.
(a)	This is the Metric and I/O type to be analyzed.
(b)	This is the unit of the metrics to be analyzed.
(c)	This is the type of a value for analyze.
(d)	Metrics of the resource, number, name, and total unit for analysis is displayed. •ResourceThis is the type of resource for analysis. In a line displaying compare against statistical data, a "-" (hyphen) is displayed. •NumberThis is the number of the resource for analysis. If the total of metrics of multiple resources is to be analyzed, up to 8 resource numbers delimited by a "," (comma) are displayed. For resources after the eighth, "..." is displayed. •NameThis is the nickname of a resource for analysis. If the total of metrics of multiple resource is to be analyzed, up to 8 nicknames delimited by a "," (comma) are displayed. For nicknames after the eighth, "..." is displayed. •Total UnitThe total method is displayed. If the total of metrics of multiple resources is to be analyzed, a total method of "Total" or "Average" is displayed. If the metrics of each resource is to be analyzed without totaling, a "-" (hyphen) is displayed.
(e)	Compare against statistical data for analysis are displayed. Compare against statistical data of the metrics and I/O type for analysis are displayed. If compare against statistical data is not added, this area is not displayed. •AverageThe average within the timeframe for the relevant metrics and I/O type is displayed. •MaximumThe maximum within the timeframe for the relevant metrics and I/O type is displayed. •MinimumThe minimum within the timeframe for the relevant metrics and I/O type is displayed. •MedianThe median (the numeric value at the center when values are arranged by size) within the timeframe for the relevant metrics and I/O type is displayed. •ModeThe mode (the mode frequent numeric value) within the timeframe for the relevant metrics and I/O type is displayed. If a Metric was not selected for the relevant metrics and I/O type, a "-" (hyphen) is displayed.



Disk Array S4900
Timeframe 07/18/2005 17:43 - 07/19/2005 17:42 (Hourly Summary)

Metric				Write (Std)I/O Density(IOPS)	Read I/O Density(IOPS)	
Value for Analyze				Measured	Measured	
Resource	Number	Name	Total Unit			
Port	0dh-00h	-	-	1.93	15.75	(a)
Port	05h-00h	-	-	1.87	15.72	
Port	0ch-02h	-	-	0.33	1.71	
Port	06h-02h	-	-	0.45	0.10	
Port	04h-02h	-	-	0.34	0.29	
-	-	-	Average	0.98	6.71	(b)
-	-	-	Standard Deviation	0.64	7.06	
-	-	-	Positive Deviation	-	5(100%)	
-	-	-	Negative Deviation	-	0(0%)	

Display Item	Explanation
(a)	Content is the same as in (i).
(b)	For the raw data of a difference graph, difference information of the metrics for analysis is displayed. For the raw data of a graph other than a difference graph, this area is not displayed. • AverageThe average of the metrics or differences within the timeframe for the relevant resource, metrics, and I/O type is displayed. • Standard DeviationThe standard deviation (the degree of variation of the average) of the metrics or differences within the timeframe for the relevant resource, metrics, and I/O type is displayed. • Positive DeviationThe total number of resources for which the difference between the metrics and the available resource data is a positive value and the ratio of that total value to the number of all resources for analysis for the relevant resource, metrics, and I/O type are displayed. If it is the available resource data, a “-” (hyphen) are displayed. • Negative DeviationThe total number of resources for which the difference between the metrics and the available resource data is a negative value and the ratio of that total value to the number of all resources for analysis for the relevant resource, metrics, and I/O type are displayed. If it is the available resource data, a “-” (hyphen) are displayed.



Disk Array S4900
Timeframe 07/16/2005 00:00 - 07/19/2005 23:55 (Hourly Summary)
Metric Write I/O Density (MB/s)
Value for Analyze Measured

Resource	Number	Name	Total Unit/Compare Against		
Port	0dh-00h	-	-	9.99	(a)
Port	05h-00h	-	-	9.90	
Port	0dh-02h	-	-	-5.65	
Port	04h-02h	-	-	-7.06	
Port	06h-02h	-	-	-7.14	
-	-	-	Average	0.00	
-	-	-	Standard Deviation	7.06	
-	-	-	Positive Deviation	2(40%)	
-	-	-	Negative Deviation	3(60%)	(b)
-	-	-	(Std) Average	7.69	

Display Item	Explanation
(a)	Content is the same as in (ii).
(b)	The compare against (average, maximum, minimum, median, or mode) that is the available resource data of the relevant metrics and I/O type is displayed. For a resource, metrics, and I/O type for which available resource data is not displayed, a “-” (hyphen) is displayed.

Appendix E

File Capacity Calculation

The capacities of the interval information, hourly summary, daily summary, and monthly summary files that are created after importing the foregoing files can be estimated from the number of disk array resources, Metric accumulation interval, and logging interval by the formula below.

The file capacity to be calculated is assumed as a general case.

When the configuration is changed, a logical disk name is changed, or a logical disk is moved during accumulation of Metric or when there is a period having no input/output during accumulation of Metric and so on, the actual capacity differs from the calculated one.

Therefore, reserve a disk capacity sufficiently larger than the calculated one.

Interval information file

The disk capacity for the interval information file required when Metric is imported for one month can be calculated by using the following formula.

Required disk capacity [MB] = (A Number of Logical Disks + Number of Physical Disks) B Logging interval [minutes]

According to the following table, a constant for each disk array used is assigned to A.

Disk Array	Constant (A)	Constant (B)
SnapSAN S5000	100	4
4000 series	400	4
D8 series	1000	12

Summarized information file

The disk capacity required when Metric is summarized for one month can be calculated by using the following formula.

"Hourly summary file

Required disk capacity [MB] = (C Number of Logical Disks Number of Physical Disks) 100 24 (Number of hours for a day)

"Daily summary file

Required disk capacity [MB] = (C Number of Logical Disks Number of Physical Disks) 100

"Monthly summary file

Required disk capacity [MB] = (C Number of Logical Disks Number of Physical Disks) 200

According to the following table, a constant for each disk array used is assigned to B.

Disk Array	Constant (C)
SnapSAN S5000S5000	100
4000 series	1000
D8 series	2500

<Example of calculating required disk capacity>

An example of calculation of the required disk capacity is provided below.

Disk array to be monitored:S4900 (Number of Logical Disks: 8192, Number of Physical Disks: 1200)

Logging interval:10 minutes

Keep period:Interval information fileOne month (= 31 days)

Hourly summary fileSix months (= 186 days)

Daily summary fileOne year (= 12 months)

Monthly summary fileOne year

Capacity for interval information file= (400 8192 1200) 4 10 1 (month)

= 4076.8 [MB] = 4.0 [GB]

Capacity for hourly summary file= (1000 8192 1200) 100 24 6 (months)

= 14964.48 [MB]

Capacity for daily summary file= (1000 8192 1200) 100 12 (months)

= 1247.04 [MB]

Capacity for monthly summary file= (1000 8192 1200) 200

= 51.96 [MB]

Required disk capacity= 4076.8 14964.48 1247.04 51.96

= 20340.28 [MB]

= Approx. 20 [GB]

Index

U

V