



Overland
Storage

SnapSAN™ S5000 AutoTier

User Guide



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Preface

This User Guide describes how to use the data allocation optimization function. Data allocation optimization analyzes the access frequency, and load concentration, and according to a policy, relocates a logical disk to the most appropriate device, thereby optimizing the cost performance. 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.

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Product Documentation and Firmware Updates

Overland Storage SnapSAN product documentation and additional literature are available online, along with the latest release of the SnapSAN 5000 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>.

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

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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.

Preface

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What is Data Allocation Optimization

Data allocation optimization is a function provided to improve cost performance, which moves stored data to the optimum device autonomously depending on the frequency of accessing the data so as to make effective use of devices inside the storage unit that differ in cost and performance. This chapter describes a function outline, configuration, and other basics of data allocation optimization.

A storage unit contains devices that differ in cost and performance. A general design practice to optimize the cost performance of storage is to place data from the following standpoints:

- □ Store frequently accessed data on high-speed (high-cost) devices
- □ Store infrequently accessed data on low-speed (low-cost) devices

To improve effective use of devices' characteristics, data allocation optimization analyzes the access frequency and load concentration, and according to a policy, relocates a logical disk to the most appropriate device, thereby optimizing the cost performance.

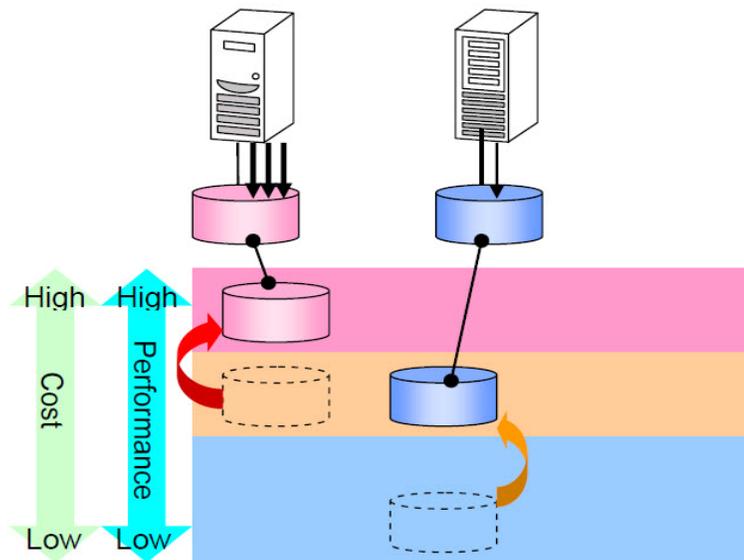


Figure 1-1: Data Allocation Optimization

Features of Data Allocation Optimization

Data allocation optimization has the following two features:

- **Autonomous operation**
You can set an operation policy, according to which this function automatically analyzes the performance of the storage unit, decides on whether logical disk relocation is necessary, and moves a logical disk as necessary. This operation policy sets how to analyze the storage performance (analysis period, analysis timing), the mode of executing logical disk relocation (immediate, schedule), and other required settings.
- **Manual operation**
A function is provided to move the specified logical disk to an arbitrary pool. You can reallocate logical disks according to the plan depending on your system operation. You can also eliminate bottlenecks of highly loaded pools or shift to a pool with a different characteristic (e.g. from RAID6 to RAID10) for access acceleration.
- **Non-disruptive operation**
Logical disk relocation is performed on a per logical disk basis, which can be done without stopping business operations.
It is also possible to conduct planned logical disk movement according to the system operation. A capability of moving a specific logical disk at the user-specified time is provided as well.

Logical Disk Relocation

The data allocation optimization function moves a logical disk whose usage frequency is low to a low-cost large-capacity physical disk, enabling you to use resources on the entire storage effectively. Also, the function

moves a logical disk located on a high-load physical disk where I/O concentrates to a low-load physical disk so as to distribute the concentration of I/O, thereby canceling the I/O competition and removing the bottleneck.

These operations are done by moving logical disks, which is called logical disk relocation.

The work disks shown in the figure are logical disks that are temporarily allocated during logical disk movement (work disk for data allocation optimization). The source logical disk is deleted when the logical disk movement is completed. The logical disks are moved inside the disk array without affecting any business system. As a result, performance tuning is possible while business is in operation. Movement of logical disks will not require any changes in settings or access methods of business systems.

NOTE: The data allocation optimization function automatically creates and deletes a work disk for data allocation optimization when moving logical disks.

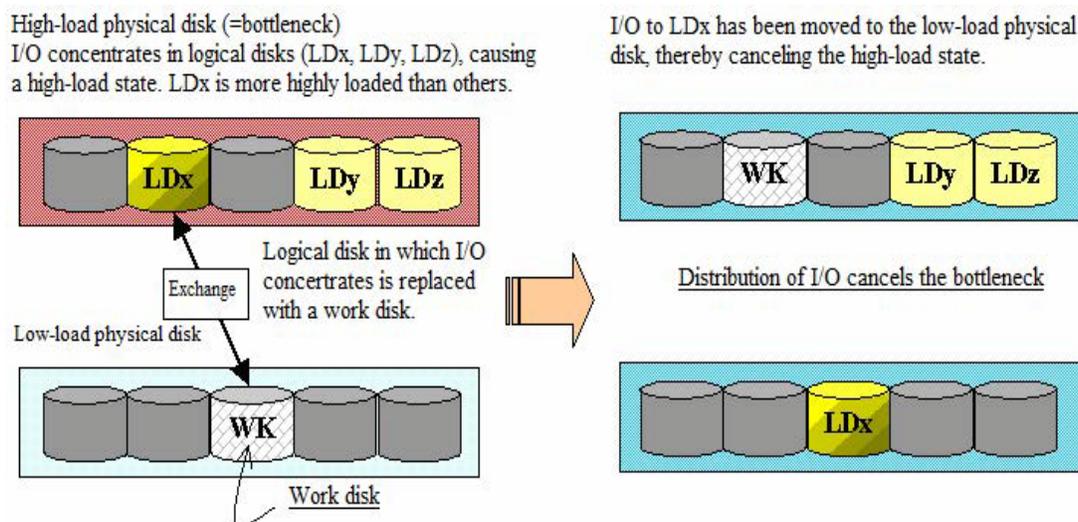


Figure 1-2: Concept of Logical Disk Reallocation

Examples of Using Data Allocation Optimization

Examples of using data allocation optimization are described below.

Reducing Operational Cost

System operational costs can be optimized by moving infrequently accessed data to a low-cost disk. Some data in operation becomes accessed less frequently over time.

You can utilize high-speed devices effectively by storing data on a high-speed (high-cost) device while accessed frequently for operation, and then moving a volume that is not accessed for a certain period to a slower (low-cost) device. Data allocation optimization can relocate a logical disk that has not been accessed for a certain period to a low-speed device according to a policy you set.

Improving Response Performance

Performance degradation caused by a bottleneck of the storage can be prevented by moving a volume that is under constantly high load due to access concentration, to a high-speed device. If disk access increases and a pool is highly loaded on an ongoing basis, the response performance degrades one day all of a sudden. You can avoid this by checking the performance status and moving some logical disks in a high-load pool to another pool. If a pool is highly loaded continuously, data allocation optimization can relocate a logical disk to a low-load pool according to a policy you set.

Autonomous Operation

This chapter describes the data allocation optimization function.

The data allocation optimization function can be used in one of two operation modes: you set an operation policy, by which performance analysis and relocation are conducted autonomously (autonomous operation); or you directly specify a particular logical disk to move it (manual operation).

Autonomous operation refers to the function that analyzes the access frequency of logical disks on a regular basis and relocates logical disks automatically depending on the access frequency. You create a pool group in advance, and repeating performance analysis for a specific period and logical disk relocation if required by the analysis result optimizes the cost performance of the storage.

Creation of A Pool Group

For autonomous operation, create a group of pools in which to move logical disks. Logical disks are relocated inside this group. This group is called a pool group. Specify pools used for movement, movement policy, and movement mode.

[Pool specification]

To create a pool group, specify two types of pools; high-speed pool and low-speed pool. The high-speed pool is the pool with a high speed and high cost in the pool group (e.g. pool bound by a high-speed device). The low-speed pool is the pool with a low speed and low cost in the pool group (e.g. pool bound by a low-speed device). It is not possible to register a pool in multiple pool groups.

[Movement policy]

The movement policy defines the logical disk movement direction. There are two types of movement policies.

- Performance oriented: Logical disks are moved from a low-speed pool to a high-speed pool within a pool group.
- Cost oriented: Logical disks are moved from a high-speed pool to a low-speed pool within a pool group.

[Movement mode]

Movement mode refers to the timing for moving a logical disk. Three modes are available.

- Immediate (Movement Mode: Movement is performed immediately after the storage performance analysis is completed.
- Schedule: Movement is performed as scheduled. You can specify a day of the week and time.

- notification: Only a notification of movement recommendation is made. By referring to the notification, you decide on whether the movement is necessary, and then move a logical disk manually.

Performance Analysis of Storage

The storage performance is analyzed on a periodic basis to perform data allocation optimization. The analysis timing and period can be set by the user for each storage unit. Performance analysis does not place burden on the disk array.

- Analysis timing: Analysis is started at the specified timing. You can specify a specific time and day of the week.
- Analysis period: Since movement is performed on a per logical disk basis, the data analysis needs to be made for a relatively long period of time. You can specify then umber of weeks (one to four weeks).

About Relocation

Depending on the result of the performance analysis, a logical disk is moved according to the movement policy and movement mode that are specified for the pool group.

If the movement of a logical disk will cause the busy ratio to increase, that logical disk is not moved.

You can change the speed of logical disk movement at relocation.

Examples of pool group creation and relocation are shown below.

Pool group 1

Movement policy: Performance oriented

Pool A: High-speed disk

Pool B: Low-speed disk

- A high-load logical disk is moved to pool A (high-speed disk).

Pool group 2

Movement policy: Cost oriented

Pool C: High-speed disk

Pool D: Low-speed disk

- An infrequently accessed logical disk is moved to pool D (low-speed disk).

Autonomous Operation Settings

Autonomous operation settings are divided into disk array settings and pool group settings.

Disk array settings

No.	Item	Description
1	Enable/disable autonomous operation	Enables or disables autonomous operation.
2	Analysis time	Specify the analysis time and analysis period.
3	Analysis period	Specify the time and period of disk array performance analysis according to your operation.

No.	Item	Description
4	Day of week and time to start moving logical disks	Specify the day of week and time to start and stop moving logical disks.
5	Day of week and time to stop moving logical disks	To minimize the influence on operations, do not select the operation load peak time as the start and stop times.
6	Moving speed	Specify the copy speed during move. The default value is automatic adjustment.

Pool Group settings

No.	Item	Description
1	Pool group number	Specify the pool group number.
2	Pool group name	Specify the pool group name.
3	High-speed pool number and upper limit of pool capacity	Specify the high-speed pool number and the upper limit of pool capacity.
4	Low-speed pool number and upper of limit pool capacity	Specify the low-speed pool number and the upper limit of pool capacity.
5	Moving policy	Specify the moving policy. Performance-driven or cost-driven policy can be selected.
6	Moving mode	Specify the moving mode. Immediate move, scheduled move, or notified mode can be specified.

Manual Operation

Manual operation allows you to make performance analysis or capacity trend analysis and move a specific logical disk for the purpose of leveling loads or optimizing cost.

Start of logical disk movement

Start moving a logical disk. You can also specify a schedule to start movement.

Changes to logical disk movement

You can change the speed of ongoing logical disk movement, or cancel the movement. You can also operate (start, cancel) the logical disk movement in the notification mode.

Reference function

The reference function can display information of the logical disk which is moving, scheduled, or recommended to move in the notification mode.

Moving Logical Disks.

The data allocation optimization function eliminates bottlenecks and optimizes costs both in autonomous and manual operations by moving logical disks.

Moving logical disks

Move a specific logical disk to a different pool. To move a logical disk, specify the source logical disk and the destination pool.

While moving a logical disk, the function continues to access the source logical disk and copies data by using the work disk for data allocation optimization created on the destination pool. When moving the logical disk is complete, access is switched to the destination within the disk array. Because the logical disk attributes are also inherited, it is not necessary to change the operation system settings or the access method.

The work disk for data allocation optimization is automatically created in the destination pool when the system starts moving a logical disk. Therefore, the destination pool must have an empty capacity with the same size as the source logical disk in order to move it. The work disk for data allocation optimization is automatically deleted by the SnapSAN Manager server, which performs monitoring, after the system stops moving logical disks.

When moving a logical disk, you can specify the copy speed during data move and the attribute inheritance setting when using the thin provisioning function.

Area	Description
Copy speed	<p data-bbox="605 720 1419 772">Auto or high can be selected as the copy speed. These options are described below.</p> <ul data-bbox="605 783 678 814" style="list-style-type: none"><li data-bbox="605 783 678 814">• Auto <p data-bbox="605 825 1419 877">The disk array automatically adjusts the copy speed depending on the load status to minimize the influence on the operation system.</p> <p data-bbox="605 888 1419 919">This is the recommended speed and the default value for Copy speed.</p> <ul data-bbox="605 930 678 961" style="list-style-type: none"><li data-bbox="605 930 678 961">• High <p data-bbox="605 972 1419 1008">Data is copied at the fastest transfer speed. Although the moving time becomes shorter than auto, the influence on the operation system becomes</p>

Area	Description
LD capacity threshold value/LD capacity quota attribute inheritance setting	<p>This setting is enabled if both of the source and destination logical disks are virtual capacity logical disk. Specify whether the moved logical disk inherits the LD capacity threshold value/LD capacity quota.</p> <ul style="list-style-type: none"> • Inherits settings <p>The destination logical disk inherits the LD capacity threshold value/LD capacity quota set to the source logical disk.</p> <ul style="list-style-type: none"> • Resets settings <p>The LD capacity threshold value/LD capacity quota is not set to the destination logical disk. You must specify these settings again if necessary.</p> <p>* This option is not available if the source or destination logical disk is not a virtual capacity logical disk. Also, note that if the destination logical disk is a virtual capacity logical disk, the LD capacity threshold value/LD capacity quota</p>
Move start time	The function starts moving logical disks at the specified time. The move start time can be specified. If the storage is not started at the move start time, logical disks are not moved.
Move stop time	If moving logical disks is not complete at the specified time, the function stops moving logical disks.

It is not allowed to move logical disks in the following cases:

- If the user role is monitor.
- If the maximum number of logical disks that can be simultaneously moved in a single disk array is exceeded (Maximum number: 8).
- If the logical disk to be moved is in the same pool as the destination pool.
- If the source logical disk is already being moved.
- If the source logical disk is already registered with the move schedule.
- If the disk array, pool, or logical disk has failed.
- In the case of snapshot-related volume except for BV: Base volume (Original volume from which data is replicated).

- If the source logical disk is being formatted (except for while a logical disk bound in the dynamic pool is being normally formatted).
- If the source logical disk is a system volume.
- If the source logical disk is protected.
- If the source logical disk or the destination pool is stopped by the power saving function.
- If a pool bound in the source logical disk or the destination pool is being expanded.
- If the capacity of logical disk (virtual capacity logical disk) is being released (Note 2).
- If the source logical disk is a logical disk for L2 cache or the destination pool is a pool dedicated for L2 cache.

When the thin provisioning function is available, allocation to the destination logical disk could occur while logical disks are moved, possibly resulting in an insufficient capacity of the pool which the destination logical disk belongs to. Therefore, you may fail to move logical disks if the destination logical disk is a virtual capacity logical disk.

When the thin provisioning function is available, allocation to the source logical disk could occur while logical disks are move without stopping operations, possibly result in the exceeded LD capacity quota or an insufficient capacity of the pool which the source logical disk belongs to. In such a case, you must restore the data on the destination logical disk after the move operation is complete though logical disks are successfully moved.

If you move a logical disk with “LD capacity threshold value/LD capacity quota setting” disabled or treating the destination logical disk as the actual capacity logical disk during the move operation, the moved logical disk may not display “Valuative quota)” or “Fault(over capacity).” Check the faulty logical disk in the message output to the SnapSAN Manager operation log and restore data.If the logical disk bound on an encrypted disk is moved to a non-encrypted disk, the logical disk is decrypted at the destination.

In the case of manual operation, if multiple logical disk movements are scheduled for the same date and time, some scheduled logical disk movements may fail depending on the disk array status. To prevent a failure, schedule multiple logical disk movements to start every one minute at least.Also, take into account that the number of logical disk movements that can be concurrently run in a disk array is up to eight.

Exceptional Operations

In some cases, you may have to cancel the move operation, change the speed, or change (cancel) the move schedule for some reasons after you start moving a logical disk or register a move schedule for some reason.

- Reason for cancelling the move operation

You have mistakenly moved an unnecessary logical disk.

- Reason for changing the speed

You want to change the speed to high because you must complete the move operation as soon as possible.

You want to change the speed to auto because the operation system is largely affected.

- Reason for changing (cancelling) the move schedule

You want to change the move start time or cancel the scheduled move operation because you can no longer execute the move operation at the scheduled time.

As described below, you do not perform the operations for cancelling the move operation, changing the speed, or changing (cancelling) the move schedule during normal operation. However, the data allocation optimization function provides the commands to cancel the move operation, change the speed, or change (cancel) the move schedule in case that such an exceptional event occurs.

If you cancel moving logical disks, copying data to the work disk for allocation optimization is interrupted and the work disk for allocation optimization created in the destination pool is deleted. Operation is not affected because you can continue to access the source logical disk.

Operation of Data Allocation Optimization

For data allocation optimization, iSM and SnapSAN Manager commands (iSMCLI) provide functions that perform settings/operations for autonomous relocation, operations for manual relocation, and display of the movement status.

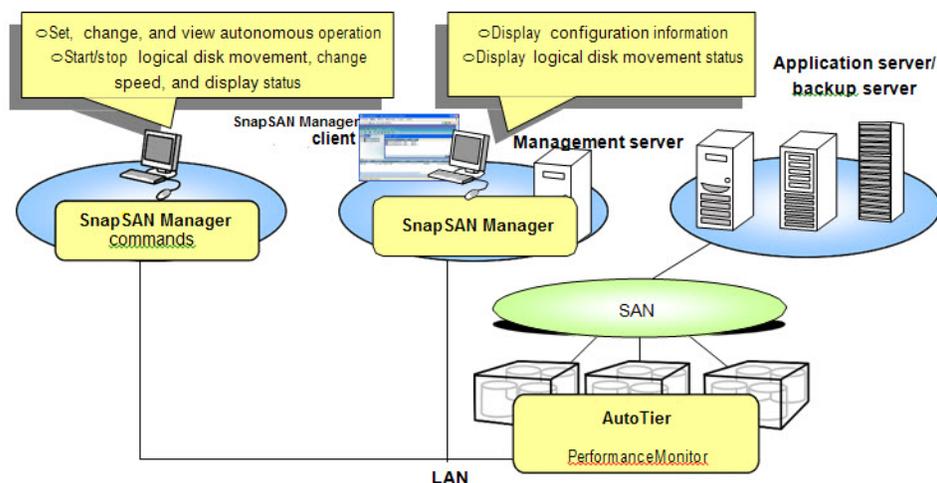


Figure 2-1: Data Allocation Optimization Function Operations

Operation by SnapSAN Manager Client

The SnapSAN Manager client can display the configuration information as well as the logical disk movement status. The functions provided by the SnapSAN Manager client are described below.

The SnapSAN Manager Client can display the configuration information as well as the logical disk movement status. The functions provided by the SnapSAN Manager Client are described below.

Operations	Storage Group User & Partition User		
	Monitor	Operator	Administrator
Display the configuration information	✓	✓	✓
Display the logical disk movement progress	✓	✓	✓

✓ Able to operate -Unable to operate

Storage group user: User who manages disk array as a whole

Partition user: User who manages specific partitions

monitor: Disk array monitoring, status display, and other reference are permitted.

operator: Operations necessary for operating are permitted.

administrator: Disk array configuration setting and all other operations are permitted.

The storage configuration information and logical disk movement status can be displayed when the role of the user is monitor or above.

Displaying the configuration information

You can view the storage configuration information on the SnapSAN Manager Client main window. The main window appears first when the SnapSAN Manager Client connects to the SnapSAN Manager server. The SnapSAN Manager main window displays the configuration information and the state of resources of each disk array being monitored by SnapSAN Manager.

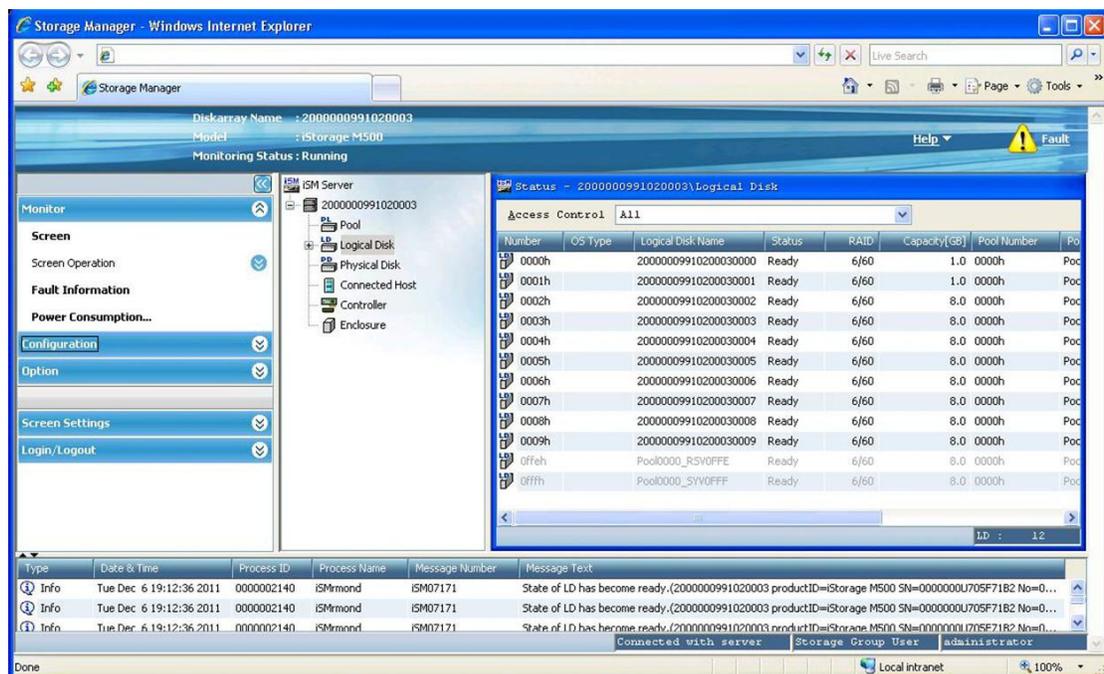


Figure 2-2: Main

Displaying the logical disk movement status

Information about a logical disk that is being moved for data allocation optimization is displayed on the [Logical disk list] and [Logical disk detail information] screens.

Display on the [Logical disk list] screen

In the [Movement Status] column on the [Logical disk list] screen, "Moving" appears for the source logical disk when the data is being moved by the data allocation optimization function. Nothing is displayed for the other logical disks.

Operations by SnapSAN Manager ControlCommand

SnapSAN Manager Controlcommand provides functions for making, changing, and viewing settings of autonomous operation, as well as functions relating to logical disk movement. These operations can be performed using the SnapSAN Manageradr command of SnapSAN Manager ControlCommand.

SnapSAN ManagerCLI Listed

Command	Operation	Storage Group User & Partition User		
		Monitor	Operator	Administrator
SnapSAN Manageradr set_storage	Setting the details of storage used for data allocation optimization	-	-	✓
SnapSAN Manageradr set_plgrp	Setting the details of pool group used for data allocation optimization	-	-	✓
SnapSAN Manageradr del_plgrp	Clearing the data allocation optimization pool group setting	-	-	✓
SnapSAN Manageradr config_query	Displaying the data allocation optimization settings	-	-	✓
SnapSAN Manageradr start	Starting moving the logical disk	-	-	✓
SnapSAN Manageradr chgspd	Changing the movement speed	-	-	✓
SnapSAN Manageradr stop	Stopping moving the logical disk	-	-	✓
SnapSAN Manageradr term	Making the logical disk movement completed.	-	-	✓
SnapSAN Manageradr ldmv_query	Checking the movement status	-	-	✓

✓ Able to operate-: Unable to operate

Storage group user: User who manages disk array as a whole

Partition user: User who manages specific partitions

Monitor: Disk array monitoring, status display, and other reference are permitted. operator: Operations necessary for operating are permitted.

administrator: Disk array configuration setting and all other operations are permitted.

The user must have a role higher than administrator to execute the autonomous operation setting function, settings change function, setting display function, and various functions related to the move operation of logical disks.

System Configuration

This chapter describes installation of the data allocation optimization function.

The data allocation optimization function can be used in an environment that satisfies the conditions below:

- The data allocation optimization function is supported by the S5000 disk array.
- Performance Monitor is a mandatory product.
- The SnapSAN Manager server must be running on the management server.

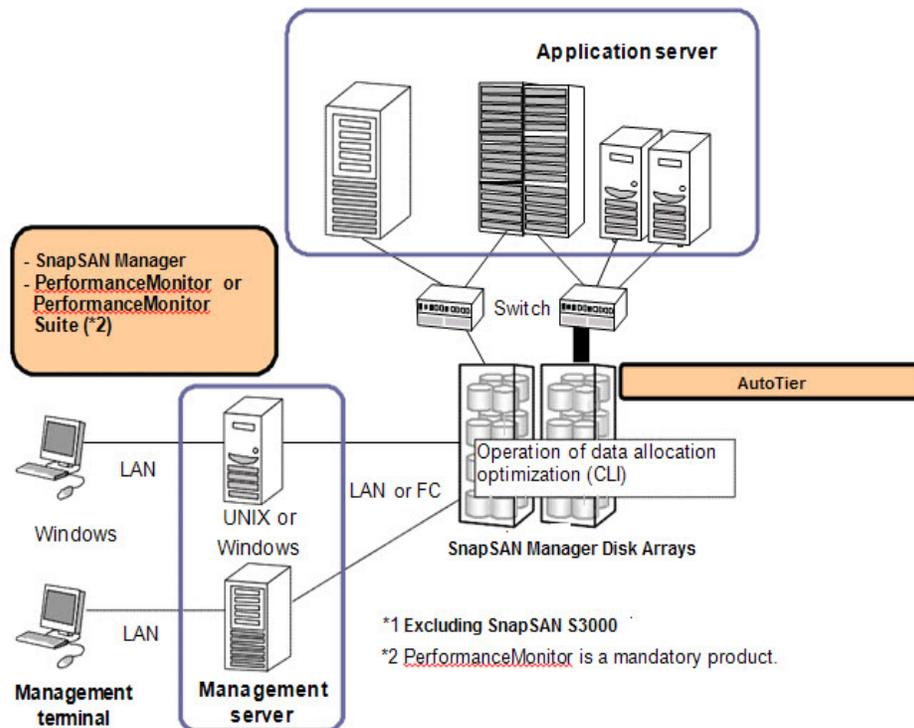


Figure 3-1: System Configuration

Related Products

To use the data allocation optimization function, the following related program products are required:

AutoTier

This is the product covered in this manual. It provides functions that use data allocation optimization. Data allocation optimization can be performed by using SnapSAN ManagerCLI.

SnapSAN Manager

This product provides functions that monitor the state of the resources of the disk array and set up the disk array configuration.

Performance Monitor

This product provides the function that monitors the disk array performance.

To decide on volume relocation, the data allocation optimization function utilizes the storage statistics information accumulated by Performance Monitor.

In addition, to use the data allocation optimization function more effectively, the following program product is recommended:

Performance Monitor Suite (Set of Performance Monitor and Performance Navigator)

This product includes the analysis function (Performance Navigator) in addition to the disk array performance monitor function.

Analyzing the storage performance information allows you to confirm the effects of the data allocation optimization.

Software Installation

To use the data allocation optimization function, you need to install SnapSAN Manager. For installation, uninstallation, and update, refer to the installation guide attached to SnapSAN Manager.

Also, before installing this function, you need to unlock the licenses of AutoTier and the other required program products for the target disk array.

This chapter describes operation examples that use the data allocation optimization function.

The operation examples described below cover “autonomous operation” which performs performance analysis and relocation autonomously by setting an operation policy, and “manual operation” in which a particular logical disk is directly specified to move it.

Autonomous Operation

This section describes setup and operation of autonomous operation.

When setting up autonomous operation, set an operation policy on how to analyze the storage performance and how to execute logical disk movement so that logical disks are moved on the basis of operation conditions.

Setup of Autonomous Operation

This section describes how to set up autonomous operation.

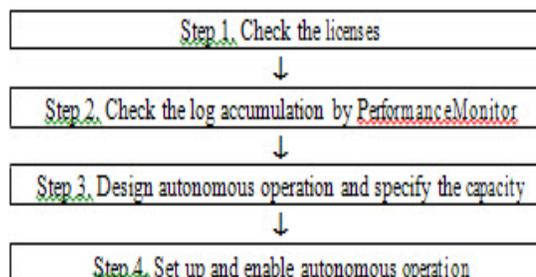


Figure 4-1: Setup

1. Check the licenses

Make sure that the following required licenses are unlocked:

- AutoTier
- Performance Monitor
- Storage control software (BaseProduct)

Check the state of license in the SnapSAN Manager Client main window (disk array properties) or with SnapSAN Managerview. If there are locked licenses, unlock them. If not unlocked, unlock the target license.

2. Check the log accumulation by Performance Monitor

Make sure that log accumulation of statistics information is correctly being performed by Performance Monitor.

Normally, log accumulation is automatically started if the licenses for Performance Monitor and AutoTier are correctly unlocked.

Log accumulation is correctly being performed if [Start] is displayed in the [Status] column on the [Accumulation of Statistics Information Start/Stop] dialog of the performance monitor client. If no log is accumulated, click the [Start] button

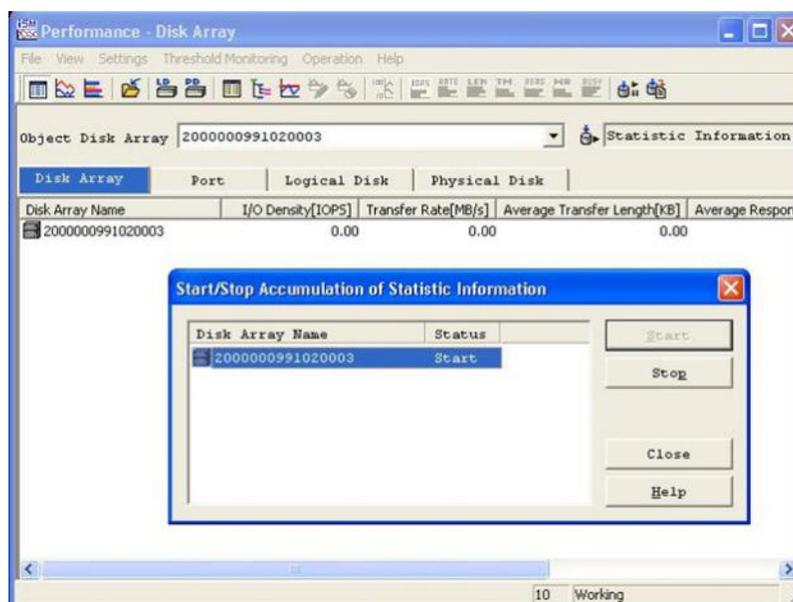


Figure 4-2: Accumulation of Statistic Information

3. Design autonomous operation and specify the capacity

Determine the target pool for autonomous operation and reserve the capacity necessary for the destination pool. Note that if the destination pool does not have a sufficient capacity in autonomous operation, it is not regarded as the move destination candidate.

4. Set up and enable autonomous operation

To set up autonomous operation, make settings for the storage and a pool group. Enabling data allocation optimization starts autonomous operation.

Making settings for the storage

Make common settings for the entire storage.

No	Description	Setting Value
1	Enable data allocation optimization.	-auto_moveon
2	Start analysis at 22:00 every Friday.	-analysis_date Fri 22:00
3	Specify one week as the analysis period.	-analysis_term 1w
4	Start moving a logical disk at 20:00 every	-schedl_starttime Sat 20:00
5	Stop moving a logical disk at 6:00 every Monday	-schedl_stoptime Mon 06:00
6	Set the copy speed to automatic adjustment.	-speed auto

SnapSAN Manageradr set_storage Command

Use the SnapSAN Manageradr `set_storage` command to make the above settings

```
# SnapSAN Manageradr set_storage -auto_move on -analysis_date Fri 22:00 -analysis_term
1w
-schdl_starttime Sat 20:00 -schdl_stoptime Mon 06:00 -speed auto
```

Use the SnapSAN Manageradr `config_query` command to check the settings

```
# SnapSAN Manageradr config_query
--- Storage Information ---
Auto Move: on
Copy Speed: auto
Analysis Time: Fri 22:00
Analysis Term: 1week
Start Time: Sat 20:00
Stop Time: Mon 06:00
SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0
```

Setting a Pool Group

Set a group of pools in which logical disks can be moved, and make a setting specific to each pool. Example settings are shown below

No	Description	Setting Value
1	Set the pool name to POOLGRP1.	-plgrpname POOLGRP1
2	Set pool 0001h as the high-speed pool, and set the maximum capacity to 80%.	-pri_highpool 0001h,80
3	Set pool 0005h as the low-speed pool, and set the maximum capacity to 60%.	-pri_lowpool 0005h,60
4	Set the movement policy for logical disks to cost	-policy cost
5	Set the movement mode for logical disks to schedule.	-mvmode schedule

Use the SnapSAN Manageradr `set_plgrp` command to make the above settings.

```
# SnapSAN Manageradr set_plgrp -plgrpname POOLGRP1 -pri_highpool 0001h,80
-pri_lowpool 0005h,60 -policy cost -mvmode schedule
```

Use the SnapSAN Manageradr `config_query` command to check the settings

```

# SnapSAN Manageradr config_query

--- Storage Information ---
Auto Move      : on
Copy Speed     : auto
Analysis Time  : Fri 22:00
Analysis Term  : 1week
Start Time     : Sat 20:00
Stop Time      : Mon 06:00

--- Pool Group Information ---
Pool Group No      : 0000h
Pool Group Name    : POOLGRP1
High Speed Pool    : 0001h
Capacity Limit of the High Speed Pool : 80%
Low Speed Pool     : 0003h
Capacity Limit of the Low Speed Pool  : 60%
Policy             : cost
LD Movement Mode   : schedule

SnapSAN Manageradr: Info.: SnapSAN Manager37000 : Command completed
successfully
ExitStatus:0

```

Figure 4-3: Check Settings of Pool Group

Normal Autonomous Operation

A notification message on logical disk movement (SnapSAN Manager09232) is also output to syslog (event log for Windows). Thus, you can monitor this message in concert with operation management software.

1. In reference to the notification output in (i), decide on whether moving the logical disk is appropriate, and, if necessary, run the command for moving a logical disk.

The following is an example of using the command for moving a logical disk

```
# SnapSAN Manageradr start -srcldn 0001h -dstpoolnumber 0005h -speed high
```

When a logical disk movement is started, the following message is output to the SnapSAN Manager server's operation log.

```
SnapSAN Manager09202:LD movement of LD(0001h) from POOL(0001h) to
POOL(0005h) in diskarray1 was started
```

2. Check the movement state of the logical disk on the SnapSAN Manager Client main window and using the SnapSAN Manageradr ldmv_query command.

When the logical disk has been moved completely, the following message is output to the SnapSAN Manager server's operation log.

```
SnapSAN Manager09203:LD movement of LD(0001h) from POOL(0001h) to POOL(0005h)
in diskarray1 wascompleted
```

You can change the speed of ongoing logical disk movement by using the SnapSAN Manageradr chgspeed command, and can cancel the movement by using the SnapSAN Manageradr stop command.

Making Changes to Autonomous Operation

This section describes how to make changes to autonomous operation.

Changing a setting of the storage

Use the SnapSAN Manageradr `set_storage` command to change a setting of the storage. Specify the parameter you want to change, and set a new value. It is necessary to set the parameters not to be changed.

Check the current settings by using the SnapSAN Manageradr `config_query` command

```
# SnapSAN Manageradr config_query
--- Storage Information --- Auto Move: on
Copy Speed: auto
Analysis Time: Fri 22:00
Analysis Term: 1week
Start Time: Sat 06:00
Stop Time: Mon 06:00
```

(Omitted)

After checking the current settings, make a new setting by using the SnapSAN Manageradr `set_storage` command

The following example changes the analysis period (interval) from one week to two weeks.

```
# SnapSAN Manageradr set_storage -auto_move on -analysis_date Fri 22:00 -analysis_term
2w
-schdl_starttime Sat 20:00 -schdl_stoptime Mon 06:00 -speed auto
# SnapSAN Manageradr config_query
--- Storage Information --- Auto Move: on
Copy Speed: auto
Analysis Time: Fri 22:00
Analysis Term: 2week?Check that the change has been made
Start Time: Sat 06:00
Stop Time: Mon 06:00
```

(Omitted)

Changing a Setting of a Pool Group

Use the SnapSAN Manageradr `set_plgrp` command to change a setting of a pool group. Specify the parameter you want to change, and set a new value. It is necessary to set the parameters not to be changed.

Check the current settings by using the SnapSAN Manageradr `config_query` command

```
# SnapSAN Manageradr config_query
--- Storage Information --- Auto Move: on
Copy Speed: auto
```

Analysis Time: Fri 22:00

Analysis Term: 1week

Start Time: Sat 06:00

Stop Time: Mon 06:00

POOL Group Information

POOL Group No: 0001h

POOL Group Name: POOLGRP1

High Speed Pool: 0001h Capacity Limit of the High Speed Pool: 80% Low Speed Pool: 0003h
Capacity Limit of the Low Speed Pool: 60%

Policy: performance

LD Movement Mode: schedule

SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0

After checking the current settings, make a new setting by using the SnapSAN Manageradr
set_plgrp command.

The following example changes the movement mode for logical disks from schedule to
notification.

```
# SnapSAN Manageradr set_plgrp -plgrpn 0001h -plgrpname POOLGRP1 -pri_highpool
0001h,80 -pri_lowpool 0005h,60 -policy cost -mvmode notification
```

Use the SnapSAN Manageradr config_query command to check the new setting/

```
# SnapSAN Manageradr config_query
```

```
--- Storage Information --- Auto Move: on
```

```
Copy Speed: auto
```

```
Analysis Time: Fri 22:00
```

```
Analysis Term: 1week
```

```
Start Time: Sat 06:00
```

```
Stop Time: Mon 06:00
```

```
--- POOL Group Information ---
```

```
POOL Group No: 0001h
```

```
POOL Group Name: POOLGRP1
```

```
High Speed Pool: 0001h
```

```
Capacity Limit of the High Speed Pool: 80% Low Speed Pool: 0003h Capacity Limit of the
Low Speed Pool: 60% Policy: cost
```

LD Movement Mode: notification? Check that the change has been made

SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0

Adding a Pool Group

Use the SnapSAN Manageradr set_plgrp command to add a new pool group.

Add a pool group using the SnapSAN Manageradr set_plgrp command

```
# SnapSAN Manageradr set_plgrp -plgrpname POOLGRP2 -pri_high0006h,80 -pri_low
0016h,60 -policy cost -mvmode immediate
```

```
# SnapSAN Manageradr set_plgrp -plgrpname POOLGRP2 -pri_high0006h,80 -pri_low
0016h,60 -policy cost -mvmode immediate
```

Use the SnapSAN Manageradr config_query command to check the settings

```
--- Storage Information ---
Auto Move           : on
Copy Speed          : auto
Analysis Time       : Fri 22:00
Analysis Term       : 1week
Start Time          : Sat 06:00
Stop Time           : Mon 06:00

--- POOL Group Information ---
POOL Group No       : 0001h
POOL Group Name     : POOLGRP1
High Speed Pool     : 0001h
Capacity Limit of the High Speed Pool : 80%
Low Speed Pool      : 0003h
Capacity Limit of the Low Speed Pool  : 60%
Policy              : cost
LD Movement Mode   : notification

POOL Group No       : 0002h      ← Check that the pool has
POOL Group Name     : POOLGRP2   been added
High Speed Pool     : 0006h
Capacity Limit of the High Speed Pool : 80%
Low Speed Pool      : 0016h
Capacity Limit of the Low Speed Pool  : 60%
Policy              : cost
LD Movement Mode   : immediate

SnapSAN Manageradr: Info : SnapSAN Manager37000 : Command completed
successfully
ExitStatus:0
```

Figure 4-4: Check Setting - Adding Pool Group

Deleting a Pool Group

Use the SnapSAN Manageradr del_plgrp command to delete a pool group.

Delete a pool group using the SnapSAN Manageradr `del_plgrp` command. The following example deletes

```
POOLGRP1.# SnapSAN Manageradr del_plgrp -plgrpname POOLGRP1
```

```
# SnapSAN Manageradr config_query

--- Storage Information ---
Auto Move           : on
Copy Speed          : auto
Analysis Time       : Fri 22:00
Analysis Term       : 1week
Start Time          : Sat 06:00
Stop Time           : Mon 06:00

--- POOL Group Information ---
POOL Group No       : 0002h          ← Check that POOLGRP1
POOL Group Name     : POOLGRP2      has been deleted
High Speed Pool     : 0006h
Capacity Limit of the High Speed Pool : 80%
Low Speed Pool      : 0016h
Capacity Limit of the Low Speed Pool  : 60%
Policy              : cost
LD Movement Mode    : immediate

SnapSAN Manageradr: Info : SnapSAN Manager37000 : Command completed
successfully
ExitStatus:0
```

Figure 4-5: Check Setting - Delete Pool Group

NOTE: Even when a pool group has been deleted, the logical disk movement set by autonomous operation (including schedule and notification modes) remains. Cancel such logical disk movement as necessary.

Manual Operation

Manual operation allows you to make performance analysis or capacity trend analysis and move a specific logical disk for the purpose of leveling loads or optimizing cost.

Use the SnapSAN Manageradr `start` command to move a logical disk. For detailed syntax of the SnapSAN Manageradr `start` command.

NOTE: If a logical disk scheduled to be moved is canceled, the schedule to move the logical disk is not deleted. In such a case, cancel the schedule to move the logical disk with the SnapSAN Manageradr `stop` command when cancelling the logical disk. In the case of manual operation, if multiple logical disk movements are scheduled for the same date and time, some scheduled logical disk movements may fail depending on the disk array status. To prevent a failure, schedule multiple logical disk movements to start every one minute at least. Also, take into account that the number of logical disk movements that can be concurrently run in a disk array is up to eight.

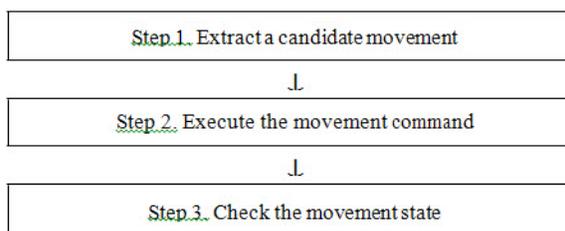


Figure 4-6: Manual Operation Procedure

Extract a Candidate Movement

Use Performance Monitor to extract a candidate movement.

Execute the movement command

Use the SnapSAN Manageradr start command to move a logical disk. The information required to move a logical disk is as follows:

- Source logical disk
- Destination pool
- Copy speed
- Whether to take over the logical disk capacity threshold/logical disk capacity quota settings (when a movement is performed between virtual capacity pools used with thin provisioning).

Examples of specifying the command are shown below.

```
#SnapSAN Manageradr start -srcldn 0001h -dstpoolnumber 0002h -speed high
```

Move logical disk 0001h to pool 0002h. Set the copy speed to auto. Set the movement start date and time to 2011/8/25 12:00

```
#SnapSAN Manageradr start -srcldn 0001h -dstpoolnumber 0002h -schdl_starttime
2011/8/25 12:00
```

Move virtual capacity logical disk 0001h to virtual capacity pool 0002h. Set the copy speed to high. Cancel the LD capacity threshold/LD capacity quota settings.

```
#SnapSAN Manageradr start -srcldn 0001h -dstpoolnumber 0002h -speed high -capattr
reset
```

Check the movement state

The SnapSAN Manageradr start command is the command that gives an instruction to start the movement of a logical disk. It does not wait for completion of the logical disk movement.

When you have executed a logical disk movement using this command, check the start and completion of the movement by the following method:

Start of the movement

You can check with the message output to the SnapSAN Manager operation log. When the movement has started normally, the following message is output. Message in the SnapSAN Manager operation log: SnapSAN Manager09202 message SnapSAN Manager09202:LD movement of LD(0001h) from POOL(0001h) to POOL(0005h) in diskarray1 was started

Completion of the movement

You can check with the message output to the SnapSAN Manager operation log. Message in the SnapSAN Manager operation log: SnapSAN Manager09203 message

The SnapSAN Manager09203 message is output at the end of the movement regardless of whether normal or abnormal, so you can check the completion state for sure with this message.

SnapSAN Manager09203:LD movement of LD(0001h) from POOL(0001h) to POOL(0005h) in diskarray1 wascompleted

Also, the moving state can be checked on the SnapSAN Manager Client main window and using the SnapSAN Manageradr ldmv_query command.

Abnormal Case Handling

This section describes action to be taken when an abnormality occurs while data allocation optimization is in operation.

Handling when a work disk for logical disk movement remains

A work disk may remain due to some error during logical disk movement. A check is made to see if any work disk remains when the SnapSAN Manager server starts or monitoring starts, and, if any, the following message is output to the operation log.

SnapSAN Manager09232: Temporary Disk(Offdh) in diskarray1 for LD movement is remained.

When this message is output, check that the movement of the remaining logical disk is not in operation, and then cancel the remaining logical disk with the SnapSAN Managercfg ldunbind command.

```
# SnapSAN Managercfg ldunbind -ldn Offdh
```

```
SnapSAN Manager31001:[ldunbind]Please wait for a moment..... SnapSAN
Manager31000:[ldunbind]Command has completed successfully. ExitStatus:0
```

Handling when performance monitoring logs are not accumulated

When analysis processing for autonomous data allocation optimization is started, if it is detected that performance monitoring logs required to analyze the storage performance are not accumulated, the following message is output.

SnapSAN Manager09233: The analysis of the performance information was failed in diskarray1

Check whether log accumulation of statistics information is correctly being performed by Performance Monitor.

Operations when the SnapSAN Manager server is not operating on the management server

If the SnapSAN Manager server is not operating, the work disk is not deleted even after moving the logical disk is complete. Check the progress of logical disk move operation with the SnapSAN Manageradr ldmv_query -all command and complete the operation with the SnapSAN Manageradr term command if the logical disk has been completely moved. The work disk is then deleted.

```
# SnapSAN Manageradr ldmv_query -all
```

- Movement Progress Information ---

```
Src LD No.(h)Dst Pool No.(h)Dst LD No.(h)StatusProgress(%)Speed
```

Start TimeEnd Time

001000010ffdComplete100 auto2011/8/4 12:002011/8/4 13:00

SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0

SnapSAN Manageradr term -srcldn 0010h

SnapSAN Manageradr: Notice: SnapSAN Manager37050: LD movement of LD(0010h) from
POOL(0000h) to

POOL(0001h) is Complete.

SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0

SnapSAN Manageradr ldmv_query -all

SnapSAN Manageradr: Info: SnapSAN Manager37105: There is no Logical Disk which is
moving or reserved.

SnapSAN Manageradr: Info: SnapSAN Manager37000: Command completed successfully
ExitStatus:0

Data Allocation Optimization

General notes on data allocation optimization are described below.

- The SnapSAN Manager server must be running on the management server.
- When registering schedules of logical disk movement, the maximum number of schedules that can be registered at the same time is 100.
- A pool that is registered in a pool group cannot be deleted. Delete it after deleting the pool group.
- When the data allocation optimization function is used, the auto archive feature of the performance monitoring function is executed even if it has been set to be disabled.

Logical Disk Movement

Logical disk movement cannot be performed in the following cases:

- The role of the user is monitor or operator.
- The maximum number of movements that can be simultaneously executed in one disk array is exceeded (max. 8).
- An attempt is made to move a logical disk to the pool including it.
- The specified source logical disk is in "moving" state.
- A movement schedule is already registered for the specified source logical disk.
- The target disk array, pool, or logical disk is in fault state.
- A snapshot-related volume (except the BV BV: base volume (original volume which is the copy source)) is specified.
- The source logical disk is a System Volume.
- The source logical disk has protection setting.
- The source logical disk or destination pool is not in use due to the power saving function.
- The pool where the source logical disk is bound is being expanded.
- The target logical disk (virtual capacity logical disk) is being released
- The target logical disk is set for data movement.
- The number of logical disks that have been bound reached the maximum number specified by the specifications.
- The destination logical disk is a logical disk for L2 cache or the destination pool is a pool dedicated for L2 cache.

Additional notes on logical disk movement are as follows:

NOTE: If the destination pool for a logical disk that is created on an encrypted disk is composed of unencrypted disks, the destination logical disk is unencrypted. In the case of manual operation, if multiple logical disk movements are manually scheduled for the same date and time, some scheduled logical disk movements may fail depending on the disk array status. To prevent a failure, schedule multiple logical disk movements to start every one minute at least. Also, take into account that the number of logical disk movements that can be concurrently run in a disk array is up to eight.

Thin Provisioning Installed

The following are notes to consider when data allocation optimization is performed for a virtual capacity pool used with the thin provisioning function:

- If allocation to the destination logical disk occurs during logical disk movement, the capacity of the virtual capacity pool including the destination logical disk might be insufficient and the logical disk movement might fail. Be sure to secure a sufficient capacity for the destination pool.
- If allocation to the source logical disk occurs during logical disk movement, the LD capacity quota might be exceeded or the capacity of the pool including the source logical disk might be insufficient. In such a case, the logical disk is successfully moved, but, after that, the data of the destination logical disk must be recovered.
- If a logical disk is moved with the “LD capacity threshold/LD capacity quota settings” cancelled, or if a logical disk is moved assuming that the destination logical disk is an actual capacity logical disk, the moved logical disk might not be “fault (over quota)” or “fault (over capacity).” Identify a faulty logical disk by referring to the message output to the SnapSAN Manager operation log, and then recover the data in it.
- If a failure occurs in a virtual capacity logical disk due to “fault (over capacity)” or “fault (over quota),” a logical disk cannot be moved. In such a case, restore the virtual capacity logical disk and then move the logical disk. If writing fails in the virtual capacity logical disk due to the insufficient capacity of the pool including the virtual capacity logical disk (over capacity) or the LD capacity quota excess, restore it to the level where data consistency is ensured for example by restoring backup data.
- Cost could become high if the number of virtual capacity pool changes before and after the move operation.

Consider the following case as an example. Source: Logical disk belonging to the virtual capacity pool of which allocated capacity is about 1% Destination: Actual capacity pool. As more than 99% allocation occurs in the actual capacity pool at the destination, making it impossible to benefit from the cost advantage.

Moving Logical Disks Criterion

Whether to move logical disks is determined as a result of performance analysis in autonomous operation. The following criteria are used for determining whether to move logical disks depending on whether the policy is performance-driven or cost-driven.

Performance-Driven Policy

For the performance-driven policy, the following information is used to determine the candidate logical disks for the move operation.

Determination based on the busy ratio

If the average busy ratio of pool is high during the analysis period, the system determines that there are continuously highly load and move highly loaded logical disks to the high-speed pool

- Eliminate the continuously highly loaded status

Determination based on the access frequency

Move the logical disks of which access frequency (I/OPS) is high during the analysis period to the high-speed pool.

- Optimize logical disk allocation

Cost-Driven Policy

For the cost-driven policy, the following information is used to determine the candidate logical disks for the move operation.

Determination based on the access frequency

Move the logical disks of which access frequency (I/OPS) is low during the analysis period to the low-speed pool.

- Optimize logical disk allocation

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