

ETERNUS SF



ETERNUS SF Storage Cruiser V15.1



Operation Guide for Optimization Option

Windows/Solaris/Linux

B1FW-5965-03ENZ0(00)
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Preface

Purpose

This manual describes Optimization Option, the optional product for ETERNUS SF Storage Cruiser (hereafter referred to as "Storage Cruiser").

Intended readers

This manual is intended for the system administrator and operators using the Optimization Option and managing storage system.

Organization

This manual is composed as follows:

[Chapter 1 Overview](#)

This chapter describes an overview of the Optimization Option.

[Chapter 2 Design](#)

This chapter describes the necessary design-related matters that must be addressed before setting up the Optimization Option.

[Chapter 3 Setup](#)

This chapter describes the setup of the Automated Storage Tiering function.

[Chapter 4 Operation](#)

This chapter describes the operation of the Automated Storage Tiering function.

[Chapter 5 Operational Maintenance](#)

This chapter describes the operational maintenance for the Optimization Option.

Notation

The names, abbreviations, and symbols shown below are used in this manual.

Operating systems

| Formal name | Abbreviation | |
|--|------------------------|---------|
| Microsoft(R) Windows Server(R) 2003, Standard Edition Microsoft(R) Windows Server(R) 2003, Standard x64 Edition Microsoft(R) Windows Server(R) 2003, Enterprise Edition Microsoft(R) Windows Server(R) 2003, Enterprise x64 Edition Microsoft(R) Windows Server(R) 2003 R2, Standard Edition Microsoft(R) Windows Server(R) 2003 R2, Standard x64 Edition Microsoft(R) Windows Server(R) 2003 R2, Enterprise Edition Microsoft(R) Windows Server(R) 2003 R2, Enterprise x64 Edition | Windows Server 2003 | Windows |
| Microsoft(R) Windows Server(R) 2008 Standard (32-bit)(64-bit) Microsoft(R) Windows Server(R) 2008 Standard without Hyper-V(TM) (32-bit)(64-bit) Microsoft(R) Windows Server(R) 2008 Enterprise (32-bit)(64-bit) Microsoft(R) Windows Server(R) 2008 Enterprise without Hyper-V(TM) (32-bit)(64-bit) Microsoft(R) Windows Server(R) 2008 Datacenter (32-bit)(64-bit) Microsoft(R) Windows Server(R) 2008 Datacenter without Hyper-V(TM) (32-bit)(64-bit) | Windows Server 2008 | |
| Microsoft(R) Windows Server(R) 2008 R2 Foundation Microsoft(R) Windows Server(R) 2008 R2 Standard | Windows Server 2008 R2 | |

| Formal name | Abbreviation | |
|---|-------------------------|--------------------------|
| Microsoft(R) Windows Server(R) 2008 R2 Enterprise Microsoft(R) Windows Server(R) 2008 R2 Datacenter | | |
| Microsoft(R) Windows(R) XP Professional Edition Microsoft(R) Windows(R) XP Home Edition | Windows XP | |
| Windows Vista(R) Home Basic Windows Vista(R) Home Premium Windows Vista(R) Business Windows Vista(R) Enterprise Windows Vista(R) Ultimate | Windows Vista | |
| Windows(R) 7 Home Basic Windows(R) 7 Home Premium Windows(R) 7 Professional Windows(R) 7 Enterprise Windows(R) 7 Ultimate | Windows 7 | |
| Solaris(TM) 9 Operating System | Solaris 9 | Solaris or Solaris OS |
| Oracle Solaris 10 | Solaris 10 | |
| Oracle Solaris 11 | Solaris 11 | |
| Red Hat(R) Enterprise Linux(R) AS (v.4 for x86) Red Hat(R) Enterprise Linux(R) AS (v.4 for EM64T) | RHEL-AS4 | Linux |
| Red Hat(R) Enterprise Linux(R) ES (v.4 for x86) Red Hat(R) Enterprise Linux(R) ES (v.4 for EM64T) | RHEL-ES4 | |
| Red Hat(R) Enterprise Linux(R) 5 (for x86) Red Hat(R) Enterprise Linux(R) 5 (for Intel64) | RHEL5 | |
| Red Hat(R) Enterprise Linux(R) 6 (for x86) Red Hat(R) Enterprise Linux(R) 6 (for Intel64) | RHEL6 | |
| SUSE(R) Linux Enterprise Server 11 (for x86) SUSE(R) Linux Enterprise Server 11 (for EM64T) | - | |
| HP-UX 11.0 HP-UX 11i v1 HP-UX 11i v2 HP-UX 11i v3 | HP-UX | |
| AIX 5L(TM) V5.1 AIX 5L(TM) V5.2 AIX 5L(TM) V5.3 AIX(R) V6.1 AIX(R) V7.1 | AIX | |
| VMware(R) Infrastructure 3 Foundation VMware(R) Infrastructure 3 Standard VMware(R) Infrastructure 3 Enterprise | VMware Infrastructure 3 | VMware |
| VMware vSphere(R) 4 Essentials Kit VMware vSphere(R) 4 Essentials Plus Kit VMware vSphere(R) 4 Standard Edition(TM) VMware vSphere(R) 4 Standard Plus Data Recovery VMware vSphere(R) 4 Advanced Edition(TM) VMware vSphere(R) 4 Enterprise Edition(TM) VMware vSphere(R) 4 Enterprise Plus Edition(TM) | VMware vSphere 4 | |
| VMware vSphere(R) 5 Essentials Kit VMware vSphere(R) 5 Essentials Plus Kit VMware vSphere(R) 5 Standard Edition(TM) | VMware vSphere 5 | |

| Formal name | Abbreviation | |
|--|--------------|--|
| VMware vSphere(R) 5 Standard Plus Data Recovery VMware vSphere(R) 5 Enterprise Edition(TM) VMware vSphere(R) 5 Enterprise Plus Edition(TM) | | |

Oracle Solaris might be described as Solaris, Solaris Operating System, or Solaris OS.

Related products with Fujitsu Storage System ETERNUS and Storage Management Software ETERNUS SF

| Formal name | Abbreviation | | |
|--|--------------------------|---------------------------------|-----------------------------|
| ETERNUS DX60/DX60 S2 ETERNUS DX80/DX80 S2 ETERNUS DX90/DX90 S2 | - | ETERNUS DX series | ETERNUS Disk storage system |
| ETERNUS DX410 ETERNUS DX440 | ETERNUS DX400 series | ETERNUS DX400/DX400 S2 series | |
| ETERNUS DX410 S2 ETERNUS DX440 S2 | ETERNUS DX400 S2 series | | |
| ETERNUS DX8100 ETERNUS DX8400 ETERNUS DX8700 | ETERNUS DX8000 series | ETERNUS DX8000/DX8000 S2 series | |
| ETERNUS DX8100 S2 ETERNUS DX8700 S2 | ETERNUS DX8000 S2 series | | |
| ETERNUS2000 ETERNUS4000 ETERNUS8000 | - | | |
| Web GUI of ETERNUS DX series ETERNUSmgr | ETERNUS Web GUI | | |
| ETERNUS LT20/LT20 S2 ETERNUS LT40/LT40 S2 ETERNUS LT60/LT60 S2 ETERNUS LT200 ETERNUS LT210 ETERNUS LT220 ETERNUS LT230 ETERNUS LT250 ETERNUS LT270 | ETERNUS Tape library | | |

Software products

| Formal name | Abbreviation |
|---|-------------------|
| Microsoft(R) Internet Explorer(R) | Internet Explorer |
| Mozilla(R) Firefox(R) | Firefox |
| Microsoft(R) Cluster Service | MSCS |
| Microsoft(R) Windows Server(R) Failover Clustering | WSFC |
| Microsoft(R) Exchange Server | Exchange Server |
| Microsoft(R) SQL Server(TM) | SQL Server |
| PRIMECLUSTER Global Disk Services | GDS |
| PRIMECLUSTER Global File Services | GFS |
| Symfoware Server Enterprise Extended Edition Symfoware Server Enterprise Edition | Symfoware |
| HITACHI JPI/HiCommand Dynamic Link Manager | HDLM |

| Formal name | Abbreviation |
|------------------------------|---|
| VMware(R) ESX(R) | VMware ESX |
| VMware(R) ESXi(TM) | VMware ESXi |
| VMware(R) vCenter(TM) Server | VMware vCenter Server or vCenter Server |

Manuals

| Formal name | Abbreviation |
|--|--|
| ETERNUS SF Express / ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Installation and Setup Guide | ETERNUS SF Installation and Setup Guide |
| ETERNUS SF Express / ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Migration Guide | ETERNUS SF Migration Guide |
| ETERNUS SF Express / ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Web Console Guide | ETERNUS SF Web Console Guide |
| ETERNUS SF Express / ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module | ETERNUS SF Operation Guide for Copy Control Module |
| ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Cluster Environment Setup Guide | ETERNUS SF Cluster Environment Setup Guide |
| ETERNUS SF Express / ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Messages | ETERNUS SF Messages |
| ETERNUS SF Express / ETERNUS SF Storage Cruiser Event Guide | ETERNUS SF Event Guide |
| ETERNUS SF Express / ETERNUS SF Storage Cruiser / ETERNUS SF AdvancedCopy Manager Glossary | ETERNUS SF Glossary |

Others

- In this manual, "ETERNUS4000" does not include ETERNUS4000 models 80 and 100.

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Notes

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Update history

| Content of update | Updated section | Revision |
|--|----------------------|----------|
| Added Oracle Solaris 11, AIX V6.1 and AIX V7.1 in the operating systems. | Notation in Preface | 3 |
| Added the explanation for SED-SAS. | 1.2, 2.2, 3.6.1, 4.3 | |

Manual organization and reading suggestions

Manual organization

The following table describes the Manual organization of Express, Storage Cruiser and AdvancedCopy Manager.

| When to read | Related manuals (abbreviated) | Related products (NOTE) | | | Explanation |
|---------------------|-------------------------------|-------------------------|-----|-----|---|
| | | EXP | SC | ACM | |
| Before installation | Quick Reference | Yes | Yes | Yes | This manual is unique for each product. The following manuals are available: <ul style="list-style-type: none"> - Express Quick Reference - Storage Cruiser Quick Reference - AdvancedCopy Manager Quick Reference |
| | Overview | No | No | Yes | This manual is unique for each product. |
| During installation | Installation and Setup Guide | Yes | | | This manual is common for all products. |

| When to read | Related manuals (abbreviated) | Related products (NOTE) | | | Explanation |
|------------------|---|-------------------------|-----|-----|--|
| | | EXP | SC | ACM | |
| | Cluster Environment Setup Guide | No | Yes | | This manual is common for Storage Cruiser and AdvancedCopy Manager. |
| | Migration Guide | Yes | | | This manual is common for all products. |
| During operation | Operation Guide | Yes | Yes | Yes | This manual is unique for each product. The following manuals are available: <ul style="list-style-type: none"> - Express Operation Guide - Storage Cruiser Operation Guide - Storage Cruiser Operation Guide for Optimization Option - AdvancedCopy Manager Operation Guide (for Windows) - AdvancedCopy Manager Operation Guide (for Solaris) - AdvancedCopy Manager Operation Guide (for Linux) - AdvancedCopy Manager Operation Guide (for HP-UX) - AdvancedCopy Manager Operation Guide (for AIX) |
| | Operation Guide for Copy Control Module | Yes | No | Yes | This manual is common for Express and AdvancedCopy Manager. |
| | Web Console Guide | Yes | | | This manual is common for all products. |
| Anytime | Event Guide | Yes | | No | This manual is common for Express and Storage Cruiser. |
| | Messages | Yes | | | This manual is common for all products. |
| | Glossary | Yes | | | This manual is common for all products. |

NOTE: "EXP" indicates Express, "SC" indicates Storage Cruiser and "ACM" indicates AdvancedCopy Manager.

How to read manuals

Please use the following table to find the most useful information in the Express, Storage Cruiser and AdvancedCopy Manager manuals to answer your inquiry.

| Purpose | Related products (NOTE) | Manual | Main contents | How to read |
|--|-------------------------|--|--|--|
| Acquiring a product overview and basic operation knowledge | EXP | - Express Quick Reference | - Product overview | Please read if you want to acquire a fundamental knowledge of the product and its operation in order to decide to install it or not. |
| | SC | - Storage Cruiser Quick Reference | - Installation decision | |
| | ACM | - AdvancedCopy Manager Quick Reference | - Overview of the necessary tasks from installation to first use | |
| | | - AdvancedCopy Manager Overview | - Main functions - Linkable applications - Procedure overview for Advanced Copy of ETERNUS Disk storage system | |

| Purpose | Related products (NOTE) | Manual | Main contents | How to read |
|---|--|--|--|---|
| Deciding if a version upgrade is required | common | - ETERNUS SF Migration Guide | <ul style="list-style-type: none"> - Incompatibilities with previous version - Notes and cautions about version upgrade - Version upgrade procedure | Please read if you want to upgrade from a previous version. |
| Installing and correctly operating the product Setting up operating environment depending on purpose | common | - ETERNUS SF Installation and Setup Guide | <ul style="list-style-type: none"> - Operating environment - Installation procedure - Setup procedure - Uninstallation procedure | Please read if you want to install and setup the product. |
| | SC, ACM | - ETERNUS SF Cluster Environment Setup Guide | <ul style="list-style-type: none"> - Supported cluster software - Installation procedure for a clustered system - Setup procedure for a clustered system - Uninstallation procedure for a clustered system | Please read if you want to install and setup the product on a clustered system. |
| Administration and operation of the installed system | EXP | - Express Operation Guide | <ul style="list-style-type: none"> - Starting and stopping the software - Device monitoring - Data copy inside the storage system - Necessary tasks after an architectural modification of the system as well as product maintenance | Please read if you want to start or shutdown the system, monitor the operation status, do backup/restore operations, etc. |
| | SC | - Storage Cruiser Operation Guide | <ul style="list-style-type: none"> - Starting and stopping the software - Device monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference | |
| | | - Storage Cruiser Operation Guide for Optimization Option | <ul style="list-style-type: none"> - Operating environment construction - Operating status monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance | |
| EXP, ACM | - ETERNUS SF Operation Guide for Copy Control Module | <ul style="list-style-type: none"> - Starting and stopping the software | | |

| Purpose | Related products (NOTE) | Manual | Main contents | How to read |
|---|-------------------------|--|--|---|
| | ACM | <ul style="list-style-type: none"> - AdvancedCopy Manager Operation Guide (for Windows) - AdvancedCopy Manager Operation Guide (for Solaris) - AdvancedCopy Manager Operation Guide (for Linux) - AdvancedCopy Manager Operation Guide (for HP-UX) - AdvancedCopy Manager Operation Guide (for AIX) | <ul style="list-style-type: none"> - Data backup/restore inside the storage system - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference | |
| | common | - ETERNUS SF Web Console Guide | <ul style="list-style-type: none"> - Operating environment - Screen layout description | Please read if you want to understand the ETERNUS SF Web Console. |
| Dealing with messages issued by the software | common | - ETERNUS SF Messages | <ul style="list-style-type: none"> - Messages and their explanations - Parameter (variable information) description - System action - Countermeasures | Please read if you want a practical way of investigating and dealing with messages issued by the software. |
| Dealing with events issued by the software | EXP, SC | - ETERNUS SF Event Guide | <ul style="list-style-type: none"> - Phenomenon of event - Countermeasures | Please read if you need to find a practical way of investigating and dealing with events. |
| Researching the meaning of specific terms related to the products and other important terms | common | - ETERNUS SF Glossary | <ul style="list-style-type: none"> - Product specific terminology explanation - Explanation of important terminology appearing in the manual - Synonyms and related terms - Proper form of abbreviated terms | Please read if you want to learn the meaning of important terms, product specific terms or abbreviations used in the manuals. |

NOTE: "EXP" indicates Express, "SC" indicates Storage Cruiser and "ACM" indicates AdvancedCopy Manager.

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Chapter 1 Overview

This chapter describes an overview of the Optimization Option.

1.1 Explanation of Optimization Option

The Optimization Option is an optional product for Storage Cruiser which provides an Automated Storage Tiering function.

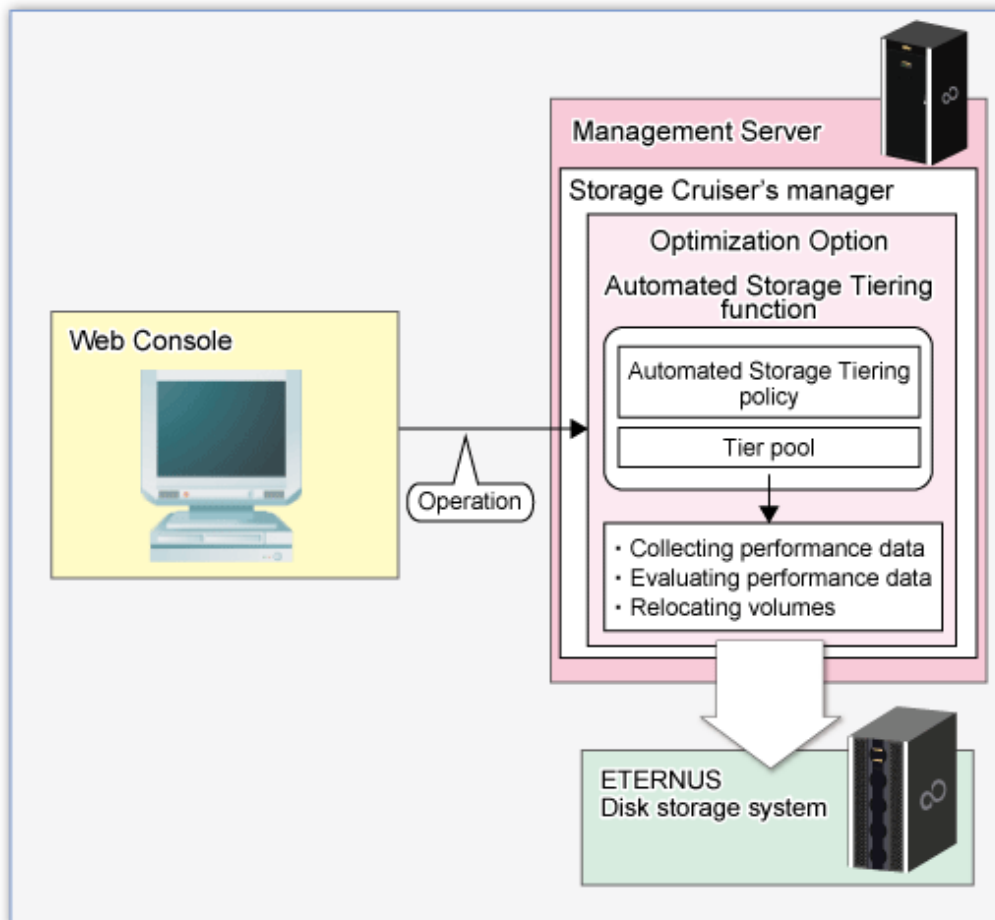
Automated Storage Tiering function

The Automated Storage Tiering function automatically performs, within the same ETERNUS Disk storage system, volume relocation to the ETERNUS Disk storage system volume with content defined by an Automated Storage Tiering policy and Tier pool. By dynamically moving data to the appropriate tier, the Automated Storage Tiering function can respond to performance changes without interruption. It lightens service and storage administrator workload for performance management and layout design. Moreover, all operations such as definition of policies or Tier pools, and execution of volume relocation can be controlled from the ETERNUS SF Web Console (hereafter referred to as "Web Console").

Note

The operation for Automated Storage Tiering function must be performed on the same Management Server. When performed on the multiple Management Servers, Automated Storage Tiering function will not operate correctly.

Figure 1.1 Overview of Automated Storage Tiering function



1.2 Operating environment

The Optimization Option can be used in the following environments:

| Object | Environment |
|---|--|
| Platform | Platforms in which ETERNUS SF Manager operates |
| Required software | ETERNUS SF Storage Cruiser 15.0 or later |
| Required licenses (software) | <ul style="list-style-type: none">- ETERNUS SF Storage Cruiser Standard Edition license- ETERNUS SF Storage Cruiser Optimization Option license |
| Storage devices (Note 1) (hereafter referred to as "Storage device") | <ul style="list-style-type: none">- ETERNUS DX80 S2/DX90 S2- ETERNUS DX400 S2 series- ETERNUS DX8000 S2 series |
| Required licenses (hardware) | Thin Provisioning license |
| Connection configuration to servers | No requirements |
| Target volumes (sources and destinations of migration) (Note 2) | FTV (Flexible Tier Volume) |

Note 1: The firmware version must be V10L20 or higher. Also Flexible Tier must be activated.

Note 2: Open volumes and Thin Provisioning Volumes cannot be specified as target volumes.

Note 3: Flexible Tier Pool supports the following disk types.

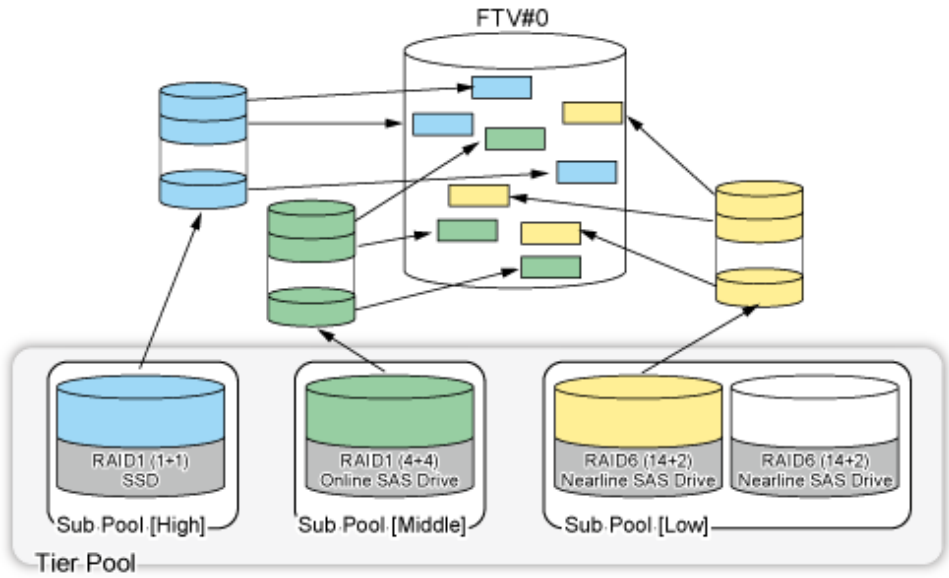
| Disk type | Use condition |
|--------------|---|
| SAS SSD | - |
| ONLINE SAS | - |
| NEARLINE SAS | - |
| SED-SAS | The firmware version must be V10L30 or higher |

1.3 Explanation of Flexible Tier

Flexible Tier is the function which manages disk drives in the pools and allocates them to virtual logical volumes when the writing from a host occurs. The managed pool is called Flexible Tier pool (FTRP).

FTRP is configured by the tiered sub pools called Tier Sub Pool (FTSP).

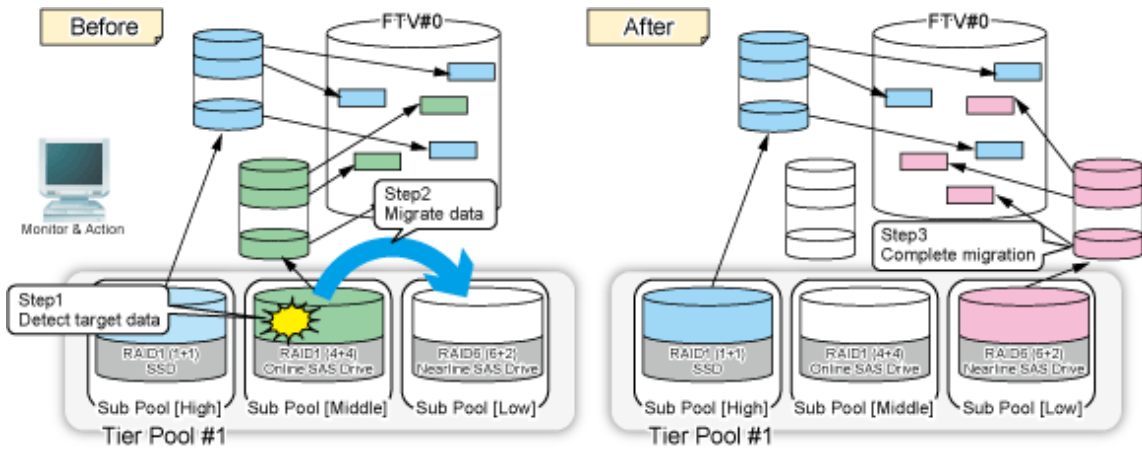
The diagram below should give you an idea of a configuration.



By utilizing Optimization Option, you can easily create FTRPs, FTSPs, and FTVs.

The volumes created in FTRP are subdivided into FTRPs, and are allocated to FTSPs.

By defining a policy, optimization of storage usage is realized by relocated volumes to the appropriate FTSP according to the usage situation from a server.



Chapter 2 Design

This chapter describes the design that is required for using the Automated Storage Tiering function.

2.1 Automated Storage Tiering policy

The baseline for migration of volume using the Automated Storage Tiering function is defined as an Automated Storage Tiering policy. The concept of the baseline values to be specified by the Automated Storage Tiering policy is provided below.

- The baseline for volume migration is the "Peak value within the evaluation period for the IOPS of the target volume"
For the evaluation period, since you can select 4, 6, 8, or 12 hours and 1 to 31 days. Specify an appropriate evaluation period and peak value considering their potential impact on transactions that utilize the target volume.
- The baseline for volume migration depends on the system configuration and type of use.
For this reason, the Automated Storage Tiering function provides 3 operating modes: "Auto", "Semi-Auto", and "Manual".
By specifying "Semi-Auto" mode or "Manual" mode, you can grasp the target volume and the amount of data on it without volume migration. This is an efficient method for determining or modifying baseline values.
Description for respective operating modes are as follows:

- Auto

All operations are automatically performed in accordance with the policy, from collection and evaluation of performance data required for volume relocation through execution of volume relocation.

- Semi-Auto

Collection and evaluation of performance data required for volume relocation are automatically performed in accordance with the policy. However, volume relocation is not performed automatically.

You need to confirm evaluation results, and manually relocate the volume as necessary.

This mode is used for modifying the evaluation criteria or selecting an arbitrarily target volume from migration candidate.

- Manual

Tiering policy is set to Tier pool. However, nothing is performed automatically.

You need to confirm evaluation results, and manually relocate the volume as necessary.

This mode is not used for the periodical operation, but for operation by temporarily changing the baseline value or for determining the validity of the baseline value.

2.2 Tier pool configuration

The Tier pool is configured by the tiered Sub Pools. Delineating different levels of access performance to the Sub Pools ("tiering") allows for appropriate data location depending on the frequency of access.

Access performance to the Sub Pools varies depending on disk types, RAID Levels, and the number of Member Disks of which each Sub Pool consists.

Therefore, besides the disk types "SSD", "Online SAS", "Nearline SAS", and "SED-SAS", Sub Pools can also be configured with different RAID Levels or the number of Member Disks even within the same disk type. Keep the following priorities in mind for the Tier pool configuration as you configure the Sub Pools.

For details on the use conditions for respective disk types, refer to "Note 3" at "[1.2 Operating environment](#)".

| Priority (in descending order of performance) | Disk type | The number of Data Disks | The number of Member Disks | RAID Level | | | |
|--|------------------------|-----------------------------|-------------------------------|------------|-------|-------|-------|
| 1 | SAS SSD | 12 | 12D+12D | RAID1+0 | | | |
| 2 | | | 12D+1P | | RAID5 | | |
| 3 | | 8 | 8D+8D | RAID1+0 | | | |
| 4 | | | 8D+1P | | RAID5 | | |
| 5 | | | 8D+2P | | | RAID6 | |
| 6 | | 7 | 7D+1P | | RAID5 | | |
| 7 | | 6 | 6D+2P | | | RAID6 | |
| 8 | | 4 | 4D+4D | RAID1+0 | | | |
| 9 | | | 4D+1P | | RAID5 | | |
| 10 | | | 4D+2P | | | RAID6 | |
| 11 | | 3 | 3D+1P | | RAID5 | | |
| 12 | | 2 | 2D+2P | RAID1+0 | | | |
| 13 | | 1 | 1D+1D | | | | RAID1 |
| 14 | ONLINE SAS, SED-SAS | 12 | 12D+12D | RAID1+0 | | | |
| 15 | | | 12D+1P | | RAID5 | | |
| 16 | | 8 | 8D+8D | RAID1+0 | | | |
| 17 | | | 8D+1P | | RAID5 | | |
| 18 | | | 8D+2P | | | RAID6 | |
| 19 | | 7 | 7D+1P | | RAID5 | | |
| 20 | | 6 | 6D+2P | | | RAID6 | |
| 21 | | 4 | 4D+4D | RAID1+0 | | | |
| 22 | | | 4D+1P | | RAID5 | | |
| 23 | | | 4D+2P | | | RAID6 | |
| 24 | | 3 | 3D+1P | | RAID5 | | |
| 25 | | 2 | 2D+2P | RAID1+0 | | | |
| 26 | | 1 | 1D+1D | | | | RAID1 |
| 27 | NEARLINE SAS | 12 | 12D+12D | RAID1+0 | | | |
| 28 | | | 12D+1P | | RAID5 | | |
| 29 | | 8 | 8D+8D | RAID1+0 | | | |
| 30 | | | 8D+1P | | RAID5 | | |
| 31 | | | 8D+2P | | | RAID6 | |
| 32 | | 7 | 7D+1P | | RAID5 | | |
| 33 | | 6 | 6D+2P | | | RAID6 | |
| 34 | | 4 | 4D+4D | RAID1+0 | | | |
| 35 | | | 4D+1P | | RAID5 | | |
| 36 | | | 4D+2P | | | RAID6 | |
| 37 | 3 | 3D+1P | | RAID5 | | | |

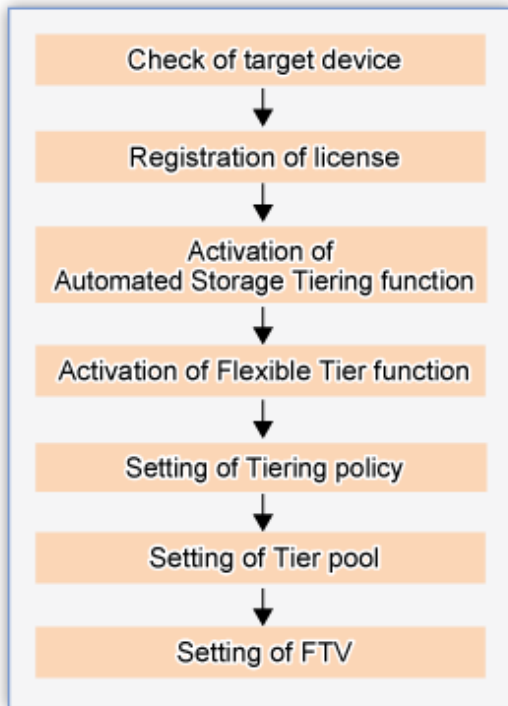
| Priority (in descending order of performance) | Disk type | The number of Data Disks | The number of Member Disks | RAID Level | | | |
|--|-----------|-----------------------------|-------------------------------|------------|--|--|-------|
| | | | | | | | |
| 38 | | 2 | 2D+2P | RAID1+0 | | | |
| 39 | | 1 | 1D+1D | | | | RAID1 |

Chapter 3 Setup

This chapter describes the setup of Automated Storage Tiering function.

The task flow for the setup of Automated Storage Tiering Function is as follows.

Figure 3.1 Task flow for setup of Automated Storage Tiering Function



3.1 Check of target device

In order to utilize the Automated Storage Tiering function provided by the Optimization Option, each target storage device must fulfill the following requirements:

- The target device must be registered in ETERNUS SF Manager.
- A Thin Provisioning license must be registered in the target device.
- Firmware version of the target device must be V10L20 or higher.

The above status can be checked in the Web Console. For information on checking methods, refer to the following parts in the "ETERNUS SF Web Console Guide".

- Check the target device's registration status
"Display ETERNUS Disk storage system"
- Check the license registration status
"Display the license"
- Check the firmware version
"Display ETERNUS Disk storage system"

3.2 Registration of license

The Optimization Option becomes available by registering the license on the server on which ETERNUS SF Manager is installed. No new installation of software is required.

The license registration is performed from the Web Console. For information on registration methods, refer to "Register the license" in the "ETERNUS SF Web Console Guide".

3.3 Activation of Automated Storage Tiering function

Activate the function for using the Automated Storage Tiering function. Implement the following procedure for the platform which you use.

For Windows:

From the Windows [Services] screen, start the [ETERNUS SF Storage Cruiser Optimization Option] service.

At the time of product installation, the Startup type for this service is set to [Manual]. Change the startup type to [Automatic] on an as needed basis.

For Solaris and Linux:

Run the following command to start the [ETERNUS SF Storage Cruiser Optimization Option] daemon.

```
# /opt/FJSVssast/bin/astctl start
```

During installation of the product, this daemon is not set to start automatically. For starting this daemon automatically, change settings by running the following commands.

- Solaris

```
# /bin/ln -s /etc/init.d/init.FJSVssast /etc/rc0.d/K00FJSVstopFJSVssast
# /bin/ln -s /etc/init.d/init.FJSVssast /etc/rc1.d/K00FJSVstopFJSVssast
# /bin/ln -s /etc/init.d/init.FJSVssast /etc/rc2.d/S99FJSVstartFJSVssast
# /bin/ln -s /etc/init.d/init.FJSVssast /etc/rcS.d/K00FJSVstopFJSVssast
```

- Linux

```
# /sbin/chkconfig startASTManager on
```

3.4 Activation of Flexible Tier function

Activate the function for using the Flexible Tier function.

Flexible Tier function is set from the Web Console.

The setup procedure is as follow:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Settings] on the [Automated Storage Tiering] pane.

For the Flexible Tier function, two types of action are available: "On" and "Off".

"On" can be selected only when [FTR Function Status] is "Off".

"Off" can be selected only when [FTR Function Status] is "On".



- When enabling the Flexible Tier function, the work volumes which the Flexible Tier function creates automatically are required.

When the number of volumes which can be created is insufficient, the Flexible Tier function cannot be enabled.

The number of work volumes for each model of devices is as follows:

- For ETERNUS DX80 S2/DX90 S2 : 32 volumes
- For ETERNUS DX400 S2 series : 64 volumes

- For ETERNUS DX8000 S2 series : 64 volumes
- Before disabling the Flexible Tier function, it is necessary to delete all the FTRPs.

3.5 Setting of Tiering policy

In Tiering policies, specify the conditions for implementing Automated Storage Tiering function.

Automated Storage Tiering function automatically reallocates volumes to FTVs in Tier pool within the same device according to the set Tiering policy.

Tiering policies can also be allocated to multiple Tier pools, either within the same or different ETERNUS Disk storage systems.

Tiering policies are set from the Web Console.

The setup procedure is as follow:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tiering policy] on the [Automated Storage Tiering] pane.
The current registered Tiering policies are displayed on the Main pane.

For Tiering policies, three types of action are available: [Create], [Delete], and [Modify].

If there is no existing Tiering policy in the ETERNUS SF Manager, only [Create] can be selected, while the other actions cannot be selected.

[Modify] cannot be executed simultaneously for multiple Tiering policies. [Modify] can be selected only when a single Tiering policy is selected. If you select multiple Tiering policies, action is grayed out.

A Tiering policy that is assigned to a Tier pool cannot be deleted.

Likewise, if a Tiering policy is already assigned to a Tier pool and the Automated Storage Tiering function is running, the relevant Tier pool cannot be modified.

3.5.1 Creation of Tiering policies

You can create multiple Tiering policies, and you can also define the identical Tiering policy to multiple Tier pools.

The following items can be specified in Tiering policy:

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|--------------|---------------|------------------------------------|---|
| 1 | Policy Name | Required | Name that defines Tiering policy | Specify a unique name overall. You can specify alphanumeric characters, "-", "_", and "#" with length from 1 to 16 characters. Note: The Policy name is not case-sensitive. |
| 2 | Execute Mode | Required | Operating mode of Tiering function | Mode in which to execute processing for Tiering function. Select from the following: - Auto - Semi-Auto - Manual The default mode is "Auto". |

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|--------------|---------------|---|--|
| 3 | Type | Required | Type of target data | Select "IOPS" from pulldown list. |
| 4 | Method | Required | Evaluation method of target data | Select "Peak" from pulldown list. |
| 5 | Interval | Required | Evaluation interval for target data | Select a number and a unit ("Hour" or "Day"). If the unit is "Hour", you can specify "4", "6", "8", or "12". If the unit is "Day", you can specify the number from 1 to 31. |
| 6 | Execute Time | Required | Time at which to start collection and evaluation of evaluation data, and relocation of volume | This selection is available only when the execution mode is "Auto" or "Semi-Auto" and the evaluation interval is "Day". Valid input range: "00:00" - "23:59". The default is "00:00". Note: If the evaluation interval unit is "Hour", execution starts at the specified time ("4", "6", "8", or "12" hours). |
| 7 | Expire Time | Required | Specification of time for terminating relocation of volume after execution time has elapsed | The default is "00" (no termination). If the evaluation interval unit is "Day", you can specify the number from 00 to 24. If the evaluation interval unit is "Hour", you can specify the number from 00 to the value of evaluation interval. |
| 8 | Low Range | Required | Specification of "Low Tier" | Specify the maximum value. You can also specify decimal fractions. The minimum value is set to "0", and "-" is displayed on the Main pane in the Tiering policy. |
| 9 | Middle Range | As needed | Specification of "Middle Tier" | Specify the minimum and maximum values. You can also specify decimal fractions. If a range is not set, "-:-" is displayed on the Main pane in the Tiering policy. Note: Not required in 2-tier configuration. |
| 10 | High Range | Required | Specification of "High Tier" | Specify the minimum value. You can also specify decimal fractions. The maximum value is set to "2147483647", and "-" is displayed on the Main pane in the Tiering policy. |

3.5.2 Deletion of Tiering policies

When registered Tiering policies are no longer necessary, delete them.

You can delete multiple Tiering policies at once.

However, you cannot delete a Tiering policy that is already assigned to a Tier pool.

3.5.3 Modification of Tiering policies

When you modify the operation for registered Tiering policies, modify the contents defined in Tiering policies. You cannot modify multiple Tiering policies at once. If you need to modify multiple Tiering policies, modify them one by one.

Likewise, if a Tiering policy is already assigned to a Tier pool and Automated Storage Tiering function is running, the relevant Tiering policy cannot be modified.

3.6 Setting of Tier pool

Tier pools are registered as FTRPs (Flexible TierR Pools) of the storage devices.

Creating Tier pools creates both FTRPs and FTSPs (Flexible Tier Sub Pools), allowing to also create FTVs.

Tier pool is set from the Web Console.

The setup procedure is as follow:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tier pool] on the [Automated Storage Tiering] pane.
The current registered Tier pools are displayed on the main pane.

For Tier pools, four types of action are available: [Create], [Delete], [Modify], and [Expand sub-pool capacity].

If there is no existing Tier pool in the target device, only [Create] can be selected, while the other actions cannot be selected.

Multiple Tier pools can be deleted at once, but Tier pools that contain FTVs cannot be deleted.

You cannot modify multiple Tier pools at once.

Likewise, Tier pools in which Automated Storage Tiering function is running cannot be modified or deleted.

3.6.1 Creation of Tier pools

You can create multiple Tier pools, but you cannot define multiple Tiering policies for a Tier pool.

The following items can be specified for each Tier pool:

| No. | Item Name | Specification | Meaning | Input Conventions |
|--|-------------|---------------|--|---|
| 1 | Pool Name | Required | Tier pool name | Specify a unique name overall. You can specify alphanumeric characters, "-", "_", and "#" with length from 1 to 16 characters. Note: The Pool name is not case-sensitive. |
| 2 | Policy Name | Required | Name of Tiering policy | Select an already defined Tiering policy. |
| 3 | Warning | As needed | Warning threshold value for pool which is received from devices | Specify a decimal number between 5 and 99. Note: You cannot set a value that is smaller than the caution threshold. |
| 4 | Caution | As needed | Cautions threshold value for pool which is received from devices | Specify a decimal number between 5 and 80. If you set this value to "0", notification of cautions will be disabled. |
| 5 | Encryption | Required | Status of pool encryption | Specify "Yes"(valid) or "No"(invalid). Default is "No"(invalid). |
| The following settings are made separately for each of the "Low" (required), "Middle" (as needed) and "High" (required) sub pools. | | | | |
| 6 | FTSP name | As needed | Sub Pool name | Specify a unique name within the storage device. You can specify alphanumeric characters, "-", "_", and "#" with length from 1 to 16 characters. |

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|--------------|---------------|------------------------|---|
| | | | | Not case-sensitive. |
| 7 | Disk | Required | Type of disk | Select from "SSD", "Online", "Nearline", and "SED-SAS". For details on the use conditions for respective disk types, refer to "Note 3" at " 1.2 Operating environment ". |
| 8 | Reliability | Required | RAID Level of Sub Pool | Select from the following: <ul style="list-style-type: none"> - High Performance(RAID1+0) - High Capacity(RAID5) - High Reliability(RAID6) - Mirroring(RAID1) - Striping(RAID0) |
| 9 | Stripe Depth | As needed | Stripe depth | Specify the size per disk for a stripe in a RAID Group. Select from the following: <ul style="list-style-type: none"> - 64 - 128 - 256 - 512 - 1024 When the selected "Reliability" is Mirroring (RAID1), this item cannot be selected. |
| 10 | Disk | Required | Disk in Sub Pool | Choose the disk which constitutes sub pool. |

3.6.2 Deletion of Tier pools

When deleting Tier pools, multiple Tier pools can be deleted at once. However, Tier pools that contain FTVs cannot be deleted.

Likewise, Tier pools in which Automated Storage Tiering function is running cannot be deleted.

In order to check the current status of a Tier pool, select that Tier pool's [Overview] and Tier pool number to display the corresponding [Detail Screen].

3.6.3 Modification of Tier pools

You can modify the contents defining a Tier pool as necessary, but you cannot modify multiple Tier pools at once.

Likewise, Tier pools in which Automated Storage Tiering function is running cannot be modified.

In order to check the current status of a Tier pool, select that Tier pool's [Overview] and the Tier pool number to display the corresponding [Detail Screen].

The following items can be specified for modifying a Tier pool.

| No | Item Name | Specification | Meaning | Input Conventions |
|----|-----------|---------------|---|--|
| 1 | Warning | Required | Warning threshold value for pool which is received from devices | Specify a decimal number between 5 and 99. |

| No | Item Name | Specification | Meaning | Input Conventions |
|----|-----------|---------------|--|--|
| | | | | Note: You cannot set a value that is smaller than the caution threshold. |
| 2 | Caution | Required | Cautions threshold value for pool which is received from devices | Specify a decimal number between 5 and 80. If you set this value to "0", notification of cautions will be disabled. |

3.6.4 Expansion of Sub Pool capacity

You can increase the capacities of Sub Pools of which a Tier pool consists.

The following items can be specified for expanding Sub Pool capacities:

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|-----------|---------------|------------------------------|---------------------------------|
| 1 | FTSP name | Required | Sub Pool name to be expanded | Same as at the time of creation |
| 2 | Disk | Required | Disk in Sub Pool | Same as at the time of creation |

3.7 Setting of FTV

In a Tier pool, only a FTV (Flexible Tier Volume) can be created.

A FTV is created from the Web Console, it cannot be created from ETERNUS Web GUI.

The setup procedure is as follow:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [FTV] on the [Automated Storage Tiering] pane.
The current registered FTVs are displayed on the Main pane.

For a FTV, four types of action are available: [Create], [Delete], [Modify], and [Format].

If there is no existing FTV, only [Create] can be selected, while the other actions cannot be selected.

Multiple FTVs can be deleted at once. However, FTV which is already assigned to a server cannot be deleted.

Multiple FTVs cannot be modified or formatted.

Ratio for FTV is percentage per tier, based on "100" as the total physical capacity assigned to the FTV.

Since the used ratio for FTV is displayed with truncating decimal places, the total of the used ratio may not be reached 100%.

3.7.1 Creation of FTV

Create a FTV.

The following items can be specified for each FTV:

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|-----------|---------------|-------------------------------------|---|
| 1 | Pool Name | Required | Pool name in which a FTV is created | Specify an existing Tier pool name. |
| 2 | FTV Name | As needed | FTV name to be created | Specify a unique name within the storage device. You can specify alphanumeric characters and symbols, with length from 1 to 16 characters. |

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|-------------------|---------------|--|--|
| | | | | (except ".", "?", "'", and " ") Not case-sensitive. |
| 3 | Total Capacity | Required | Volume capacity to be created | Available unit is either one of "MB", "GB" or "TB". |
| 4 | Number of Volumes | Required | Number of volumes to be created | - |
| 5 | Caution | As needed | Caution threshold value | Specify a decimal number between 1 and 200. If not specified, "10%" is set. |
| 6 | Priority FTSP | As needed | FTSP name allocated with higher priority | Allocate to given FTSP if not specified otherwise. |

3.7.2 Deletion of FTV

To delete a FTV, select the target FTV on [Overview], and execute [Delete] action. Multiple FTVs can be deleted at once, but FTVs that assigned to a server cannot be deleted.

For the details on FTV information, check the displayed corresponding [Detail Screen] to select a FTV number from [Overview] of FTV.

3.7.3 Modification of FTV

To modify the contents defined in FTVs, select the target FTV on [Overview] and execute [Modify] action. You cannot modify the contents defined in multiple FTVs.

For the details on FTV information, check the displayed corresponding [Detail Screen] to select a FTV number from [Overview] of FTV.

The following items can be modified for each FTV:

| No. | Item Name | Specification | Meaning | Input Conventions |
|-----|----------------|---------------|--|---|
| 1 | FTV Name | Required | FTV name to be created | Same as at the time of creation. |
| 2 | Total Capacity | Required | Volume capacity to be created | Same as at the time of creation. |
| 3 | Caution | Required | Caution threshold value | Specify a decimal number between 1 and 200. |
| 4 | Priority FTSP | As needed | FTSP name allocated with higher priority | Same as at the time of creation. |

3.7.4 Format of FTV

Format a FTV. During creation of the FTV, format is executed automatically.

To format a FTV, select the target FTV on [Overview] and execute [Format] action. Multiple FTVs cannot be formatted at once.

Chapter 4 Operation

This chapter describes operation of Automated Storage Tiering function.

4.1 Operation task flow

Automated Storage Tiering function works differently for each execution mode that is set in the Tiering policy.

In addition, when you update the status of volume relocation, the evaluation result, and the log, the procedure to start is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Overview] on the [Automated Storage Tiering] pane.
5. Click [Reload Status] under the [Automated Storage Tiering] on the [Action] pane.

4.1.1 Operation in "Auto" mode

The procedure to start Auto mode operation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tier pool] on the [Automated Storage Tiering] pane.
The current registered Tier pools are displayed on the Main pane.
5. Check the Tier pool checkbox in which is specified Tiering policy for Auto mode on the Main pane.
6. Click [Start] under the [Automated Storage Tiering] on the [Action] pane.
The volume relocation begins.

The procedure to check the relocation status of volumes is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Overview] on the [Automated Storage Tiering] pane.
The relocation status of volumes is displayed on the Main pane.

The procedure to check the log for volume relocation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tier pool] on the [Automated Storage Tiering] pane.
The current registered Tier pools are displayed on the Main pane.
5. Check the Tier pool checkbox which confirms the volume relocation log on the Main pane.
6. Click [Pool Number] on the Main pane to display detailed information.

7. Click the [History] tab on the Main pane.

4.1.2 Operation in "Semi-Auto" mode

The procedure to start Semi-Auto mode operation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tier pool] on the [Automated Storage Tiering] pane.
The current registered Tier Pools are displayed on the Main pane.
5. Check the Tier pool checkbox in which is specified Tiering policy for Semi -Auto mode on the Main pane.
6. Click [Start] under the [Automated Storage Tiering] on the [Action pane].

The procedure to check evaluation results and perform volume relocation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Overview] on the [Automated Storage Tiering] pane.
The evaluation results are displayed on the Main pane.
5. Check the evaluation results checkbox which performs the volume relocation.
6. Click [Execute] under the [Automated Storage Tiering] on the [Action pane].
The volume relocation begins.

4.1.3 Operation in "Manual" mode

The procedure to start Manual mode operation is as follows:



Note

In Manual mode, when you start evaluation within an hour after executing volume relocation, creating Tier pools, or adding/deleting FTVs, the evaluation information may not be sufficient for accurate evaluation.

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Tier pool] on the [Automated Storage Tiering] pane.
The current registered Tier pools are displayed on the Main pane.
5. Check the Tier pool checkbox in which is specified Tiering policy for Manual mode on the Main pane.
6. Click [Evaluation] under the [Automated Storage Tiering] on the [Action pane].

The procedure to check evaluation result and perform volume relocation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.

3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Overview] on the [Automated Storage Tiering] pane.
The evaluation results are displayed on the Main pane.
5. Check the evaluation result checkbox which performs the volume relocation on the Main pane.
6. Click [Execute] under the [Automated Storage Tiering] on the [Action pane].
The volume relocation begins.

4.2 Relocation of volume

For checking the progress of volume relocation, select [Overview] on the [Automated Storage Tiering] pane.

The following items are displayed in the [overview]:

| Item | Description |
|----------------------|---|
| Date | Date and time of evaluating performance data |
| Tier Pool Name | Tier pool name which contains the volume |
| FTV Number | Volume number |
| FTV Name | Volume name |
| Policy Name | Tiering policy name which is applied to the Tier pool |
| Execute Mode | Operation mode for Tiering function <ul style="list-style-type: none"> - Auto - Semi-Auto - Manual |
| Move to High | Percentage (%) of data to be migrated from "Low" and "Middle" to "High" |
| Move to Middle(up) | Percentage (%) of data to be migrated from "Low" to "Middle" |
| Move to Middle(down) | Percentage (%) of data to be migrated from "High" to "Middle" |
| Move to Low | Percentage (%) of data to be migrated from "High" and "Middle" to "Low" |
| Status | Current status (progress) of relocation <ul style="list-style-type: none"> - Evaluated: Volume which is a target of relocation in "Semi-Auto" mode - Reallocating: Volume for which relocation is currently in progress - Waiting: Volume which is a target of relocation and waiting for execution - Suspended: Volume which is stop relocation |
| Progress | Current progress of volumes |

4.2.1 Stop of volume relocation

When the status of volume relocation is "Reallocating" or "Waiting", you can stop the volume relocation.

When stop a volume relocation, evaluation must be performed once again.

The procedure to stop volume relocation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.

4. Click [Overview] on the [Automated Storage Tiering] pane.
The evaluation result is displayed on the Main pane.
5. Check the evaluation result checkbox to be stopped the volume relocation on the Main pane.
6. Click [Stop] under the [Automated Storage Tiering] on the [Action pane].
The volume relocation is stopped.
7. Click [Reload Status] under the [Automated Storage Tiering] on the [Action] pane.
The status of volume relocation will be "Suspended".

4.2.2 Deletion of volume relocation

When the status of volume relocation is "Evaluated" or "Suspended", you can delete the information of volume relocation.

The procedure to delete the information of volume relocation is as follows:

1. Click [Storage] on the Global navigation tab.
The current registered ETERNUS Disk storage systems are displayed on the Main pane.
2. Select a target ETERNUS Disk storage system on the Main pane.
3. Click [Automated Storage Tiering] on the Category pane.
4. Click [Overview] on the [Automated Storage Tiering] pane.
The evaluation result is displayed on the Main pane.
5. Check the information of volume relocation checkbox to be deleted on the Main pane.
6. Click [Delete] under the [Automated Storage Tiering] on the [Action pane].
7. Click [Reload Status] under the [Automated Storage Tiering] on the [Action] pane.
The information of volume relocation will be deleted.

4.3 Revision of operation

For revising operation, check the log of volumes which is relocated by Automated Storage Tiering function.

Select [Overview] on the [Automated Storage Tiering] pane to check the status of volume relocation.

Moreover, you can check the log of past relocations by selecting the [History] tab on the [Tier Pool Details] screen.

The following items are displayed on the [History] tab:

| No. | Item Name | | Meaning | Remarks |
|-----|--------------|--------|-------------------------------|--|
| 1 | FTV Number | | Volume number | - |
| 2 | FTV Name | | Volume alias name | - |
| 3 | FTV Capacity | | Total capacity of FTV | The unit of display is MB, GB, or TB, according to the actual capacity. |
| 4 | Latest | Update | Completion time for migration | - |
| 5 | | Status | Result of volume relocation | One of the followings is displayed. - Nomal Finished - Error Finished - Normal Suspended - Error Suspended - Unexecuted |

| No. | Item Name | | Meaning | Remarks |
|-----|-----------|------------|-------------------------------|--|
| 6 | | Used Ratio | Tier pool usage rate | Display of percentage per tier, based on "100" as the total physical capacity assigned to the FTV. |
| 7 | Last Time | Update | Completion time for migration | - |
| 8 | | Status | Result of volume relocation | One of the followings is displayed. <ul style="list-style-type: none"> - Nomal Finished - Error Finished - Normal Suspended - Error Suspended - Unexecuted - - (hyphen) |
| 9 | | Used Ratio | Tier pool usage rate | Display of percentage per tier, based on "100" as the total physical capacity assigned to the FTV. |

You can revise Tier pool contents by confirming the detailed information on each Tier pool.

Select the relevant Tier pool from the Tier pool overview to display the detailed information on each Tier Pool.

Items that can be displayed are listed follow.

The following items are displayed on the [Basic] tab:

| No. | Item Name | Meaning | Remarks |
|-----|----------------|--------------------------------------|--|
| 1 | Pool Number | Flexible Tier Pool number | - |
| 2 | Pool Name | Flexible Tier Pool name | - |
| 3 | FTRP Status | Flexible Tier Pool status | One of the followings is displayed. <ul style="list-style-type: none"> - Available - Exposed - Partially Readyng - Readyng - Maintenance - Broken - Data Lost - No Disk Path - Unknown |
| 4 | Total Capacity | Total capacity of Flexible Tier Pool | The unit of display is MB, GB, or TB, according to the actual capacity. |
| 5 | Used Capacity | Used capacity of Flexible Tier Pool | The unit of display is MB, GB, or TB, according to the actual capacity. |
| 6 | Alarm Status | Alarm status of Flexible Tier Pool | One of the followings is displayed. <ul style="list-style-type: none"> - Normal - Warning - Caution |

| No. | Item Name | Meaning | Remarks |
|-----|------------|---|---|
| | | | - N/A |
| 7 | Use Rate | Use rate (%) of Flexible Tier Pool | Displays a hyphen "-" if total capacity is "0". |
| 8 | Warning | Warning threshold value of Flexible Tier Pool (%) | - |
| 9 | Caution | Caution threshold value of Flexible Tier Pool (%) | Displays a hyphen "-" when caution threshold is disabled. |
| 10 | Encryption | Encryption status of Flexible Tier Pool | One of the followings is displayed. - Yes - No - Unknown |

The following items are displayed on the [Sub Pool] tab:

| No. | Item Name | Meaning | Remarks |
|-----|-------------|------------------------------|---|
| 1 | FTSP Number | FTSP number and its Sub Pool | - |
| 2 | FTSP name | FTSP name | - |
| 3 | Disk | Disk attribution | One of the followings is displayed. - SSD - Online - Nearline - SED-SAS - Unknown |
| 4 | Reliability | Reliability of FTSP | One of the followings is displayed. - High Performance(RAID1+0) - High Capacity(RAID5) - High Reliability(RAID6) - Mirroring(RAID1) - Striping(RAID0) - Unknown |
| 5 | FTSP Status | FTSP status | One of the followings is displayed. - Available - Exposed - Partially Ready - Ready - Maintenance - Broken - Data Lost - No Disk Path - Unknown |

| No. | Item Name | Meaning | Remarks |
|-----|-------------------|------------------------------------|--|
| 6 | Total Capacity | Total capacity of FTSP | The unit of display is MB, GB, or TB, according to the actual capacity. |
| 7 | Used Capacity | Used capacity of FTSP | The unit of display is MB, GB, or TB, according to the actual capacity. |
| 8 | RAID Group NO | RAID Group number included in FTSP | - |
| 9 | CM Number | Responsible CM for RAID Group | - |
| 10 | RAID Group Status | Status of RAID Group | - |
| 11 | Stripe Depth | Stripe depth | One of the followings is displayed. - 64 - 128 - 256 - 512 - 1024 - - (hyphen) |

The following items are displayed on the [Volume] tab:

| No. | Item Name | Meaning | Remarks |
|-----|----------------|--|---|
| 1 | FTV Number | Volume number | - |
| 2 | FTV Name | Volume alias name | - |
| 3 | Status | Volume status | Same status as for Open volume is displayed. |
| 5 | Encryption | Encryption status of volume | One of the followings is displayed. - Yes - No - Unknown |
| 6 | Total Capacity | Total capacity of volume (MB) | - |
| 7 | Used Capacity | Used capacity (MB) | - |
| 8 | Alarm | Alarm status of volume | One of the followings is displayed. - Normal - Caution - N/A |
| 9 | Caution | Caution threshold value | - |
| 10 | Priority FTSP | FTSP name allocated with higher priority | Set to "Auto" if not specified otherwise. |

Chapter 5 Operational Maintenance

This chapter describes operational maintenance for the Optimization Option.

5.1 Collect the troubleshooting data

Use the Web Console to collect the troubleshooting data.

For information on how to collect the data, refer to "Collect the troubleshooting data" in the "ETERNUS SF Web Console Guide".

5.2 Environment backup for Optimization Option

To prepare for possible errors in the Optimization Option environment, back up the environment for the Optimization Option.

Back up Storage Cruiser's manager to back up the Optimization Option environment.

For information on Storage Cruiser's manager backup, refer to "Backup of Manager" in the "ETERNUS SF Storage Cruiser Operation Guide".

5.3 Environment restoration for Optimization Option

If an error occurs in the Optimization Option environment, restore the Optimization Option environment.

Restore Storage Cruiser's manager to restore the Optimization Option environment.

For information on Storage Cruiser's manager restoration, refer to "Restoring Manager" in the "ETERNUS SF Storage Cruiser Operation Guide".

For restoring the Optimization Option environment after reinstalling of Storage Cruiser's manager, make sure to fully complete the installation and setup.

For details on installation and setup procedures, refer to "Installation of ETERNUS SF Manager" and "Setup of ETERNUS SF Manager" in the "ETERNUS SF Installation and Setup Guide".