

ETERNUS SF Express V15.0

Operation Guide

Windows/Linux

B1FW-5962-02ENZ0(01)
May 2012

Preface

Purpose

This manual gives an overview of ETERNUS SF Express. ETERNUS SF Express is part of the following Storage Management Software ETERNUS SF products (hereafter referred to as "ETERNUS SF series"):

- ETERNUS SF Express (hereafter referred to as "Express")
- ETERNUS SF Storage Cruiser (hereafter referred to as "Storage Cruiser")
- ETERNUS SF AdvancedCopy Manager (hereafter referred to as "AdvancedCopy Manager")

Express is the software that enables you to easily install and operate a storage system.

Intended Reader

This manual is intended for people who are considering installing Express or who want an overall understanding of the product.

Readers will gain an understanding of the Express functions from this manual.

Organization

This manual is composed as follows:

Chapter 1 Overview

This chapter gives an overview of Express.

Chapter 2 Flow to Operation

This chapter explains the workflow from installing to operating a storage system.

Chapter 3 Configuration

This chapter explains how to configure the operating environment of a storage system using Express.

Chapter 4 Operation

This chapter explains how to operate a storage system using Express.

Chapter 5 Maintenance

This chapter explains the maintenance of Express.

Appendix A Advanced Copy Function

This appendix explains Advanced Copy function.

Appendix B Commands

This appendix explains commands.

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	Windows Server 2003	Windows
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		

Formal name	Abbreviation	
Microsoft(R) Windows Server(R) 2003 R2, Enterprise Edition Microsoft(R) Windows Server(R) 2003 R2, Enterprise x64 Edition		
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 Microsoft(R) Windows Server(R) 2008 R2 Enterprise Microsoft(R) Windows Server(R) 2008 R2 Datacenter	Windows Server 2008 R2	
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	
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 V5.1 AIX 5L V5.2 AIX 5L V5.3	AIX	
VMware(R) Infrastructure 3 Foundation VMware(R) Infrastructure 3 Standard VMware(R) Infrastructure 3 Enterprise	VMware Infrastructure 3	VMware

Formal name	Abbreviation
VMware vSphere(R) 4 Essentials VMware vSphere(R) 4 Essentials Plus VMware vSphere(R) 4 Standard VMware vSphere(R) 4 Standard Plus Data Recovery VMware vSphere(R) 4 Advanced VMware vSphere(R) 4 Enterprise VMware vSphere(R) 4 Enterprise Plus	VMware vSphere 4
VMware vSphere(R) 5 Essentials VMware vSphere(R) 5 Essentials Plus VMware vSphere(R) 5 Standard VMware vSphere(R) 5 Standard Plus Data Recovery VMware vSphere(R) 5 Enterprise VMware vSphere(R) 5 Enterprise Plus	VMware vSphere 5

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 Disk storage system
Web GUI of ETERNUS DX series	ETERNUS Web GUI

Software products

Formal name	Abbreviation
Microsoft(R) Internet Explorer(R)	Internet Explorer
Mozilla(R) Firefox(R)	Firefox

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

Export Administration Regulation Declaration

This document may contain specific technologies that are covered by International Exchange and International Trade Control Laws. In the event that such technology is contained, when exporting or providing the document to non-residents, authorization based on the relevant laws is required.

Trademarks

- Microsoft, Windows, Windows Server, Windows XP, Windows Vista, Windows 7 and Internet Explorer are trademarks or registered trademarks of Microsoft Corporation in the United States and other countries.
- UNIX is a registered trademark exclusively licensed for X/Open Company Limited.
- Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.
- Linux is a trademark or registered trademark of Mr. Linus Torvalds in the United States and other countries.
- Red Hat, Red Hat Shadow Man logo, RPM, RPM logo and Glint are registered trademarks of Red Hat, Inc.
- SUSE is a registered trademark of Novell, Inc, in the United States and other countries.
- HP-UX is a registered trademark of Hewlett-Packard Company.
- IBM, AIX and AIX 5L are trademarks or registered trademarks of International Business Machines Corporation in the United States and other countries.
- VMware, VMware logo, Virtual SMP and VMotion are the registered trademarks or trademarks of VMware, Inc in the US and in other countries.
- All other trademarks and product names are the property of their respective owners.

Shipment date and revision history

Shipment date	Revision	Manual code
January 2012	1	B1FW-5962-01ENZ0(00) / B1FW-5962-01ENZ2(00)
January 2012	1.1	B1FW-5962-01ENZ0(01) / B1FW-5962-01ENZ2(01)
March 2012	1.2	B1FW-5962-01ENZ0(02) / B1FW-5962-01ENZ2(02)
April 2012	2	B1FW-5962-02ENZ0(00) / B1FW-5962-02ENZ2(00)
May 2012	2.1	B1FW-5962-02ENZ0(01) / B1FW-5962-02ENZ2(01)

Notes

- No part of this manual may be reproduced without permission.
- This manual is subject to change without advance notice.

Copyright

Copyright 2012 FUJITSU LIMITED

Update history

Content of update	Updated section	Revision
Added the operation on Model upgrade for ETERNUS Disk storage system.	4.6	2.1

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.
	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	
Deciding if a version upgrade is required	common	- ETERNUS SF Migration Guide	- 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	- 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	- 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	- Starting and stopping the software - Device monitoring - Data backup/restore 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	- Starting and stopping the software - Device monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance	

Purpose	Related products (NOTE)	Manual	Main contents	How to read
		- Storage Cruiser Operation Guide for Optimization Option	<ul style="list-style-type: none"> - Command reference - Operating environment construction - Operating status monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference 	
	EXP, ACM	- ETERNUS SF Operation Guide for Copy Control Module	- Starting and stopping the software	
	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 	
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 	Please read if you want to learn the meaning of important terms, product specific terms or abbreviations used in the manuals.

Purpose	Related products (NOTE)	Manual	Main contents	How to read
			- Proper form of abbreviated terms	

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

Contents

Chapter 1 Overview.....	1
1.1 Overview of a storage system.....	1
1.2 Function overview of Express.....	1
1.3 System configuration.....	2
Chapter 2 Flow to Operation.....	6
2.1 Flow from installation to operation.....	6
Chapter 3 Configuration.....	9
3.1 A setup required in advance.....	9
3.2 Checking the connection from Web Console.....	9
3.3 Registering disk storage systems.....	10
3.4 Registering servers.....	10
3.5 Event notification test.....	10
3.5.1 Procedure for SNMP Trap reception test.....	10
3.5.2 Procedure for e-mail send test.....	11
3.6 Environment configuration using wizard.....	11
Chapter 4 Operation.....	13
4.1 Resource management.....	13
4.1.1 Operations for ETERNUS Disk storage system.....	13
4.1.2 Operations related to servers.....	13
4.1.3 Operations related to RAID group.....	14
4.1.4 Operations related to Volume.....	14
4.1.5 Operations related to Thin Provisioning.....	14
4.1.6 Operations related to Component Information for Storage Device.....	14
4.1.7 Operations related to Connectivity for Storage Device.....	15
4.1.8 Operations for System management.....	15
4.1.9 Operations related to Advanced Copy.....	16
4.2 Performance management.....	16
4.2.1 Overview.....	16
4.2.1.1 Performance Information Types.....	17
4.2.1.2 Performance Graph Window Types.....	18
4.2.2 Flow of Performance Management.....	18
4.2.2.1 Checking disk space on the administrative server.....	19
4.2.2.2 Instruction for performance management.....	19
4.2.2.3 Setting monitoring intervals.....	19
4.2.2.4 Displaying performance information of the selected device.....	20
4.2.2.5 Displaying storage performance information.....	20
4.2.2.5.1 Displaying Logical Volume and RAID Group performance information.....	20
4.2.2.5.2 Displaying disk (physical drive) performance information.....	20
4.2.2.5.3 Displaying CM performance information.....	20
4.2.2.5.4 Displaying CM Port performance information.....	20
4.2.2.5.5 Displaying the number of active disks, power consumption, and temperature performance information.....	20
4.2.2.6 Examples of use of performance management.....	20
4.2.2.7 Instruction for stopping performance management.....	21
4.2.2.8 Updating configuration information.....	21
4.3 Detecting trouble.....	21
4.3.1 Identifying the trouble condition.....	22
4.3.2 Trouble analysis.....	24
4.3.3 Trouble response.....	24
4.4 Executing Advanced Copy.....	24
4.4.1 Connection type settings.....	25
4.4.2 Access volume settings.....	25
4.4.3 Copy table size settings.....	26

4.4.4 Remote Advanced Copy settings.....	26
4.4.5 Creating copy group.....	27
4.4.6 Creating copy pair.....	27
4.4.7 Executing clone copy.....	27
4.4.8 Executing Snapshot copy.....	30
4.4.9 Executing remote copy (HA configuration).....	31
4.4.9.1 Operation procedure for fault occurrence on ETERNUS Disk storage system.....	32
4.4.10 Executing remote copy (DR configuration).....	33
4.4.10.1 Operation procedure for fault occurrence on ETERNUS Disk storage system.....	34
4.4.11 Checking copy status.....	35
4.4.12 Command line operation.....	35
4.5 Thin Provisioning management.....	36
4.5.1 Threshold monitoring.....	36
4.5.2 Capacity management.....	37
4.5.2.1 Capacity Graph Window Types.....	37
4.6 Model upgrade for ETERNUS Disk storage system.....	37
Chapter 5 Maintenance.....	38
5.1 Maintenance of Express's manager environment (Windows).....	38
5.1.1 Backing up Express's manager environment (Windows).....	38
5.1.2 Restoring Express's manager environment (Windows).....	41
5.1.3 Changing Express's manager environment (Windows).....	44
5.1.3.1 Changing port numbers (Windows).....	44
5.1.3.2 Changing IP address (Windows).....	47
5.2 Maintenance of Express's manager environment (Linux).....	48
5.2.1 Backing up Express's manager environment (Linux).....	48
5.2.2 Restoring Express Environment (Linux).....	50
5.2.3 Changing Express's manager environment (Linux).....	53
5.2.3.1 Changing port numbers (Linux).....	53
5.2.3.2 Changing IP address (Linux).....	55
5.3 Action required when Management Server functionality is stopped.....	56
5.4 Caution about a disk storage system managed in several Express's managers.....	56
5.5 Caution about operating the disk storage system outside Express's manager.....	56
Appendix A Advanced Copy Function.....	57
A.1 Overview of Advanced Copy function.....	57
A.1.1 What is Advanced Copy function?.....	57
A.1.2 What is Remote Advanced Copy?.....	59
A.2 Configuration of Advanced Copy function.....	60
A.2.1 Configuration common in all copy methods.....	60
A.2.2 Configuration of clone copy.....	60
A.2.3 Configuration of snapshot copy.....	60
A.2.4 Configuration for remote copy.....	62
A.3 Clone copy (EC).....	62
A.3.1 How to work.....	63
A.3.2 Restore.....	65
A.4 Clone copy (OPC).....	67
A.4.1 How to work.....	68
A.4.2 Restore.....	68
A.5 Clone copy (QuickOPC).....	69
A.5.1 How to work.....	69
A.5.2 Restore.....	71
A.6 Snapshot copy (SnapOPC+).....	71
A.6.1 How to work.....	72
A.6.2 Restore.....	74
A.6.3 SDV operations.....	74
A.6.4 SDP operation.....	74
A.7 Remote Advanced Copy (REC).....	75

A.7.1 How to work.....	76
A.7.2 Transfer buffer operations.....	81
A.7.3 Restore.....	81
A.8 Combinations of Advanced Copy.....	82
A.8.1 Multiple copy.....	82
A.8.2 Cascade copy.....	82
A.9 Eco-mode.....	83
A.10 Note on backup and restore by Express.....	83
A.11 Troubleshooting.....	83
Appendix B Commands.....	85
B.1 storageadm perfdm (Performance information management command).....	85
B.2 esfsnap (Express's manager troubleshooting information collection command).....	89
Index.....	91

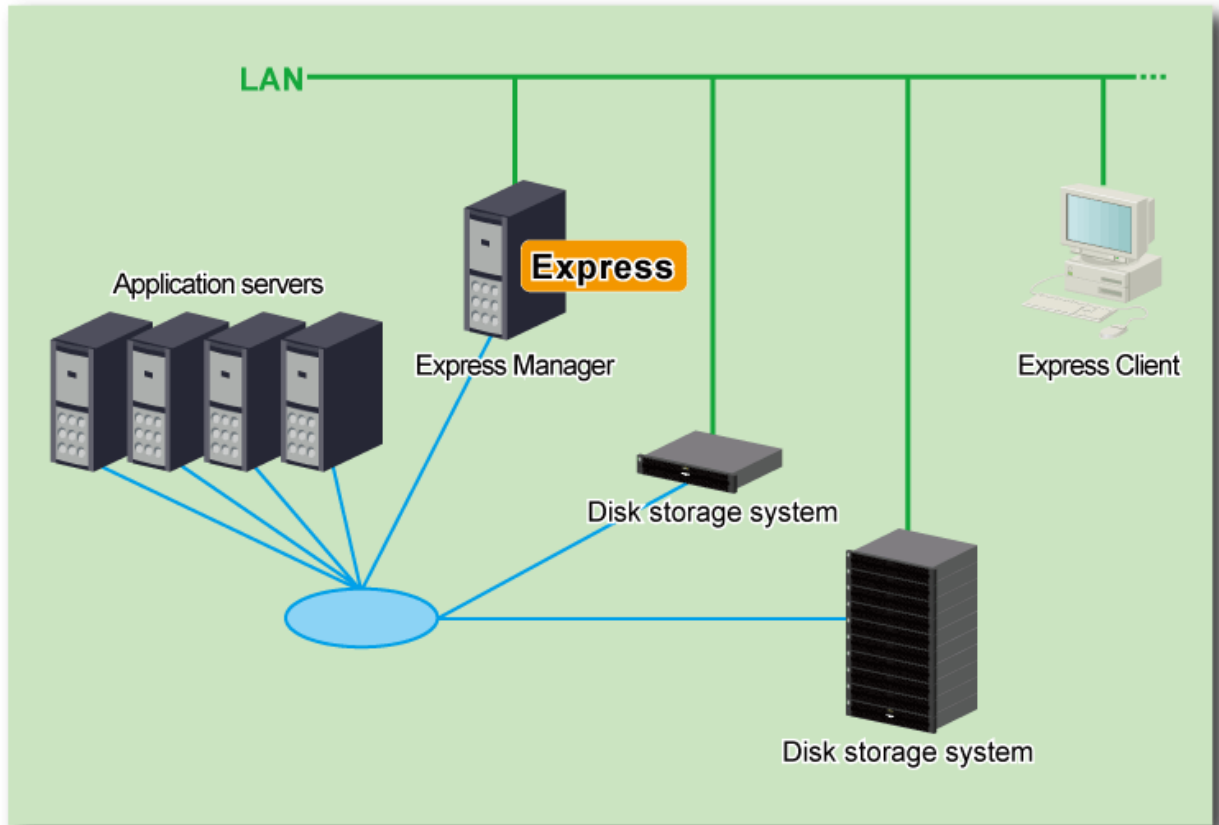
Chapter 1 Overview

This chapter gives an overview of Express.

1.1 Overview of a storage system

A storage system refers to the overall configuration of a system including servers that perform daily transactions and storage that holds data.

Figure 1.1 Overview image of a storage system



1.2 Function overview of Express

Express is designed to make management of ETERNUS Disk storage system easier than by using the GUI.

Express makes storage management less difficult thanks to the following functions:

Easy configuration and expansion

This software can be easily configured with the configuration wizard.

Even without prior experience of ETERNUS Disk storage systems configuration and setup, volume creation in ETERNUS Disk storage system can be done with a wizard. ETERNUS Disk storage systems and volumes can also be added later with only a few clicks in the wizard.

Express provides the following wizard.

- Storage configuration wizard
- Volume allocation wizard

- Advanced Copy configuration wizard
- Remote Advanced Copy configuration wizard

Easy operation

What to do, how to do it: operation target and method can be selected directly on the screen in ETERNUS SF Web Console. Therefore, operation procedures are no longer difficult to understand.

ETERNUS SF Web Console allows Express operation directly from a Web browser. In this manual, ETERNUS SF Web Console will be referred hereafter as "Web Console".

As several ETERNUS Disk storage systems can be managed, monitored and operated in the same Web Console, it is not necessary anymore to physically go to the various managed systems locations, switch between browser windows, etc.

With Express, Web Console operation can be performed without having to end the current tasks on the computer.

Easy troubleshooting

When a problem occurs, the user can determine the cause and scope of the problem before calling to report it. Easy to understand messages makes it possible to understand the cause of a problem without prior expert storage knowledge. Advice on how to handle the problem can be displayed by clicking on the message.

Data copy

Express provides the following copy functions for copies within an ETERNUS Disk storage system or to a remote ETERNUS Disk storage system. These copy functions uses the Advanced Copy function of ETERNUS Disk storage system.

- Clone copy (EC)
- Clone copy (OPC)
- Clone copy (Quick OPC)
- Snapshot copy (SnapOPC+)
- Remote Copy (REC)
 - Synchronous mode
 - Consistency mode
 - Stack mode

Operations can be performed from the GUI or the Command Line Interface (CLI). The operations through the GUI are simple. The CLI allows integration in a script, use of the OS scheduler for preset copy tasks, etc. in a customizable manner.

Point

.....

Snapshot copy (SnapOPC+) is supported for up to 8 sessions without an Advanced Copy hardware license (hereafter, "Advanced Copy license") registered for the ETERNUS Disk storage system. However, for 9 or more SnapOPC+ sessions or other copy functions, the necessary licenses must be registered.

For details on the license, refer to "License Management" in the "ETERNUS SF Installation and Setup Guide".

.....

Performance management

The use of the Web Console makes it possible to display in a graph the 24-hour performance information of ETERNUS Disk storage system.

In addition, the command line operation makes it possible to output 1-hour or 24-hour performance information of ETERNUS Disk storage system into a CSV file.

1.3 System configuration

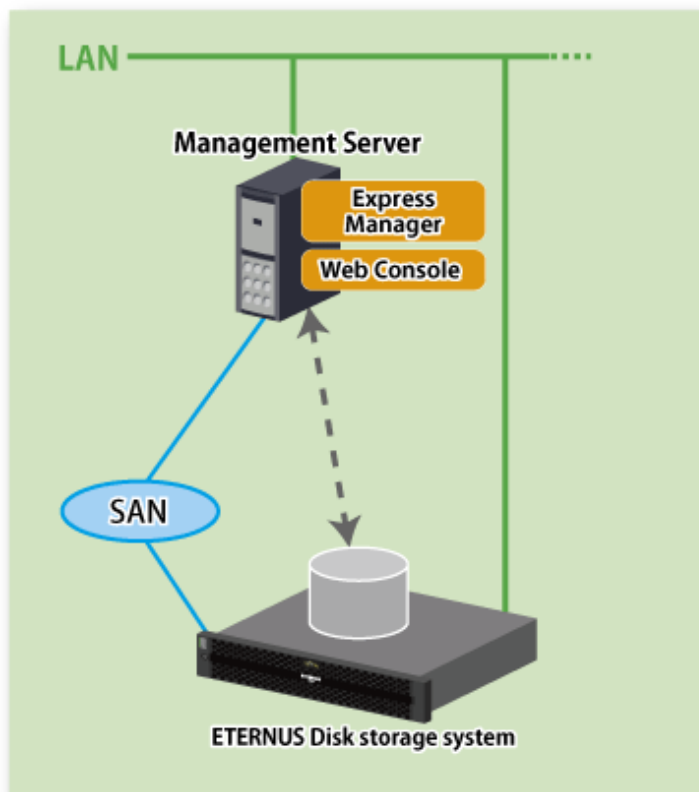
Express can manage one or more storage devices.

Express can operate in various system configurations such as the ones described in this section.

Basic system configuration

In this configuration, Express's manager and Web Console are operated on the same server.

Figure 1.2 Example of basic system configuration



The Express's manager and Web Console can be operated on different servers. In this environment, Web Console accesses to the Express's manager over the network (HTTPS connection).

System configuration using the Advanced Copy function

In Express, the Management Server sends a command to ETERNUS Disk storage system to perform an Advanced Copy function. There are two available methods for sending the copy command:

- Sending a command to ETERNUS Disk storage system to perform an Advanced Copy function from the server over the SAN (hereafter referred to as "Copy command via SAN")
- Sending a command to ETERNUS Disk storage system to perform an Advanced Copy function from the server over the LAN (hereafter referred to as "Copy command via LAN")

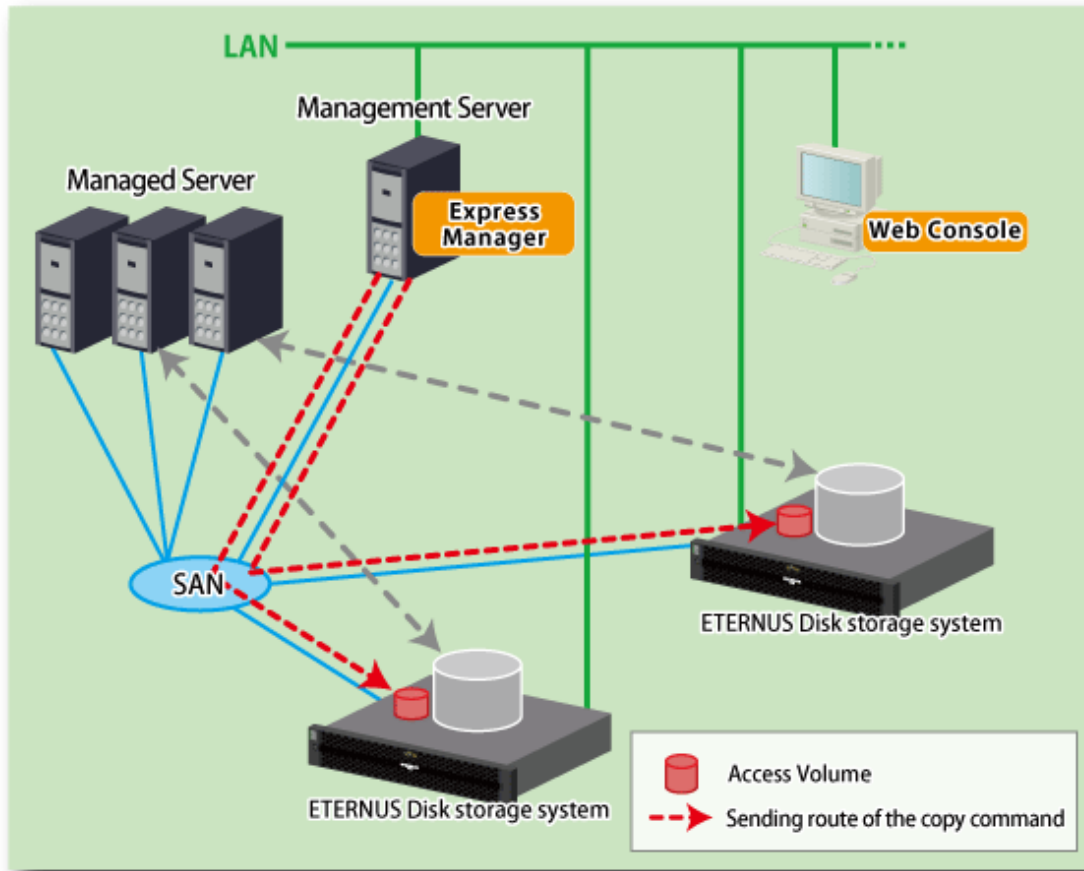
The following table describes the requirements for the two copy methods, via SAN or via LAN, for each type of system:

Device name	Copy command via SAN		Copy command via LAN	
	Operation	Firmware version	Operation	Firmware version
ETERNUS DX60/DX60 S2/DX80/DX90	A	All versions	N/A	-
ETERNUS DX80 S2/DX90 S2	A	All versions	A	All versions

(A=Available, N/A=Not Available)

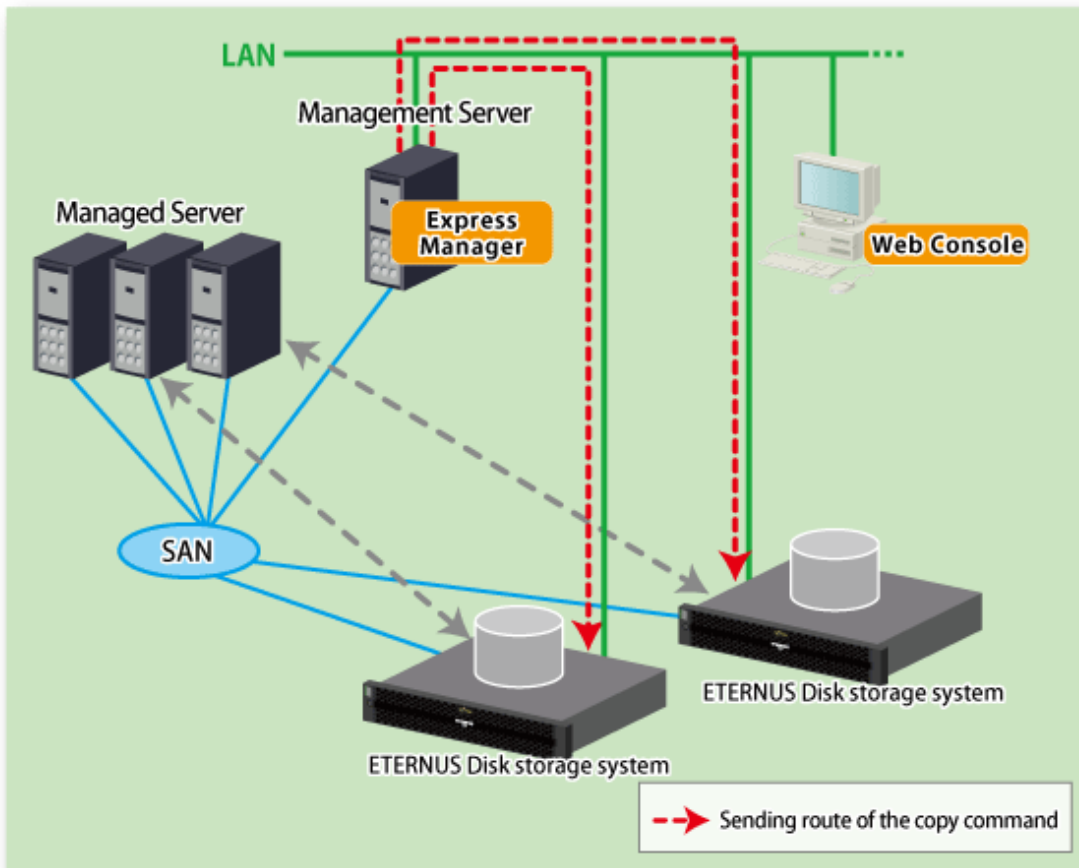
When using the Copy command via SAN method, a logical volume that can be accessed from the Management Server is needed in ETERNUS Disk storage system. In this manual, this logical volume is called "access volume". One logical volume of ETERNUS Disk storage system must be assigned to Management Server as the access volume.

Figure 1.3 Example of system configuration using Copy command via SAN



When using the Copy command via LAN method, no access volume is needed.

Figure 1.4 Example of system configuration using Copy command via LAN



 See

For details about setting up a redundant configuration, refer to "4.4.9 Executing remote copy (HA configuration)".
For details about setting up a disaster recovery configuration, refer to "4.4.10 Executing remote copy (DR configuration)".

Chapter 2 Flow to Operation

This chapter describes the required information before installation.

2.1 Flow from installation to operation

The "[Figure 2.1 Flow from installing to operating a storage system](#)" shows a flow from installation of a storage system to its operation in Express.

This manual explains the environment configuration, operation and maintenance of Express.

For installation and setting up Express, refer to the following manual.

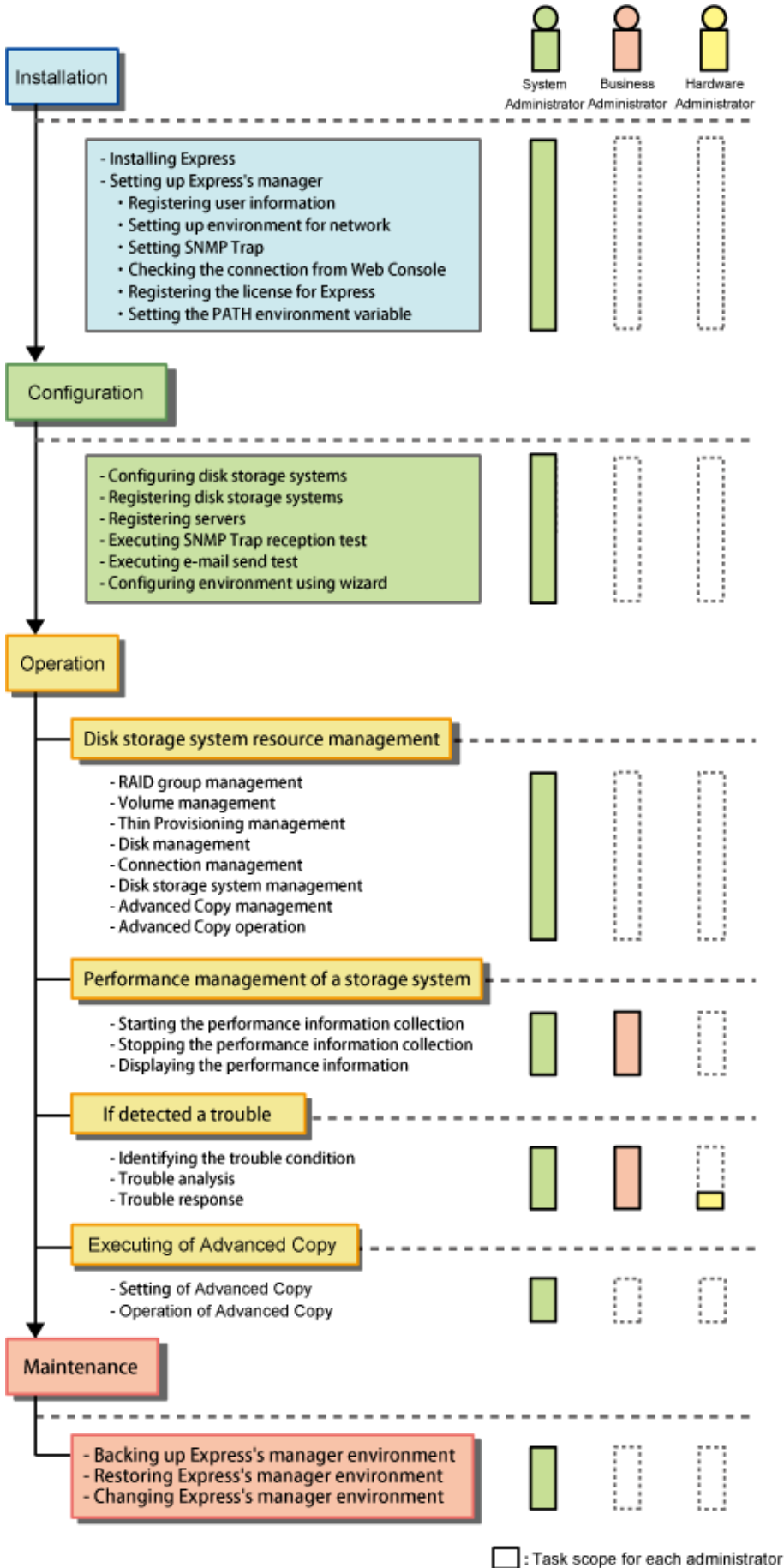
In the case of installation of Express:

ETERNUS SF Installation and Setup Guide

In the case of upgrading from a previous version to the latest version:

ETERNUS SF Migration Guide

Figure 2.1 Flow from installing to operating a storage system



Express defines the role of each administrator for installing and operating a storage system as follows.

Table 2.1 Roles of administrators

Administrator	Task
System administrator	Manages design through operation of storage systems. Handles all the tasks required to operate storage systems.
Business administrator	Manages business operations performed on servers. Performs backup and restore of business data and handles failures affecting managed business operations.
Hardware administrator	Manages storage system hardware. Handles hardware failures.

 **Information**

Administrator to be registered and required privileges:

To use Express, it is necessary to register Administrator user information on the server on which to install Express.

System administrator must be registered. Register Business administrator and Hardware administrator as required.

For privileges given to each administrator, refer to "Registering user account for using Express" in the "ETERNUS SF Installation and Setup Guide".

Chapter 3 Configuration

This chapter describes the configuration procedures of storage system operating environment by using Express.

3.1 A setup required in advance

In order to manage ETERNUS Disk storage system using Express, it is necessary to configure ETERNUS Disk storage system in advance.

Please set up the following item by using the ETERNUS Web GUI.

For more information, refer to the ETERNUS Web GUI manuals.

- Check the IP address of the Management Server.
When the Management Server exists in a different subnet from where ETERNUS Disk storage system belongs, make sure that the IP address of the Management Server is registered in "Access permission list for outside of the subnet" on "Setup environment for network" screen. If it is not registered, register it.
- Enable the SNMP function of MNT port on the "Setup SNMP Agent" screen.
- Check the ETERNUS Disk storage system names displayed in the "Name" column on the "Modify Storage System Name" screen.
When using Advanced Copy functions, specify 16 or less alphanumeric characters for ETERNUS Disk storage system name.
- When you connect iSCSI, specify "Enable" the use of iSNS server in the target port.

For ETERNUS DX80 S2/DX90 S2, in addition to the above, please execute the following settings:

- Create a new SSH server key.
In the ETERNUS Web GUI "Create SSH Server Key" screen, create a new SSH server key. The number of bits for the key is at your discretion.
- Create a Software Role Account with the account information in the ETERNUS Web GUI "Setup User Account" screen.
Use this account information during the remaining of the procedure.
- If a SNMP community name is not already set for ETERNUS Disk storage system, create the SNMP community name in the "Setup SNMP Community" screen in the ETERNUS Web GUI.



Note

Make sure to logout from the ETERNUS Web GUI if the setting up is completed.

3.2 Checking the connection from Web Console

From the next section on, the described tasks are supposed to be performed from the Web Console.

Launch the Web Console and login, and then check that the initial screen is displayed.



See

For the version level of the supported web browsers and methods for launching and logging into the Web Console, refer to the "ETERNUS SF Web Console Guide".

3.3 Registering disk storage systems

In order to manage disk storage systems, first of all it is necessary to register disk storage systems to be managed.

Disk storage systems can be registered by using the Web Console.

For details on the operation procedures, refer to "Register ETERNUS Disk storage system" in the "ETERNUS SF Web Console Guide".

3.4 Registering servers

In order to assign volume to a server using Express, it is necessary to register the target server in advance.

Using the Web Console, register a server to be managed by Express.

For details on the operation procedures, refer to "Register the server" in the "ETERNUS SF Web Console Guide".

Then, add HBA to the registered server.

For details on the operation procedures, refer to "Add the HBA" in the "ETERNUS SF Web Console Guide".



Registration of a server and the addition of HBA can be performed using the Storage configuration wizard. For details about the Storage configuration wizard, refer to "3.6 Environment configuration using wizard".

3.5 Event notification test

Express performs the fault monitoring by processing events that are asynchronously reported by SNMP Trap from ETERNUS Disk storage system. Therefore, check that the SNMP Trap settings are correctly done.

By sending e-mail to the destination address configured in advance when an abnormality occurs in the device, it is possible to notify its abnormality to the system administrator and business administrator immediately.

This section describes the procedure for SNMP Trap reception test and e-mail send test.

3.5.1 Procedure for SNMP Trap reception test

Check that the Management Server can receive SNMP Trap.

Perform the following procedure to execute a SNMP Trap reception test.

1. Launch the ETERNUS Web GUI.
2. On the ETERNUS Web GUI, check that SNMP Trap destination from ETERNUS Disk storage systems is an IP address of the Management Server.
SNMP Trap destination is automatically specified when ETERNUS Disk storage system is registered. Also, it can be manually specified on the ETERNUS Web GUI.
3. On the ETERNUS Web GUI, send the SNMP Trap.
For more information, refer to the ETERNUS Web GUI manuals.
4. On the Web Console, check that the message has been displayed in the event log.
SNMP Trap Test has been completed successfully if the message including the character string of "SNMP Trap Test" is displayed in the body of the message.

If the message has not been displayed, check the SNMP community name and SNMP Trap destination in the ETERNUS Disk storage system settings. In addition, check that the network settings (e.g. firewall setting) is correct. Then, send the SNMP Trap on the ETERNUS Web GUI again.

3.5.2 Procedure for e-mail send test

Check whether e-mail can be received at the specified e-mail address or SMTP server IP address.

Using the Web Console, check that the e-mail destination address is set up and then send test e-mail.

For details on the operation procedures, refer to "Send the test e-mail" in the "ETERNUS SF Web Console Guide".



Note

If an event notification e-mail destination address has been set, a test e-mail is sent to the e-mail destination address whether or not an event notification e-mail has been set to send.

The test e-mail is sent only to the business administrator and system administrator.

3.6 Environment configuration using wizard

Even without prior experience of ETERNUS Disk storage systems configuration and setup, the volume created in ETERNUS Disk storage system can be assigned to the server with a wizard.

In addition, when not using a wizard, it is necessary to perform the Remote Advanced Copy settings to each ETERNUS Disk storage system. However, if using a wizard, two ETERNUS Disk storage systems can be simultaneously set up.

Express provides the following wizards.

Storage configuration wizard

This wizard can register new server and assign volumes created in ETERNUS Disk storage system to new server. In addition, volumes to be assigned can be created in this wizard.

Volume allocation wizard

This wizard can assign volumes created in ETERNUS Disk storage system to the registered server.

Advanced Copy configuration wizard

This wizard can configure the copy table size and Snap Data Pool policy required for Advanced Copy operation.

Remote Advanced Copy configuration wizard

This wizard can configure the copy table size and copy route connection required for Remote Advanced Copy (REC) operation.

Wizard name	Flow of operation
Storage configuration wizard	<ol style="list-style-type: none">1. Register the server and add HBA2. Select ETERNUS Disk storage system to connect with the server3. Create RAID group (optional)4. Create volume (optional)5. Assign volume to the server<ol style="list-style-type: none">5-1. Register host5-2. Create Affinity group5-3. Add Host Affinity
Volume allocation wizard	<ol style="list-style-type: none">1. Select the server2. Assign volume to the server<ol style="list-style-type: none">2-1. Register host2-2. Create Affinity group2-3. Add Host Affinity
Advanced Copy configuration wizard	<ol style="list-style-type: none">1. Configure the copy table size

Wizard name	Flow of operation
	2. Configure Snap Data Pool policy (optional)
Remote Advanced Copy configuration wizard	<ol style="list-style-type: none"> 1. Select ETERNUS Disk storage system to connect with remote site 2. Configure the copy table size 3. Configure REC path 4. Configure REC buffer (in the case that Asynchronous Consistency mode is used)

Without using these wizards, each operation can be executed. For the executable operations, refer to "[4.1 Resource management](#)".

Chapter 4 Operation

This chapter describes the procedure to operate the disk storage system using Express.

4.1 Resource management

Various functions can be used on the Web Console to the disk storage system registered into Express.



See

For details on the operation procedures using the Web Console, refer to "Web Console Operation Method" in the "ETERNUS SF Web Console Guide".

4.1.1 Operations for ETERNUS Disk storage system

Express can execute operations related to ETERNUS Disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display ETERNUS Disk storage system
- Delete ETERNUS Disk storage system
- Change ETERNUS Disk storage system information
- Set and change the information of the account who can access ETERNUS Disk storage system
- Change the storage system name for ETERNUS Disk storage system
- Change the Box ID for ETERNUS Disk storage system
- Configure ETERNUS Disk storage system
- Assign ETERNUS Disk storage system volumes to a server
- Reload ETERNUS Disk storage system configuration information

4.1.2 Operations related to servers

Express can execute operations related to servers.

Using the Web Console, select the server, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the server
- Delete the server
- Change the server information
- Reload the server configuration information
- Add the HBA
- Delete the HBA

4.1.3 Operations related to RAID group

Express can execute operations related to RAID groups in the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the RAID group
- Display the RAID group details
- Create and delete the RAID group
- Configure the RAID group Eco-mode

4.1.4 Operations related to Volume

Express can execute operations related to volumes in the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the volume
- Create and delete the volume
- Forcible delete the volume
- Format the volume
- Expand the Thin Provisioning Volume capacity
- Start and stop the Thin Provisioning Volume restriping

4.1.5 Operations related to Thin Provisioning

Express can execute operations related to Thin Provisioning in the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the Thin Provisioning Pool
- Display the Thin Provisioning Pool status
- Create and delete the Thin Provisioning Pool
- Change the Thin Provisioning Pool threshold value
- Display the Thin Provisioning Pool capacity graph
- Expand the Thin Provisioning Pool capacity
- Format the Thin Provisioning Pool

4.1.6 Operations related to Component Information for Storage Device

Express can execute operations related to component information for the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the entire device information
- Display the Controller Enclosure information
- Display the Drive Enclosure Information
- Display the port information
- Display the disk information
- Register the Global Hot Spare disk
- Register the Dedicated Hot Spare disk
- Release the Hot Spare disk

4.1.7 Operations related to Connectivity for Storage Device

Express can execute operations related to connectivity for the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the storage port list
- Display the FC port Information, iSCSI port information and SAS port information
- Change the FC port settings, iSCSI port settings and SAS port settings
- Display the number of hosts for port type
- Add the FC host, iSCSI host and SAS host
- Display the Affinity/LUN group list
- Create, delete and change the affinity/LUN group
- Display the Host Affinity list
- Create and delete the Host Affinity
- Display the Host Response list
- Add, delete and change the Host Response



Note

The iSCSI-RA port Transfer Rate cannot be changed in the Web Console.

If it needs to be changed, use the ETERNUS Web GUI.

4.1.8 Operations for System management

Express can execute operations related to the disk storage system management.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Display the license
- Register and delete the license
- Display the Eco-mode

- Configure the Eco-mode
- Enable and disable the encryption mode

4.1.9 Operations related to Advanced Copy

Express can execute operations related to the Advanced Copy for the disk storage system.

Using the Web Console, select the disk storage system, and then select the process on the **Action** pane.

The executable operations are as follows.

- Configure the copy table size for Advanced Copy
- Configure the connection type for ETERNUS Disk storage system
- Display the copy group
- Create and delete the copy group
- Display the copy pair
- Create, add and delete the copy pair
- Perform the Advanced Copy
- Display the copy session
- Forcible suspend the copy session
- Forcible cancel the copy session
- Display the Snap Data Pool information
- Change the Snap Data Pool policy
- Display the REC path
- Set the REC path
- Measure the round trip time for REC path
- Display the REC buffer
- Change the REC buffer

4.2 Performance management

4.2.1 Overview

This software supports performance management for ETERNUS Disk storage systems. The performance management enables users to get details about the operation and load statuses of devices.

Additionally, by knowing the number of active disks, it is possible to verify the Eco-mode status of the ETERNUS Disk storage system.



- Do not execute performance monitoring for one ETERNUS Disk storage system from more than one server (*) at the same time.
*: Any of Management Servers of ETERNUS SF Express, Softek Storage Cruiser, ETERNUS SF Storage Cruiser and Systemwalker Resource Coordinator.
- The performance management always starts up when the administrative server starts up. For devices in which performance management settings have been configured, performance information collection starts in the background. Accordingly, performance

information is collected regardless of whether the Web Console is started or not. To stop performance information collection, execute performance management stop processing.

4.2.1.1 Performance Information Types

The following information can be managed:

	Performance information	Unit
Logical Volume RAID Group	Read/Write count	IOPS
	Read/Write data transfer rate	MB/S
	Read/Write response time	msec
	Read/Pre-fetch/Write cache hit rate	%
Disk drive	Disk busy rate	%
CM	Load (CPU usage) rate	%
	Copy remaining amount	GB
CM Port	Read/Write count	IOPS
	Read/Write data transfer rate	MB/S
Device	Number of active disks	Disk
	Power consumption	W
	Temperature	C

Note

- If there is a difference between the internal clocks of the administrative server and the target device, a time lag may occur in the performance graph.
To prevent this phenomenon, we recommend to setup NTP to stay in sync with the administrative server and the target device.
- If restarting a target device during performance management, the device may fail to acquire the correct performance information after the restart.
We recommend to stop the performance management before restarting a target device.
- Support for Logical Volume and RAID Group performance information varies according to the volume type and the ETERNUS Disk storage system model. However, we cannot guarantee the values for the RAID Group performance information including SDV.

		DX60	DX80	DX90	DX60 S2	DX80 S2	DX90 S2
Logical Volume RAID Group	Standard Volume	A	A	A	A	A	A
	Thin Provisioning Volume Thin Provisioning Pool	N/A	N/A	N/A	N/A	A	A
	Snap Data Volume Snap Data Pool Volume	N/A	N/A	N/A	N/A	N/A	N/A

(A=supported, N/A=not supported)

- Performance management cannot be done for ETERNUS Disk storage systems which do not have Logical Volume (LUN).
- The CM Port performance information for the ETERNUS Disk storage system device displays the following information.

		DX60	DX80	DX90	DX60 S2	DX80 S2	DX90 S2
CM Port	FC-CA	A	A	A	A	A	A
	FC-RA	N/A	N/A	A (*1)	N/A	N/A	A (*1)

		DX60	DX80	DX90	DX60 S2	DX80 S2	DX90 S2
	FC-CA/RA	N/A	N/A	N/A	N/A	A	A (*2)
	iSCSI-CA	A	A	N/A	A	A	A
	iSCSI-RA	N/A	N/A	N/A	N/A	N/A	A (*1)
	iSCSI-CA/RA	N/A	N/A	N/A	N/A	A	A (*2)
	FCoE	N/A	N/A	N/A	N/A	A	A
	SAS	N/A	N/A	N/A	N/A	N/A	N/A

(A=supported, N/A=not supported)

(*1)Performance information during the execution of REC is displayed as follows:

- It is displayed as Read performance information, if the port is set on the Initiator.
- It is displayed as Write performance information, if the port is set on the Target.

(*2)Performance information during the execution of REC includes the following information.

- Read performance information includes the performance information during the execution of REC, if the port is set on the Initiator.
- Write performance information includes the performance information during the execution of REC, if the port is set on the Target.
- RDB performance information cannot be displayed in environments that use the REC Disk Buffered Consistency function.

4.2.1.2 Performance Graph Window Types

It is possible to display the following graph.

One-day Graph window

Based on the mean values for 10-minute periods, a line graph for a one-day period is displayed.

Information

- Following performance values are displayed as they are obtained from the device (not their mean values).
 - CM Copy remaining amount
 - Number of active disks
 - Power consumption
 - Temperature
- If the summer time functionality of the operating system is enabled, a part of the graph that is supposed to show the data around the switch to summer time may not be displayed correctly.
- Each performance graph might not be displayed at every monitoring interval of 60 minutes depending on the LAN traffic condition or network environment, for example, the administrative server and target device of the performance monitoring exist in the different subnets.

4.2.2 Flow of Performance Management

When a user gives an instruction for performance management of a target device using the Web Console, the performance management unit for this product saves the device performance data for each device, and stores them as performance data to the Administrative server. This performance data is displayed on a graph.

4.2.2.1 Checking disk space on the administrative server

To conduct performance management, sufficient disk space is required on the administrative server for performance data storage. Make sure that sufficient disk space is ensured referring to "ETERNUS SF Installation and Setup Guide".

4.2.2.2 Instruction for performance management

When performing performance management, configure and start the performance management by using the Web Console.

Enter the range of target Logical Volume(LUN_V) that is obtained for performance information in the Web Console. Specifying the range of Logical Volume(LUN_V) reduces the effects on the disk area stored performance data and the loads resulting from obtaining performance information.

For details on the operation procedures, refer to "Start the performance monitoring" in "ETERNUS SF Web Console Guide".

Information

Since performance information is obtained internally in units of 64 for Logical Volume, performance information in the neighboring area of the Logical Volume setting is also obtained.

For example, if a range of 70 to 80 is set for Logical Volume (LUN_V) on the screen, the information of Logical Volume between 64 and 127 is obtained internally.

At this time, after instructing it to start the performance management, the monitoring range which is displayed on the Web Console is not the value specified at the start time but the value converted to units of 64.

When starting performance management, "Monitoring" is displayed on the "Performance Monitoring Status".

For details on the operation procedures, refer to "Display the performance monitoring status" in "ETERNUS SF Web Console Guide".

The following table shows the value of "Performance Monitoring Status", the corresponding status, and the appropriate actions.

Value of "Performance Monitoring Status"	Status	Appropriate action
Monitoring	Performance is being monitored. (Normal)	The action is no required.
Recovering	Performance monitoring is being recovered (e.g. device time-out).	The Express's manager cannot communicate with a disk storage system. Check the network status and the disk storage status. Log off, when ETERNUS Web GUI is in a login state.
Error	Performance monitoring error (e.g. device time-out, writing to the performance information file failed.)	The Express's manager cannot communicate with a disk storage system. Check the network status and the disk storage system status. Log off, when ETERNUS Web GUI is in a login state. In addition, check the write permission to the file and the capacity of the file system. Then, stop performance monitoring and restart it.
Stop	Performance monitoring has stopped. (Normal)	The action is no required.

However, the value of "Performance Monitoring Status" may differ in present value. Reload the setting for ETERNUS Disk storage system and make sure the system is up-to-date.

For details on the operation procedures, refer to "Reload ETERNUS Disk storage system configuration information" in "ETERNUS SF Web Console Guide".

4.2.2.3 Setting monitoring intervals

The performance information is acquired from ETERNUS Disk storage system at 60 second (fixed) intervals.

Information

In LAN traffic or cross-subnet (where there is a gateway between the performance monitoring target device and the administrative server) situations, it may not be possible to obtain the performance information inside the monitoring interval that was set. Please change the monitoring interval when you cannot acquire performance information on each monitoring interval.

Since the performance management unit is started as a daemon of the administrative server, the unit continues obtaining performance information while the administrative server is active, without starting the Web Console.

The logical configuration of the storage device is recognized, and the obtaining of performance information starts. At the start of obtaining performance information of the selected storage system, an amount of time (tens of seconds to several minutes) is spent to obtain the logical configuration before any performance information is actually obtained.

4.2.2.4 Displaying performance information of the selected device

Confirm by displaying the graph using the Web Console. In addition, the performance information can be output to the CSV format file by using the performance information operation command (storageadm perfdata).

For details on the operation procedures for Web Console, refer to "Display the performance information graph" and "Export the performance information" in "ETERNUS SF Web Console Guide".

4.2.2.5 Displaying storage performance information

4.2.2.5.1 Displaying Logical Volume and RAID Group performance information

Select the number of Logical Volume or RAID Group whose performance information you want to display in graph.

Note

The ETERNUS Disk storage system performance information about SDV are not supported. The value for the performance information about the RAID Group containing SDV also cannot be guaranteed.

4.2.2.5.2 Displaying disk (physical drive) performance information

Select the number of the disk whose performance information you want to display in graph.

4.2.2.5.3 Displaying CM performance information

Select the CM or CM CPU whose performance information you want to display in graph.

4.2.2.5.4 Displaying CM Port performance information

Select the CM Port from a list of ports whose performance information you want to display in graph.

4.2.2.5.5 Displaying the number of active disks, power consumption, and temperature performance information

Select the performance information you want to display in graph.

4.2.2.6 Examples of use of performance management

If an I/O delay from the server node to a storage system occurs, the user can check for the cause in the storage system by using the methods described below. These are only examples, so all causes of I/O delays cannot be determined by use of these methods.

1. Identify the time when the I/O processing delay occurred and the access path where the delay occurred.
2. Use this software to check the Affinity Group number and Logical Volume number of the ETERNUS Disk storage system defined in the target access path.

3. Using performance management, display and check the target Logical Volume performance values.
4. If a response of the Logical Volume unit takes a long time, check RAID Group performance. If a response of RAID Group also takes a long time, find another Logical Volume belonging to RAID Group, and find the LUNs to which the Logical Volume is allocated. Check the I/O statuses of these Logical Volumes, and check for a heavy load on RAID Group. If there is a heavy load, move the appropriate Logical Volume to another RAID Group, or take other appropriate action.

4.2.2.7 Instruction for stopping performance management

Execute performance management processing on the Web Console.

For details on the operation procedures, refer to "Stop the performance monitoring" in "ETERNUS SF Web Console Guide".

4.2.2.8 Updating configuration information

Device configuration information is independently maintained in the performance management.

To change the device configuration, update the device configuration information that is maintained by the performance management functionality according to the procedure shown below. Also perform the update if the configuration for a device that has executed performance management has been changed.

1. Record the performance monitoring settings contents (if performance monitoring is used)
<Recorded settings contents>
 - Performance monitoring targets (Minimum LUN_V, Maximum LUN_V)
2. Stop performance monitoring (if performance monitoring is used)
Refer to "[4.2.2.7 Instruction for stopping performance management](#)".
3. Change the configuration for a device that has executed performance management.
4. Start performance monitoring based on the settings contents recorded in step 1. (if performance monitoring is used).
Make sure to set it to create configuration information.
Refer to "[4.2.2.2 Instruction for performance management](#)".



Note

.....
If the configuration for a device that has executed performance management has been changed, the configuration information before the change is used for performance management. Performance information cannot be guaranteed prior to the configuration information update.
.....

4.3 Detecting trouble

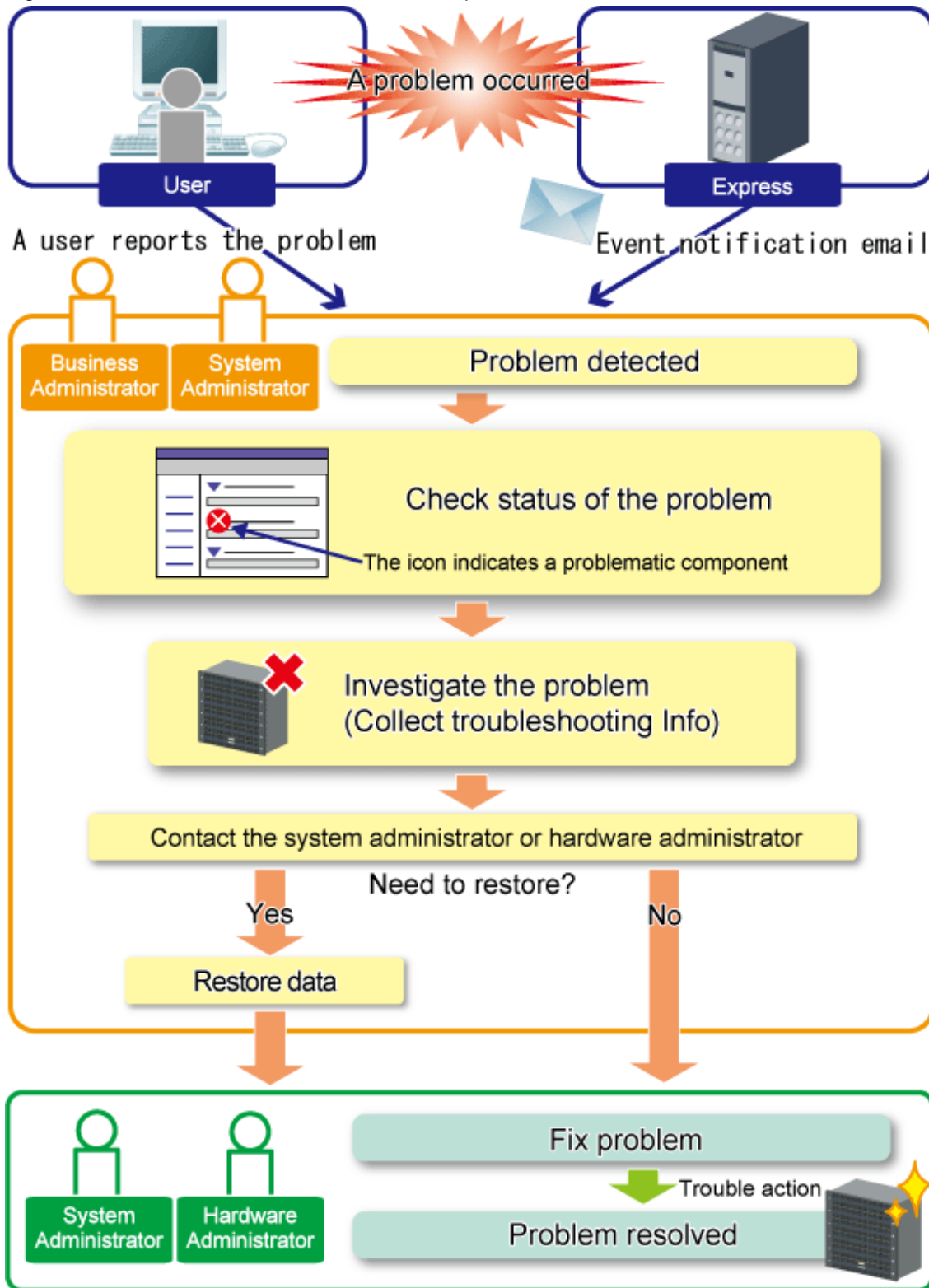
The following is a description of the procedure to be taken if trouble should occur during Disk storage system operations.

Trouble occurrence is detected in the following way.

- An e-mail of error or warning level trouble occurrence is sent from Express.
- Trouble occurrence reported from a user.

The following is a flow from trouble detection to its response.

Figure 4.1 Flow from trouble detection to its response

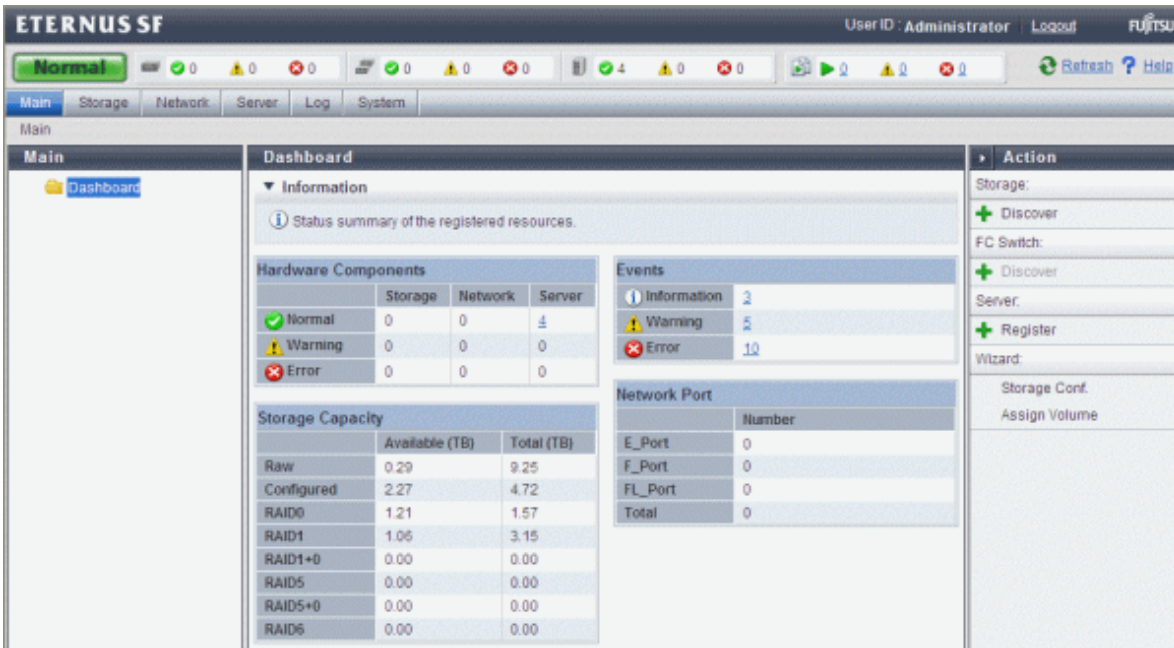


4.3.1 Identifying the trouble condition

The Web Console can identify the trouble condition.

Since the Web Console displays the status of each device with icons or messages, it is easy to identify the trouble condition.

Figure 4.2 Web Console



If trouble is occurring, check the following item.

- Dashboard

This is the initial screen when you login to the Web Console.

It is possible to check the status of components in the device to be managed and the state of event log immediately.

When trouble occurs, number of trouble-occurred devices or events is counted up in the field which "Error (⊗)" or "Warning (⚠)" icon is displayed.

If the value in the field is counted up, it is highly possible that business operations are affected. Therefore, identify the cause of the trouble to determine how to correct it.

By clicking the value in the field, the management screen is displayed. It is possible to check the detailed status in the management screen.

- Event log

When trouble occurs in the disk storage system, the Management Server receives an event notification by SNMP Trap. The notified event can be verified in the event log.

For details on displaying the event log, refer to "Display the events" in the "ETERNUS SF Web Console Guide".

 Note

If an Error or Warning level event is reported, update the corresponding storage system element status manually.

When the status of the storage system is recovered, also update the corresponding storage system element status manually.

The global status of the system containing the element is updated automatically.

For details on the operation procedures, refer to "Reload ETERNUS Disk storage system configuration information" in the "ETERNUS SF Web Console Guide".

 Point

In the following cases, the status icon is updated.

- When there is a higher error event notification from the disk storage system.
- When the configuration information is reloaded using the Web Console.

4.3.2 Trouble analysis

There are other methods to analyze the effects of the trouble besides "[4.3.1 Identifying the trouble condition](#)". Use those methods as required.

In addition, for hardware troubles, contact the hardware administrator when needed.

- Trouble information collection

The trouble information can be collect using either the command or Web Console.

For using the command, refer to "[B.2 esfsnap \(Express's manager troubleshooting information collection command\)](#)".

For using the Web Console, refer to "Collect the troubleshooting data" in the "ETERNUS SF Web Console Guide".

- Displaying operation history

The Web Console operation (contents, execution status and results) history can be displayed.

For details, refer to "Display the operation history" in the "ETERNUS SF Web Console Guide".

- Displaying login/logout history

The Web Console user login and logout history can be displayed.

For details, refer to "Display the login/logout history" in the "ETERNUS SF Web Console Guide".

4.3.3 Trouble response

After identifying the trouble condition as shown in "[4.3.1 Identifying the trouble condition](#)" or "[4.3.2 Trouble analysis](#)", contact a system administrator or a hardware administrator, referring to the message and trouble information.

After resolving the trouble, reload the configuration information to update information. For details on the operation procedures, refer to "Reload ETERNUS Disk storage system configuration information" in the "ETERNUS SF Web Console Guide".

4.4 Executing Advanced Copy

This section explains the procedures for executing Advanced Copy.

Express can execute the following Advanced Copy function.

- Clone copy (OPC)
- Clone copy (QuickOPC)
- Clone copy (EC)
- Snapshot copy (SnapOPC+)
- Remote copy (REC)



.....
Refer to "[Appendix A Advanced Copy Function](#)" for details of Advanced Copy.
.....

When you use Advanced Copy function, to assure data consistency, please confirm that there is no access to a business volume.

For more secure consistency, it is recommended to stop the server connected to the business volume.

When you cannot stop the business server, unmount the business volume by the server's OS command and reflect the data from the file cache and stop the access to file cache.

For the unmount command, refer to each operating system manual.

4.4.1 Connection type settings

Set up the type of the connection with ETERNUS Disk storage system used by Copy command via SAN or Copy command via LAN.



For details about Copy command via SAN and Copy command via LAN, refer to "System Configuration" in the "ETERNUS SF Operation Guide for Copy Control Module".

There are three connection types.

Connection type	Explanation
Access through volumes	If use the Copy command via SAN, this type must be selected.
Access through network	If use the Copy command via LAN, this type must be selected.
Using as remote partner (REC)	If fulfill the following condition, this type must be selected. <ul style="list-style-type: none"> - Remote Advanced Copy is performed by using the Copy command via SAN, and - It is impossible to set up the access volume in ETERNUS Disk storage system at remote site (i.e., Disaster Recovery system configuration).

When the Remote Advanced Copy is used, set up the connection type to copy source/destination ETERNUS Disk storage systems by referring the following table.

Copy source ETERNUS Disk storage system		Copy destination ETERNUS Disk storage system				
		ETERNUS DX90		ETERNUS DX90 S2		
		Access through volumes	Using as remote partner (REC)	Access through volumes	Access through network	Using as remote partner (REC)
ETERNUS DX90	Access through volumes	A	A	A	N/A	A
	Using as remote partner (REC)	N/A	N/A	N/A	N/A	N/A
ETERNUS DX90 S2	Access through volumes	A	A	A	A	A
	Access through network	N/A	N/A	A	A	A
	Using as remote partner (REC)	N/A	N/A	N/A	N/A	N/A

A: Configurable combination

N/A: Unconfigurable combination

For details on the operation procedures, refer to "Configure the connection type for ETERNUS Disk storage system" in the "ETERNUS SF Web Console Guide".

4.4.2 Access volume settings

In Express, the Management Server sends a command to ETERNUS Disk storage system to perform an Advanced Copy function. When using the Copy command via SAN method, a logical volume that can be accessed from the Management Server is needed in ETERNUS Disk storage system. In this manual, this logical volume is called "access volume".

One logical volume of ETERNUS Disk storage system must be assigned to Management Server as the access volume.

Point

When registering ETERNUS Disk storage system to be used the Copy command via LAN method, no access volume is needed.

For Windows

Perform the following procedure to set an access volume on the Management Server:

1. Allocate the logical volume from ETERNUS Disk storage system that is to be used as the access volume.
The allocated volume is recognized as a disk.
2. Initialize the disk as MBR disk format (DOS format) or GPT disk format.
3. Create a partition and assign the drive letter.

For Linux

Perform the following procedure to set an access volume on the Management Server:

1. Allocate the logical volume from ETERNUS Disk storage system that is to be used as the access volume.
The allocated volume is recognized as a disk.
2. Initialize the disk as MBR disk format (DOS format) or GPT disk format.

4.4.3 Copy table size settings

Configure the copy table size and resolution required to use Advanced Copy (or Remote Advanced Copy). It is necessary to calculate the value of these parameters on the basis of the copy capacity and the number of sessions (volumes) that will be performed simultaneously. For about the calculation method, refer to the hardware manual.

- Copy table size

Set the size of the copy table assigned in ETERNUS Disk storage system. The copy table is the dedicated memory area required to manage Advanced Copy.

- Resolution

Set the resolution of the copy table (data size represented each bit). Specify the value as small as possible.

For details on the operation procedures, refer to "Configure the copy table size for Advanced Copy" in the "ETERNUS SF Web Console Guide".

Point

In order to use Remote Advanced Copy, it is necessary to set the same value except 0 to the copy table size and resolution for ETERNUS Disk storage systems at both local site and remote site.

4.4.4 Remote Advanced Copy settings

In order to use Remote Advanced Copy, it is necessary to set the REC path. The REC path must be set all of ETERNUS Disk storage systems which Remote Advanced Copy is performed. Configure the REC path between ETERNUS Disk storage systems by the combination of FC ports or iSCSI ports.

In addition, when the Consistency mode is used as the transfer mode for Remote Advanced Copy, set the REC buffer size and use purpose (for sending/receiving).

For details on the operation procedures, refer to "Set the REC path" and "Change the REC buffer" in the "ETERNUS SF Web Console Guide".

Point

Using a wizard makes it easier to set up Remote Advanced Copy.

For details on the operation procedures, refer to "Set the Remote Advanced Copy by wizard" in the "ETERNUS SF Web Console Guide".

4.4.5 Creating copy group

Create copy groups. A copy group is a group of copy pairs, consisting of a copy source logical volume and a copy destination logical volume.

When creating copy groups, specify which type of Advanced Copy and which ETERNUS Disk storage system to use.

For details on the operation procedures, refer to "Create the copy group" in the "ETERNUS SF Web Console Guide".

4.4.6 Creating copy pair

Before executing Advanced Copy, create a pair consisting of a copy source volume and a copy destination volume.

For details on the operation procedures, refer to "Create the copy pair" in the "ETERNUS SF Web Console Guide".

4.4.7 Executing clone copy

Advanced Copy has three types of clone copies.

For details on the operation procedures, refer to "Perform the Advanced Copy" in the "ETERNUS SF Web Console Guide".

- Clone copy (OPC)

This is a copy method to execute OPC of ETERNUS Disk storage system.

The clone copy (OPC) copies one volume. If copy source volume is accessed, it can copy the volume.

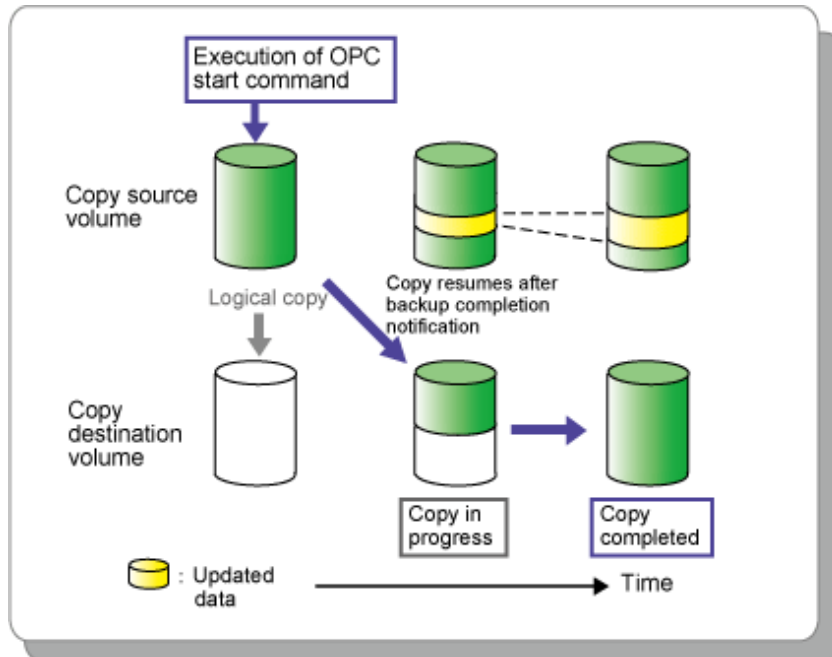
When the OPC command is invoked, ETERNUS Disk storage system creates a point in time snapshot of the source volume and then immediately returns a notification to the operator that the backup is complete, before any physical copying has even occurred. This allows for access to be returned to the transaction or source volume with little or no interruption while the copy is performed as a background process at the hardware level in ETERNUS Disk storage system.

The clone copy (OPC) is highly effective available for:

- Generation backups where continuous uptime is critical such as internet business applications.
- Restore from backups where OPC can be used regardless of the backup copy method and minimizing downtime.
- Case where minimizing server I/O load is critical to overall business application performance.

The following diagram explains the process of clone copy (OPC).

Figure 4.3 Clone copy (OPC) diagram



- Clone copy (QuickOPC)

This is a copy method to execute QuickOPC of ETERNUS Disk storage system.

When the QuickOPC command is invoked, it will determine if an initial copy exists, then will copy only updated blocks of data that have been tracked since the initial copy was created to the backup volume for that specific QuickOPC session.

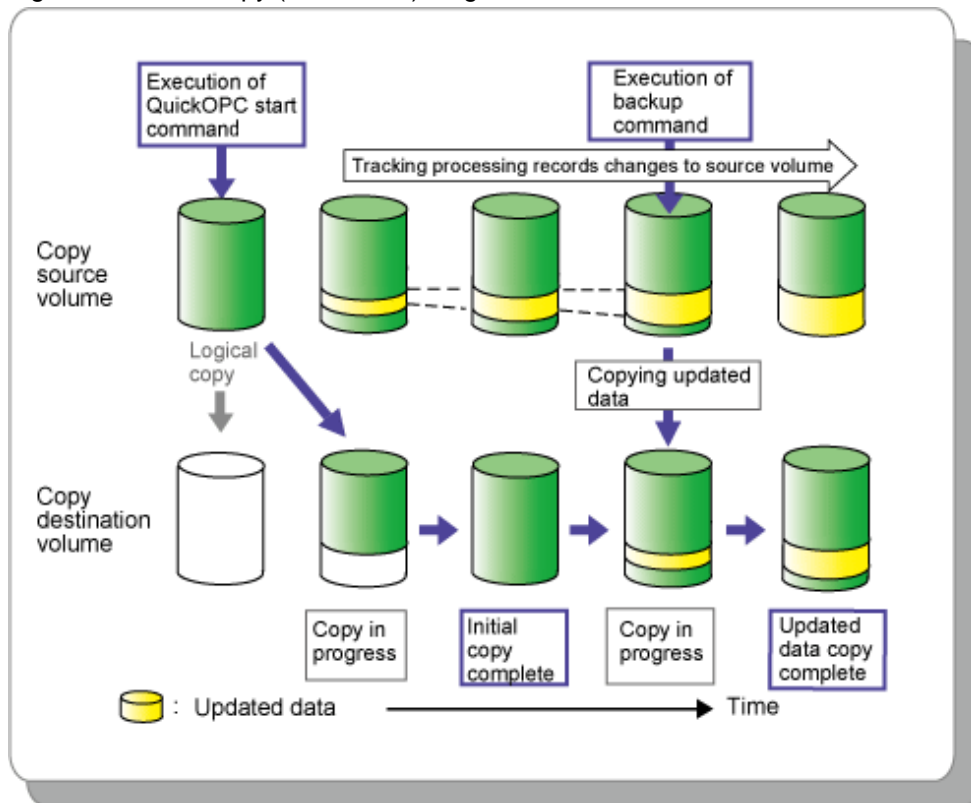
If QuickOPC detects that an initial copy does not exist, it will create the initial copy using OPC. The differential copy method used in QuickOPC significantly reduces the time required for physical data copying in order to create a Point in Time snapshot while minimizing the I/O load on the storage system host server.

The clone copy (QuickOPC) is highly effective available for:

- Backup to disk where uptime is critical.
- Frequent restore point creation and frequent backups.

The following diagram represents the differential copy process used in QuickOPC copy after an initial copy has been created.

Figure 4.4 Clone copy (QuickOPC) diagram



- Clone copy (EC)

This is a copy method to execute EC of ETERNUS Disk storage system.

The EC feature invokes a process of synchronization between source and destination volumes to create a synchronized copy of the source volume. The purpose of the synchronization is to reach and maintain a state of equivalence with the source volume in order to create a temporary copy or archival backup.

The source volume remains available and accessible as there is no need to stop or suspend access to the source volume while the copy is built using the synchronization process.

When a state of equivalence with the source volume has been attained, the destination volume continues to be maintained as an image of the source volume.

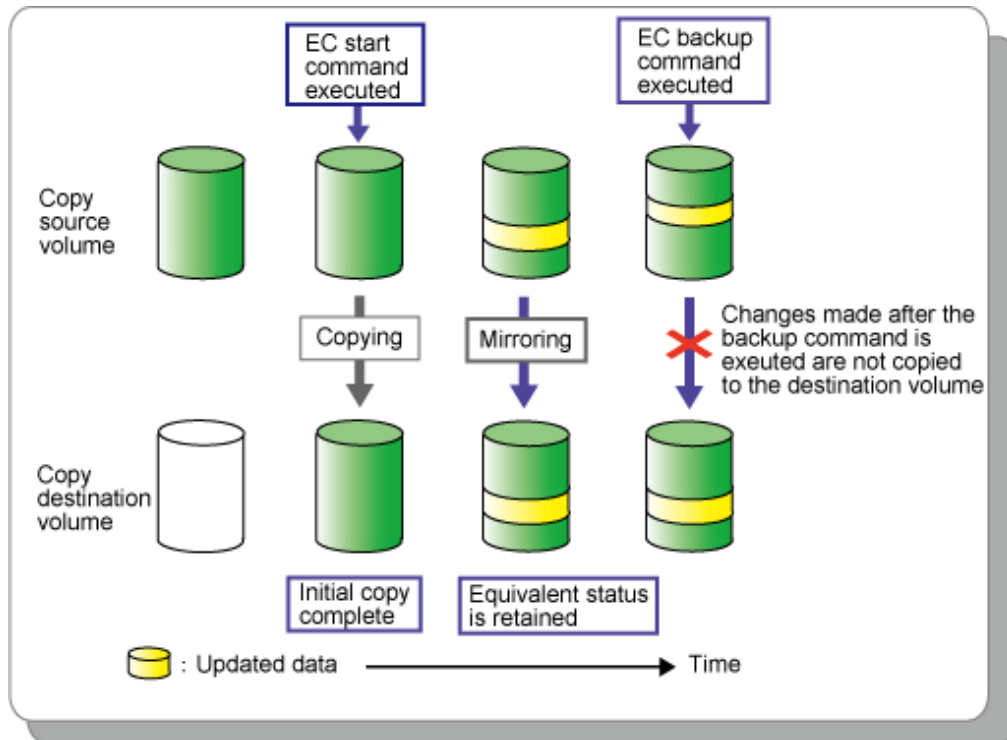
At any subsequent point while the source volume and the destination copy are in this state of equivalence, the destination copy can be split from the source, thus creating a backup with history or a replica copy as at that point in time.

The clone copy (EC) is highly effective available for:

- Making backups much more quickly than with conventional backup processes, because backup data can be collected in parallel with ordinary transactions.

- Reducing processing time and costs by means of distributed processing using copy data.

Figure 4.5 Clone copy (EC) diagram



4.4.8 Executing Snapshot copy

This is a copy method to execute SnapOPC+ of ETERNUS Disk storage system.

SnapOPC+ uses the Copy-On-Write method to create a pre-update copy source volume.

For details on the operation procedures, refer to "Perform the Advanced Copy" in the "ETERNUS SF Web Console Guide".

SnapOPC+ can save pre-update data on the copy source volume on a per snap generation (unit of volume replication) basis.

SnapOPC+ is designed in view of its mechanism and features to be used as backups for recovery from software failures such as operation mistake and software error.

If a copy source volume becomes inaccessible due to any hardware failure, the relevant session will become an error, thus making it impossible to properly read the data on the copy destination volume.

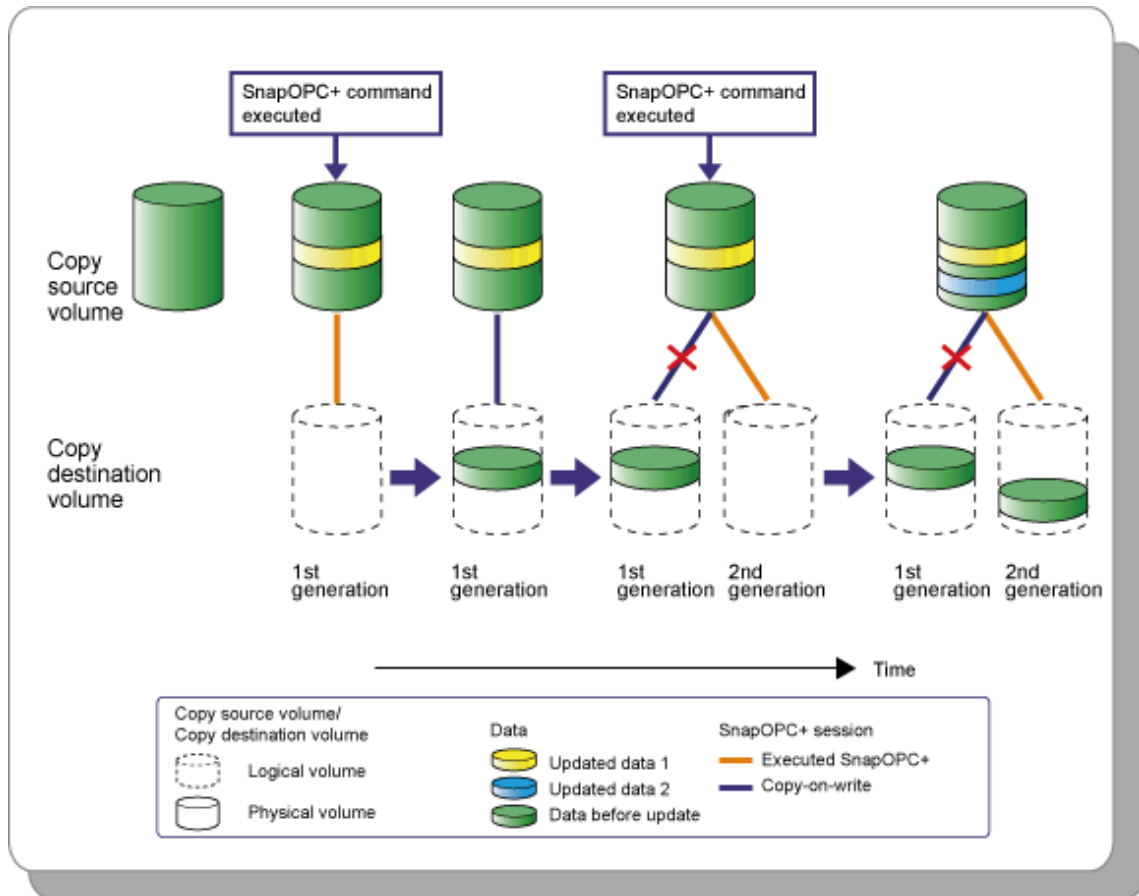
To provide for such critical hardware failures, it is recommended to make a complete copy of data using clone copy (OPC/QuickOPC/EC) or remote copy (REC) as well as SnapOPC+.

The snapshot copy (SnapOPC+) is effectively available for:

- Backups of temporary files used for cascade copy to alternate media such as tape.

- Backups of file servers and other data less frequently updated.

Figure 4.6 Snapshot copy (SnapOPC+) diagram



Note

ETERNUS DX80 S2/DX90 S2 need one or more Snap Data Pool Volumes.

4.4.9 Executing remote copy (HA configuration)

This section describes remote copy in a HA (High Availability) configuration.

Remote copy in a HA configuration executes copy between the following ETERNUS Disk storage systems within LAN.

- Between two ETERNUS DX90
- Between two ETERNUS DX90 S2
- Between ETERNUS DX90 and ETERNUS DX90 S2

For details on the operation procedures, refer to "Perform the Advanced Copy" in the "ETERNUS SF Web Console Guide".

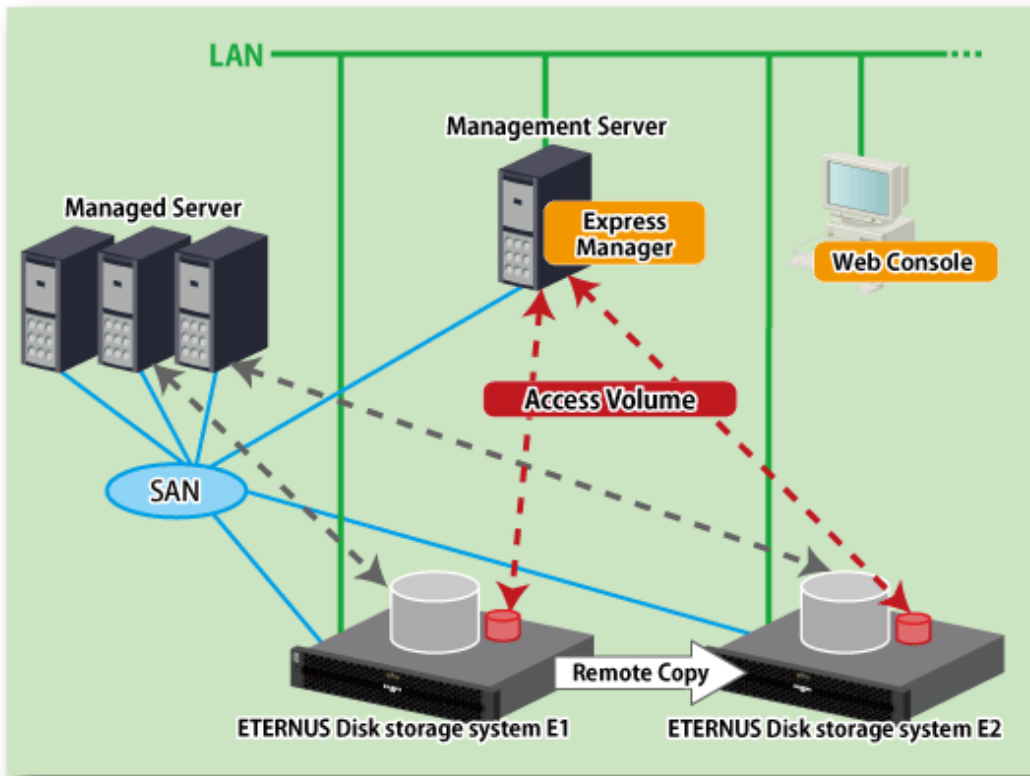
Even if any failure occurs in one ETERNUS Disk storage system, the other ETERNUS Disk storage system continues the operation.

The remote copy has three types of operation modes. Select an operation mode according to the operation form. For more specific information about operation mode, refer to "A.7 Remote Advanced Copy (REC)".

It is required to consider Recovery Point Objective (RPO) and Recovery Time Objective (RTO).

For the transfer mode of Remote Advanced Copy in a HA configuration, synchronous mode is recommended to reduce the Recovery Point Objective.

Figure 4.7 HA configuration diagram



4.4.9.1 Operation procedure for fault occurrence on ETERNUS Disk storage system

If Advanced Copy cannot be continued due to some hardware fault, ETERNUS Disk storage system automatically suspends Advanced Copy.

In addition, remote copy sessions automatically turn to "Error Suspend" or "Hardware Suspend".

- In the case that "Hardware Suspend" occurs
 1. If all the following conditions are fulfilled, execute "Suspend" operation to suspend remote copy sessions.
 - Transfer mode is "Synchronous".
 - Copy status is equivalent.
 - Split mode is "Manual Split".
 2. Remove the error.
 3. If Recovery mode is "Manual Recovery", execute "Suspend" operation to suspend the operation. After that, execute "Resume" operation to recover the remote copy sessions.

Point

.....
If Recovery mode is "Automatic Recovery", remote copy sessions are automatically recovered, so that no operation is required.
.....

- In the case that ETERNUS Disk storage system in which the copy source volume exists causes "Error Suspend"
 1. Execute "Suspend" operation to suspend the remote copy sessions.
Or, execute "Cancel" operation to cancel the remote copy sessions.
 2. Change the volume accessed by the business server to copy destination volume.
 3. Make sure that ETERNUS Disk storage system in which the copy source volume exists has been recovered, and then restore the copy destination volume to the source volume.

In the case that ETERNUS Disk storage system has been recovered:

1. When the copy sessions have been suspended by "Suspend" operation, execute "Reverse" and "Resume" operation to restore data from the copy destination volume to the source volume.
When the copy sessions have been stopped by "Cancel" operation, execute "Start Backward Copy" operation to restore data from the copy destination volume to the source volume.
2. On completion of restore, stop business server access to the copy destination volume.
3. Execute "Suspend" operation to suspend the remote copy sessions.
4. Execute "Reverse" operation to change the copy direction to the copy destination volume from the source volume.
5. Execute "Resume" operation to resume the remote copy sessions.
6. Return the volume accessed by the business server to the source volume.

In the case that ETERNUS Disk storage system has been replaced:

1. Execute "Cancel" operation to cancel all remote copy sessions.
2. Delete the pre-replacement ETERNUS Disk storage system from Express.
3. Register the post-replacement ETERNUS Disk storage system to Express.
4. Create a copy pair and a copy group.
5. Execute "Start Backward" operation to start remote copy session.
6. Execute steps 2 to 6 described in the above-mentioned "[In the case that ETERNUS Disk storage system has been recovered:](#)".

- In the case that ETERNUS Disk storage system in which the copy destination volume exists causes "Error Suspend"
 1. Recover ETERNUS Disk storage system in which the copy destination exists.
 2. Execute "Resume" operation to recover the remote copy sessions.

4.4.10 Executing remote copy (DR configuration)

This section describes remote copy (or Extended Remote Advanced Copy) in a Disaster Recovery system configuration.

For details on the operation procedures, refer to "Perform the Advanced Copy" in the "ETERNUS SF Web Console Guide".

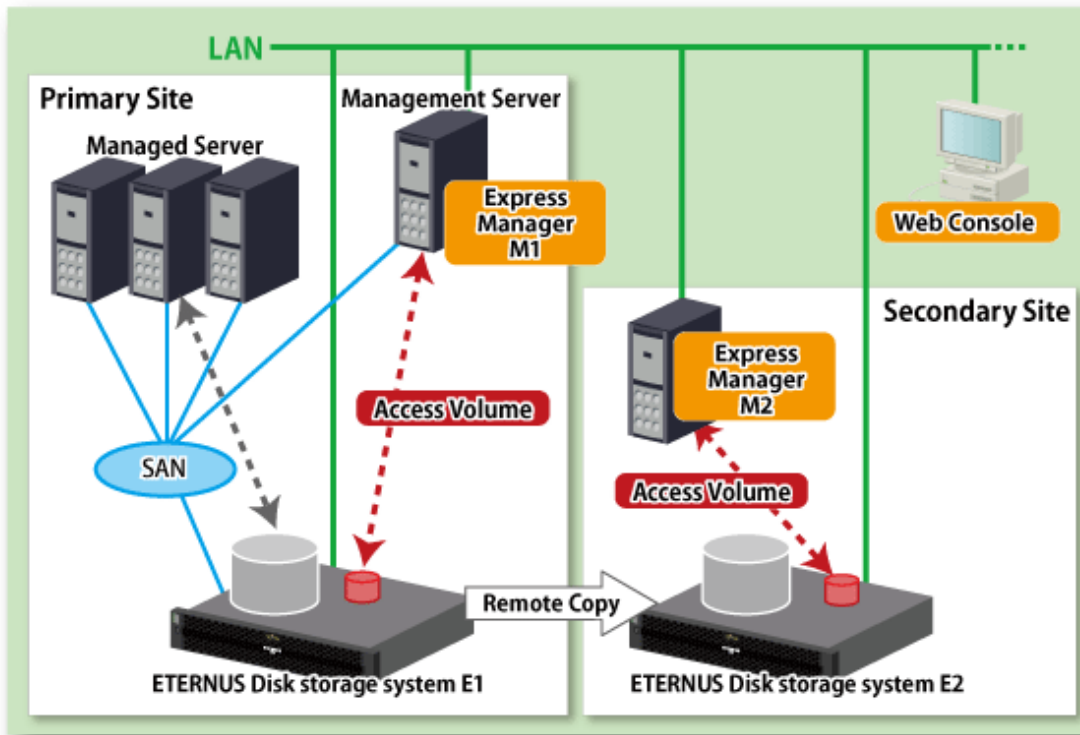
Against disasters, remote copy in a DR configuration executes copy within ETERNUS Disk storage systems at both local site and remote site. If a disaster occurs, ETERNUS Disk storage system at local site is switched to ETERNUS Disk storage system at remote site to continue the system operation.

The remote copy has three types of operation modes. Select an operation mode according to the operation form. For more specific information about operation mode, refer to "[A.7 Remote Advanced Copy \(REC\)](#)".

In a configuration that data transfer length is long or a configuration that transfer path includes WAN, data transfer time could be long. In synchronous transfer mode, response to input/output request from the business server could not be returned within response time. Using the asynchronous transfer mode can reduce the effect of delaying response to input/output request from the business server.

For DR configuration, asynchronous transfer mode is recommended.

Figure 4.8 DR configuration diagram



4.4.10.1 Operation procedure for fault occurrence on ETERNUS Disk storage system

If Advanced Copy cannot be continued due to hardware fault, the ETERNUS Disk storage system automatically suspends Advanced Copy. In addition, remote copy sessions are automatically turned to "Error Suspend" or "Hardware Suspend".

- In the case that "Hardware Suspend" occurs
 1. If all the following conditions are fulfilled, execute "Suspend" operation to suspend the remote copy session.
 - Transfer mode is "Synchronous".
 - Copy status is equivalent.
 - Split mode is "Manual Split".
 2. Remove the error.
 3. If Recovery mode is "Manual Recovery", execute "Suspend" operation to suspend the copy session. After that, execute "Resume" operation to recover the remote copy session.

P Point

.....
 If Recovery mode is "Automatic Recovery", remote copy sessions are automatically recovered, so that no operation is required.

- In the case that ETERNUS Disk storage system at local site causes "Error Suspend"
 1. Configure the access volume to ETERNUS Disk storage system at remote site from the Management Server.
 2. Select the remote copy session in the target ETERNUS Disk storage system to suspend or cancel, and then execute the forcibly cancel suspend or forcibly suspend.

In this way, you can access from the operation server to the volumes.

- In the case that ETERNUS Disk storage system at remote site causes "Error Suspend"
 1. Recover ETERNUS Disk storage system in which the copy destination volume exists.
 2. Execute "Resume" operation to recover the remote copy session.

4.4.11 Checking copy status

This section describes how to check the status of Advanced Copy.

For details on the operation procedures, refer to "Display the copy session" in the "ETERNUS SF Web Console Guide".



.....
If the copy status is "???" or "Unknown", an access volume may be wrong. Check the access volume with "acarray detail (ETERNUS Disk storage system detail information display command)" in the "ETERNUS SF Operation Guide for Copy Control Module".

If the access volume is wrong, refer to "Set the access volume" in the "ETERNUS SF Web Console Guide" to set a correct access volume.
.....

4.4.12 Command line operation

This section describes how to execute Advanced Copy functions with command line interface.



.....
For details on the commands, refer to "Commands" in the "ETERNUS SF Operation Guide for Copy Control Module".
.....

Access volume settings

Create a volume to ETERNUS Disk storage system and assign it to the Management Server.

For details, refer to "Set the access volume" in the "ETERNUS SF Web Console Guide".

Registering ETERNUS Disk storage system

Using "acarray add" command, register an ETERNUS Disk storage system.

Set up the type of the connection with ETERNUS Disk storage system at the same time.



.....
For ETERNUS Disk storage system name specified with -a option of "acarray add" command, specify an ETERNUS Disk storage system name registered to Express.

If a different name is registered, Advance Copy using the Web Console is not available.
.....

Creating copy groups

Using "acgroup create" command, create a copy group.

Adding copy pairs

Using "acpair add" command, add a copy pair to a copy group.

Executing copy

Execute copy, using the copy start commands prepared for each copy function.



Note

- If the copy status or SID is "???" or "Unknown", an access volume may be wrong. Check the access volume with "acarray detail" command.
If the access volume is wrong, refer to "Set the access volume" in the "ETERNUS SF Web Console Guide" to set a correct access volume.
- When changing the copy mode of remote copy (REC), suspend the copy with "acec suspend" command and then execute "acec change" command.

4.5 Thin Provisioning management

This product can manage storage capacity virtualization operations that use the Thin Provisioning function of the ETERNUS Disk storage system. The functions below are provided.

Threshold monitoring

This function monitors the threshold values for the Thin Provisioning Pool capacity used. It can also change the threshold values.

Capacity management

This function displays the changes in capacity used for the Thin Provisioning Pool graphically.

4.5.1 Threshold monitoring

This function monitors the threshold values for the Thin Provisioning Pool capacity used.

Threshold values and Threshold monitoring status

The values of the "Caution threshold value" and the "Warning threshold value" set for each Thin Provisioning Pool and the Threshold monitoring status are displayed. The "Caution threshold value" and the "Warning threshold value" are prepared at the disk storage system, and are the threshold values for Thin Provisioning Pool capacity used.

Threshold value settings

The initial values for the "Caution threshold value" and the "Warning threshold value" are set by the disk storage system when a Thin Provisioning Pool is created. If required, change the settings for the capacity threshold values.

Procedure for setting threshold values

Set the threshold values by using the Web Console.

Action to take when threshold values are exceeded

If threshold values are exceeded, then follow the procedures below:

- Detection of status change

When a threshold value is exceeded, the product displays an SNMP Trap in the event log, which notifies the change in Thin Provisioning Pool status at the disk storage system.

- Refreshing

After checking the displayed event, perform [Reload Conf.] on the applicable storage system.

- Checking the status of the Thin Provisioning Pool

Start the Thin Provisioning Pool monitor window and check the Thin Provisioning Pool status. Extend disks or take other action in accordance with the exceeded threshold values.



See

.....

If the SNMP Trap that notifies of changes in the Thin Provisioning Pool status is not received due to packet loss or other reason, then the product detects the change by polling the Thin Provisioning Pool information of the disk storage system. Since the polling interval is one hour, the time from status change to detection is within one hour. The polling intervals can be customized. For details, refer to "Polling Service Setting File" in the "ETERNUS SF Storage Cruiser Operation Guide".

.....



Information

.....

Even if capacity reaches "Caution threshold value" which is set for each LogicalVolume, SNMP trap will not be sent. "Caution threshold value" for LogicalVolume is a threshold value for unallocated capacity of LogicalVolume which is at the disk storage system.

.....

4.5.2 Capacity management

This function displays the Thin Provisioning Pool Capacity and its changes in the capacity used graphically to grasp the changes in the capacity used for the Thin Provisioning Pool.

This enables users to grasp the period to expand the size of the physical disk for the Thin Provisioning Pool, or to review the threshold setting according to the situation.



Information

.....

The information of the Thin Provisioning Capacity and its capacity used is displaying in graph. The information is obtained everyday at 1:00:00.

You can change the time to obtain the information by using a polling service setting file. For details, refer to "Polling Service Setting File" in the "ETERNUS SF Storage Cruiser Operation Guide".

.....

4.5.2.1 Capacity Graph Window Types

It is possible to display the following graph.

One-month Graph window

The line graph displays data for the past 31 days from the present day.

The plot points are displayed on a daily basis.

4.6 Model upgrade for ETERNUS Disk storage system

When applying Model upgrade options for ETERNUS Disk storage system, ETERNUS SF Manager cannot manage the corresponding ETERNUS Disk storage system since the device information of it is changed.

Reload configuration information and delete the license registered with ETERNUS Disk storage system. Then, re-register the license with ETERNUS Disk storage system.

For details on the operation procedures, refer to "Operation on Model upgrade for ETERNUS Disk storage system" in the "ETERNUS SF Web Console Guide".

When you use the performance management function, update configuration information of the performance management function in reference to "[4.2.2.8 Updating configuration information](#)".

Chapter 5 Maintenance

This chapter describes the maintenance of Express's manager.

5.1 Maintenance of Express's manager environment (Windows)

5.1.1 Backing up Express's manager environment (Windows)

It is required to back up the Express's manager environment to recover from failure on the Management Server. Perform the following procedure to back up the Express's manager environment. All operations are performed on the Management Server.

Information

About description in the procedure:

Directory name	Explanation
\$BAK_DIR	This is a backup destination directory.
\$INS_DIR	This is the "Program Directory" specified at the ETERNUS SF Manager installation.
\$ENV_DIR	This is the "Environment Directory" specified at the ETERNUS SF Manager installation.
\$TMP_DIR	This is the "Work Directory" specified at the ETERNUS SF Manager installation.

1. Stop the ETERNUS SF Express Tomcat service.

Open Service Control Manager to stop the following service.

- ETERNUS SF Express Tomcat Service

2. Create a backup data.

Using Explorer, create the following backup directories:

- \$BAK_DIR\Common

Execute the following command to create a backup data. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*. The file name of the created backup data is *<file_name>*.

```
$INS_DIR\Common\sys\postgres\bin\pg_dump -U esfpostgres -C --attribute-inserts -p <port number> -f $BAK_DIR\Common\<file_name> esfdb
```

The prompt is displayed, and waiting for input. Input the following strings.

```
master01!
```

3. Execute the following batch to stop the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Stop_ESFservice.bat
```

Note

When the batch is executed, the message that ETERNUS SF Manager Tomcat Service has been already stopped is displayed many times. Please ignore because there is no problem.

4. Back up the management information for disk storage system.

Using Explorer, create the following backup directory:

- \$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr

Copy the subdirectories and files in the following source directory to the backup destination directory.

Source directory	Destination directory
\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr	\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr

5. Back up an essential file.

If a file does not exist, this step is unnecessary.

Using Explorer, create the following backup directory.

- \$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current

Copy the following backup source file to the backup destination directory.

Source file	Destination directory
\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\systemevent.csv	\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current

6. Back up files that are related to the performance management function.

If you are not using the performance management function, this step is unnecessary. if there is no subdirectory or file, you don't need to backup.

Using Explorer, create the following backup directory.

- \$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current
- \$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perfconf
- \$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf

Copy the subdirectories and files in the following source directory to the backup destination directory.

Source file	Destination directory
\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perf.conf	\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current

Copy the subdirectories and files in the following source directory to the backup destination directory.

Source directory	Destination directory
\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perfconf	\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perfconf
\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf	\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf

7. Back up customizable files.

It is unnecessary to back up the files or directories which are not existed.

Using Explorer, create the following backup directory.

- \$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current
- \$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\eventmail

Copy the following backup source file to the backup destination directory.

Source file	Destination directory
\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\sanma.conf	\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current

Copy the subdirectories and files in the following source directory to the backup destination directory.

Source directory	Destination directory
\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\eventmail	\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\eventmail

8. Back up the polling service setting file.

This step can be skipped if you are not customizing the polling service setting file.

If customizing the polling service setting file pollingService.xml, follow the step below to back it up.

Create the following backup directory in Explorer or a similar program.

- \$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\polling

Using Explorer or a similar program, copy the following file to its backup location.

Copy Source File	Copy Destination Directory
\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\polling\pollingService.xml	\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\polling

9. Back up the files associated with definition of copy group and copy pair.

This step is required only when using Advanced Copy function.

Using Explorer, create the following backup directories.

- \$BAK_DIR\CCM\etc
- \$BAK_DIR\CCM\etc\db
- \$BAK_DIR\CCM\etc\db\cg
- \$BAK_DIR\CCM\etc\prop
- \$BAK_DIR\CCM\var\micc\database

Copy the following backup source files to the backup destination directory.

Source file	Destination directory
\$ENV_DIR\CCM\etc\db\eternus.xml	\$BAK_DIR\CCM\etc\db
\$TMP_DIR\CCM\var\micc\database\DeviceRegList.xml	\$BAK_DIR\CCM\var\micc\database

If the following source files exist, copy them to the backup destination directory.

Source file	Destination directory
\$ENV_DIR\CCM\etc\prop\user.properties	\$BAK_DIR\CCM\etc\prop
\$ENV_DIR\CCM\etc\stxc.alias	\$BAK_DIR\CCM\etc
\$ENV_DIR\CCM\etc\stxc_ext.alias	
\$ENV_DIR\CCM\etc\stxcvolinf	

Copy the subdirectories and files in the following backup source directory to the backup destination directory.

Source directory	Destination directory
\$ENV_DIR\CCM\etc\db\cg	\$BAK_DIR\CCM\etc\db\cg

10. Back up the license management database.

Using Explorer, create the following backup directory:

- \$BAK_DIR\LM

Execute the following command. The file specified with *<file_name>* will be created as a backup file.

```
$INS_DIR\LM\bin\esflm backup $BAK_DIR\LM\<file_name>
```

11. Execute the following batch to start the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Start_ESFservice.bat
```

5.1.2 Restoring Express's manager environment (Windows)

If any failure occurs in the Management Server, perform the following procedure to restore Express's manager environment. All operations are performed on the Management Server.



Information

About description in the procedure:

Directory name	Explanation
\$BAK_DIR	This is a backup destination directory.
\$INS_DIR	This is the "Program Directory" specified at the ETERNUS SF Manager installation.
\$ENV_DIR	This is the "Environment Directory" specified at the ETERNUS SF Manager installation.
\$TMP_DIR	This is the "Work Directory" specified at the ETERNUS SF Manager installation.

1. Reconfigure the Express's manager.

Install the ETERNUS SF Manager, and set up it as the Express's manager.

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

2. Stop the ETERNUS SF Express Tomcat service.

Open Service Control Manager to stop the following service.

- ETERNUS SF Express Tomcat Service

3. Restore a backup data.

Execute the following command. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*.

```
$INS_DIR\Common\sys\postgres\bin\psql -U esfpostgres -p <port number> postgres
```

The prompt is displayed, and waiting for input. Input the following strings in order.

```
master01!
drop database esfdb;
\q
```

Execute the following command to restore the backup data. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*. The *<file_name>* is the file name specified when the backup data was created.

```
$INS_DIR\Common\sys\postgres\bin\psql -U esfpostgres -p <port number> -f $BAK_DIR\Common
\file_name> postgres
```

The prompt is displayed, and waiting for input. Input the following strings.

```
master01!
```

- Execute the following batch to stop the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Stop_ESFservice.bat
```

 **Note**

When the batch is executed, the message that ETERNUS SF Manager Tomcat Service has been already stopped is displayed many times. Please ignore because there is no problem.

- Restore the management information for disk storage system.

Using Explorer, delete files under the following restore destination directory. However, do not delete the following directory itself. If the directory does not exist, create it.

- \$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr

Copy the subdirectories and files in the following source directory to the destination directory.

Source directory	Destination directory
\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr	\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\opencimom\logr

- Restore the essential file.

Using Explorer, delete the following restore destination file.

- \$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\systemevent.csv

Copy the following source file to the destination file. If the file does not exist, this step is unnecessary.

Source file	Destination directory
\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\systemevent.csv	\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current

- Restore files that are related to the performance management function.

If you are not using the performance management function or the files related to the performance management function are not backed up, this step is unnecessary.

If you are upgrading from a previous version, restore only the files which were backed up in the previous version.

Using Explorer, delete files and subdirectories under following restore destination directory.

However, do not delete the restore destination directory itself. If the restore destination directory does not exist, create it.

- \$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf

Copy the following source file to the destination directory.

Source file	Destination directory
\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perf.conf	\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current

Copy the subdirectories and files in the following source directory to the destination directory.

Source directory	Destination directory
\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perfconf	\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\perfconf
\$BAK_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf	\$TMP_DIR\ESC\Manager\var\opt\FJSVssmgr\current\perf

8. Restore customizable files.

Restore only the files and directories which were backed up.

If you are upgrading from a previous version, restore only the files which were backed up in the previous version.

Copy the following files to the destination directory.

Source file	Destination directory
\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\sanma.conf	\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current

Copy the subdirectories and files in the following source directory to the destination directory.

Source directory	Destination directory
\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\eventmail	\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\eventmail

9. Restore the polling service setting file.

This restoration is unnecessary for the files which have not been backed up.

Using Explorer or a similar program, copy the polling service setting file from its backup location.

Copy Source File	Copy Destination Directory
\$BAK_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\polling\pollingService.xml	\$ENV_DIR\ESC\Manager\etc\opt\FJSVssmgr\current\polling

10. Restore the files associated with definition of copy group and copy pair.

This step is required only when using Advanced Copy function.

If you are upgrading from a previous version, restore only the files which were backed up in the previous version.

Using Explorer, delete files under the following restore destination directory.

- \$ENV_DIR\CCM\etc\db\cg

In addition, if the following files exist, delete them.

- \$ENV_DIR\CCM\etc\prop\user.properties
- \$ENV_DIR\CCM\etc\stxc.alias
- \$ENV_DIR\CCM\etc\stxc_ext.alias
- \$ENV_DIR\CCM\etc\stxcvolinf

Copy the following source files to the destination directory.

Source file	Destination directory
\$BAK_DIR\CCM\etc\db\eternus.xml	\$ENV_DIR\CCM\etc\db
\$BAK_DIR\CCM\var\micc\database\DeviceRegList.xml	\$TMP_DIR\CCM\var\micc\database

If the following source files exist, copy them to the destination directory.

Source file	Destination directory
\$BAK_DIR\CCM\etc\prop\user.properties	\$ENV_DIR\CCM\etc\prop
\$BAK_DIR\CCM\etc\stxc.alias	\$ENV_DIR\CCM\etc
\$BAK_DIR\CCM\etc\stxc_ext.alias	
\$BAK_DIR\CCM\etc\stxcvolinf	

Copy the subdirectories and files in the following source directory to the destination directory.

Source directory	Destination directory
\$BAK_DIR\CCM\etc\db\cg	\$ENV_DIR\CCM\etc\db\cg

- Restore the license management database.

If the license management database is not backed up (in case of upgrading from a previous version), this step is unnecessary.

Execute the following command. The *<file_name>* is the file name specified when the backup data was created.

```
$INS_DIR\LM\bin\esflm restore $BAK_DIR\LM\<file_name>
```

- Execute the following batch to start the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Start_ESFservice.bat
```

5.1.3 Changing Express's manager environment (Windows)

This section describes the following procedure.

- How to change port number that is used by Express
- How to change the IP address of the Management Server

5.1.3.1 Changing port numbers (Windows)

This section describes how to change port number that is used by Express.

The port numbers are defined in the operating system's services file. The ports shown in the following table are used by Express. The default values for the port numbers are shown. If you have changed the value for these port numbers, please read the numbers to replace after the change in this section.

port number	service name	protocol	Note
9855	esfmanagerweb	tcp	Port number used for the Web Console
1226	stgxfws	tcp	Port number used for configuration management and polling monitoring
2004	rdaswstf	tcp	Port numbers used inside Express
9851	rmiswstf	tcp	
9852	semswstf	tcp	
24916	sscruiserm	tcp	



Information

About description in the procedure:

- \$INS_DIR: "Program Directory" specified at the ETERNUS SF Manager installation

- \$ENV_DIR: "Environment Directory" specified at the ETERNUS SF Manager installation

Perform the following procedure to change the port numbers used by Express.

1. Open the file "%SystemRoot%\system32\drivers\etc\services" with a notepad.
2. Pick out the entry of a service name to be changed to change its entry port number.
A port number can be entered between 1024 and 65535. However, a port number from 5001 to 32768 is recommended.

```
# <service name> <port number>/<protocol> [aliases...] [#<comment>]
#
rdaswstf 2004/tcp
stgxfws 1226/tcp
rmiswstf 9851/tcp
semswstf 9852/tcp
esfmanagerweb 9855/tcp
sscruiserm 24916/tcp
```

3. Save the "%SystemRoot%\system32\drivers\etc\services" file and close it.
4. Edit httpd.conf file if the port number used by Web Console is changed.
 1. Open the "\$INS_DIR\Common\sys\apache\conf\httpd.conf" file with text editor.
 2. Replace the port number (9855) in red letters with the other port number listed immediately after the Listen directive.

```
Listen 9855
```

3. Save the "\$INS_DIR\Common\sys\apache\conf\httpd.conf" file and close it.
5. Restart services.
 1. Execute the following batch on the Management Server to stop the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Stop_ESFservice.bat
```

2. Stop the SymfoWARE services.
Open Service Control Manager to stop the following service.
 - SymfoWARE RDA RDBSWSTF
 - SymfoWARE RDB RDBSWSTF

3. Execute the following batch on the Management Server to start the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Start_ESFservice.bat
```

4. Start the SymfoWARE services.
Open Service Control Manager to start the following service.
 - SymfoWARE RDA RDBSWSTF
 - SymfoWARE RDB RDBSWSTF

6. Create a server information change instruction file on the Management Server, then execute the stgxfwcmmodsrv command with the -f option specified to change the port numbers.

[Example] In the case that name of the server information change instruction file is "c:\acm\modfile".

```
$INS_DIR\ACM\bin\stgxfwcmmodsrv -f c:\acm\modfile
```

7. Restart the Management Server.



For details on the stgxfwcmmodsrv command and the server information change instruction file, refer to "stgxfwcmmodsrv (Server information change command)" in the "ETERNUS SF AdvancedCopy Manager Operation Guide" for the operating system of the Management Server.

The Web Console uses the following ports internally.

port number	protocol	Note
28005	tcp	Port numbers used inside Web Console
28009	tcp	
28443	tcp	
15432	tcp	
5441	udp	

If the above port numbers are used by other applications, the Web Console cannot start. In this case, change the port numbers according to the following steps.

1. Execute the following batch on the Management Server to stop the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Stop_ESFservice.bat
```

2. Open the following files with text editor.

- \$INS_DIR\Common\sys\tomcat\conf\server.xml
- \$INS_DIR\Common\sys\apache\conf\httpd.conf
- \$ENV_DIR\Common\etc\db\data\postgresql.conf
- \$INS_DIR\Common\sys\tomcat\webapps\esfv15\WEB-INF\config\database.yml
- \$INS_DIR\ESC\Manager\opt\FJSVssmgr\etc\properties\escs_event.properties

3. Change the default port numbers (28005, 28009, 28443, 15432 and 5441) to other numbers.

- server.xml

Change the port number of the Server tag.

```
<Server port="28005" shutdown="SHUTDOWN">
```

Change the port number listed in the port of the Connector tag and redirectPort.

```
<Connector port="28009" address="127.0.0.1"
enableLookups="false" redirectPort="28443" protocol="AJP/1.3" />
```

- httpd.conf

Change the port numbers of the ProxyPass and ProxyPassReverse directive.

```
ProxyPass / ajp://localhost:28009/ timeout=900
ProxyPassReverse / ajp://localhost:28009/
```

- postgresql.conf

Change the port number of the port directive.

```
port = 15432 # (change requires restart)
```

- database.yml

Change the port number of the port directive to the same number as described in postgresql.conf.

```
port = 15432
```

- escs_event.properties

Change the port number of the ccs.event.port directive.

```
ccs.event.port = 5441
```

4. Save and close these files.
5. Execute the following batch on the Management Server to start the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Start_ESFservice.bat
```

5.1.3.2 Changing IP address (Windows)

The following is the procedure to change the IP address of Management Server.



About description in the procedure:

- \$INS_DIR: "Program Directory" specified at the ETERNUS SF Manager installation

Perform the following procedure to change the IP address of Management Server.

1. Execute the following batch file on the Management Server to stop the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Stop_ESFservice.bat
```

2. Stop the SymfoWARE services.

Open Service Control Manager to stop the following service.

- SymfoWARE RDA RDBSWSTF
- SymfoWARE RDB RDBSWSTF

3. Change the IP address of the Management Server.

4. Execute the following batch file on the Management Server to start the ETERNUS SF Manager services.

```
$INS_DIR\Common\bin\Start_ESFservice.bat
```

5. Start the SymfoWARE services.

Open Service Control Manager to start the following service.

- SymfoWARE RDA RDBSWSTF
- SymfoWARE RDB RDBSWSTF

6. Create a server information change instruction file on the Management Server, then execute the stgxfwcmmodsrv command with the -f option specified to change the IP addresses.

[Example] In the case that name of the server information change instruction file is "c:\acm\modfile".

```
$INS_DIR\ACM\bin\stgxfwcmmodsrv -f c:\acm\modfile
```

7. If the IP address of the Management Server is specified for SNMP Trap destination, change the specified IP address using the ETERNUS Web GUI.
For more information, refer to the ETERNUS Web GUI manuals.
8. Restart the Management Server.

9. Launch the Web Console and connect to Express's manager running on the Management Server whose IP address has been changed.



For details on the `stgxfwcmmodsrv` command and the server information change instruction file, refer to "stgxfwcmmodsrv (Server information change command)" in the "ETERNUS SF AdvancedCopy Manager Operation Guide" for the operating system of the Management Server.

5.2 Maintenance of Express's manager environment (Linux)

5.2.1 Backing up Express's manager environment (Linux)

It is required to back up the Express's manager environment to recover from failure on the Management Server. Perform the following procedure to back up the Express's manager environment. All operations are performed on the Management Server.



About description in the procedure:

Directory name	Explanation
\$BAK_DIR	This is a backup destination directory.

1. Stop the ETERNUS SF Manager Web service.

Execute the following shell script to stop the service.

```
/opt/FJSVesfcm/bin/stop-webservice.sh
```

2. Create a backup data.

Create the following backup directories:

```
mkdir -p $BAK_DIR/Common
```

Execute the following command to create a backup data. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*. The file name of the created backup data is *<file_name>*.

```
/opt/FJSVesfcm/postgres/bin/pg_dump -U esfpostgres -C --attribute-inserts -p <port number> -f $BAK_DIR/Common/<file_name> esfdb
```

The prompt is displayed, and waiting for input. Input the following strings.

```
master01!
```

3. Execute the following shell script to stop the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/stopesf.sh
```



When the batch is executed, the message that ETERNUS SF Manager Web Service has been already stopped is displayed many times. Please ignore because there is no problem.

4. Back up the management information for disk storage system.

Create the following backup directory:

```
mkdir -p $BAK_DIR/var/opt/FJSVssmgr/current/opencimom/logr
```

Copy the files to the backup destination directory.

```
cp -Rp /var/opt/FJSVssmgr/current/opencimom/logr/* $BAK_DIR/var/opt/FJSVssmgr/current/opencimom/logr/
```

5. Back up an essential file.

If a file does not exist, this step is unnecessary.

Create the following backup directory.

```
mkdir -p $BAK_DIR/var/opt/FJSVssmgr/current
```

Copy the backup source file to the backup destination directory.

```
cp -p /var/opt/FJSVssmgr/current/systemevent.csv $BAK_DIR/var/opt/FJSVssmgr/current/
```

6. Back up files that are related to the performance management function.

If you are not using the performance management function, this step is unnecessary.

Create the following backup directory.

```
mkdir -p $BAK_DIR/etc/opt/FJSVssmgr/current
mkdir -p $BAK_DIR/etc/opt/FJSVssmgr/current/perfconf
mkdir -p $BAK_DIR/var/opt/FJSVssmgr/current/perf
```

Copy the subdirectories and files to the backup destination directory.

```
cp -p /etc/opt/FJSVssmgr/current/perf.conf $BAK_DIR/etc/opt/FJSVssmgr/current/
cp -p /etc/opt/FJSVssmgr/current/perfconf/* $BAK_DIR/etc/opt/FJSVssmgr/current/perfconf/
cp -Rp /var/opt/FJSVssmgr/current/perf/* $BAK_DIR/var/opt/FJSVssmgr/current/perf/
```

7. Back up customizable files.

It is unnecessary to back up the files or directories which are not existed.

Create the following backup directory.

```
mkdir -p $BAK_DIR/etc/opt/FJSVssmgr/current
mkdir -p $BAK_DIR/etc/opt/FJSVssmgr/current/eventmail
```

Copy the subdirectories and files to the backup destination directory.

```
cp -p /etc/opt/FJSVssmgr/current/sanma.conf $BAK_DIR/etc/opt/FJSVssmgr/current/
cp -Rp /etc/opt/FJSVssmgr/current/eventmail/* $BAK_DIR/etc/opt/FJSVssmgr/current/eventmail/
```

8. Back up the polling service setting file.

This step can be skipped if you are not customizing the polling service setting file.

If you have customized the polling service setting file pollingService.xml, back up this file using the step shown below:

Create the directory for the backup data.

```
# mkdir -p $BAK_DIR/etc/opt/FJSVssmgr/current/polling
```

Copy the file to the backup location.

```
# cp -p /etc/opt/FJSVssmgr/current/polling/pollingService.xml $BAK_DIR/etc/opt/FJSVssmgr/current/polling/
```

9. Back up the files associated with definition of copy group and copy pair.

This step is required only when using Advanced Copy function.

Create the following backup directories.

```
mkdir -p $BAK_DIR/CCM/etc
mkdir -p $BAK_DIR/CCM/etc/db
mkdir -p $BAK_DIR/CCM/etc/db/cg
mkdir -p $BAK_DIR/CCM/etc/prop
mkdir -p $BAK_DIR/CCM/var/micc/database
```

Copy the subdirectories and files to the backup destination directory.

It is unnecessary to back up the files which are not existed.

```
cp -p /etc/opt/FJSVccm/db/eternus.xml $BAK_DIR/CCM/etc/db
cp -p /var/opt/FJSVccm/micc/database/DeviceRegList.xml $BAK_DIR/CCM/var/micc/database
cp -p /etc/opt/FJSVccm/prop/user.properties $BAK_DIR/CCM/etc/prop
cp -p /etc/opt/FJSVccm/acc/etc/stxc.alias $BAK_DIR/CCM/etc
cp -p /etc/opt/FJSVccm/acc/etc/stxc_ext.alias $BAK_DIR/CCM/etc
cp -p /etc/opt/FJSVccm/acc/etc/stxcvolinf $BAK_DIR/CCM/etc
cp -Rp /etc/opt/FJSVccm/db/cg/* $BAK_DIR/CCM/etc/db/cg
```

10. Back up the license management database.

Create the following backup directory:

```
mkdir -p $BAK_DIR/LM
```

Execute the following command. The file specified with *<file_name>* will be created as a backup file.

```
/opt/FJSVesflm/bin/esflm backup $BAK_DIR/LM/<file_name>
```

11. Execute the following shell script to start the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/startesf.sh
```

5.2.2 Restoring Express Environment (Linux)

If any failure occurs in the Management Server, perform the following procedure to restore Management Server environment. All operations are performed on the Management Server.



Information

About description in the procedure:

Directory name	Explanation
\$BAK_DIR	This is a backup destination directory.

1. Reconfigure the Express's manager.

Install the ETERNUS SF Manager, and set up it as the Express's manager.

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

2. Stop the ETERNUS SF Manager Web service.

Execute the following shell script to stop the service.

```
/opt/FJSVesfcm/bin/stop-webservice.sh
```

3. Restore a backup data.

Execute the following command. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*.

```
/opt/FJSVesfcm/postgres/bin/psql -U esfpostgres -p <port number> postgres
```

The prompt is displayed, and waiting for input. Input the following strings in order.

```
master01!  
drop database esfdb;  
/q
```

Execute the following command to restore the backup data. Specify 15432 to *<port number>* by default. If you have changed the port number, specify that port number to *<port number>*. The *<file_name>* is the file name specified when the backup data was created.

```
/opt/FJSVesfcm/postgres/bin/psql -U esfpostgres -p <port number> -f $BAK_DIR/Common/<file_name>  
postgres
```

The prompt is displayed, and waiting for input. Input the following strings.

```
master01!
```

4. Execute the following shell script to stop the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/stopesf.sh
```



Note

When the batch is executed, the message that ETERNUS SF Manager Web Service has been already stopped is displayed many times. Please ignore because there is no problem.

5. Restore the management information for disk storage system.

Delete files under the following restore destination directory.

However, do not delete the following directory itself. If the directory does not exist, create it.

```
rm -rf /var/opt/FJSVssmgr/current/opencimom/logr/*
```

Copy the files from the destination directory.

```
cp -Rp $BAK_DIR/var/opt/FJSVssmgr/current/opencimom/logr/* /var/opt/FJSVssmgr/current/opencimom/  
logr/
```

6. Restore the essential file.

Delete the following restore destination file.

```
rm -f /var/opt/FJSVssmgr/current/systemevent.csv
```

Copy the following source file from the destination file. If the file does not exist, this step is unnecessary.

```
cp -p $BAK_DIR/var/opt/FJSVssmgr/current/systemevent.csv /var/opt/FJSVssmgr/current/
```

7. Restore files that are related to the performance management function.

If you are not using the performance management function or the files related to the performance management function are not backed up, this step is unnecessary.

Delete files and subdirectories under following restore destination directory.

However, do not delete the restore destination directory itself. If the restore destination directory does not exist, create it.

```
rm -f /etc/opt/FJSVssmgr/current/perf.conf
rm -rf /etc/opt/FJSVssmgr/current/perfconf/*
rm -rf /var/opt/FJSVssmgr/current/perf/*
```

Copy the subdirectories and files from the destination directory.

```
cp -p $BAK_DIR/etc/opt/FJSVssmgr/current/perf.conf /etc/opt/FJSVssmgr/current/
cp -p $BAK_DIR/etc/opt/FJSVssmgr/current/perfconf/* /etc/opt/FJSVssmgr/current/perfconf/
cp -Rp $BAK_DIR/var/opt/FJSVssmgr/current/perf/* /var/opt/FJSVssmgr/current/perf/
```

8. Restore customizable files.

Restore only the files and directories which were backed up.

Delete files and subdirectories under following restore destination directory.

However, do not delete the restore destination directory itself. If the restore destination directory does not exist, create it.

```
rm -f /etc/opt/FJSVssmgr/current/sanma.conf
rm -rf /etc/opt/FJSVssmgr/current/eventmail/*
```

Copy the subdirectories and files from the destination directory.

```
cp -p $BAK_DIR/etc/opt/FJSVssmgr/current/sanma.conf /etc/opt/FJSVssmgr/current/
cp -Rp $BAK_DIR/etc/opt/FJSVssmgr/current/eventmail/* /etc/opt/FJSVssmgr/current/eventmail/
```

9. Restore the polling service setting file.

This restoration is unnecessary for the files which have not been backed up.

Copy the file from the backup location.

```
# cp -p $BAK_DIR/etc/opt/FJSVssmgr/current/polling/*.xml /etc/opt/FJSVssmgr/current/polling/
```

10. Restore the files associated with definition of copy group and copy pair.

This step is required only when using Advanced Copy function.

Delete files under the following restore destination directory.

```
rm -rf /etc/opt/FJSVccm/db/cg/*
rm -f /etc/opt/FJSVccm/prop/user.properties
rm -f /etc/opt/FJSVccm/acc/etx/stxc.alias
rm -f /etc/opt/FJSVccm/acc/etx/stxc_ext.alias
rm -f /etc/opt/FJSVccm/acc/etx/stxcvolinf
```

Copy the subdirectories and files from the destination directory.

It is unnecessary to restore the files which are not existed.

```
cp -p $BAK_DIR/CCM/etc/db/eternus.xml /etc/opt/FJSVccm/db
cp -p $BAK_DIR/CCM/var/micc/database/DeviceRegList.xml /var/opt/FJSVccm/micc/database
cp -p $BAK_DIR/CCM/etc/prop/user.properties /etc/opt/FJSVccm/prop
cp -p $BAK_DIR/CCM/etc/stxc.alias /etc/opt/FJSVccm/acc/etx
cp -p $BAK_DIR/CCM/etc/stxc_ext.alias /etc/opt/FJSVccm/acc/etx
cp -p $BAK_DIR/CCM/etc/stxcvolinf /etc/opt/FJSVccm/acc/etx
cp -Rp $BAK_DIR/CCM/etc/db/cg/* /etc/opt/FJSVccm/db/cg
```

11. Restore the license management database.

Execute the following command. The <file_name> is the file name specified when the backup data was created.

```
/opt/FJSVccm/bin/esflm restore $BAK_DIR/LM/<file_name>
```

12. Execute the following shell script to start the ETERNUS SF Manager services.

```
/opt/FJSVccm/bin/startesf.sh
```


5.2.3 Changing Express's manager environment (Linux)

This section describes the following procedure.

- How to change port number that is used by Express
- How to change the IP address of the Management Server

5.2.3.1 Changing port numbers (Linux)

This section describes how to change port number that is used by Express.

The port numbers are defined in the operating system's services file. The ports shown in the following table are used by Express. The default values for the port numbers are shown. If you have changed the value for these port numbers, please read the numbers to replace after the change in this section.

port number	service name	protocol	Note
9855	esfmanagerweb	tcp	Port number used for the Web Console
1226	stgxfws	tcp	Port number used for configuration management and polling monitoring
32004	rdaswstf	tcp	Port numbers used inside Express
9851	rmiswstf	tcp	
9852	semswstf	tcp	
24916	sscruiserm	tcp	

Perform the following procedure to change the port numbers used by Express.

1. Open the file "/etc/services" with a notepad.
2. Pick out the entry of a service name to be changed to change its entry port number.
A port number can be entered between 1024 and 65535. However, a port number from 5001 to 32768 is recommended.

```
# <service name> <port number>/<protocol> [aliases...] [#<comment>]
#
rdaswstf 32004/tcp
stgxfws 1226/tcp
rmiswstf 9851/tcp
semswstf 9852/tcp
esfmanagerweb 9855/tcp
sscruiserm 24916/tcp
```

3. Save the "/etc/services" file and close it.
4. Edit httpd.conf file if the port number used by Web Console is changed.
 1. Open the "/etc/opt/FJSVesfcm/conf/apache/httpd.conf" file with text editor.
 2. Change the port number listed immediately after the Listen directive.

```
Listen 0.0.0.0:9855
```

3. Save the "/etc/opt/FJSVesfcm/conf/apache/httpd.conf" file and close it.
5. Restart services.
 1. Execute the following shell script on the Management Server to stop the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/stopesf.sh
```

2. Execute the following shell script on the Management Server to start the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/startesf.sh
```

6. Create a server information change instruction file on the Management Server, then execute the `stgxfwcmmodsrv` command with the `-f` option specified to change the port numbers.

[Example] In the case that name of the server information change instruction file is `"/acm/modfile"`.

```
/opt/FJSVswstf/bin/stgxfwcmmodsrv -f /acm/modfile
```

7. Restart the Management Server.



See

For details on the `stgxfwcmmodsrv` command and the server information change instruction file, refer to "stgxfwcmmodsrv (Server information change command)" in the "ETERNUS SF AdvancedCopy Manager Operation Guide" for the operating system of the Management Server.

The Web Console uses the following ports internally.

port number	protocol	Note
28005	tcp	Port numbers used inside Web Console
28009	tcp	
28443	tcp	
15432	tcp	
5441	udp	

If the above port numbers are used by other applications, the Web Console cannot start. In this case, change the port numbers according to the following steps.

1. Execute the following shell script on the Management Server to stop the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/stopesf.sh
```

2. Open the following files with text editor.

- `/etc/opt/FJSVesfcm/conf/tomcat/server.xml`
- `/etc/opt/FJSVesfcm/conf/apache/httpd.conf`
- `/var/opt/FJSVesfcm/db/data/postgresql.conf`
- `/opt/FJSVesfcm/tomcat/webapps/esfv15/WEB-INF/config/database.yml`
- `/opt/FJSVssmgr/etc/properties/escs_event.properties`

3. Change the default port numbers (28005, 28009, 28443, 15432 and 5441) to other numbers.

- `server.xml`

Change the port number of the Server tag.

```
<Server port="28005" shutdown="SHUTDOWN">
```

Change the port number listed in the port of the Connector tag and `redirectPort`.

```
<Connector port="28009" address="127.0.0.1"
enableLookups="false" redirectPort="28443" protocol="AJP/1.3" />
```

- `httpd.conf`

Change the port numbers of the `ProxyPass` and `ProxyPassReverse` directive.

```
ProxyPass / ajp://localhost:28009/ timeout=900
ProxyPassReverse / ajp://127.0.0.1:28009/
```

- postgresql.conf

Change the port number of the port directive.

```
port = 15432
```

- database.yml

Change the port number of the port directive to the same number as described in postgresql.conf.

```
port = 15432
```

- escs_event.properties

Change the port number of the ccs.event.port directive.

```
ccs.event.port = 5441
```

4. Save and close these files.
5. Execute the following shell script on the Management Server to start the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/startesf.sh
```

5.2.3.2 Changing IP address (Linux)

The following is the procedure to change the IP address of Management Server.

1. Execute the following batch file on the Management Server to stop the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/stopesf.sh
```

2. Change the IP address of the Management Server.
3. Execute the following shell script on the Management Server to start the ETERNUS SF Manager services.

```
/opt/FJSVesfcm/bin/startesf.sh
```

4. Create a server information change instruction file on the Management Server, then execute the stgxfwcmmodsrv command with the -f option specified to change the IP addresses.

[Example] In the case that name of the server information change instruction file is "c:/acm/modfile".

```
/opt/FJSVswstf/bin/stgxfwcmmodsrv -f /acm/modfile
```

5. If the IP address of the Management Server is specified for SNMP Trap destination, change the specified IP address using the ETERNUS Web GUI.
For more information, refer to the ETERNUS Web GUI manuals.
6. Restart the Management Server.
7. Launch the Web Console and connect to Express's manager running on the Management Server whose IP address has been changed.



See

.....
For details on the stgxfwcmmodsrv command and the server information change instruction file, refer to "stgxfwcmmodsrv (Server information change command)" in the "ETERNUS SF AdvancedCopy Manager Operation Guide" for the operating system of the Management Server.
.....

5.3 Action required when Management Server functionality is stopped

If processing stops in Express's manager or the Management Server before an operation started in the Web Console is complete, the operation result may not be reflected properly in the Express's manager.

In this case, reload the device information to reflect in Express's manager.

For details on the operation procedures, refer to "Reload ETERNUS Disk storage system configuration information" in the "ETERNUS SF Web Console Guide".

5.4 Caution about a disk storage system managed in several Express's managers

If the same Disk storage system is managed in several Express's managers, the result of an operation initiated in a Web Console connected to an Express's manager will not be reflected in the other Express's manager.

In this case, reload the device information on other Express's manager. to reflect it in other Express's manager.

For details on the operation procedures, refer to "Reload ETERNUS Disk storage system configuration information" in the "ETERNUS SF Web Console Guide".

5.5 Caution about operating the disk storage system outside Express's manager

If an operation has been initiated directly in the ETERNUS Disk storage system by the ETERNUS Web GUI, the operation result will not be reflected in Express's manager.

To reflect the operation result in Express's manager, follow the same procedure as in ["5.4 Caution about a disk storage system managed in several Express's managers"](#).

Appendix A Advanced Copy Function

This appendix explains the Advanced Copy function of ETERNUS Disk storage system.



For details on the commands used in Express, refer to "Commands" in the "ETERNUS SF Operation Guide for Copy Control Module".

A.1 Overview of Advanced Copy function

A.1.1 What is Advanced Copy function?

Advanced Copy functions allow ETERNUS Disk storage system to carry out high-speed copying operations itself, with no need to draw on server CPU resources. With Advanced Copy functions, at any point in time a business data volume can be copied to a separate copy volume, quickly and within ETERNUS Disk storage system. Once the copy is complete, the copy volume can be separated from the business volume ensuring no further updates to the business volume are applied to the copy volume. This allows the copy volume data to be backed up to a tape device, as a point in time copy of the business data, while normal operations continue.

Advanced Copy methods

Advanced Copy functions provide three clone functions (EC, OPC and QuickOPC) and one snapshot function (SnapOPC+).

- Clone is a full (real) copy of the original data.
- Snapshot is a virtual copy of the original data.

EC (Equivalent Copy)

A function that maintains a synchronized copy of a business data volume on a copy volume (Mirroring method).

The business volume and copy volume are synchronized but can be separated at any required time (mirror suspend). The copy volume can then be backed up to a tape device while business operations continue on the business volume.

Suspend/Resume functions can be used to re-establish the mirror by copying only updated data since the mirror was suspended.

OPC (One Point Copy)

A function that creates a copy of the business data volume at any point in time (Background Copy).

Data on the business volume is copied logically to a copy volume, quickly, as and when required.

The copy volume can be used for backup operation, to a tape device, without waiting for physical copy completion, while business operations can continue on the business volume.

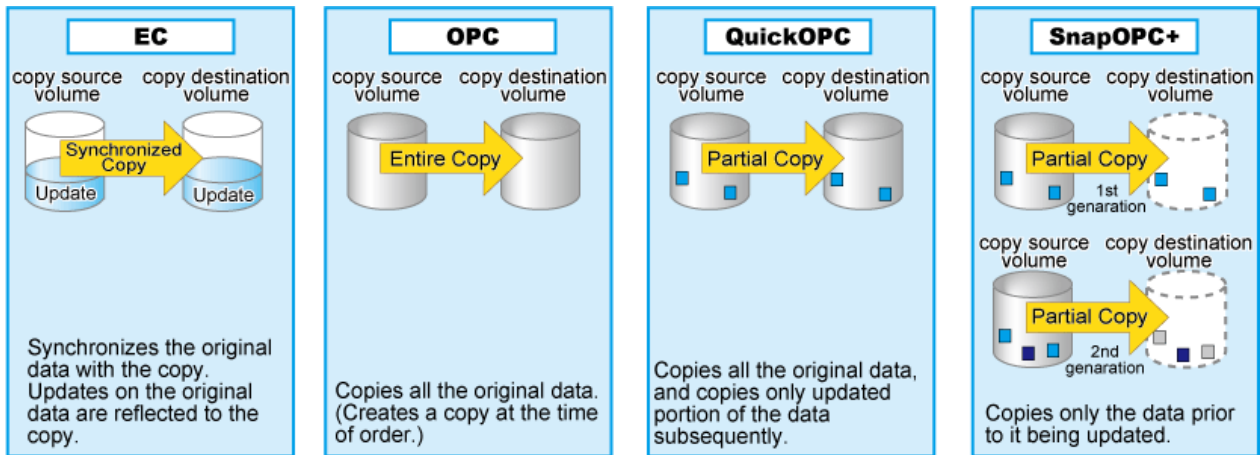
QuickOPC

A function that creates a copy of all the business data volume and subsequently only copies updated data (Background Copy). This suits large database operation where backup times must be reduced.

SnapOPC+

A function that creates a copy of the data prior to it being updated (Copy-on-Write).

As requires less copy volume capacity compared with clone, SnapOPC+ is ideal for copy operations for systems with relatively few updates such as file servers.



These copy methods all provide access to the data as it exists at a specific point in time, but there are different features, advantages and disadvantages to each method as detailed below:

Function name	Copy type			
	Clone copy			Snapshot copy
	EC	OPC	QuickOPC	SnapOPC+
Copy method	Mirror breaking method	Background copy method	Background copy method	Copy-on-write method
Timing of actual copy load	Before "mirror breaking"	After the copy command is issued	After the copy command is issued	-
Effect on access to the copy source while copy is running	None	Minor	Minor	Yes
Effect on access to the copy source after copy has "finished"	None	Slight during background copy	Slight during background copy	Yes
Lifetime of copy session	Until the Equivalent state is stopped	Until background copy is completed	Until session is stopped and copy is completed	Until session is stopped
Size of copy destination area	Same as the copy source (Clone)	Same as the copy source (Clone)	Same as the copy source (Clone)	Sufficient for changed areas (Snapshot)
Copy action during restore	<ul style="list-style-type: none"> - Copy back all the data by OPC - EC Reverse (Suspend -> Reverse -> Resume) only copies updated areas 	<ul style="list-style-type: none"> - If OPC is active, copy back only the already copied data (Restore OPC) - If OPC is completed, copy back all of the copied data 	Copy back only the already copied data	Copy back only the already copied data For ETERNUS DX60/DX60 S2/ DX80/DX90, restore operation is not available (use OS tools to copy whole files instead)
Best used for...	<ul style="list-style-type: none"> - Backup to disk - Creation of testing data 	<ul style="list-style-type: none"> - Backup to disk - Creation of testing data - Restoring from backup disk 	<ul style="list-style-type: none"> - Backup to disk - Creation of testing data - Recovery from physical disk 	<ul style="list-style-type: none"> - Temporary backup area for backup to tape - Backup to disk for file server

Function name	Copy type			
	Clone copy			Snapshot copy
	EC	OPC	QuickOPC	SnapOPC+
			failure when data modification rate is low	and other low modification rate data (generational management is available)

 **Note**

These are generic observations based on the mechanisms involved. Actual effect on servers will depend on the specifics of the usage environment.

A.1.2 What is Remote Advanced Copy?

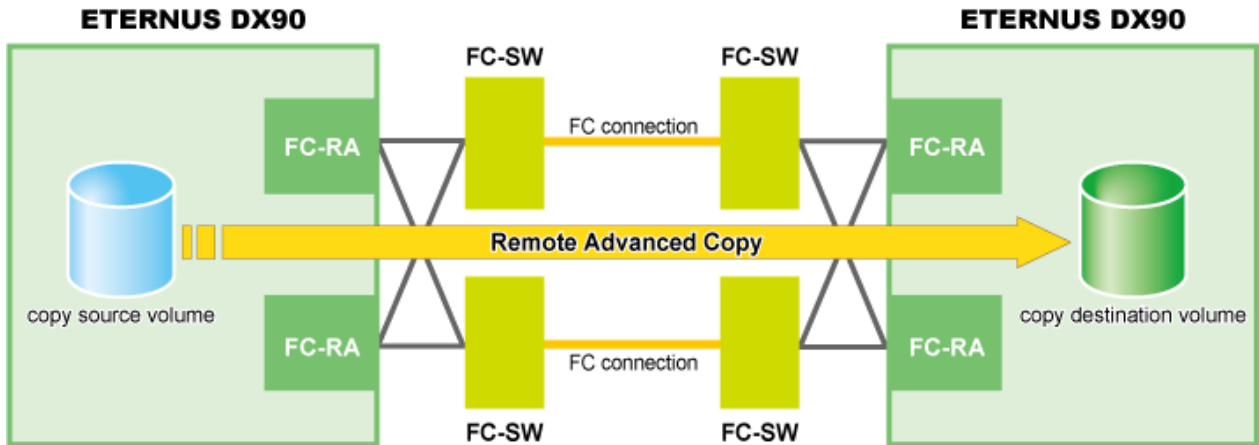
Remote Advanced Copy provides a server-less remote mirroring function which ensures fast recovery when the primary site Disk storage system becomes unusable because of a disaster, such as fire, earthquake or malicious damage.

Remote Advanced Copy method

Remote Advanced Copy

By using Fibre Channel interfaces, Remote Advanced Copy can provide lower cost remote site support up to a maximum distance of 10km between a primary storage device and a secondary device.

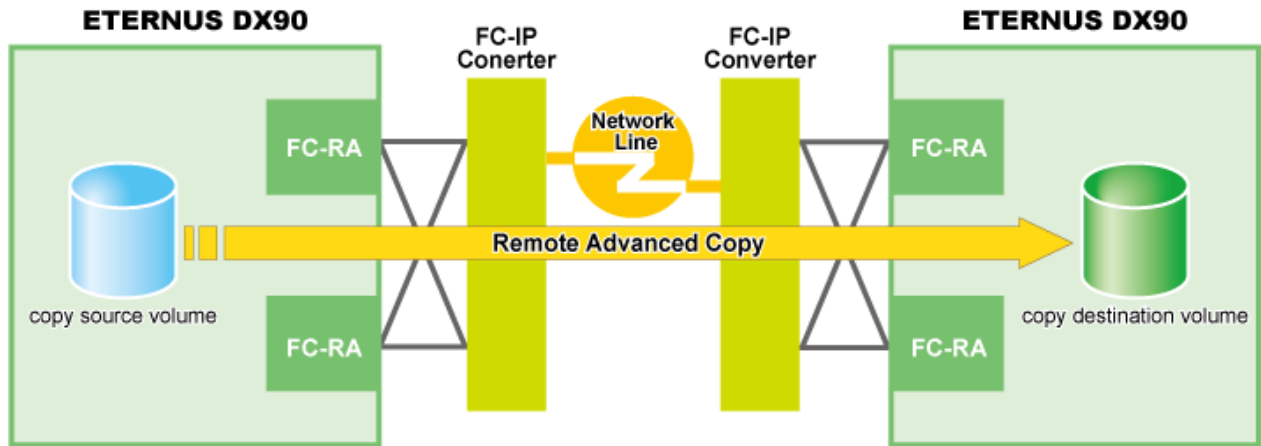
Figure A.1 Remote Advanced Copy connection



Extended Remote Advanced Copy

Extended Remote Advanced Copy uses a combination of a Fibre Channel switch and WAN converter to support very long distances over WAN. Replicated data can be located at a remote site hundreds of kilometers away from the primary site. This provides high security for the protection of critical data from both man-made and natural disasters.

Figure A.2 Extended Remote Advanced Copy connection (via FC-RA)



A.2 Configuration of Advanced Copy function

A.2.1 Configuration common in all copy methods

Copy table size settings

Specify the parameters required to use (Remote) Advanced Copy. Decide these parameters by the copy capacity and the number of sessions (volumes) that will be run simultaneously, and then set them using the Web Console, ETERNUS Web GUI, or ETERNUS CLI.

- Copy table size

The copy table size is the dedicated memory area required for Advanced Copy management. Please allocate in advance.

- Resolution

The resolution is the value that determines the amount of data each bit in the copy bitmap represents.

The allowed resolution settings of "1 (standard)", "2", "4", "8", and "16" respectively give 8KB, 16KB, 32KB, 64KB, and 128KB regions of data per bitmap bit. The same value is used in the ETERNUS Disk storage system. The smallest possible resolution value should be set, to reduce the internal process overhead.

Please estimate by 1 time as much as possible.

A.2.2 Configuration of clone copy

Creating copy destination volumes

When creating copy destination volumes for clone copy, note the following:

- The type of a copy destination volume must be OPEN, standard or Thin Provisioning Volume (TPV). Snap Data Volume (SDV) or Snap Data Pool Volume (SDPV) cannot be used as a copy destination volume for clone copy.
- The size of a copy destination volume must be the same as that of copy source volume (the original volume).

For procedures about creating a copy destination volume, refer to "Create the volume" in the "ETERNUS SF Web Console Guide".

A.2.3 Configuration of snapshot copy

Creating copy destination volumes

When creating copy destination volumes for snapshot copy, note the following:

- The type of a copy destination volume must be SDV.
OPEN, SDPV, standard or TPV cannot be used as a copy destination for snapshot copy.
- The size of a copy destination volume must be the same as that of copy source volume (the original volume).
- When creating an SDV, set the appropriate capacity.

For procedures about creating a copy destination volume, refer to "Create the volume" in the "ETERNUS SF Web Console Guide".

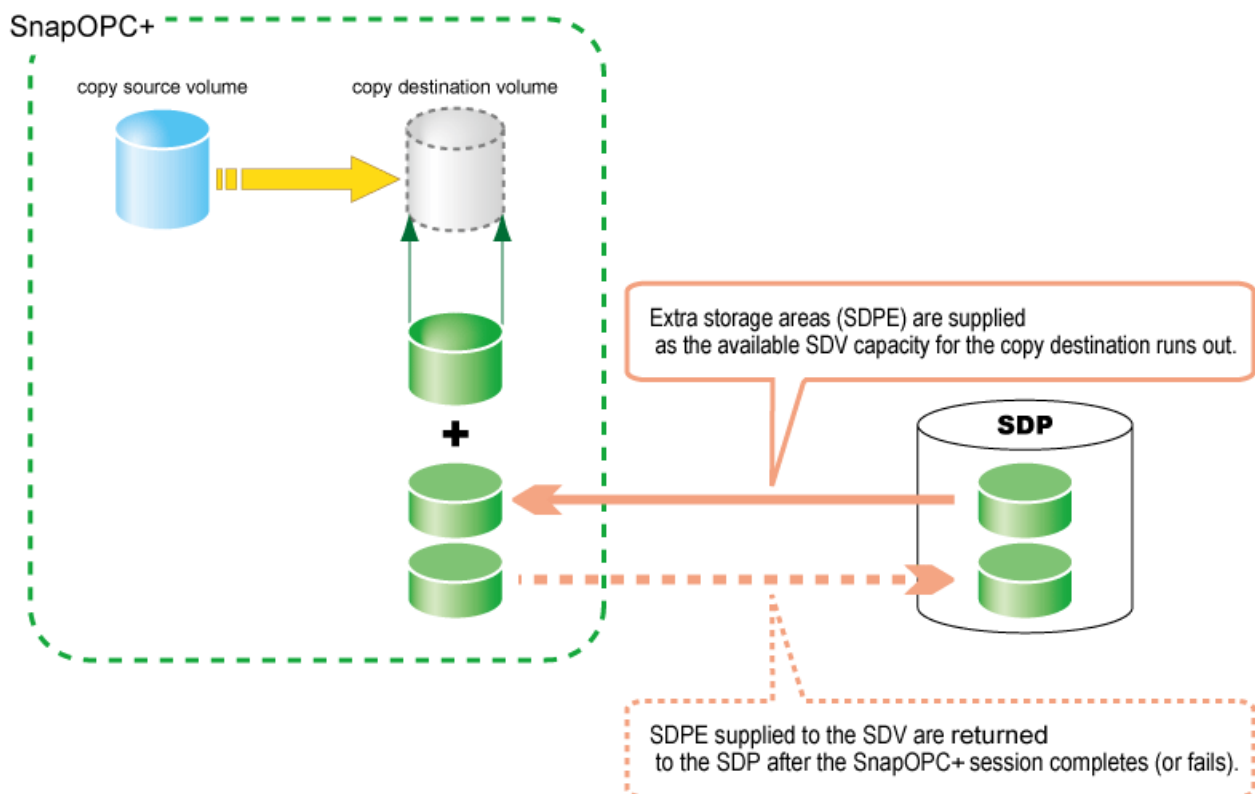
Creating Snap Data Pool (SDP)

Snap Data Pool (SDP) is used for SnapOPC+.

By registering standby storage areas in the SDP, it is possible to supply extra storage areas (SDPE: Snap Data Pool Elements) from the SDP whenever the amount of updates exceeds the capacity of the copy destination SDV, allowing the copy session to continue without failing. For ETERNUS DX80 S2/DX90 S2, one or more than SDPVs are required.

- If storage area capacity runs short in an SDV, extra storage area (SDPE) is automatically supplied from the SDP.
- Once the copy session is completed, all extra storage area (SDPE) supplied to the SDV is returned to the SDP. (The SDPE is also returned to the SDP if the copy session fails.)

Figure A.3 SDP concept

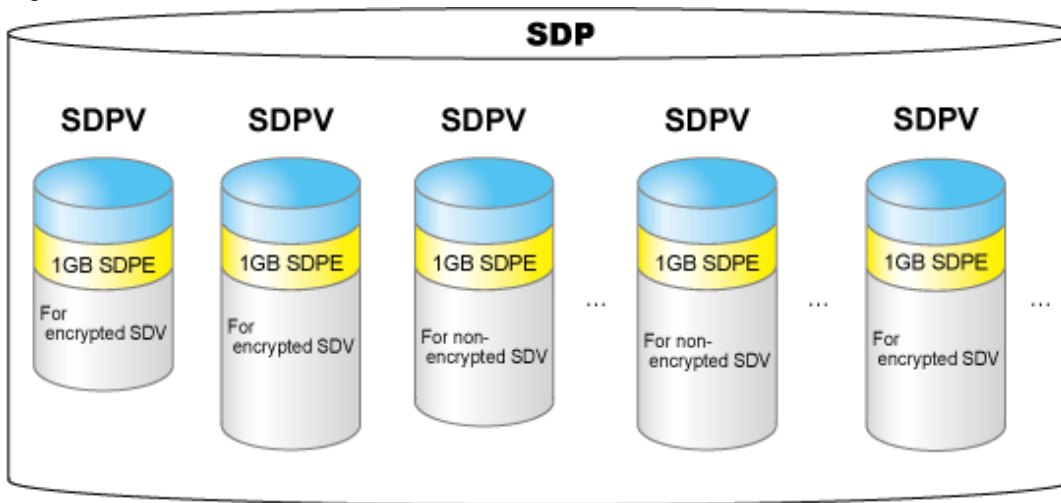


When creating copy destination volumes for snapshot, note the following:

- One SDP can be created per ETERNUS Disk storage system.
- SDP becomes available upon creating a dedicated SDPV. After creation, the SDPV is automatically allocated to the SDP.
- If the SDV is encrypted, make sure the SDPV is also encrypted.
- If the ETERNUS Disk storage system contains both encrypted and non-encrypted SDVs, then both encrypted and non-encrypted SDPVs will be needed.

- Estimate the update amounts expected for each copy source volume, then decide the SDV and SDP capacities. If estimation is difficult, try setting up the SDV and SDP with a total capacity of 50% of that of the copy source (note that this is just a rule-of-thumb value and that different operating configurations will require different SDP capacities).

Figure A.4 Construction of SDP



A.2.4 Configuration for remote copy

Creating copy destination volumes

When creating copy destination volumes for remote copy, note the following:

- The type of a copy destination volume must be OPEN, standard or TPV. SDV or SDPV cannot be used as a copy destination volume for remote copy.
- The size of a copy destination volume must be the same as that of copy source volume (the original volume).

For procedures about creating a copy destination volume, refer to "Create the volume" in the "ETERNUS SF Web Console Guide".

Setting of port mode

FC-RA ports or iSCSI-RA ports are required for REC.

Change the port mode of FC port or iSCSI port to Remote Adapter (RA).

Setting of copy paths

This setting is required for all storage systems that perform REC.

Create a data transmission path by combination of FC-RA ports or iSCSI-RA ports.

Setting of REC buffers

When using the Consistency mode, REC buffers are used. Up to four REC buffers can be set. Set the REC buffer size for both data transmission and reception units. You can use a single buffer for unidirectional data transfer only. Therefore, if you use the bidirectional data transfer, you must also set the buffer for reverse directional data transfer.

A.3 Clone copy (EC)

A.3.1 How to work

Figure A.5 State transition diagram

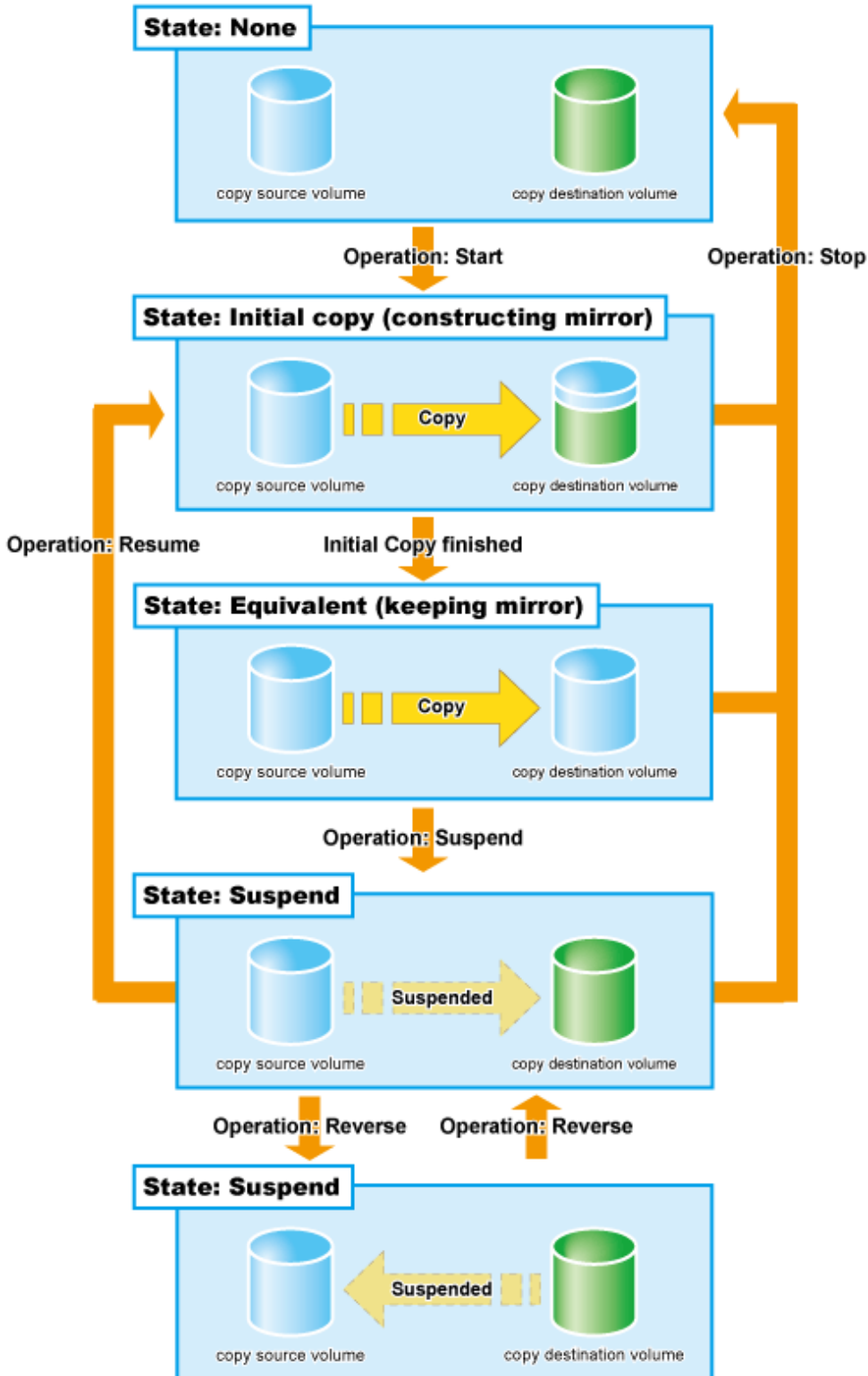


Table A.1 Relationship between session operation and Express function

Session operation	Express function
Start	acec start
Suspend	acec suspend

Session operation	Express function
Resume	acec resume
Reverse	acec reverse
Stop	acec cancel

Start

When the EC session is started, the whole area of data specified by the source parameters is copied.

- If data copying has been completed for a given area and a write operation is applied to that area, the write data is also transferred to the destination area.
- After all data in the specified area has been copied over, the data in source and destination areas will be kept in almost the same state by the EC function. This is called the Equivalent state. In the Equivalent state, if source data is changed, the same data is transferred to the destination area to maintain the Equivalent state.
- Until the EC session reaches to the Equivalent state, copy destination volume is neither readable nor writable.
When using Destination Access Permission function, copy destination volume is neither readable nor writable if the EC session reaches to the Equivalent state. In order to access the copy destination volume, it is necessary to suspend the EC session.
When not using Destination Access Permission function, copy destination volume is not writable but readable if the EC session is in the Equivalent state.



See

For details on the Destination Access Permission function, refer to "Using Destination Access Permission function for EC/REC" in the "ETERNUS SF Operation Guide for Copy Control Module".

Suspend

When the EC session is suspended, both the copy source volume and the copy destination volume are accessible as independent volumes (copy destination volume becomes readable and writable). The Suspend operation can only be executed when the EC session is in the Equivalent state.

Unlike the Stop operation, changes to the source and destination volumes continue to be tracked while the Suspend state applies.

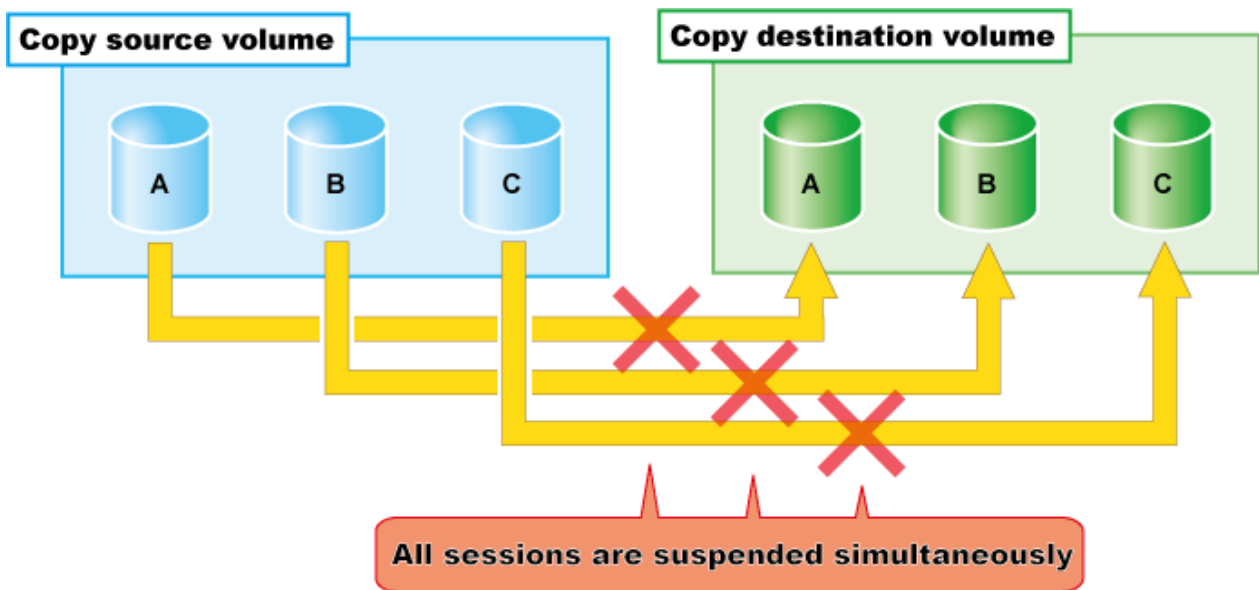
Resume

When the EC session is resumed, data is copied over from the source to the destination so as to catch up on all the changes that were made after the Suspend operation was performed and recover the Equivalent state. As the amount of data that thus needs to be transferred is much less than would be required if the whole source area were to be recopied, the time required to recover the Equivalent state is also greatly reduced.

If the source is changed under the Suspend state (when copying is temporarily interrupted by the Suspend operation), the changes are sent to the destination after the Resume operation is performed (when the copy is restarted). However, any changes made at the destination while under the Suspend state will be rolled-back (overwritten from the source data). Consequently, any and all changes made to the destination during the Suspend state are discarded and lost following the Resume operation.

Concurrent Suspend

Multiple EC sessions can be suspended using the Concurrent Suspend operation. This allows consistent copies of multi-volume data-objects, such as databases, to be easily acquired.



Reverse

When the EC session is reversed, the copy direction is reversed. The Reverse operation can only be executed when the EC session data is in the Suspend state.

Stop

When the EC session is stopped, it terminates. If the EC session in one of the following statuses is stopped, the copy destination volume should not be used because the mirroring is incomplete.

- Initial copy state
- Error suspend state

If the EC session in one of the following statuses is stopped, the copy destination volume can be used because the mirroring has been complete.

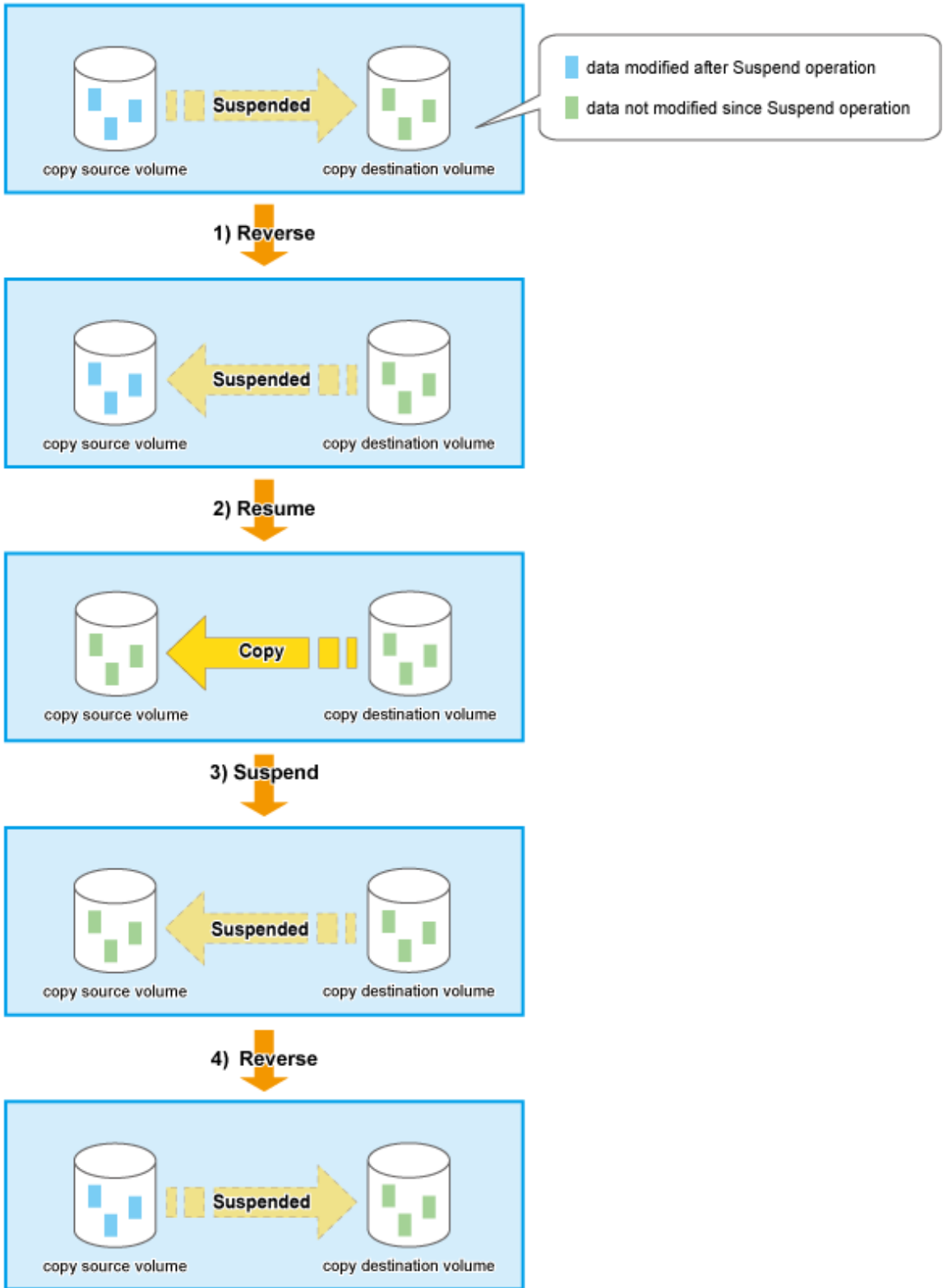
- Equivalent state
- Suspend state

A.3.2 Restore

Restoration can be performed by the Reverse function of EC or by OPC.

Restore by reversing EC

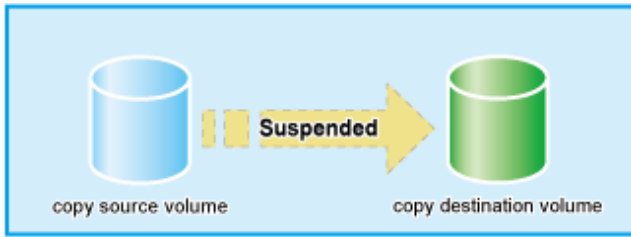
The Reverse operation of EC allows high-speed restoration of the pre-update data saved in the secondary destination back to the updated areas of the primary volume. (The Suspended copy session is reversed and then resumed.)



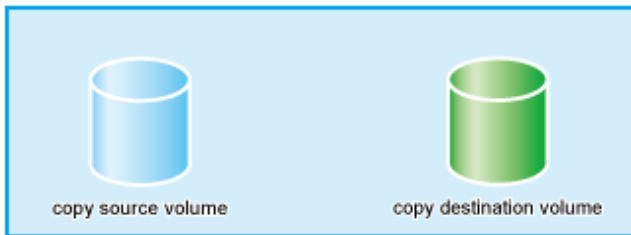
Restore by OPC

To perform restoration by OPC, define the OPC copy group and register a copy pair for the target volumes after stopping the EC session. Then, start the OPC in the reverse direction.

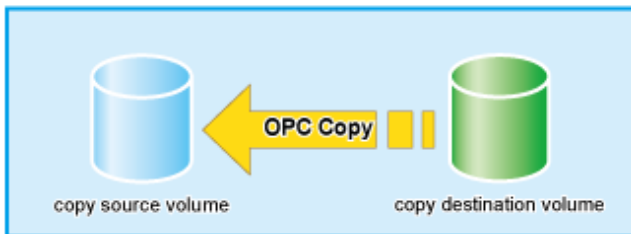
The method using OPC has no advantage over the method using the EC reverse function in that a full copy is required. However, it has the benefit that the original volume can be used immediately after the logical copy has completed.



1) Stop



2) Start OPC in reverse direction



A.4 Clone copy (OPC)

A.4.1 How to work

Figure A.6 State transition diagram

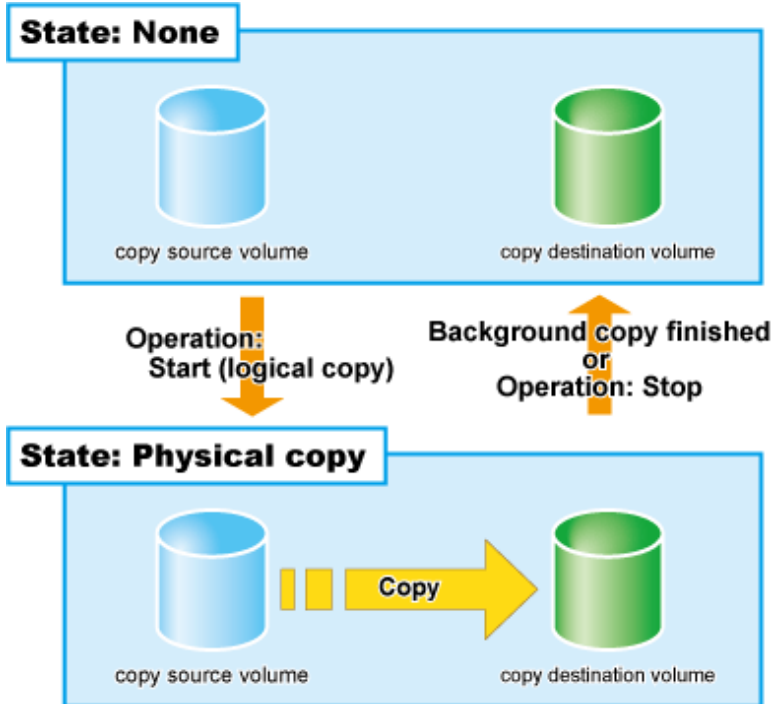


Table A.2 Relationship between OPC operation and Express function

Session operation	Express function
Start	acopc start
Stop	acopc cancel

Start

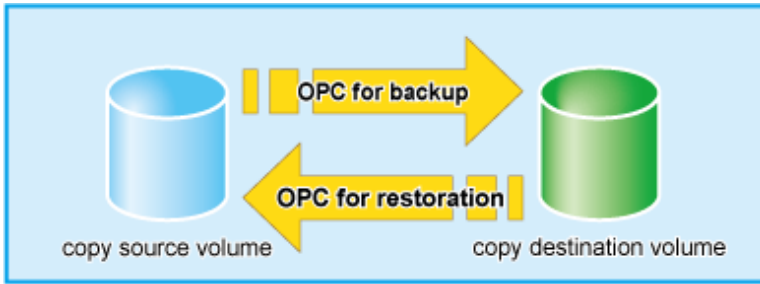
When the OPC session is started, the logical copy completes immediately and returns a "copied" response before any actual (physical) copying occurs. The actual physical copy process starts after the logical copy has finished. This is an internal ETERNUS Disk storage system background process. After the logical copy has completed, the copy destination area becomes accessible. When the physical copy has completed, the session automatically terminates.

Stop

When the OPC session is stopped, it terminates. The copy destination volume cannot be used because the physical copy is incomplete.

A.4.2 Restore

Restore can be done by executing OPC in the reverse direction. Especially, restoration with a background physical copy is possible.



A.5 Clone copy (QuickOPC)

A.5.1 How to work

Figure A.7 State transition diagram

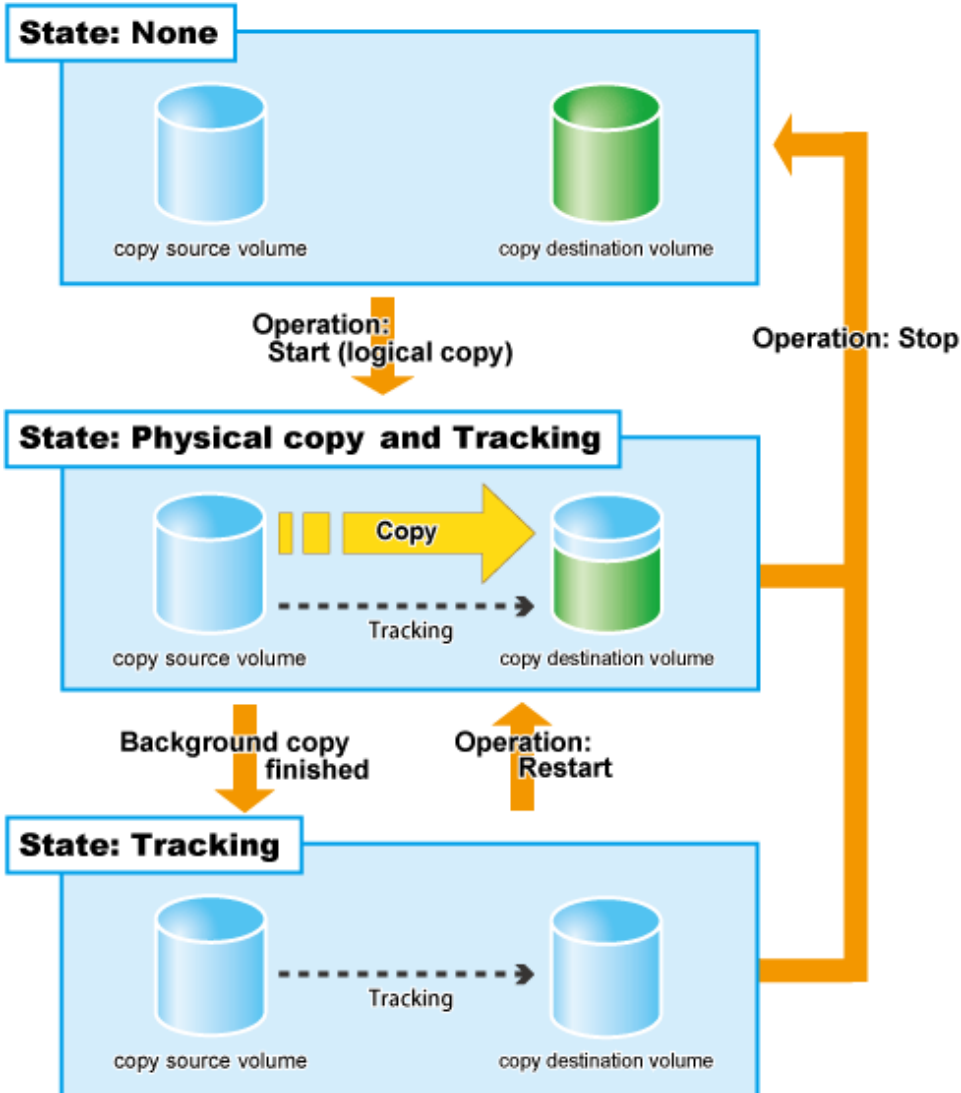


Table A.3 Relationship between QuickOPC operation and Express function

Session operation	Express function
Start	acopc start
Differential copy start	acopc start -diff
Stop	acopc cancel

Start

When the QuickOPC session is started, the logical copy completes immediately and returns a "copied" response before any actual (physical) copying occurs. The actual physical copy process and tracking process start after the logical copy has finished (the tracking process keeps track of data which is modified for copy source and copy destination volumes after the logical copy). These two processes are internal ETERNUS Disk storage system background processes that are not visible to the server. After the logical copy has completed, the copy destination area becomes accessible. Even if the physical copy has finished, the session remains because the tracking process is still active.

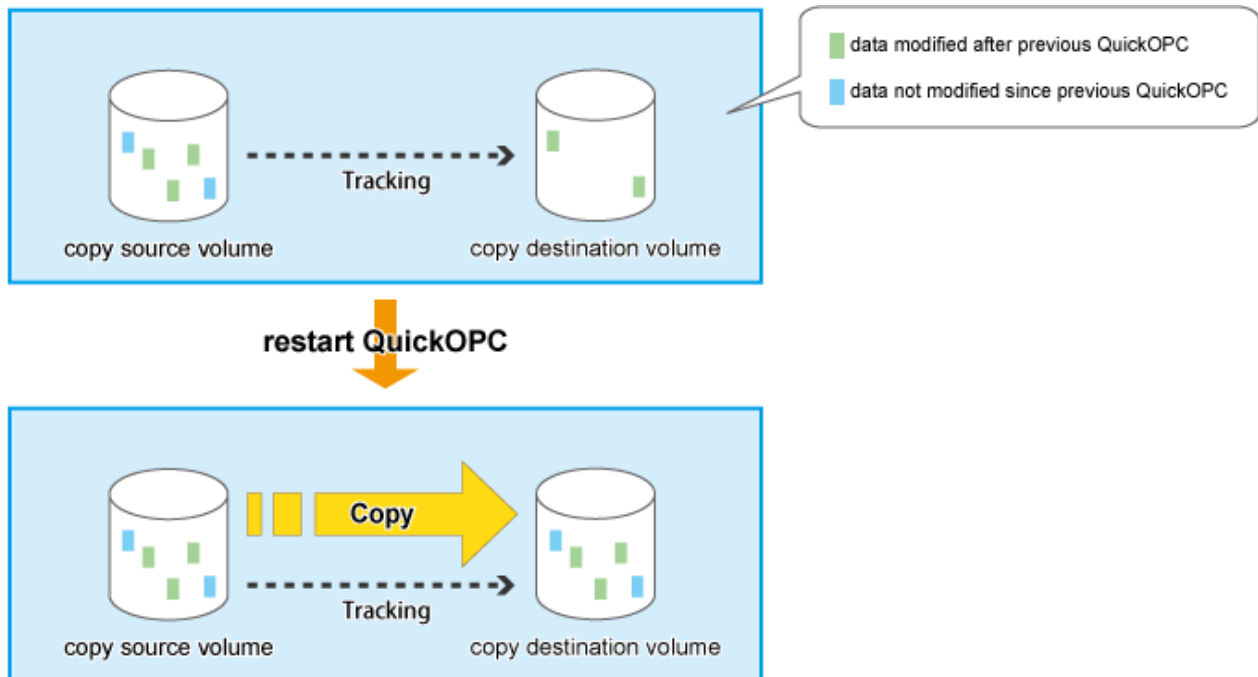
Point

The QuickOPC function allows hardware to record updates that occur on copy source/destination after logical copy has been finished. The state that hardware is recording the updated point is referred to as "Tracking state".

Differential copy start

When the QuickOPC session is restarted, then instead of the initial full copy, only the data areas recorded by the tracking process are copied over from the source to the destination.

While less data needs to be copied, this copy is similar to the initial copy in that a logical copy step precedes the actual physical copy, and the copy destination becomes read/write accessible as soon as the logical copy has completed. The tracking process also starts recording subsequent updates again at this stage.



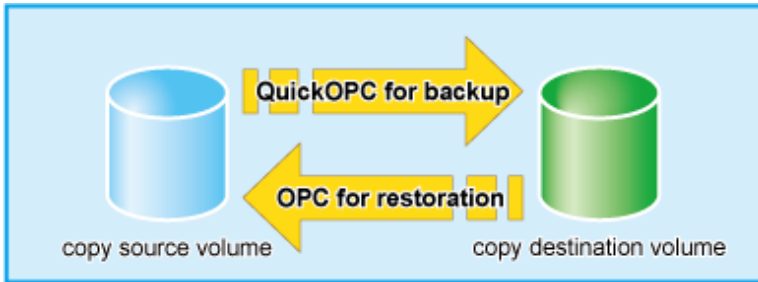
If the source is changed after the previous logical copy, the changes are sent to the destination after the Restart operation is performed (when the copy is restarted). However, any changes made at the destination after the previous logical copy will be rolled-back (overwritten from the source data). Consequently, any and all changes made to the destination after the previous logical copy are discarded and lost following the Restart operation.

Stop

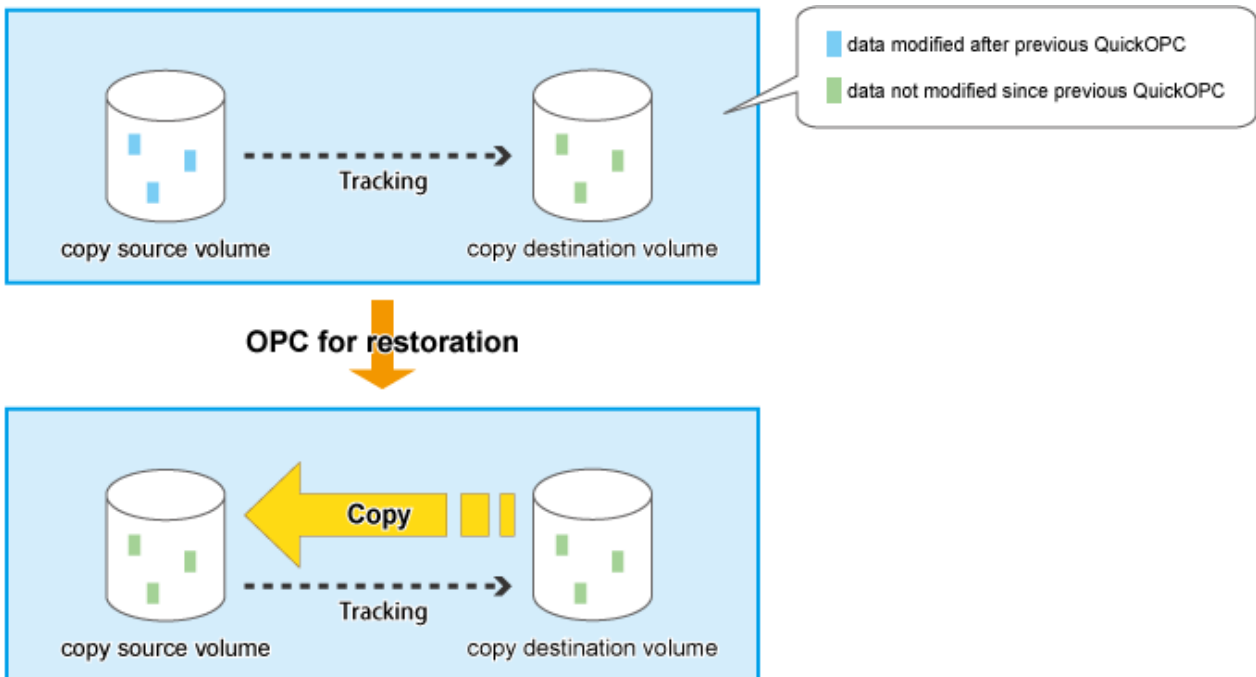
When the QuickOPC session is stopped, it terminates. If the QuickOPC session which is in the Physical copy and Tracking state is stopped, the copy destination volume cannot be used because the physical copy is incomplete. If the QuickOPC session in the Tracking state is stopped, the copy destination volume can be used because the physical copy has completed.

A.5.2 Restore

Restore can be done by reversing the copy direction of QuickOPC and executing OPC.



Although a restore is executed with OPC, only the data that has been updated since the previous QuickOPC is copied. Therefore, in copy using QuickOPC, not only a physical backup but also restore is completed in a short period of time.



By performing OPC for restore, any changes made at the primary volume after the previous logical copy will be rolled-back (overwritten from the secondary volume data). Consequently, any and all changes made to the primary volume after the previous logical copy are discarded and lost following OPC for restoration.

A.6 Snapshot copy (SnapOPC+)

A.6.1 How to work

Figure A.8 State transition for (normal) SnapOPC+

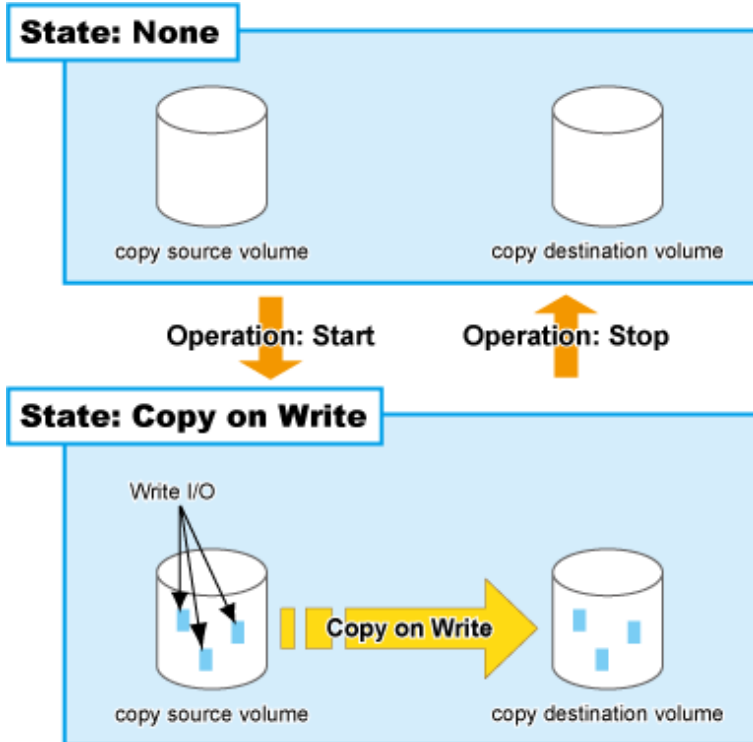


Figure A.9 State transition diagram for dummy SnapOPC+

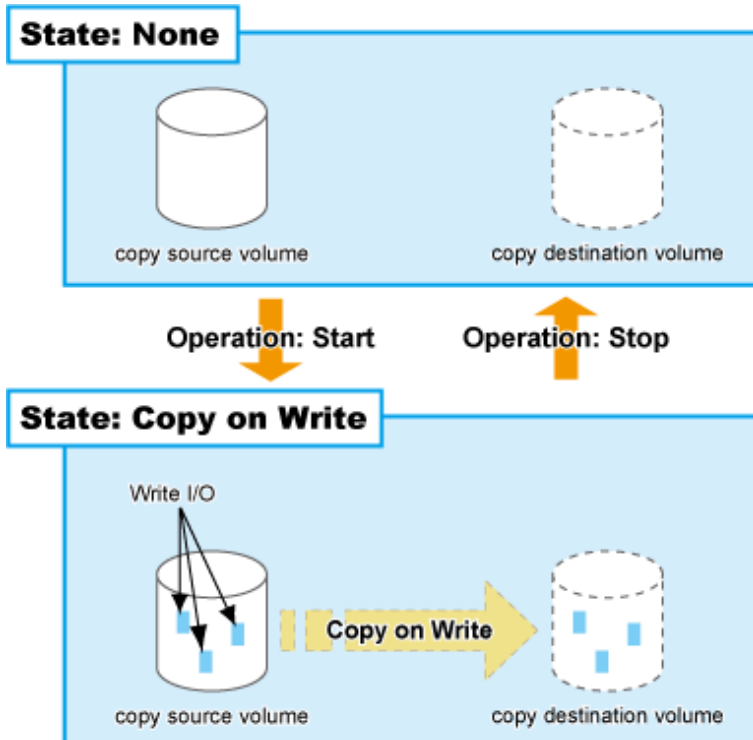


Table A.4 Relationship between session operation and Express function

Session operation	Express function
Start normal SnapOPC+	acsnap start

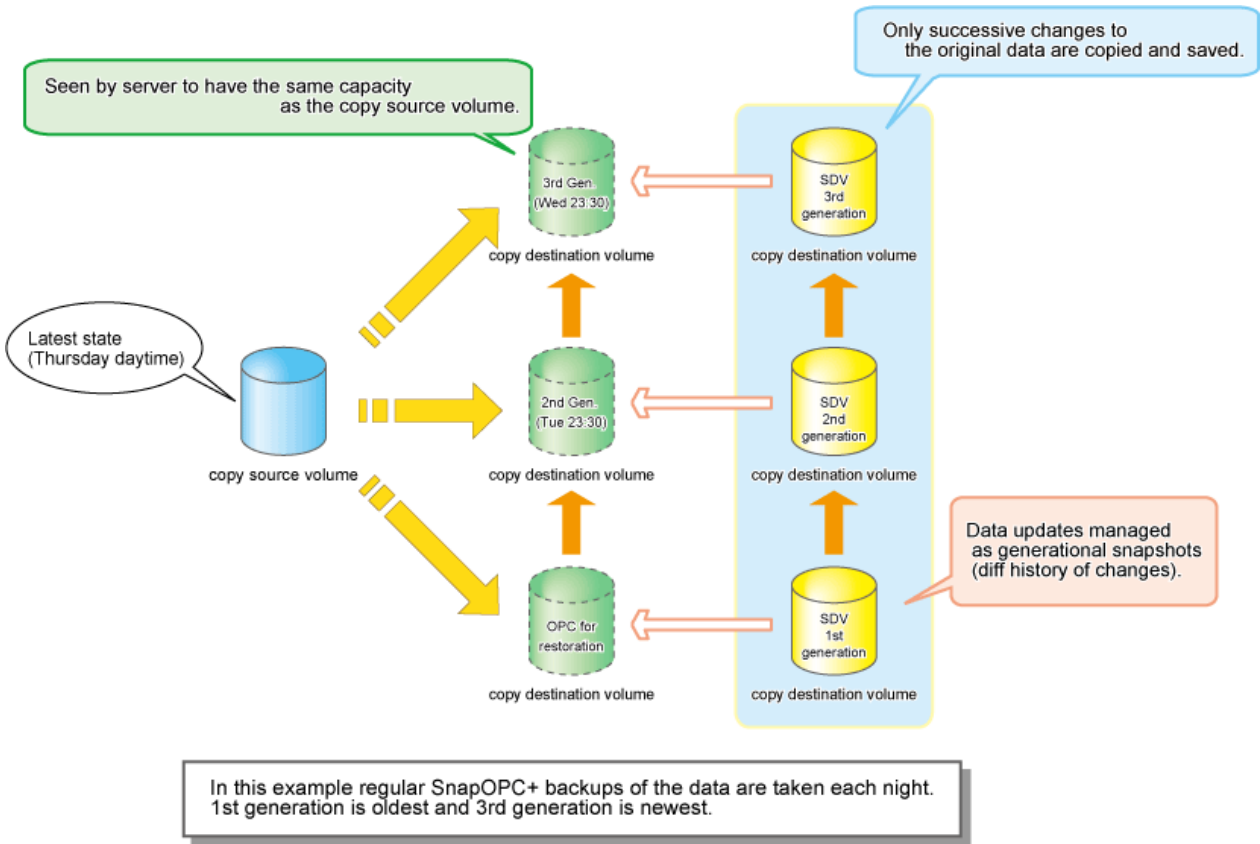
Session operation	Express function
Start dummy SnapOPC+	acsnap start -estimate
Stop	acsnap cancel

Start

When the SnapOPC+ session is started, the copy-on-write process starts. When a write I/O is requested from the server, the copy-on-write process copies the old data to the copy destination before writing the new data to the copy source. This process is an internal ETERNUS Disk storage system background process that is not visible to the server. After the SnapOPC+ session has been started, the copy destination area becomes accessible.

- Unlike Clone (OPC, QuickOPC, EC), as the physical copy destination only needs to be large enough to contain updated areas, size requirements are usually small.
- While the referencing of unmodified areas of the SnapOPC+ "copy" directly from the original data on the copy source volume reduces the copy load, this dependence on the copy source volume means that SnapOPC+ is not suited to persistent or long-term data backup/recovery use.
- Multiple SnapOPC+ sessions per one copy source can be set.
 - For ETERNUS DX60/DX60 S2/DX80/DX90
Up to 8 SnapOPC+ sessions can be set.
 - For ETERNUS DX80 S2/DX90 S2
Up to 256 SnapOPC+ sessions can be set.

Since multiple SnapOPC+ sessions for one copy source are managed in generations, multiple copy operation can be performed with less disk capacity.



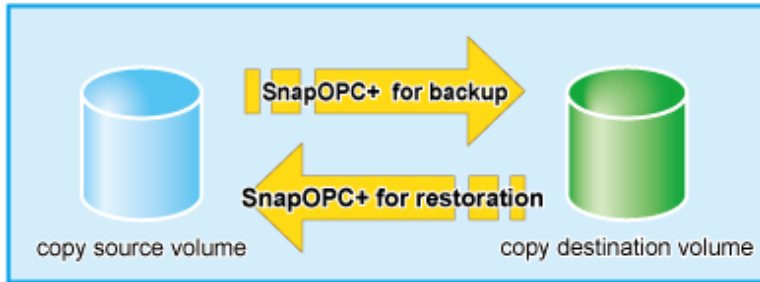
Stop

When the SnapOPC+ session is stopped, the copy-on-write process terminates and all the data saved in SDV are lost.

If there are older SnapOPC+ sessions than the SnapOPC+ session to stop, it cannot be stopped. Such a SnapOPC+ session can be stopped by using the force option. However, the Stop operation with the force option stops not only the specified SnapOPC+ session but also all the older SnapOPC+ sessions.

A.6.2 Restore

Restoration requires the SnapOPC+ copy destination be mounted by the OS and the target data restored using normal file copying.



Note

Restoration by the SnapOPC+ cannot be performed for ETERNUS DX60/DX60 S2/DX80//DX90.
For the restoration, mount the copy destination volume and copy each file on the operating system.

A.6.3 SDV operations

Table A.5 Relationship between SDV operation and Express function

SDV operation	Express function
Monitoring SDV capacity	acsdv stat
Initialize SDV	acsdv init

Monitoring SDV capacity

If an SDP is not used, the SDV should be monitored on a periodic basis to ensure that adequate remaining capacity leeway is maintained.

Initializing SDV

- Even if no copy sessions are running, programs may write data to SDV. If SDV capacity becomes large, the "Initialize SDV" operation should be performed with ETERNUS Web GUI or ETERNUS CLI.
- When copy session is running, space for SDV or SDP used by the copy session is decreased. In this case, amount of maintaining data may be decreased.

Note that when a Snap Data Volume is initialized, any existing data on it will become inaccessible, so this data should be backed up beforehand, using OS commands.

A.6.4 SDP operation

Table A.6 Relationship between SDP operation and Express function

SDP operation	Express function
Monitoring SDP capacity	acsdv poolstat

Monitoring SDP capacity

If an SDP is used, the SDP should be monitored on a periodic basis to ensure that adequate remaining capacity leeway is maintained.

If the allocatable SDP capacity runs short, this is indicated by e-mail/SNMP Trap notification.

A.7 Remote Advanced Copy (REC)

Remote Equivalent Copy (REC) is used for both Remote Advanced Copy and Extended Remote Advanced Copy.

Whereas EC is an internal cabinet copy function, REC is the equivalent copy function for use between cabinets.

A.7.1 How to work

Figure A.10 Session state and state transition

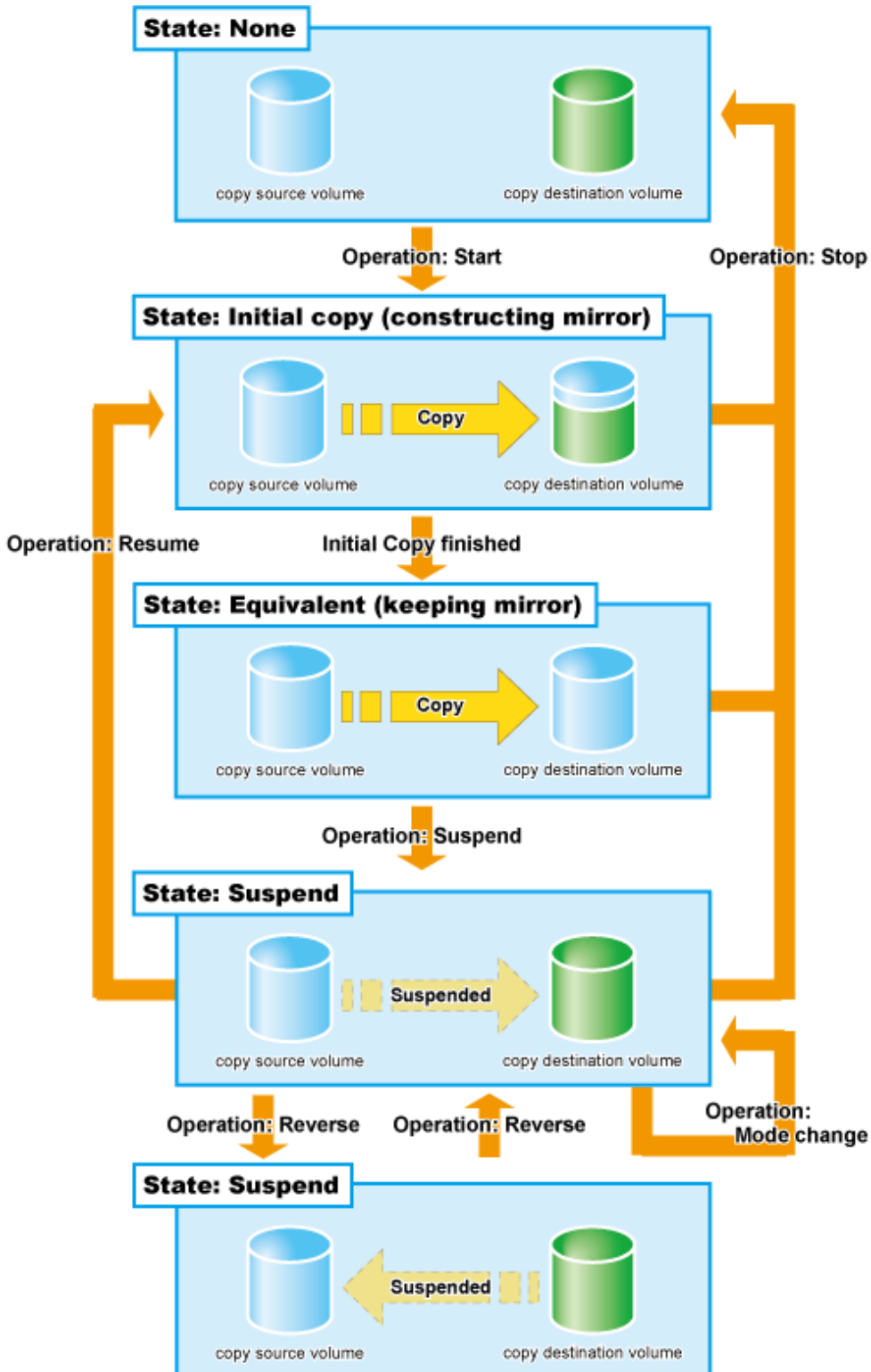


Table A.7 Relationship between session operation and Express function

Session operation	Express function
Start	acec start
Suspend	acec suspend

Session operation	Express function
Resume	acec resume
Reverse	acec reverse
Mode change	acec change
Stop	acec cancel

Start

When the REC session is started, the whole area of data specified by the source parameters is copied.

- If data copying has been completed for a given area and a write operation is applied to that area, the write data is also transferred to the destination area.
- After all data in the specified area has been copied over, the data in source and destination areas will be kept in almost the same state by the REC function. This is called the Equivalent state. In the Equivalent state, if source data is changed, the same data is transferred to the destination area to maintain the Equivalent state.
- Until the REC session reaches to the Equivalent state, copy destination volume are neither readable nor writable.
When using Destination Access Permission function, copy destination volume is neither readable nor writable if the REC session reaches to the Equivalent state. In order to access the copy destination volume, it is necessary to suspend the REC session.
When not using Destination Access Permission function, copy destination volume is not writable but readable if the REC session is in the Equivalent state.



See

For details on the Destination Access Permission function, refer to "Using Destination Access Permission function on EC/REC" in the "ETERNUS SF Operation Guide for Copy Control Module".

Unlike EC, the following operation modes need to be specified at the start of REC sessions.

REC operation mode

REC function has the following three types of copy modes. You can specify the best copy mode fitted to the operation.

- Transfer mode
- Split mode
- Recovery mode

Transfer mode

This mode is concerned with data transfer of REC.

Transfer method	Mode	Explanation
Synchronous transfer	Synchronous	On the Write request from the server, data is written onto a copy source volume and copy is done to the destination volume to return completion to the server. Writing to the source volume and copying to the destination volume are synchronized. Therefore, on completion of copy, both data on the copy source and destination volumes are guaranteed. Since an impact of Write access from the server is great, this is best fitted for REC in a short-delay site.
Asynchronous transfer	Stack	Since only updated block points are recorded and after that completion is returned to the server, response impacts to the server are reduced. Using independent transfer engine, transfer the recorded block data.

Transfer method	Mode	Explanation
		Even if the band width of the line is small, copy can be executed. However, a significant amount of not transferred data may accumulate.
	Consistency	To copy destination ETERNUS Disk storage system, transfer order between copy sessions is guaranteed. This is best fitted for mirroring of copy made up of multiple areas, such as database. This mode uses part of cache memory as a REC buffer. All data is stored to the REC buffer for sending and copy to REC buffer for receiving and transfer to the destination.
	Through	This is a mode to transfer the data that is not transferred when suspending or stopping Stack mode and Consistency mode.

Split mode

This mode is concerned with how REC sessions behave when the line paths are disconnected by a disaster or line error.

Split Mode	Description
Automatic Split	If the communication has failed due to certain reasons during REC execution, the REC session is disconnected automatically so that data can be updated at the source location.
Manual Split	If the communication has failed due to certain reasons during REC execution, the operator is asked whether or not to disconnect the REC session or not in the Manual Split mode. Though the Manual Split mode does reduce availability somewhat, it also helps keep the copy source data and copy destination data better synchronized, resulting in much lower data losses in the event of a disaster. If data copying has failed due to the disconnection of all paths or other reasons, the server becomes unable to update the data in this mode. Therefore, applications that require the data be updated by the server cannot continue if all REC paths become disconnected, or the backup center or backup ETERNUS Disk storage system fails.

Recovery mode

This mode is concerned with how REC sessions are recovered after the line that was disconnected by the transmission error has recovered.

Recovery Mode	Description
Automatic Recovery	REC sessions are automatically resumed as soon as the line that was disconnected by the transmission error has recovered.
Manual Recovery	REC sessions must be manually resumed after the line that was disconnected by the transmission error has recovered.

Suspend

When the REC session is suspended, both the copy source volume and the copy destination volume are accessible as independent volumes (copy destination volume becomes readable and writable). The Suspend operation can only be executed when the REC session is in the Equivalent state.

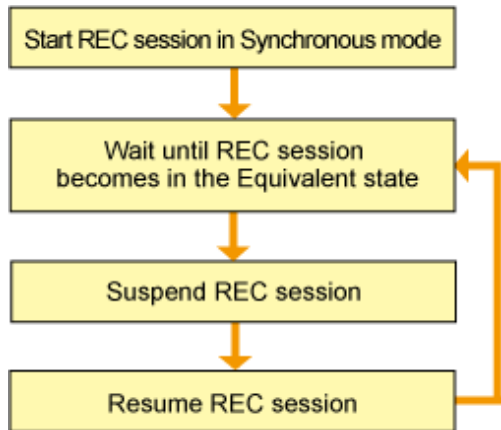
Unlike the Stop operation, changes to the source and destination volumes continue to be recorded while the Suspend state applies.

The procedure to suspend the REC session varies depending on REC Transmission mode.

Synchronous mode

In this case, the procedure is the same as that of EC.

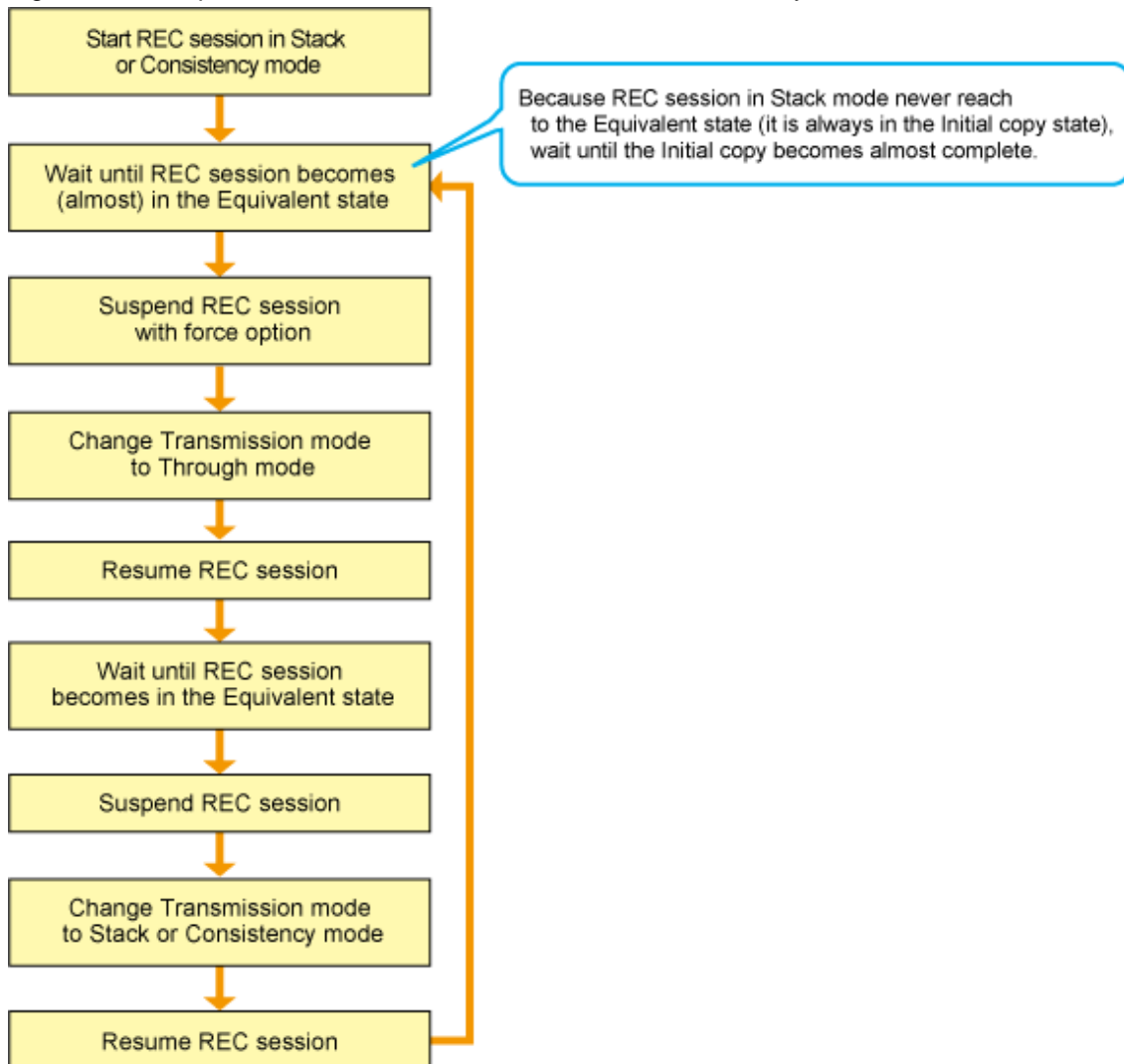
Figure A.11 Suspend and resume work flow in Synchronous mode



Stack mode or Consistency mode

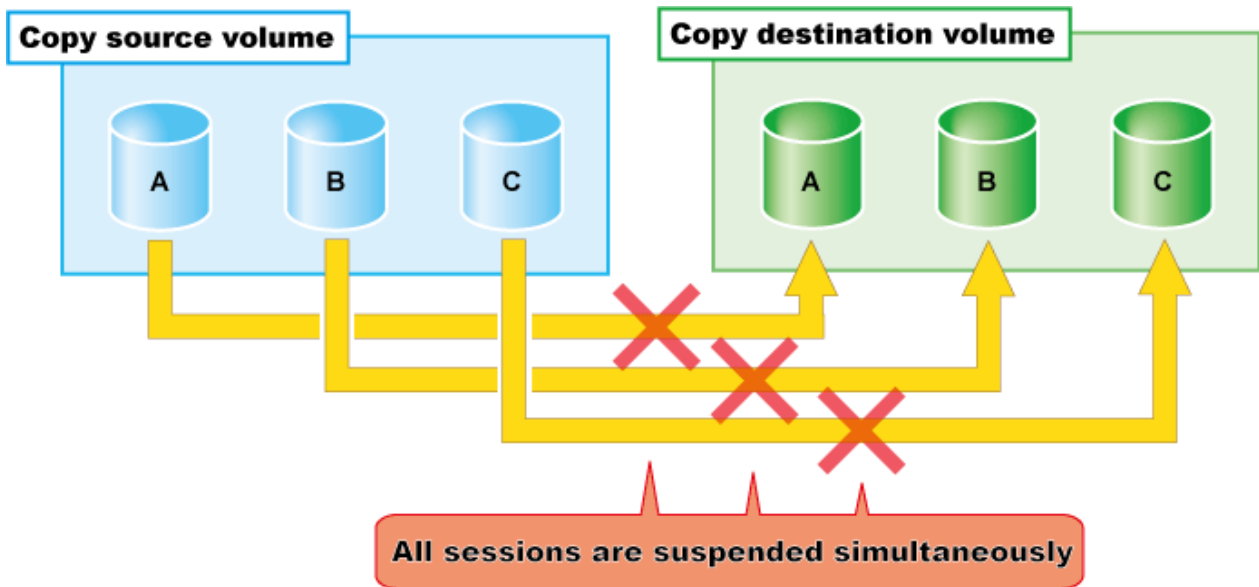
In order to suspend the REC session in these modes, the Transmission mode must be changed to through mode. However, the Transmission mode is not required to be changed if the REC session in Consistency mode is suspended by Concurrent Suspend.

Figure A.12 Suspend and resume work flow in Stack or Consistency mode



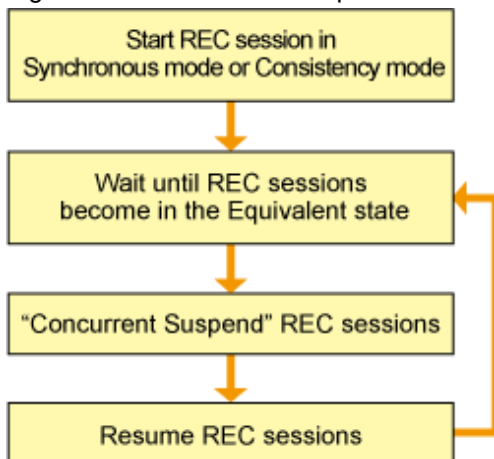
Concurrent Suspend

As EC, multiple REC sessions can be suspended using the Concurrent Suspend operation. This allows consistent copies of multi-volume data-objects, such as databases, to be easily acquired.



The Concurrent Suspend operation can be performed only if the transfer mode is Synchronous mode or Consistency mode.

Figure A.13 Concurrent Suspend and resume work flow in Synchronous or Consistency mode



Resume

When the REC session is resumed, data is copied over from the source to the destination so as to catch up on all the changes that were made after the Suspend operation was performed and recover the Equivalent state. As the amount of data that thus needs to be transferred is much less than would be required if the whole source area were to be recopied, the time required to recover the Equivalent state is also greatly reduced.

If the source is changed under the Suspend state (when copying is temporarily interrupted by the Suspend operation), the changes are sent to the destination after the Resume operation is performed (when the copy is restarted). However, any changes made at the destination while under the Suspend state will be rolled-back (overwritten from the source data). Consequently, any and all changes made to the destination during the Suspend state are discarded and lost following the Resume operation.

The operation modes of REC are not changed by the Resume operation.

Reverse

When the REC session is reversed, the copy direction is reversed. The Reverse operation can only be executed when the REC session data is in the Suspend state.

Mode change

When the REC session is in the Suspend state, the operation modes can be changed by the "Mode Change" operation.

Stop

When the REC session is stopped, it terminates. If the REC session in one of the following statuses is stopped, the copy destination volume should not be used because the mirroring is incomplete.

- Initial copy state
- Error suspend state
- Halt state which occurred when the REC session was in the Initial copy state

If the REC session in one of the following statuses is stopped, the copy destination volume can be used because the mirroring has been complete.

- Equivalent state
- Suspend state
- Halt state which occurred when the REC session was in the Equivalent state

A.7.2 Transfer buffer operations

Table A.8 Relationship between session operation and Express function

Session operation	Express function
Change buffer role	acrecbuff set
Monitor buffer usage	acrecbuff stat

Change buffer role

The Set operation can change the use of REC buffer from SEND to RECV and vice versa.

Monitor buffer usage

The transfer buffer usage can be checked using the "Monitoring buffer" operation. Monitor buffer usage regularly while REC sessions in Consistency mode are running. A "Rate" of 100% means the transfer buffer is in high-load state.

A.7.3 Restore

Restoration can be performed by the Reverse function of REC.

The procedure for restoration is the same as EC.

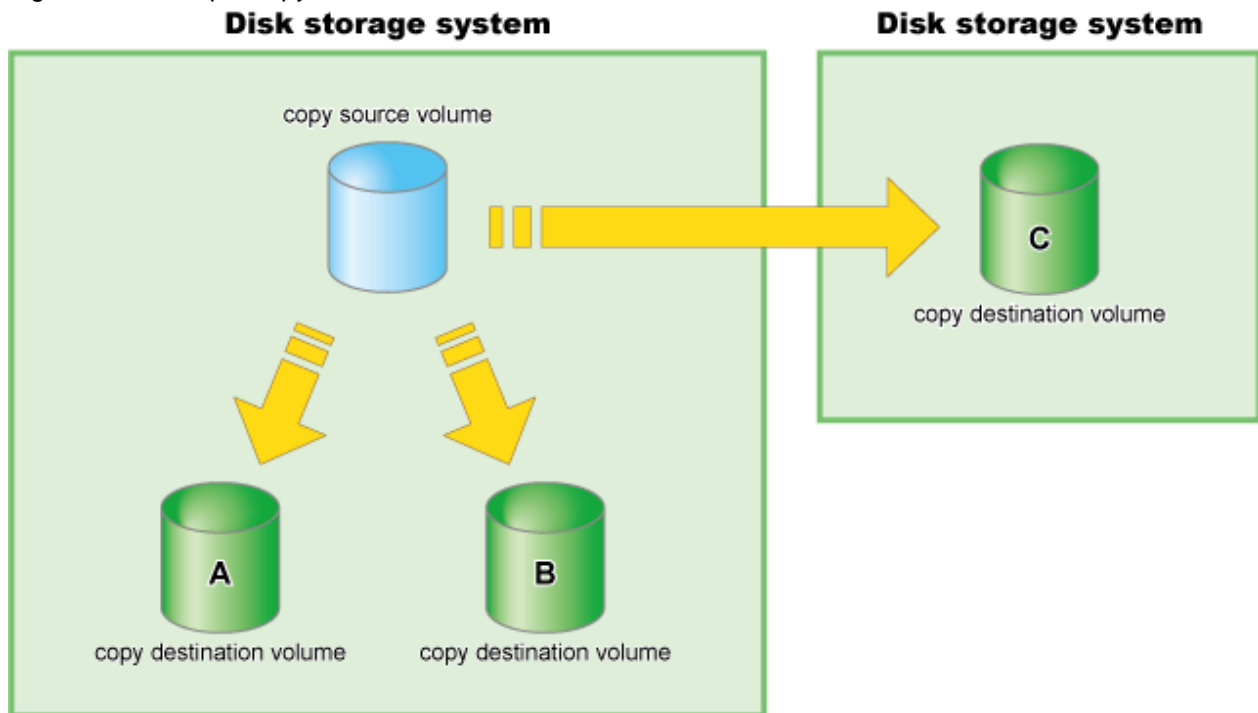
A.8 Combinations of Advanced Copy

A.8.1 Multiple copy

Multiple copy is a method that copies the same copy source area to multiple copy destinations.

Multiple copy destinations may be specified to obtain more than one copy of the original data at a time. This allows copies of the same data for different purposes, such as backup and testing.

Figure A.14 Multiple copy



Note

Following copy type combination selection rules when using multiple copy.

- For multiple copy with EC only, REC only, or both EC and REC, the start and end points of all copy sessions must be the same.
- For remote copy, REC (Consistency mode) cannot be used for multiple copy destination volumes in the same copy destination device.

A.8.2 Cascade copy

Cascade copy is a method that adds copy sessions end-to-end, with an existing copy destination volume becoming the copy source for a new copy session, or vice versa.

Figure A.15 Cascade copy



A.9 Eco-mode

ETERNUS Disk storage system offers the Eco-mode (power-saving) function based on the Massive Array of Idle Disks (MAID) technology.

By managing the usage schedule of specified disk drives and turning off the spindle rotation of the disk drives in the periods when they are idle, the Eco-mode can significantly reduce the power consumption of the ETERNUS Disk storage system.

Express can monitor the Disk storage systems where the Eco-mode has been enabled.

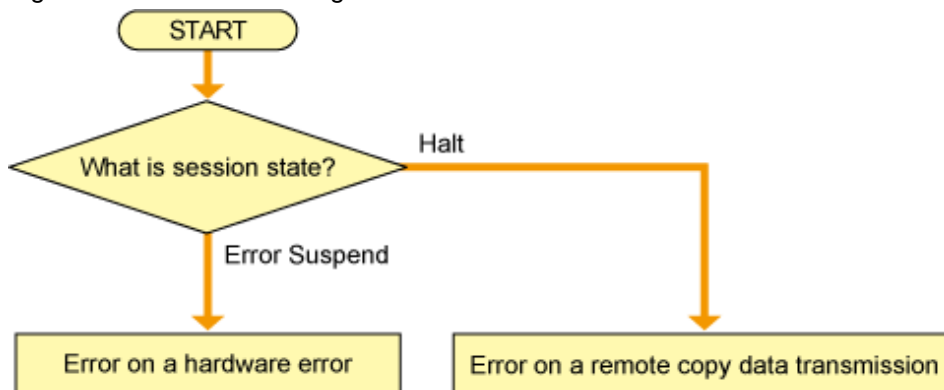
A.10 Note on backup and restore by Express

Express performs backup and restoration regardless of the state of the server to be backed up. Therefore, make sure that both copy source and destination volumes are inaccessible in order to ensure consistency of backup data. For absolute assurance of data consistency, we highly recommend to stop the target server before executing backups and restorations. If the server cannot be suspended, dismount a target volume using the OS function to prevent data within a file cache from being reflected and inhibit access to the target volume.

A.11 Troubleshooting

The following figure shows the flow of troubleshooting tasks if a hardware or similar fault occurs.

Figure A.16 Troubleshooting flow



Hardware error

When a hardware error occurs in a source or destination volume, perform the repair work on the error according to the following procedures.

1. Use copy management software (e.g. Express) to stop the session in which the error occurred. If the session cannot be stopped by using copy management software, use ETERNUS Web GUI to stop it.
2. Correct the hardware error.
3. If required, for copy management software, redefine copy source and destination volumes.
4. Re-start the session in which the error occurred.

Remote copy data transfer error

If the Recovery mode of the REC session is Manual Recover mode, the session needs to be recovered manually after the transmission error has recovered. The procedure to do this is as follows.

1. Execute the `acec suspend` command with the `-force` option to change the status of REC session from the halt status to the Suspend state.
2. Resume the REC sessions.

Appendix B Commands

This appendix explains the various commands that are used with Express.

Information

How to use other commands:

Express provides other commands besides those described in this manual.

For details, refer to "Commands" in the "ETERNUS SF Operation Guide for Copy Control Module".

B.1 storageadm perfdata (Performance information management command)

This section explains the command for managing performance information.

NAME

storageadm perfdata - Manages performance information

SYNOPSIS

For Windows

```
$INS_DIR\ESC\Manager\opt\FJSVssmgr\sbin\storageadm perfdata export outdirname -ipaddr ipaddr [-recent 24]
```

(\$INS_DIR means "Program Directory" specified at the ETERNUS SF Manager installation.)

For Linux

```
/opt/FJSVssmgr/sbin/storageadm perfdata export outdirname -ipaddr ipaddr [-recent 24]
```

DESCRIPTION

This command outputs one-hour or 24-hour performance information for disk storage system before the command is executed.

By specifying the IP address of a disk storage system whose performance information is output and the time in the command operand, the disk storage system performance information is output in CSV format.

A target disk storage system must be managed by Express and performance monitoring is either still running or already completed.

The details of CSV files are as follows.

Table B.1 CM performance information for disk storage system

Items	Explanation
File name	CM.csv
Header line	Date, CM0xXX:CPUX - CPU Use Rate, CM0xXX:CPUX - Copy Remain, ...
Data line	<i>date,CM00u,CM00r, ... ,CMNNu,CMNNr</i> The following information is output for each field. (After <i>date</i> , the information is repeated for the actual number of CMs.) <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>CM00u</i> : CM0x00:CPU0 (*1) CPU Load at <i>date</i> (Decimal notation. The unit is %.) <i>CM00r</i> : CM0x00:CPU0 (*1) CM Copy remaining amount at <i>date</i> . (Decimal notation. The unit is GB.)

Items	Explanation
	<i>CMNNu</i> : CM0xNN:CPUN (*1) CPU Load at <i>date</i> . (Decimal notation. The unit is %.) <i>CMNNr</i> : CM0xNN:CPUN (*1) CM Copy remaining amount at <i>date</i> . (Decimal notation. The unit is GB.)

Table B.2 Logical Volume performance information for disk storage system

Items	Explanation
File name	LogicalVolume/ <i>nnnn</i> .csv (<i>nnnn</i> indicates the Logical Volume number by hexadecimal notation.)
Header line	Date, LogicalVolume0xXXXX - Read IOPS, LogicalVolume0xXXXX - Write IOPS, LogicalVolume0xXXXX - Read Throughput, LogicalVolume0xXXXX - Write Throughput, LogicalVolume0xXXXX - Read Response Time, LogicalVolume0xXXXX - Write Response Time, LogicalVolume0xXXXX - Read Cache Hit Rate, LogicalVolume0xXXXX - Write Cache Hit Rate, LogicalVolume0xXXXX - Prefetch Cache Hit Rate.
Data line	<i>date,read,write,through-r,through-w,resp-r,resp-w,hit-r,hit-w,fetch</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>read</i> : Read Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>write</i> : Write Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>through-r</i> : Read data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.) <i>through-w</i> : Write data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.) <i>resp-r</i> : Read Response Time at <i>date</i> . (Decimal notation. The unit is msec.) <i>resp-w</i> : Write Response Time at <i>date</i> . (Decimal notation. The unit is msec.) <i>hit-r</i> : Read Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.) <i>hit-w</i> : Write Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.) <i>fetch</i> : Read Pre-fetch Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.)

Table B.3 RAID Group performance information for disk storage system

Items	Explanation
File name	RAID Group/ <i>nnnn</i> .csv (<i>nnnn</i> indicates the RAID Group number by hexadecimal notation.)
Header line	Date, RAID Group0x0xXXXX - Read IOPS, RAID Group0x0xXXXX - Write IOPS, RAID Group0x0xXXXX - Read Throughput, RAID Group0x0xXXXX - Write Throughput, RAID Group0x0xXXXX - Read Response Time, RAID Group0x0xXXXX - Write Response Time, RAID Group0x0xXXXX - Read Cache Hit Rate, RAID Group0x0xXXXX - Write Cache Hit Rate, RAID Group0x0xXXXX - Prefetch Cache Hit Rate.
Data line	<i>date,read,write,through-r,through-w,resp-r,resp-w,hit-r,hit-w,fetch</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>read</i> : Read Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>write</i> : Write Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>through-r</i> : Read data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.) <i>through-w</i> : Write data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.) <i>resp-r</i> : Read Response Time at <i>date</i> . (Decimal notation. The unit is msec.) <i>resp-w</i> : Write Response Time at <i>date</i> . (Decimal notation. The unit is msec.) <i>hit-r</i> : Read Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.) <i>hit-w</i> : Write Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.) <i>fetch</i> : Read Pre-fetch Cache Hit Rate at <i>date</i> . (Decimal notation. The unit is %.)

Table B.4 Disk performance information for disk storage system

Items	Explanation
File name	Disk/ <i>nnnn</i> .csv (<i>nnnn</i> indicates the DE number by hexadecimal notation.)
Header line	Date, DE0xXX:DiskX - busy time, ...
Data line	<i>date</i> , <i>Disk0</i> , ... , <i>DiskN</i> The following information is output for each field. (After <i>date</i> , the information is repeated for the actual number of Disks.) <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>Disk0</i> : Disk0 Disk busy rate at <i>date</i> . (Decimal notation. The unit is %.) <i>DiskN</i> : DiskN Disk busy rate at <i>date</i> . (Decimal notation. The unit is %.)

Table B.5 CA/CM Port performance information for dis storage system

Items	Explanation
File name	Port/ <i>nnnn</i> .csv (<i>nnnn</i> indicates the CA/CM Port number by hexadecimal notation. CA/CM port numbers are assigned in ascending order, starting with 0000 for the lowest CA/CM port number in the device. CM0x0 CA0x0 Port0 is 0000, CM0x0 CA0x0 Port1 is 0001, : CM0x7 CA0x3 Port2 is 007E, CM0x7 CA0x3 Port3 is 007F.)
Header line	- Case of CA Port Date, CM0xX:CA0xX:PortX - Read IOPS, CM0xX:CA0xX:PortX - Write IOPS, CM0xX:CA0xX:PortX - Read Throughput, CM0xX:CA0xX:PortX - Write Throughput - Case of CM Port Date, CM0xX:PortX - Read IOPS, CM0xX:PortX - Write IOPS, CM0xX:PortX - Read Throughput, CM0xX:PortX - Write Throughput
Data line	<i>date</i> , <i>read</i> , <i>write</i> , <i>through-r</i> , <i>through-w</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>read</i> : Read Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>write</i> : Write Count at <i>date</i> . (Decimal notation. The unit is IOPS.) <i>through-r</i> : Read data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.) <i>through-w</i> : Write data transfer rate at <i>date</i> . (Decimal notation. The unit is MB/S.)

Table B.6 Performance information for disk storage system active disks

Items	Explanation
File name	ACTIVE_DISK.csv
Header line	Date, Total Disks, Active Disks
Data line	<i>date</i> , <i>total</i> , <i>active</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>total</i> : Overall number of loaded disk devices at <i>date</i> . (Decimal notation. The unit is Disk.) <i>active</i> : Overall number of active disk devices at <i>date</i> . (Decimal notation. The unit is Disk.)

Table B.7 Power consumption performance information for disk storage system

Items	Explanation
File name	SYSTEM_POWER_CONSUMPTION.csv

Items	Explanation
Header line	Date, System Power Consumption
Data line	<i>date, power</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>power</i> : Power used by the device as a whole at <i>date</i> . (Decimal notation. The unit is W.)

Table B.8 Temperature performance information for disk storage system

Items	Explanation
File name	SYSTEM_TEMPERATURE.csv
Header line	Date, System Temperature
Data line	<i>date, temperature</i> The following information is output for each field. <i>date</i> : Performance Information Acquisition Time. (YYYY/MM/DD hh:mm:ss format) <i>temperature</i> : Air intake temperature at device at <i>date</i> . (Decimal notation. The unit is degrees Centigrade.)

OPERANDS

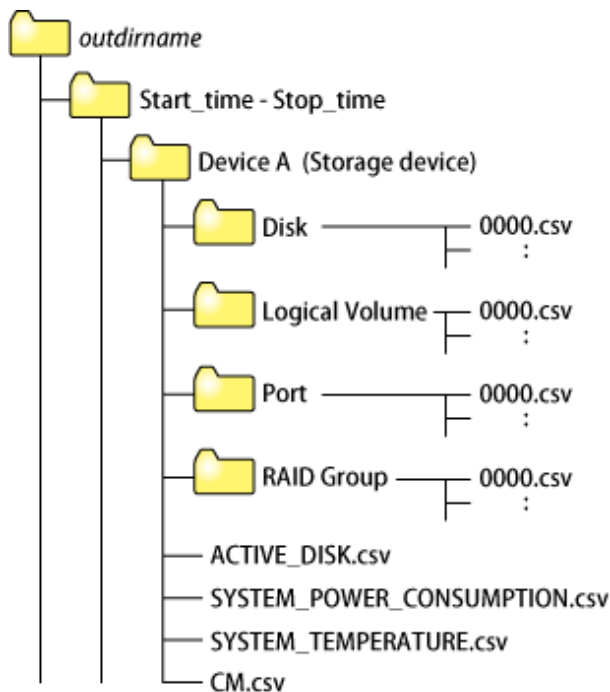
export

Outputs performance information for the specified time in CSV format.

outdirname

Specify the directory that outputs performance information.

Performance information is output to the *outdirname* directory based on the following configuration.



The following free space (unit: MB) is required for this directory.

$$(((0.1 + 0.4 * \text{installed DEs} + 0.1 * \text{installed CM ports} + 0.2 * (\text{LUs} + \text{RAID groups})) * 1440) + (0.2 + 0.6 * \text{installed DEs} + 0.2 * \text{installed CM ports} + 0.4 * (\text{LUs} + \text{RAID groups}))) / 1024$$

OPTIONS

`-ipaddr ipaddr`

This option specifies the IP address of the device that outputs performance information.

The output target device must satisfy the following conditions:

- Storage devices output performance information must be registered in this software.

For the settings of performance monitoring, refer to "Performance management".

`-recent 24`

This option collects the latest 24-hour performance data.

If this option is skipped, the latest 1-hour performance data is collected.

EXAMPLES

For Windows

Output of performance information for a device with IP address 10.12.13.14 to the c:\work directory:

```
> C:\ETERNUS_SF\ESC\Manager\opt\FJSVssmgr\sbin\storageadm perfdata export "C:\work" -ipaddr 10.12.13.14
```

For Linux

Output of performance information for a device with IP address 10.12.13.14 to the /tmp directory:

```
# /opt/FJSVssmgr/sbin/storageadm perfdata export /tmp -ipaddr 10.12.13.14
```

NOTES

The full path of an existing directory must be specified in *outdirname*.

B.2 esfsnap (Express's manager troubleshooting information collection command)

This section explains the command for collection the troubleshooting information of the Express's manager.

NAME

`esfsnap` - Collects the troubleshooting information of the Express's manager

SYNOPSIS

For Windows

```
$INS_DIR\Common\bin\esfsnap -dir dirname [-all]
```

(*\$INS_DIR* means "Program Directory" specified at the ETERNUS SF Manager installation.)

For Linux

```
/opt/FJSVesfcm/bin/esfsnap -dir dirname [-all]
```

DESCRIPTION

This command collects the troubleshooting information of the Express's manager on the Management Server when a problem occurs. Only user of OS administrative group can execute this command.

Please send the collected data to a Fujitsu system engineer.

OPTIONS

`-dir dirname`

For Windows

Specify a directory where the troubleshooting data is stored. It is necessary to specify the full path name that begins with a drive letter for *dirname*.

The maximum length that can be specified for *dirname* is 70 bytes.

The collected troubleshooting data are stored in the directory which its name begins with "esfsnap_". Before executing this command, please check that *dirname* directory has the following free space.

Collected information	Required free space
Initial investigation information	More than 40MB
All troubleshooting information	More than "80 + (2 * number of registered device)" MB

For Linux

Specify a directory where the troubleshooting data is stored. It is necessary to specify the full path name for *dirname*.

The collected troubleshooting data are created as the file which its name begins with "esfsnap_". Before executing this command, please check that *dirname* directory has the following free space.

Collected information	Required free space
Initial investigation information	More than 40MB
All troubleshooting information	More than "80 + (2 * number of registered device)" MB

`-all`

Collects all troubleshooting data on servers. Data includes lots of information, which will increase the size of the data. This option is not necessary for initial investigation.

EXAMPLES

For Windows

Collecting the troubleshooting data for initial investigation on D:\temp directory.

```
> C:\ETERNUS_SF\Common\bin\esfsnap -dir D:\temp
```

For Linux

Collecting the troubleshooting data for initial investigation on /tmp directory.

```
# /opt/FJSVesfcm/bin/esfsnap -dir /tmp
```

Index

	[B]	
Business administrator.....		8
	[H]	
Hardware administrator.....		8
	[R]	
REC operation mode.....		77
Recovery mode.....		78
	[S]	
System administrator.....		8
	[T]	
Transfer mode.....		77