

FUJITSU Storage

ETERNUS SF AdvancedCopy Manager V16.5

Overview

Preface

Purpose

This manual provides an overview for understanding FUJITSU Storage ETERNUS SF AdvancedCopy Manager (hereafter abbreviated as "AdvancedCopy Manager").

This manual describes the AdvancedCopy Manager features and functions for backup and replication management in a large-scale Storage Area Network.

Intended Reader

This manual is intended for users who use or want to evaluate AdvancedCopy Manager.

Knowledge of the following facilitates an understanding of the contents described in this manual:

- Large-scale Storage Area Networks
- FUJITSU Storage ETERNUS
- The importance of backup and disaster recovery operations
- Ordinary hard copies, such snapshot, differential copy, and incremental copy
- Clustered systems

Organization

This manual is composed as follows:

[Chapter 1 Overview of AdvancedCopy Manager](#)

This chapter provides an overview of AdvancedCopy Manager.

[Chapter 2 Operating Models](#)

This chapter explains the operating models of AdvancedCopy Manager.

[Chapter 3 AdvancedCopy Manager Functions](#)

This chapter explains the functions of AdvancedCopy Manager.

Notation

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

Operating Systems

Formal Name	Abbreviation	
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	Windows
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 Server(R) 2012 Standard Microsoft(R) Windows Server(R) 2012 Datacenter	Windows Server 2012	

Formal Name	Abbreviation	
Microsoft(R) Windows Server(R) 2012 R2 Standard Microsoft(R) Windows Server(R) 2012 R2 Datacenter	Windows Server 2012 R2	
Microsoft(R) Windows Server(R) 2016 Standard Microsoft(R) Windows Server(R) 2016 Datacenter	Windows Server 2016	
Windows(R) 7 Home Basic Windows(R) 7 Home Premium Windows(R) 7 Professional Windows(R) 7 Enterprise Windows(R) 7 Ultimate	Windows 7	
Windows(R) 8 Windows(R) 8 Pro	Windows 8	
Windows(R) 8.1 Windows(R) 8.1 Pro	Windows 8.1	
Windows(R) 10 Home Windows(R) 10 Pro Windows(R) 10 Mobile	Windows 10	
Solaris(TM) 9 Operating System	Solaris 9	
Oracle Solaris 10	Solaris 10	
Oracle Solaris 11	Solaris 11	
Red Hat(R) Enterprise Linux(R) 5 (for x86) Red Hat(R) Enterprise Linux(R) 5 (for Intel64)	RHEL5	Linux
Red Hat(R) Enterprise Linux(R) 6 (for x86) Red Hat(R) Enterprise Linux(R) 6 (for Intel64)	RHEL6	
Red Hat(R) Enterprise Linux(R) 7 (for Intel64)	RHEL7	
SUSE(R) Linux Enterprise Server 12 for AMD64 & Intel64	SUSE Linux Enterprise Server 12	
HP-UX 11i v3	HP-UX	
AIX(R) V6.1 AIX(R) V7.1	AIX	
VMware vSphere(R) 5	VMware vSphere 5	VMware
VMware vSphere(R) 6	VMware vSphere 6	

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

FUJITSU Storage ETERNUS

Formal Name	Abbreviation	
FUJITSU Storage ETERNUS DX60	-	ETERNUS DX series or ETERNUS Disk storage system
FUJITSU Storage ETERNUS DX410 FUJITSU Storage ETERNUS DX440	ETERNUS DX400 series	
FUJITSU Storage ETERNUS DX8100 FUJITSU Storage ETERNUS DX8400 FUJITSU Storage ETERNUS DX8700	ETERNUS DX8000 series	
FUJITSU Storage ETERNUS DX60 S2 FUJITSU Storage ETERNUS DX80 S2 FUJITSU Storage ETERNUS DX90 S2	-	ETERNUS DX S2 series

Formal Name	Abbreviation	
FUJITSU Storage ETERNUS DX410 S2 FUJITSU Storage ETERNUS DX440 S2	ETERNUS DX400 S2 series	
FUJITSU Storage ETERNUS DX8100 S2 FUJITSU Storage ETERNUS DX8700 S2	ETERNUS DX8000 S2 series	
FUJITSU Storage ETERNUS DX60 S3 FUJITSU Storage ETERNUS DX100 S3 FUJITSU Storage ETERNUS DX200 S3	-	ETERNUS DX S3 series
FUJITSU Storage ETERNUS DX500 S3 FUJITSU Storage ETERNUS DX600 S3	-	
FUJITSU Storage ETERNUS DX8700 S3 FUJITSU Storage ETERNUS DX8900 S3	ETERNUS DX8000 S3 series	
FUJITSU Storage ETERNUS DX60 S4 FUJITSU Storage ETERNUS DX100 S4 FUJITSU Storage ETERNUS DX200 S4	-	
FUJITSU Storage ETERNUS AF250 FUJITSU Storage ETERNUS AF650	ETERNUS AF series	ETERNUS All-Flash Arrays
FUJITSU Storage ETERNUS DX200F	-	

Each individual device name in this document is listed with "FUJITSU Storage" omitted from it.

Software Products

Formal Name	Abbreviation
Windows(R) Internet Explorer(R)	Internet Explorer
Mozilla(R) Firefox(R)	Firefox
Google Chrome(TM)	Chrome
Microsoft(R) Windows Server(R) Failover Clustering	WSFC
Microsoft(R) Exchange Server	Exchange Server
Microsoft(R) SQL Server(R)	SQL Server
FUJITSU Storage ETERNUS SF Express	Express
FUJITSU Storage ETERNUS SF Storage Cruiser	Storage Cruiser
FUJITSU Software PRIMECLUSTER Global Disk Services	GDS
FUJITSU Software PRIMECLUSTER Global File Services	GFS

Manuals

Formal Name	Abbreviation
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Quick Reference	ETERNUS SF Quick Reference
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Release Notes	ETERNUS SF Release Notes
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Installation and Setup Guide	ETERNUS SF Installation and Setup Guide
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Migration Guide	ETERNUS SF Migration Guide

Formal Name	Abbreviation
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Web Console Guide	ETERNUS SF Web Console Guide
FUJITSU Storage ETERNUS SF Storage Cruiser / AdvancedCopy Manager Cluster Environment Setup Guide	ETERNUS SF Cluster Environment Setup Guide
FUJITSU Storage ETERNUS SF Storage Cruiser / AdvancedCopy Manager Operation Guide for VMware vSphere Virtual Volumes	ETERNUS SF Operation Guide for VMware vSphere Virtual Volumes
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Messages	ETERNUS SF Messages
FUJITSU Storage ETERNUS SF Express / Storage Cruiser Event Guide	ETERNUS SF Event Guide
FUJITSU Storage ETERNUS SF Express / Storage Cruiser / AdvancedCopy Manager Glossary	ETERNUS SF Glossary

Besides the above-mentioned, each individual manual name in this document is listed with "FUJITSU Storage" omitted from it.

Others

- In this manual, unless there is a special disclaimer, ETERNUS Disk storage system includes the ETERNUS All-Flash Arrays. However, the following functions are not supported in the ETERNUS All-Flash Arrays:
 - Energy saving operation for storage device
 - NAS operation for storage device

The following function is not supported in the ETERNUS DX200F All-Flash Arrays:

- Automated Storage Tiering operation at multiple tiers (two or more)

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Notes

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Update History

Content of Update	Updated Section	Revision
The information related to ETERNUS DX200F is described.	"Others" in Preface	1.1
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The information related to VMware is added.	1.6	
The manual to confirm details of Advanced Copy is described.	3.1	
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The description about the Storage Cluster Continuous Copy function is added.	1.1, 1.6, 2.1.2, 2.2.1, 2.2.2, 3.1.3, 3.5	3.1
The term "VMware Virtual Volumes" is changed to "VMware vSphere Virtual Volumes" according to the terms used by VMware, Inc.	Throughout this manual	
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Content of Update	Updated Section	Revision
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Information related to the ETERNUS DX60 S4/DX100 S4/DX200 S4 is added.	"Notation" in Preface, 2.2.2	

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 (*1)			Explanation
		EXP	SC	ACM	
Before installation	Quick Reference	Yes	Yes	Yes	This manual is common for all products.
	Release Notes	Yes	Yes	Yes	This manual is common for all products.
	Overview	-	-	Yes	This manual is unique for the product.
During installation	Installation and Setup Guide	Yes	Yes	Yes	This manual is common for all products.
	Cluster Environment Setup Guide	-	Yes	Yes	This manual is common for Storage Cruiser and AdvancedCopy Manager.
	Migration Guide	Yes	Yes	Yes	This manual is common for all products.
During operation	Operation Guide	Yes	Yes	Yes	<p>This manual is unique for each product. The following manuals are available:</p> <ul style="list-style-type: none"> - Express Operation Guide - Storage Cruiser Operation Guide - Storage Cruiser Operation Guide for Optimization Function - 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) - AdvancedCopy Manager Operation Guide for Copy Control Module - Storage Cruiser / AdvancedCopy Manager Operation Guide for VMware vSphere Virtual Volumes

When to Read	Related Manuals (Abbreviated)	Related Products (*1)			Explanation
		EXP	SC	ACM	
	Web Console Guide	Yes	Yes	Yes	This manual is common for all products.
Anytime	Event Guide	Yes	Yes	-	This manual is common for Express and Storage Cruiser.
	Messages	Yes	Yes	Yes	This manual is common for all products.
	Glossary	Yes	Yes	Yes	This manual is common for all products.

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

How to Read Manuals

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

Purpose	Manual	Main Contents	How to Read
Acquiring a product overview and basic operation knowledge	Quick Reference	<ul style="list-style-type: none"> - Product overview - Installation decision - Overview of the necessary tasks from installation to first use 	Read if you want to acquire a fundamental knowledge of the product and its operation in order to decide to install it or not.
	AdvancedCopy Manager Overview	<ul style="list-style-type: none"> - Main functions - Linkable applications - Procedure overview for Advanced Copy of ETERNUS Disk storage system 	
Confirming the updated contents	Release Notes	<ul style="list-style-type: none"> - New function overview with - Incompatibilities with previous version - Fixed bugs 	Read if you want to know the updated contents from a previous version and if you perform the upgrade.
Deciding if an upgrade is required	Migration Guide	<ul style="list-style-type: none"> - Notes and cautions about the upgrade - Upgrade procedure 	Read if you want to upgrade from a previous version.
Installing and correctly operating the product Setting up operating environment depending on purpose	Installation and Setup Guide	<ul style="list-style-type: none"> - Operating environment - Installation procedure - Setup procedure - Uninstallation procedure 	Read if you want to install and setup the product.
	Cluster Environment Setup Guide	<ul style="list-style-type: none"> - Supported cluster software - Installation procedure for a clustered system - Setup procedure for a clustered system - Uninstallation procedure for a clustered system 	Read if you want to install and setup the product on a clustered system.

Purpose	Manual	Main Contents	How to Read
Administration and operation of the installed system	Express Operation Guide	<ul style="list-style-type: none"> - Starting and stopping the software - Device monitoring - Data copy inside the storage system - Necessary tasks after an architectural modification of the system as well as product maintenance 	Read if you want to start or shutdown the system, monitor the operation status, do backup/restore operations, etc.
	Storage Cruiser Operation Guide	<ul style="list-style-type: none"> - Starting and stopping the software - Device monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference 	
	Storage Cruiser Operation Guide for Optimization Function	<ul style="list-style-type: none"> - Operating environment construction - Operating status monitoring - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference 	
	AdvancedCopy Manager Operation Guide (for Windows)	<ul style="list-style-type: none"> - Starting and stopping the software - Data backup/restore inside the storage system - Necessary tasks after an architectural modification of the system as well as product maintenance - Command reference 	
	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)			
AdvancedCopy Manager Operation Guide for Copy Control Module	<ul style="list-style-type: none"> - Operating environment construction - Virtual machine operation using a virtual volume - Backup/restore of the virtual machine 		
Storage Cruiser / AdvancedCopy Manager Operation Guide for VMware vSphere Virtual Volumes			

Purpose	Manual	Main Contents	How to Read
		<ul style="list-style-type: none"> - Necessary tasks after an architectural modification of the system as well as product maintenance 	
	Web Console Guide	<ul style="list-style-type: none"> - Operating environment - Screen layout description 	Read if you want to understand the ETERNUS SF Web Console.
Dealing with messages issued by the software	Messages	<ul style="list-style-type: none"> - Messages and their explanations - Parameter (variable information) description - System action - Countermeasures 	Read if you want a practical way of investigating and dealing with messages issued by the software.
Dealing with events issued by the software	Event Guide	<ul style="list-style-type: none"> - Phenomenon of event - Countermeasures 	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	Glossary	<ul style="list-style-type: none"> - Product specific terminology explanation - Explanation of important terminology appearing in the manual - Synonyms and related terms - Proper form of abbreviated terms 	Read if you want to learn the meaning of important terms, product specific terms or abbreviations used in the manuals.

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Chapter 1 Overview of AdvancedCopy Manager

1.1 What Is AdvancedCopy Manager?

This product is storage management software that achieves high speed backup/restore and replication by utilizing the Advanced Copy functions of the ETERNUS Disk storage systems. This product also responds to backup of virtual volumes in a server virtual environment, online backup in cooperation with applications, and green IT features to support the continuity of diverse business systems.

Main Features

High speed Backup and Replication without Loading Business Systems

This product uses Advanced Copy functions of the ETERNUS Disk storage systems to copy data. Even as the amount of data to be processed increases, the high speed data copy keeps the backup windows to a minimum. The downtime required for backups and replication is drastically reduced. In addition, since data copy processing is performed within ETERNUS Disk storage systems, backup and replication are achievable without loading business systems.

Non-downtime Application Backup

Suspension of operation for backups can be avoided by coordinating with major databases, including Exchange Server, SQL Server, Oracle, DB2, and Symfoware. 24-hour and 365-day continuous operation is feasible.

Simplification of Exchange Server and SQL Server Operations

This product provides wizards to simplify Exchange Server and SQL Server operations:

- Wizard to create backup environments

The risk of human error is reduced, and backup environments can be created quickly.

Registering the backup script generated by a wizard in the scheduler of this product enables regular backup operations.

- Wizard to perform restore

Operation downtimes can be reduced as a restore can be performed safely and securely based on information provided during backup.



Information

- The ETERNUS SF AdvancedCopy Manager for Exchange Server license is required in order to use the wizard that performs restore of Exchange Server.
- The ETERNUS SF AdvancedCopy Manager for Microsoft SQL Server license is required in order to use the wizard that performs restore of SQL Server.

Power-saving Operation

To reduce power consumption of storage devices, backup destination disks can be scheduled to spin-up for backup windows and power down when unused. Storage Cruiser's visualization of power consumption and temperatures, allows for easy verification of power-savings.

Provision for Disaster Recovery Solutions

The ETERNUS Disk storage system Remote Advanced Copy feature can copy and store data to ETERNUS Disk storage systems at remote sites, minimizing the risk of data loss from a disaster. Business can be quickly resumed after a disaster by either accessing data at the remote site or recovering the data to the primary site.

Snapshot/Backup on a per Virtual Machine Basis in VMware vSphere Virtual Volumes Environments

In VMware vSphere Virtual Volumes environments, high-speed snapshot, backup, and restore on a per virtual machine basis can be achieved using the Advanced Copy function of the ETERNUS Disk storage system.

Refer to the *ETERNUS SF Operation Guide for VMware vSphere Virtual Volumes* for details.

Storage Cluster Continuous Copy Function

In a Storage Cluster environment, if a failover occurs in the Primary Storage while executing Advanced Copy, the Secondary Storage can continue the copy operation by automatically taking over the Advanced Copy process.

Main Functions

The main functions provided by AdvancedCopy Manager are as follows:

- Backup management functions
 - Policy management function
Manages data such as number of preservation generations and interval days as backup policy
 - Storage configuration management function
Manages the configurations of copy source volumes (to be backed up) and copy destination volumes (where backup data are stored)
 - Backup/restore functions
 - Backup history management function
Manages the data in a generation of data backed up in the past as a backup history
- Replication management functions
- Backup functions using the AdvancedCopy Manager Copy Control Module (hereafter abbreviated as "AdvancedCopy Manager CCM")
- Web Console function
Allows for control of the AdvancedCopy Manager operating environment from a web browser, This GUI is called ETERNUS SF Web Console (hereafter abbreviated as "Web Console").

Below chart shows for each function of AdvancedCopy Manager, whether backup, replication, or backup utilizing the AdvancedCopy Manager CCM are available.

Table 1.1 Availability of Backup, Replication, and Backup Utilizing AdvancedCopy Manager CCM for Each Function of AdvancedCopy Manager

AdvancedCopy Manager Function	Backup	Replication	Backup Utilizing AdvancedCopy Manager CCM
Policy management function	Available	Not available	Not available
Storage configuration management function	Available	Available	Available
Backup history management function	Available	Not available	Not available
Selection of target volume in copying	Auto/Manual	Manual	Manual
Control by command lines	Available	Available	Available
Use of Web Console	Available	Available	Available (*1)
Storage Cluster Continuous Copy function (*2)	Not available	Available	Available

*1: Available only in AdvancedCopy Manager CCM when bundled with ETERNUS SF Manager.

*2: This function can be used only in Storage Cluster environments.

1.2 Product Organization

AdvancedCopy Manager consists of the following programs.

Table 1.2 AdvancedCopy Manager Programs and Supported Operating Systems

No.	Program Name	Function Overview	Operating System (A= Available, N/A=Not Available)				
			Windows	Solaris	Linux	HP-UX	AIX
1	ETERNUS SF Manager	Data management of storage systems with Agent-based operation model	A	A	A	N/A	N/A
2	AdvancedCopy Manager's agent	Management of backup and replication	A	A	A	A	A
3	AdvancedCopy Manager CCM	Data Management of storage systems with Agent-less operation model	A	A	A	N/A	N/A

In this document, program names are abbreviated as follows:

- "ETERNUS SF Manager" as "Manager"
- "AdvancedCopy Manager's agent" as "Agent"

Furthermore, explanations use the following terminology:

Term	Meaning
Management Server	Server on which ETERNUS SF Manager is installed
CCM Server	Server on which AdvancedCopy Manager CCM is installed
Managed Server	Server controlled by a Management Server or CCM Server

Information

After installation of ETERNUS SF Manager, if ETERNUS SF Manager is set up as the AdvancedCopy Manager's manager, it is possible to use AdvancedCopy Manager.

Refer to "Setup of ETERNUS SF Manager" in the *ETERNUS SF Installation and Setup Guide* for details.

1.3 System Configuration

The servers (including PCs) of which the operating environment of AdvancedCopy Manager consists may include the items described below.

Management Server

The configuration of the operating environment for AdvancedCopy Manager requires a Management Server.

The Management Server's primary roles are as follows:

- Serve as centralized control center.
- Maintain a database of Management Servers and associated devices such as transaction volumes, backup volumes and replication pairs.
- Accept commands from the Web Console and execute the AdvancedCopy Manager functions.

A Management Server can manage multiple Managed Servers.

The Manager is equipped with agent functions. If the Management Server is connected to an ETERNUS Disk storage system, the Management Server can additionally take up the role of a Managed Server.

Managed Server

This server is a business server (where business applications are running), that is connected to ETERNUS Disk storage system and controlled by the Management Server or CCM Server. A single operating environment of AdvancedCopy Manager can be set up with multiple Managed Servers.

In order to execute commands of the backup management function and replication management function on this server, agents must be installed.

In order to back up resources for ETERNUS Disk storage system connected to a server without any agents installed on it, use the AdvancedCopy Manager CCM.

CCM Server

This server is a server that performs backup of the resources in the ETERNUS Disk storage system in that server without the need to install the AdvancedCopy Manager's agent on the business servers that are connected to ETERNUS Disk storage system.

Setting up this type of server is not necessary if you do not use AdvancedCopy Manager CCM for backup.



See

Refer to the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for information on AdvancedCopy Manager CCM.



Information

The programs of AdvancedCopy Manager CCM are included in ETERNUS SF Manager. Consequently, if you already have ETERNUS SF Manager installed, you have AdvancedCopy Manager CCM available for use without any need to install it separately.

For using AdvancedCopy Manager CCM as included in ETERNUS SF Manager, the Management Server must be assigned as a CCM Server.

Web Console

AdvancedCopy Manager provides a function called "Web Console", which can be used to monitor and manage the AdvancedCopy Manager operating environment from a web browser.



See

Refer to the *ETERNUS SF Web Console Guide* for information on the Web Console operating environment and its screens.

1.4 Supported Cluster Software

AdvancedCopy Manager supports the following clustered systems.

However, the degree of support may vary according to the version level of the host operating system.

Table 1.3 Usable Clustered Systems

OS Type	Usable Clustered Systems
Solaris	SynfinityCLUSTER PRIMECLUSTER VERITAS Cluster Server Sun Cluster
Linux	PRIMECLUSTER VERITAS Cluster Server
Windows	Windows Server Failover Clustering
HP-UX	MC/ServiceGuard VERITAS Cluster Server

OS Type	Usable Clustered Systems
AIX	None.

Refer to "Operating Environment" in the *ETERNUS SF Cluster Environment Setup Guide* for details.

1.5 Supported Devices

AdvancedCopy Manager supports backup at the device level, and supports partitions, volume groups, slices, and similar devices. Volume compatibility depends on the active system configuration.

Refer to "Managing Device on AdvancedCopy Manager" in the *ETERNUS SF AdvancedCopy Manager Operation Guide* for the operating system of the Managed Server for details.

Refer to "Supported Functions" in the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for information on AdvancedCopy Manager CCM.

1.6 Linkable Applications

AdvancedCopy Manager can be linked up with the applications listed below. Refer to "[Chapter 2 Operating Models](#)" for information on the Agent-based operating model and Agent-less operating model.

Application Name	Linkable Function (A=Available, N/A=Not Available)		
	Agent-Based Operating Model		Agent-Less Operating Model
	Backup Management Function (*1)	Replication Management Function	
Oracle	A	A	N/A
SQL Server	A	A	N/A
Exchange Server	N/A	A	N/A
Symfoware	A	A (*2)	N/A
DB2	A	A	N/A
Hyper-V	N/A	A	N/A
VMware	N/A	N/A	A

*1: This function cannot be used in Storage Cluster environments.

*2: Windows environment only



See

Refer to the *ETERNUS SF AdvancedCopy Manager Operation Guide* for the operating system on which each application is running for details.

Chapter 2 Operating Models

With AdvancedCopy Manager, the following two operating modes are available:

Agent-Based Operating Model

This operating model requires the installation of ETERNUS SF Manager and the AdvancedCopy Manager's agent. Use of this operating model requires that the installed ETERNUS SF Manager be set up as the AdvancedCopy Manager's manager.

Application data copy is possible on a business server. As a function to trigger scripts before and after the copy operation is provided, scripts can be customized to conform to the administration policies and allow flexible and optimized operations.

Agent-Less Operating Model

This operating model requires the installation of AdvancedCopy Manager CCM.

There is no need to install either ETERNUS SF Manager or AdvancedCopy Manager's agent, therefore the time to get ready to start is shorter compared to Agent-based operating model. Moreover, as all the operations can be done directly on the server where the CCM has been installed, there are no requirements about the OS environment of the business server.

Unlike the copy operation with an agent, the copy is done per disk rather than per partition or slice. For this reason, the copy destination resource must be larger. Also, as copy is done without relation to the application running on the business server, the operator must ensure the integrity of the copied data. (for example, by performing the copy when the data are inactive).

Decide which operating model to use by considering the following criteria.

Operating Model	Choice Criteria
Agent-based	<ul style="list-style-type: none"> - If you want to use some of the functions available when the AdvancedCopy Manager's agent is installed. <p>For example, if you want to use Advanced Copy operations such as multiple generation backup/restore functions, interaction with a DBMS on a business server, volume shadow copy service (VSS Volume Shadow Copy Service function).</p>
Agent-less	<ul style="list-style-type: none"> - If there are many business servers, and you want to reduce the cost of installation and start operation as soon as possible. - If the OS on the business server is not supported by the AdvancedCopy Manager's manager or the AdvancedCopy Manager's agent. - If the AdvancedCopy Manager's agent cannot be installed on the business server. <p>For example, if installation of applications is not permitted on the business server outside a restricted set of applications, or if an exclusive software application is already installed on the server.</p> <ul style="list-style-type: none"> - If you want to reduce the maintenance tasks on the business server. <p>For example, if you want to avoid having to apply patches on the software.</p>

Note

It is possible to have operating models with Agent-based and Agent-less at the same time, but when operated in parallel, the copy data of both operating models must not have common areas.

If the copy data of both operating models have common areas, there is a possibility of data loss when copy operations use the mutual areas.

See

Refer to the following sections in the *ETERNUS SF Installation and Setup Guide* for details about incompatible software with AdvancedCopy Manager.

- Agent-based operating model:
"Operating Environment of ETERNUS SF Manager" and "Operating Environment of AdvancedCopy Manager's Agent"
- Agent-less operating model:
"Operating Environment of AdvancedCopy Manager CCM"

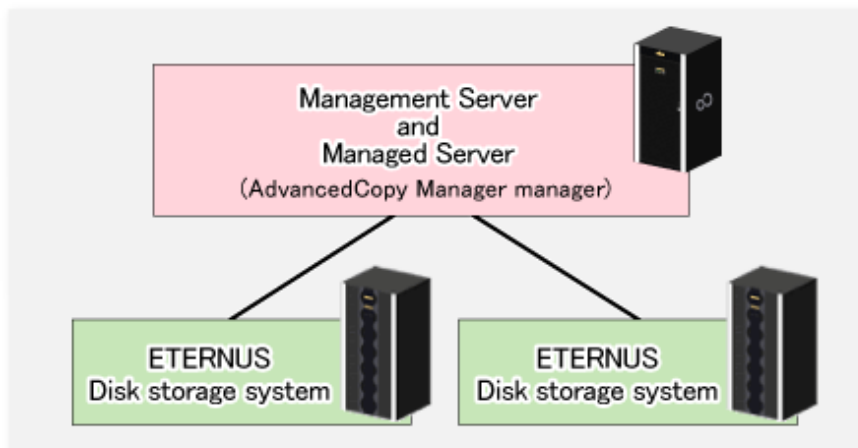
2.1 Agent-Based Operation

This section explains the operating model that is based on using agents.

2.1.1 Single Server Configuration

If there is only one server connected to the ETERNUS Disk storage system, install the Manager on that server. Since the Manager also provides Agent functions, the Management Server role and the Managed Server role can be performed on one server.

Figure 2.1 Single Server Configuration



2.1.2 Multiple Servers Configuration

If two or more servers are connected to the ETERNUS Disk storage system, the following two configurations are possible:

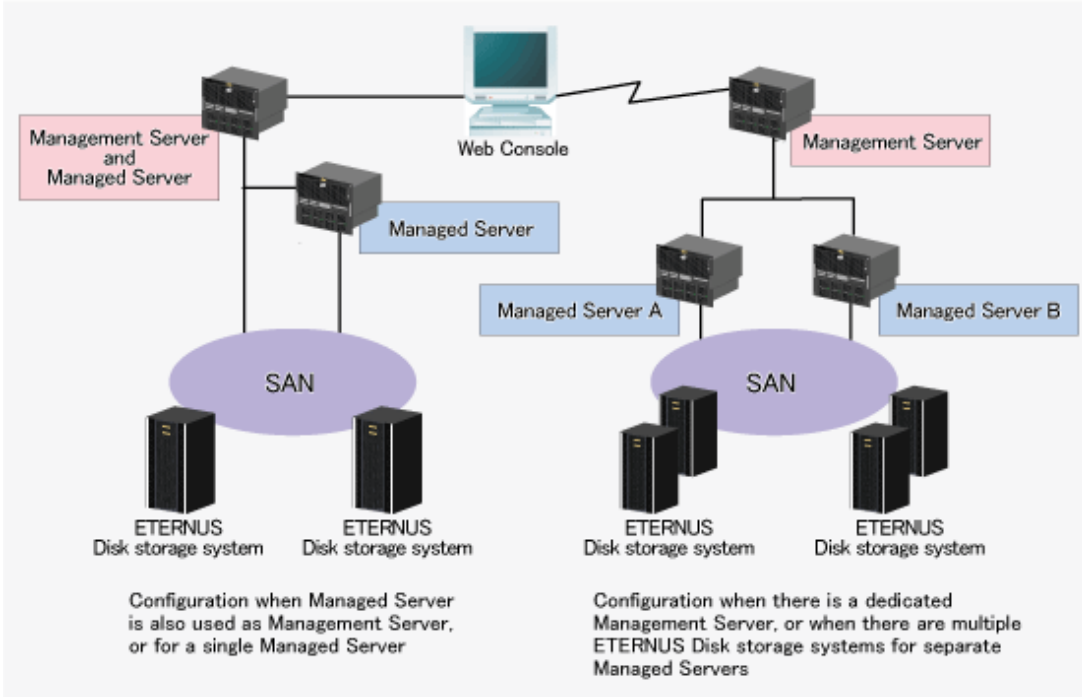
- A single server can perform the roles of both Management Server and Managed Server. The other servers are operated as Managed Servers.
- All servers are operated as Managed Servers. A server dedicated to the role of Management Server is set up separately.

The Web Console can be used to manage one or more AdvancedCopy Manager configurations.

The Manager uses some server resources, so the operational performance of agents and other applications installed on these servers may be adversely affected. For this reason, it is recommended that the Manager is installed on a dedicated server.

The following figure shows a configuration containing multiple servers connected to the ETERNUS Disk storage system.

Figure 2.2 Multiple Servers Configuration



Backup can only function within a single ETERNUS Disk storage system connected to a single Managed Server, while Replication can be performed across multiple Managed Servers or ETERNUS Disk storage systems.

The following table shows the available copy modes. Refer to "3.1 Advanced Copy Functions" for information on the copy modes.

Table 2.1 Copy Mode Availability

		Intra-box	Inter-box
Intra-server (Single Managed Server)	Functionality	Backup and replication	Only replication
	Copy Mode	OPC/EC/QuickOPC/SnapOPC/SnapOPC+ (*1)	REC (*1)
	Diagram		
Inter-server (Multiple Managed Servers)	Functionality	Only replication	Only replication
	Copy Mode	OPC/EC/QuickOPC/SnapOPC/SnapOPC+ (*1)	REC (*1)
	Diagram		

*1: SnapOPC, SnapOPC+, and REC cannot be used in Storage Cluster environments.

2.2 Agent-Less Operation

This section explains the Agent-less operating model.

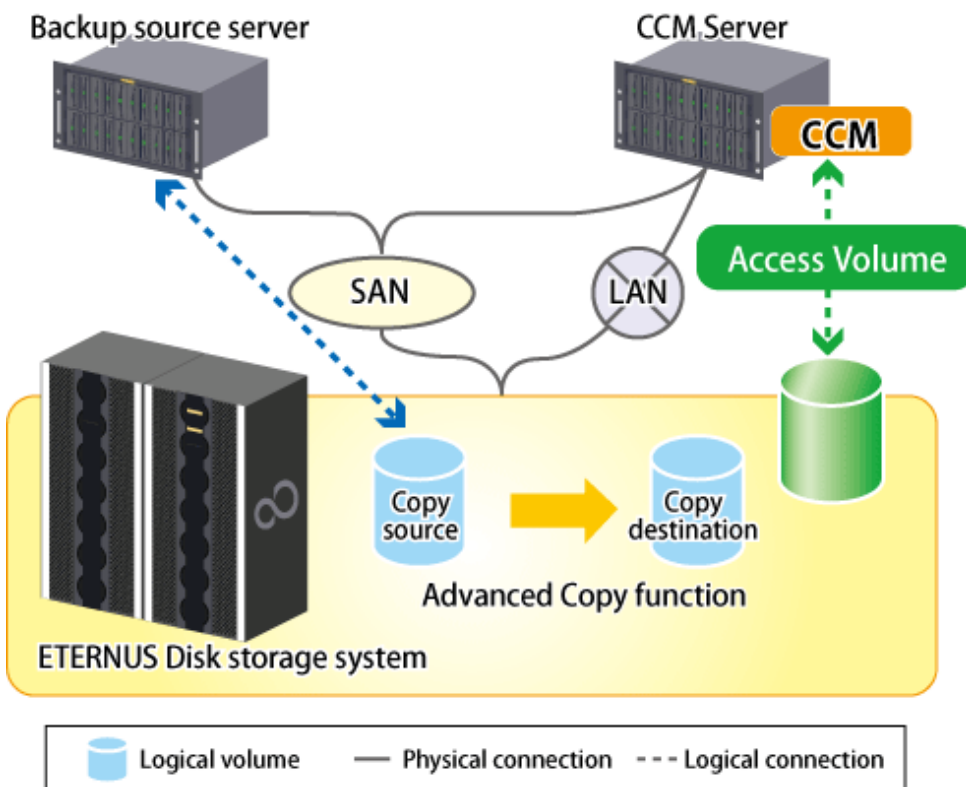


See

Refer to "System Configuration" in the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for further details.

2.2.1 Using Copy Command via SAN

This operating model serves to give Advanced Copy instructions from the CCM Server to the ETERNUS Disk storage system via SAN. The following figure shows a configuration in which intra-box copy is performed.



See

Refer to "System Configuration" in the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for information on configurations in which inter-box copy is performed.

Refer to "Storage Cluster Continuous Copy Function" in the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for information on configurations in Storage Cluster environments.

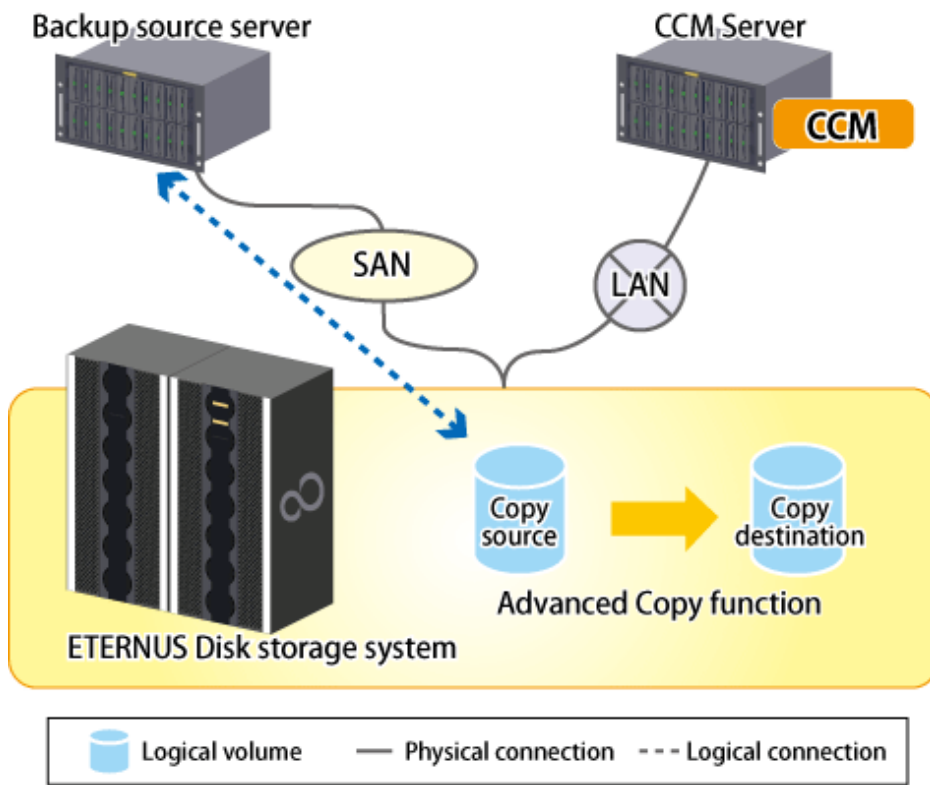
2.2.2 Using Copy Command via LAN

This operating model serves to give Advanced Copy instructions from the CCM Server to the ETERNUS Disk storage system via LAN. This operating model is available only on the following storage devices:

- ETERNUS DX S4 series
- ETERNUS DX S3 series
- ETERNUS DX S2 series (excluding DX60 S2)

- ETERNUS AF series
- ETERNUS DX200F

The following figure shows a configuration in which intra-box copy is performed.



See

Refer to "System Configuration" in the *ETERNUS SF Advanced Copy Manager Operation Guide for Copy Control Module* for information on configurations in which inter-box copy is performed.

Refer to "Storage Cluster Continuous Copy Function" in the *ETERNUS SF Advanced Copy Manager Operation Guide for Copy Control Module* for information on configurations in Storage Cluster environments.

Chapter 3 AdvancedCopy Manager Functions

This chapter describes the main functions of AdvancedCopy Manager.

3.1 Advanced Copy Functions

AdvancedCopy Manager supports two distinct copy modes:

- Snapshot high-speed copy

This creates a snapshot of data. The copy types available with this function are:

- OPC
- QuickOPC
- SnapOPC
- SnapOPC+

- Synchronous high-speed copy

This maintains the equivalent state for a transaction volume and backup volume. The copy types available with this function are:

- EC
- REC

With these copy functions (except the OPC), once an initial copy has been made, it is possible to perform differential copying, which copies only the modified portions.

With the REC, it is possible to perform synchronous high-speed copy from ETERNUS Disk storage system to other ETERNUS Disk storage system at remote locations.

Advanced Copy is executed by ETERNUS Disk storage system. Therefore, refer to the manuals of ETERNUS Disk storage system in use for details about Advanced Copy.

3.1.1 Snapshot High-Speed Copy

AdvancedCopy Manager supports both Snapshot backup and differential copying. Point in Time recovery for high transaction database environments where roll-forward has been enabled is also available. These features are particularly effective in minimizing system downtime and server I/O load.

OPC

OPC executes a disk copy of the entire volume.

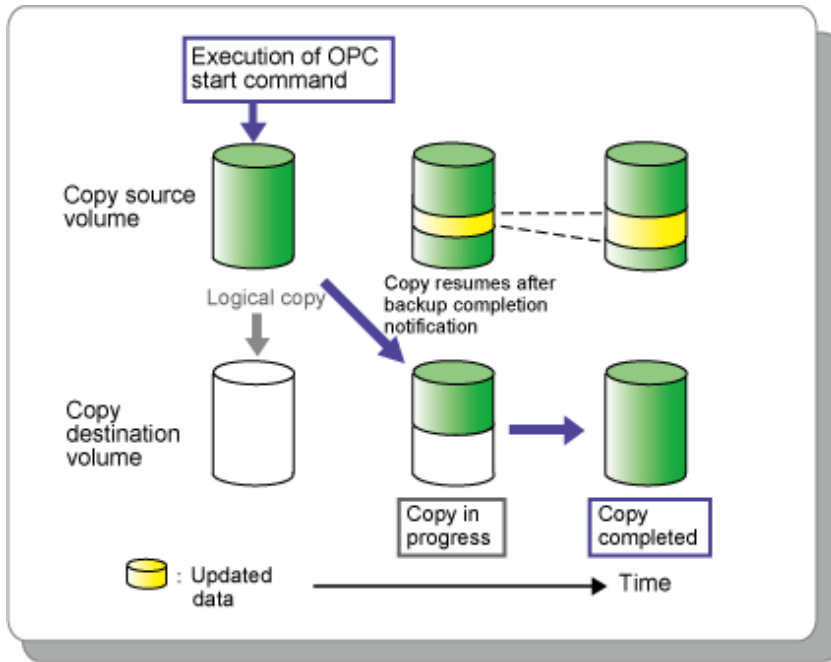
When OPC is executed, ETERNUS Disk storage system creates a point in time snapshot of the source volume and then immediately returns a notification to the operator that the copy is complete, before any physical copying has even occurred. This allows for access to be returned to the transaction or source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

OPC is highly effective for the following applications:

- Generation backups where continuous transactions are critical, such as in Internet business applications
- Data restoration from a backup volume
- Maintenance of data for archival purposes

The following diagram represents the process used in OPC.

Figure 3.1 Processing Flow of OPC



QuickOPC

Differential copying using QuickOPC requires that an initial copy exists.

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

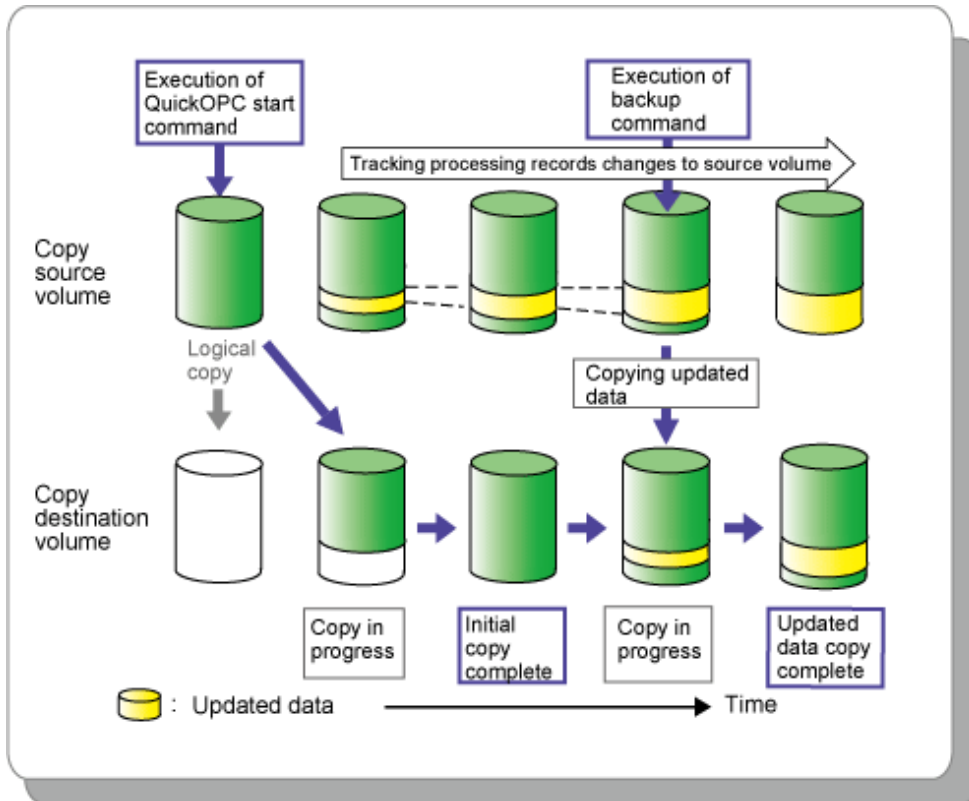
If QuickOPC detects that an initial copy does not exist, it creates the initial copy using OPC. The differential copy method used in QuickOPC significantly reduces the time required for physical data copying in order to create a Point in Time snapshot while minimizing the I/O load on the storage system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

QuickOPC is highly effective where:

- Backup to disk where uptime is critical
- Frequent creation of restore points or generation backups

The following diagram represents the processing flow of differential copying used in a QuickOPC copy after an initial copy has been created.

Figure 3.2 Processing Flow of QuickOPC



SnapOPC

SnapOPC uses the Copy-on-Write method to create a copy of the source volume as it was before any updates are made. Only the replication function can use SnapOPC.

When an update is required to be made to the copy source volume, the original data in the copy source volume is first copied to the copy destination volume. The change is then applied to the source volume. This method of backup copy is called "Copy-on-Write".

The copy destination volume stores only original data that has been modified or updated on the copy source volume.

The size of the copy destination volume is relative to the rate of modification on the copy source volume and a utility is used to provide an accurate estimate of the size. If the copy source volume is relatively stable, only a relatively small copy destination volume is required.

Although the physical size of the copy destination volume maybe smaller, the logical size (that is, the size presented to the operating system) of the copy destination volume is in effect the same as the copy source volume. AdvancedCopy Manager achieves this by combining the original data copied to the copy destination volume with the unmodified data on the copy source volume to form a logical view of the copy destination volume.

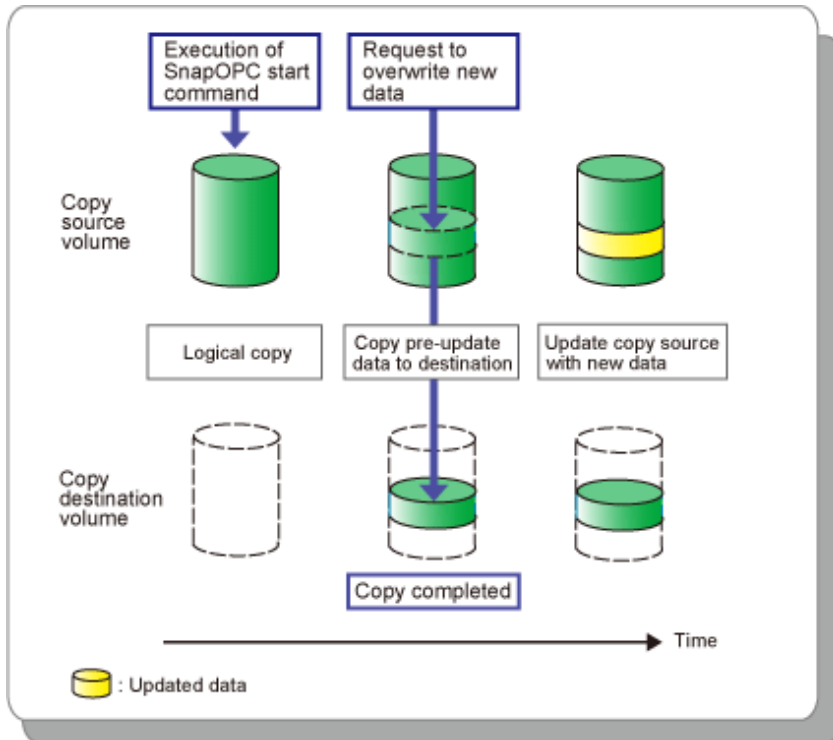
However, it should be understood that SnapOPC may be unsuitable for some purposes as the copy method can reduce access performance in the copy source volume, and any loss of data on the copy source volume would render the copied data unusable.

SnapOPC is used for the following situations:

- Temporary file to use when performing a cascade copy to alternate media such as tape
- Backup of file servers and "other data" with low modification rates

The following diagram represents the processing flow of SnapOPC.

Figure 3.3 Processing Flow of SnapOPC



SnapOPC+

Like SnapOPC, SnapOPC+ uses the Copy-on-Write method to create a copy of the source volume as it was before any updates. Only the replication function can use SnapOPC+.

SnapOPC+ can save the copy source volume data as it was before any updates are made in snap generation units (units in which replication volumes were created). Since copy is performed only to the new copy destination volume, the access load on the copy source volume and the physical size used on the copy destination volume can be smaller than with SnapOPC.

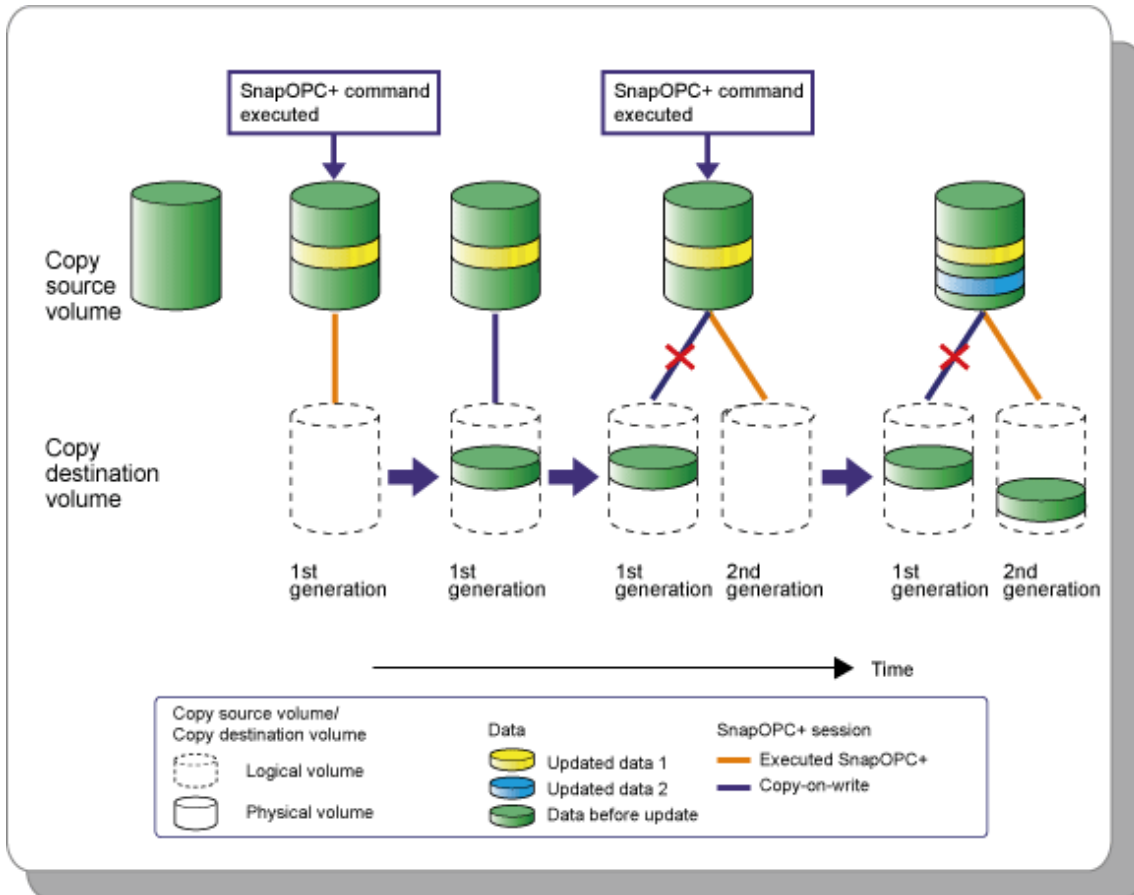
Due to the mechanism and features of SnapOPC+, it is assumed that it is used as a backup to enable recovery in case of soft faults (such as operator mistakes and software errors). If a copy source volume becomes inaccessible due to a hardware fault, then the relevant copy session also becomes inaccessible. As a result, the data on the copy destination volume cannot be read. In order to be prepared for such fatal hardware faults, it is recommended that, in conjunction with SnapOPC+, OPC/QuickOPC/EC/REC should be used to make a complete copy of data.

SnapOPC is used for the following situations:

- Temporary file to use when performing a cascade copy to alternate media such as tape
- Backup of file servers and "other data" with low modification rates

The following diagram represents the processing flow of SnapOPC+.

Figure 3.4 Processing Flow of SnapOPC+



3.1.2 Synchronous High-Speed Copy

EC

The EC feature of AdvancedCopy Manager 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.

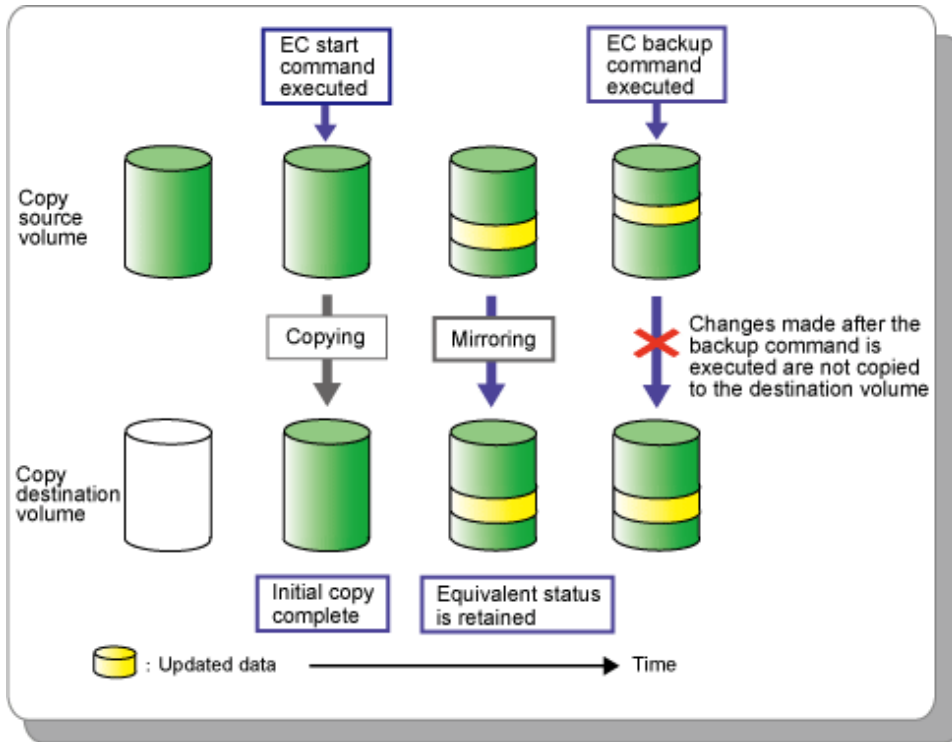
At any subsequent point while the copy source volume and destination volume are in this state of equivalence, the destination volume can be split from the source, thus creating a backup with history or a replica copy as at that point in time.

EC is highly effective for:

- Collection of backup data in parallel with ordinary transactions
- Distributed processing using copy data

The following diagram represents the processing flow of EC.

Figure 3.5 Processing Flow of EC



Suspend/Resume Function Provided by EC

The Suspend/Resume option of the EC function is used to create a backup after an initial copy has been built using the EC synchronization process. At this point, the copy source and copy destination volumes (Volume Pair) have attained a state of equivalence.

The EC session is then suspended using the Suspend option, detaching the destination volume from the EC session to create a copy which can be used as a backup with history or as a source volume for a subsequent copy to an archive device. This copy could also be mounted and become available for use by other applications.

While the session is suspended all updates to the copy source volume continue to be tracked so that they can be applied to the destination volume should that EC session be subsequently resumed.

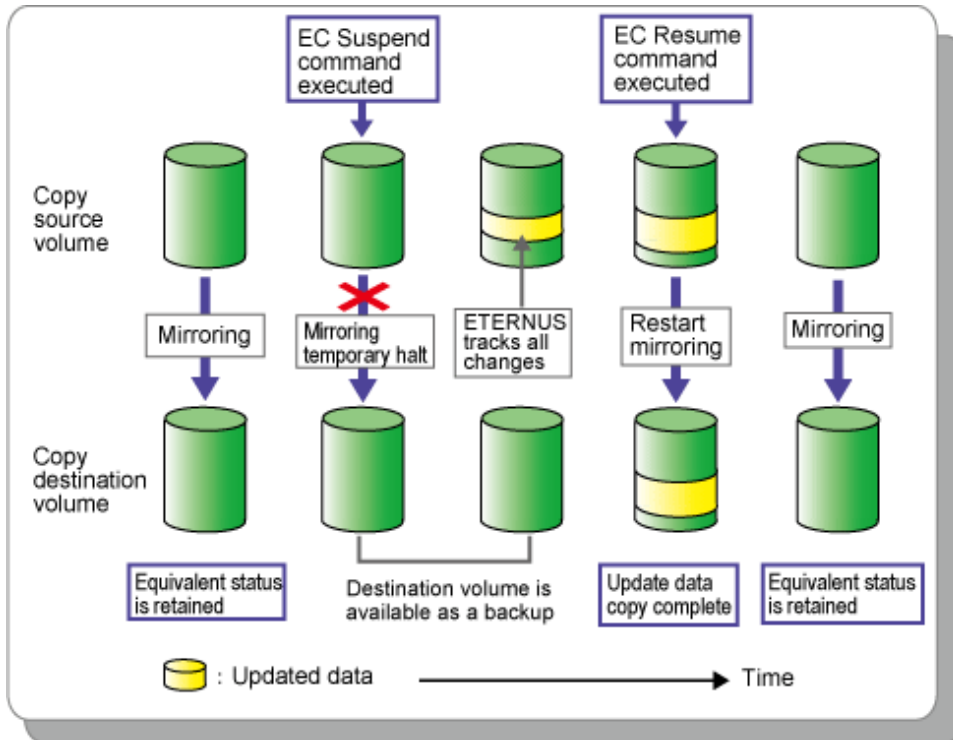
This allows the same destination volume to be reused as the base for a continuing backup, thus reducing the time required for backup.

The Resume option invokes a re-synchronization process of the same source and destination volume pair where all of the tracked changes to the source volume are applied to the destination volume to attain a state of equivalence again.

A suspend and resume process can be performed on the same volume pair as many times as required.

The following diagram represents the processing flow of the Suspend/Resume function.

Figure 3.6 Processing Flow of Suspend/Resume Function



REC

REC is a method for copying data between different ETERNUS Disk storage systems, but only the replication function can use REC.

REC has two transmission modes; synchronous and asynchronous.

Synchronous mode guarantees that the copy destination always matches the copy source.

Asynchronous transfer mode is typically used in the following circumstances:

- Where there may be a significant communications lag between the devices
- Used to avoid adversely affecting server performance and write performance on the copy source.

Asynchronous mode has two primary sub-modes which provide greater control over data transmission according to transaction intensity and or data volume, or available bandwidth between copy source and copy destination.

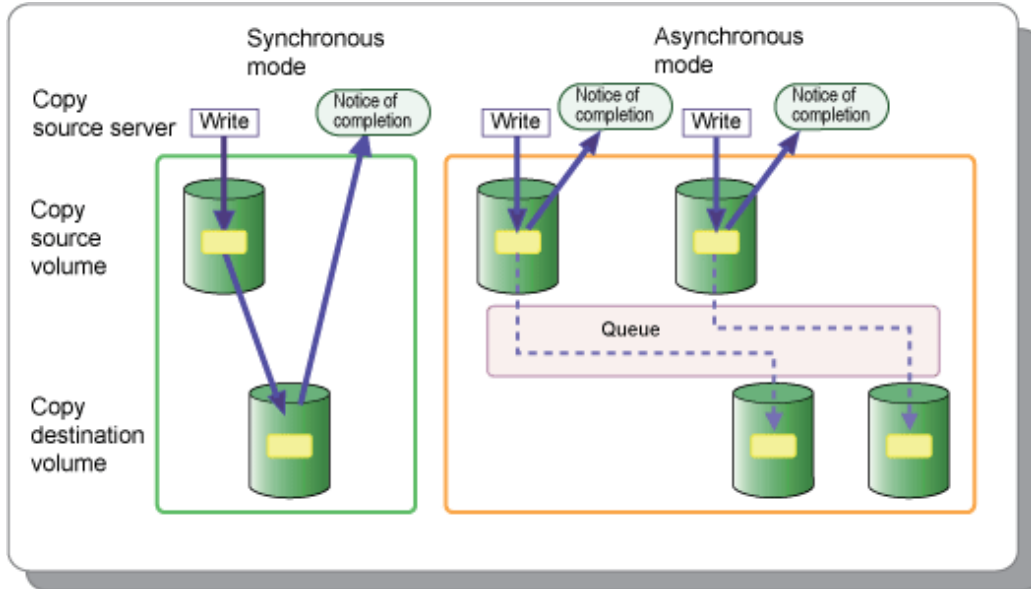
The default Asynchronous mode must however be selected to perform a split (create a backup or replica).

REC is highly effective for:

- Remote backup of a disaster countermeasure system or similar

The following diagram represents the processing flow of REC.

Figure 3.7 Processing Flow of REC



3.1.3 Additional Copy Functions

Concurrent Copy

The AdvancedCopy Manager multiple copy function allows concurrent copy from a single source volume to multiple destinations. Only one of these destinations can be in a different ETERNUS Disk storage system.

Cascade Copy

Cascade copy involves specifying the destination of one copy process as the source of a subsequent copy. One copy might be used as a nearby backup and another as a remote copy for disaster recovery or archive.

Possible copy combinations for cascade copy include:

- A copy destination made with OPC used as the source for REC
- A copy destination made with EC used as the source for REC
- A copy destination made with REC used as the source for OPC
- A copy destination made with REC used as the source for SnapOPC
- A copy destination made with REC used as the source for EC

Storage Cluster Continuous Copy Function

In a Storage Cluster environment, if a failover occurs in the Primary Storage while executing Advanced Copy, the Secondary Storage can continue the copy operation by automatically taking over the Advanced Copy process.

Only TFOV can use Storage Cluster Continuous Copy.

3.2 Backup Management Function

This section describes the backup management function provided by AdvancedCopy Manager.

3.2.1 Backup

Features of backup using AdvancedCopy Manager include the following:

- High-speed backup between volumes regardless of volume capacities

- The Advanced Copy functions of ETERNUS Disk storage system are used to significantly reduce the operational impact of a backup or restoration.
- Online backup is supported in mainstream database environments.
- Faster backups can be made by performing updates of differential copies.
- AdvancedCopy Manager automatically selects destination volumes to be used for backup. Alternatively, you can define explicit relationships between source volumes and backup volumes manually.

3.2.2 Restore

The backup management information stored by AdvancedCopy Manager allows data to be restored from the most suitable backup volume to a transaction volume. This is performed using the OPC hardware function and the history management information saved by AdvancedCopy Manager to restore to a point in time.

By default, data is restored to the transaction volume that was the backup source; however, it is possible to change the restore destination.

3.3 Replication Management Function

Replication in AdvancedCopy Manager uses the Advanced Copy functions of the ETERNUS Disk storage system to perform high-speed copying. The copy data created using this function can be used as backup data.

For the purpose of this overview, replication is defined as copying that is intended for concurrent use by other applications. The destination volume in a replication remains accessible, unlike destination volumes in backup which are typically unmounted.

Replication is not limited to within a single Managed Server or a single ETERNUS Disk storage system. Using REC, replication can also be performed across different ETERNUS Disk storage systems regardless of geographical locations.

The replication function of AdvancedCopy Manager has the following features:

- With the AdvancedCopy Manager replication function, replication can be configured in two directional modes:
 - Uni-directional: copying can only be performed from the source volume to the destination volume.
 - Bi-directional: copying can be performed in either direction between volumes.
- If the copy source and copy destination volumes are both in the same ETERNUS Disk storage system and hosted by the same Managed Server, data can be copied in real-time.

3.4 Backup Using AdvancedCopy Manager CCM

Features of backup using AdvancedCopy Manager CCM include the following:

- It is not necessary to install an agent on the server that is the backup source, which, compared to Agent-based operation, allows for shorter times to start operation.
- Backup can be performed regardless of the OS that is running on the backup source server.
- By isolating the LAN connected to the backup source server from the CCM Server, security can be enhanced.

Refer to the *ETERNUS SF AdvancedCopy Manager Operation Guide for Copy Control Module* for details.

3.5 Storage Cluster Continuous Copy Function

In a Storage Cluster environment, even if a failover occurs in the Primary Storage while executing Advanced Copy, we provide a function that can continue the copy operation with the Secondary Storage by automatically taking over the Advanced Copy process.

This function can only be used when the copy source and copy destination volumes are TFOV. The copy types that can be used are OPC, QuickOPC, and EC.

Traditionally with Storage Cluster operations, copy settings were required on both the Primary Storage and Secondary Storage, so if the Primary Storage stopped, re-executing the copy on the Secondary Storage was required. However, this function can continue the copy

operation by sharing the copy settings on both the Primary Storage and Secondary Storage without needing to perform a copy setting and re-execution of the copy in the Secondary Storage.