Contents

Preface................................................................................................................................. xix
Intended audience...................................................................................................................... xx
Product version.......................................................................................................................... xx
Release notes............................................................................................................................. xx
Document organization........................................................................................................... xx
Referenced documents........................................................................................................... xxii
Document conventions........................................................................................................... xxiii
Convention for storage capacity values................................................................................ xxiv
Accessing product documentation........................................................................................ xxiv
Getting help............................................................................................................................... xxv
Comments................................................................................................................................ xxv

1 Introduction.......................................................................................................................... 1-1
   About Replication Manager.................................................................................................. 1-2
   Example of a replication environment................................................................................ 1-2
   Replication Manager features............................................................................................ 1-3
   Architecture and components............................................................................................ 1-4
   System configurations......................................................................................................... 1-6
   Replication Manager operations roadmap.......................................................................... 1-10
   Units used for calculating capacity and displaying values.................................................. 1-11

2 Getting started..................................................................................................................... 2-1
   Using the Help system......................................................................................................... 2-2
   Initial setup......................................................................................................................... 2-3
      Initial settings configuration workflow........................................................................ 2-3
   Setting up redundant pair management server configurations....................................... 2-3
      About redundant pair management server configurations......................................... 2-4
      Registering redundant pair management server nodes (while creating a copy group) .... 2-5
      Registering redundant pair management servers manually....................................... 2-6
      Adding pair management server nodes........................................................................ 2-6
      Deleting pair management server nodes...................................................................... 2-6
      Identifying a pair management server associated with a copy group............................. 2-7
   Confirming the prerequisite environment........................................................................... 2-7
   Logging in and out.............................................................................................................. 2-7
# 8 Setting up storage systems

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>About setting up storage systems</td>
<td>8-1</td>
</tr>
<tr>
<td>Storage system setup functions</td>
<td>8-2</td>
</tr>
<tr>
<td>Explorer menu items for setting up storage systems</td>
<td>8-3</td>
</tr>
<tr>
<td>Prerequisite settings for replicating volumes</td>
<td>8-4</td>
</tr>
<tr>
<td>Setting up V-VOLs</td>
<td>8-6</td>
</tr>
<tr>
<td>About creating V-VOLs</td>
<td>8-6</td>
</tr>
<tr>
<td>V-VOL limits</td>
<td>8-7</td>
</tr>
<tr>
<td>Prerequisites for creating V-VOLs</td>
<td>8-7</td>
</tr>
<tr>
<td>Conditions for primary volumes that can be added (V-VOL Creation)</td>
<td>8-7</td>
</tr>
<tr>
<td>Permitted V-VOL operations based on CVS installation</td>
<td>8-8</td>
</tr>
<tr>
<td>About the Create V-VOL Wizard</td>
<td>8-8</td>
</tr>
<tr>
<td>Launching the Create V-VOL Wizard</td>
<td>8-9</td>
</tr>
<tr>
<td>Creating V-VOLs</td>
<td>8-9</td>
</tr>
<tr>
<td>Setting up command devices</td>
<td>8-11</td>
</tr>
<tr>
<td>About command devices</td>
<td>8-11</td>
</tr>
<tr>
<td>Storage system types and volume requirements (command devices)</td>
<td>8-11</td>
</tr>
<tr>
<td>About the Add Command Devices Wizard</td>
<td>8-13</td>
</tr>
<tr>
<td>Launching the Add Command Devices Wizard</td>
<td>8-13</td>
</tr>
<tr>
<td>Adding command devices</td>
<td>8-13</td>
</tr>
<tr>
<td>Setting up remote paths</td>
<td>8-14</td>
</tr>
<tr>
<td>About remote paths</td>
<td>8-14</td>
</tr>
<tr>
<td>Conditions for specifying remote paths</td>
<td>8-15</td>
</tr>
<tr>
<td>About the Create Remote Path Wizard</td>
<td>8-16</td>
</tr>
<tr>
<td>Creating a remote path</td>
<td>8-16</td>
</tr>
<tr>
<td>Setting up DMLUs</td>
<td>8-17</td>
</tr>
<tr>
<td>About DMLUs</td>
<td>8-17</td>
</tr>
<tr>
<td>Setting up a DMLU</td>
<td>8-18</td>
</tr>
<tr>
<td>Storage system types and volume requirements (DMLU)</td>
<td>8-18</td>
</tr>
<tr>
<td>About Add DMLUs Wizard</td>
<td>8-19</td>
</tr>
<tr>
<td>Launching the Add DMLUs Wizard</td>
<td>8-19</td>
</tr>
<tr>
<td>Adding a DMLU</td>
<td>8-19</td>
</tr>
<tr>
<td>Adding DMLU capacity</td>
<td>8-20</td>
</tr>
<tr>
<td>Setting up pool volumes</td>
<td>8-20</td>
</tr>
<tr>
<td>About pool volumes</td>
<td>8-21</td>
</tr>
<tr>
<td>Storage system types and volume requirements (pools)</td>
<td>8-21</td>
</tr>
<tr>
<td>About the Create Pool Wizard</td>
<td>8-24</td>
</tr>
<tr>
<td>Launching the Create Pool Wizard</td>
<td>8-24</td>
</tr>
<tr>
<td>Adding pools</td>
<td>8-24</td>
</tr>
<tr>
<td>Setting up journal groups</td>
<td>8-25</td>
</tr>
<tr>
<td>About journal groups</td>
<td>8-25</td>
</tr>
<tr>
<td>Storage system types and volume requirements (journal)</td>
<td>8-25</td>
</tr>
<tr>
<td>Items permitted for journal options</td>
<td>8-26</td>
</tr>
<tr>
<td>Items permitted for mirror options</td>
<td>8-27</td>
</tr>
<tr>
<td>About the Create Journal Group Wizard</td>
<td>8-28</td>
</tr>
<tr>
<td>Create journal group workflow</td>
<td>8-28</td>
</tr>
<tr>
<td>Launching the Create Journal Group Wizard</td>
<td>8-29</td>
</tr>
<tr>
<td>Adding journal groups</td>
<td>8-30</td>
</tr>
</tbody>
</table>
About filtering candidate volumes.................................................................10-23
  Conditions affecting displayed storage system information........................10-23
Selecting multiple candidate volumes.............................................................10-24
About volume capacity checking.....................................................................10-24
Defining copy groups..........................................................................................10-24
  About copy groups........................................................................................10-25
  Copy group requirements for pair configuration (mainframe systems)... 10-25
About assigning CTGID/JNLGID for copy pairs................................................10-26
  Conditions for creating local copy pairs with the CTG option......................10-26
Configuring open and mainframe consistency groups.........................................10-26
About HORCM instances................................................................................10-27
Creating copy groups....................................................................................10-28
Changing copy group names...........................................................................10-29
Associating pair groups with copy groups........................................................10-30
Creating a container with multiple copy groups (mainframe systems).............10-31
Supported copy group and container combinations...........................................10-32
Defining multi-target and cascade configurations..............................................10-32
  About multi-target and cascade copy pair configurations.........................10-32
  Copy type requirements for pair configuration definitions........................10-33
  Permitted topologies for cascade and multi-target configurations.............10-38
About TCS/UR 3DC delta resync.......................................................................10-38
  Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems).................................................................10-39
Defining copy groups in a multi-target or cascade configuration.........................10-39
Creating a TCS/UR 3DC multi-target configuration...........................................10-40
Using a GAD 3DC delta resync configuration....................................................10-40
  About GAD 3DC delta resync configurations.............................................10-41
GAD 3DC delta resync requirements................................................................10-43
Precautions for GAD 3DC delta resync configurations.....................................10-43
Creating a GAD 3DC delta resync configuration.............................................10-44
Deleting a GAD 3DC delta resync configuration.............................................10-46
Troubleshooting GAD 3DC delta resync errors.............................................10-46
Using snapshot groups....................................................................................10-47
  About snapshot groups................................................................................10-47
Snapshot group requirements..........................................................................10-48
Snapshot group configuration workflow..........................................................10-49
Creating a snapshot group.............................................................................10-50
Viewing or modifying snapshot groups............................................................10-51
Deleting a snapshot group.............................................................................10-51
Changing the pair management server for snapshot groups.............................10-51
Migrating copy groups to snapshot groups......................................................10-52
Scheduling and managing tasks.........................................................................10-52
  About tasks..................................................................................................10-53
About task statuses........................................................................................10-55
About task types (open systems)...................................................................10-55
About task types (mainframe systems)...........................................................10-57
Scheduling tasks.............................................................................................10-57
  Modifying task execution schedule..............................................................10-57
  Editing tasks..............................................................................................10-58
Viewing a list of tasks....................................................................................10-60
Canceling tasks...............................................................................................10-60
Deleting tasks.................................................................................................10-61
11 Refreshing management information ........................................ 11-1

11-1 About refreshing management information .......................... 11-2
11-3 Functions for refreshing management information...................... 11-3
11-3 Explorer menu items for refreshing management information .. 11-3
11-4 Refreshing copy pair status .................................................. 11-4
11-4 About refreshing copy pair status ........................................... 11-4
11-5 Refreshing copy pair statuses data flow (open systems) ......... 11-5
11-6 Refreshing copy pair statuses data flow (mainframe systems) . 11-6
11-7 Disabling the Device Manager refresh function ....................... 11-7
11-8 Refreshing copy pair statuses manually for each host ......... 11-8
11-8 Refreshing copy pair statuses manually for each volume ...... 11-8
11-9 Refreshing copy pair statuses manually for each copy group or snapshot group . 11-9
11-9 Refreshing copy pair statuses manually for My Copy Groups .... 11-9
11-10 Refreshing the copy pair status automatically for each information source .... 11-10
### 13 Managing My Copy Groups

- My Copy Groups management functions ........................................ 13-2
- Explorer menu items for My Copy Groups management ................... 13-2
- Checking My Copy Groups ............................................................ 13-2
- Editing My Copy Groups ............................................................... 13-3

### 14 Managing resources

- Resource management functions ................................................. 14-3
- Explorer menu items for resource management .............................. 14-4
- Viewing a list of copy pair configurations ...................................... 14-4
- Viewing a list of copy pairs associated with a task .......................... 14-4
- Viewing a list of hosts ................................................................. 14-5
- Viewing a list of storage systems ................................................ 14-5
- Viewing a summary of storage systems ......................................... 14-5
- Viewing DEVN information (mainframe systems) .......................... 14-6
- Viewing individual host information ............................................ 14-6
- Viewing individual storage system information ............................. 14-7
- Viewing information about copy groups belonging to a copy pair configuration definition ................................................................. 14-8
- Icons representing a copy topology ............................................... 14-8
- Viewing copy group information in the Pair Configurations view (mainframe systems) ......................................................... 14-9
- Viewing copy group information in the Pair Configurations view (open systems) .......................................................... 14-9
- Viewing information about copy groups or snapshot groups belonging to a host ................................................................. 14-9
- Viewing copy group information in the Hosts view (mainframe systems) ................................................................. 14-10
- Viewing copy group information in the Hosts view (open systems) .... 14-10
- Viewing information about pair management servers ....................... 14-11
- Viewing information about prefixes belonging to a host (mainframe systems) ............................................................. 14-11
- Viewing information about volumes belonging to a host .................. 14-12
- Viewing information about volumes belonging to a storage system .... 14-12
- Viewing information about CUs belonging to a storage system (mainframe systems) .......................................................... 14-12
- Viewing LDEV information (mainframe systems) .......................... 14-13
- LDEV display format ..................................................................... 14-14
- Viewing LUN information in the Storage Systems view (open systems) ................................................................. 14-14
- Viewing LUN information in the Hosts view (open systems) .......... 14-15
- Viewing storage system information (mainframe systems) .............. 14-15
- Viewing storage system information (open systems) ..................... 14-15
- Viewing information about LDKCs belonging to a storage system (mainframe systems) .......................................................... 14-16

### 15 Managing storage systems

- Managing V-VOLs ........................................................................ 15-2
  - Conditions for deleting V-VOLs .................................................... 15-2
  - Deleting V-VOLs ........................................................................ 15-2
  - Deleting multiple V-VOLs ............................................................. 15-2
- Managing command devices ............................................................ 15-3
16 Managing sites .......................................................... 16-1
  About site administration .................................................. 16-2
    Site setup example .......................................................... 16-2
    Site management functions ................................................. 16-3
      Explorer menu items for site administration ......................... 16-3
    Viewing a list of sites ...................................................... 16-4
    Viewing individual site information ....................................... 16-4
    Editing sites ................................................................. 16-4
    Removing hosts from a site ................................................ 16-5
    Removing storage systems from a site ................................... 16-5
    Removing pair management servers from a site ....................... 16-5
    Removing applications from a site ........................................ 16-6
    Deleting sites ............................................................... 16-6
      Deleting individual sites ................................................ 16-7
      Deleting multiple sites .................................................. 16-7

17 Managing alerts ................................................................... 17-1
  About alert management ...................................................... 17-2
    Alert management functions ................................................. 17-2
      Explorer menu items for alert management ............................. 17-3
    Enabling or disabling alert settings ....................................... 17-3
    Viewing alerts and settings ................................................. 17-3
    Testing alert settings ........................................................ 17-4
    Editing alert settings ........................................................ 17-5
    Marking alerts as completed ............................................... 17-5
    Deleting alert settings ....................................................... 17-6
    Disabling or enabling alert automarking .................................. 17-6

18 Managing licenses ............................................................ 18-1
  About licenses ................................................................. 18-2
19 Managing users and permissions ........................................................... 19-1
   User management functions ................................................................... 19-2
   Explorer menu items for user management .............................................. 19-2
   Managing users ...................................................................................... 19-3
      Viewing a list of users .......................................................................... 19-3
      Viewing individual user information .................................................. 19-3
      Changing user passwords (managing users and permissions) ............... 19-4
      Changing user roles ............................................................................. 19-5
      Editing user profiles (managing users and permissions) ....................... 19-5
      Deleting users ....................................................................................... 19-6
         Deleting individual users ................................................................. 19-6
         Deleting multiple users ................................................................. 19-7
   Managing user permissions ..................................................................... 19-7
      Viewing a list of user permissions ....................................................... 19-7
      Viewing a summary of user permissions ............................................. 19-8
   Managing user profiles .......................................................................... 19-8
      About user profiles .............................................................................. 19-8
         User profile management functions .............................................. 19-8
      Explorer menu items for user profile management .............................. 19-9
      Viewing user profiles .......................................................................... 19-9
      Editing user profiles (managing user profiles) ..................................... 19-9
      Changing user passwords (managing users and permissions) ............... 19-10
   Managing user accounts and user authentication .................................... 19-11
      About account locking ........................................................................ 19-11
      Locking user accounts ....................................................................... 19-12
      Unlocking user accounts ................................................................... 19-13
      About user authentication ................................................................... 19-14
      Linking to an external authentication server ....................................... 19-14
      Changing the user authentication method ......................................... 19-15
      Using an external authorization server (authorization groups) ............. 19-16

20 Managing resource groups ................................................................. 20-1
   About resource group management ....................................................... 20-2
      Resource group management functions ........................................... 20-2
      Explorer menu items for resource group management ........................ 20-3
   Editing resource groups ....................................................................... 20-3
   Viewing a list of resource groups .......................................................... 20-3
   Viewing individual resource group information .................................... 20-4
   Removing hosts from a resource group ................................................. 20-4
   Removing storage systems from a resource group ................................ 20-5
   Removing users from a resource group .................................................. 20-5
   Removing applications from a resource group ...................................... 20-6
   Deleting resource groups ..................................................................... 20-6
      Deleting individual resource groups .................................................. 20-7
      Deleting multiple resource groups .................................................... 20-7

xiv
21 Managing security ............................................................................................................. 21-1
   About security settings .................................................................................. 21-2
   Functions for setting security .................................................................... 21-2
   Explorer menu items for setting security .................................................. 21-3
   Viewing conditions for passwords ............................................................. 21-3
   Changing conditions for passwords .............................................................. 21-3
   Viewing settings for automatic account locking ...................................... 21-4
   Changing settings for automatic account locking ...................................... 21-4
   About warning banners ............................................................................. 21-5
   Viewing a preview of the warning banner ................................................. 21-6
   Editing a warning banner .......................................................................... 21-6
   Deleting a warning banner ......................................................................... 21-6

22 Managing information sources ................................................................................ 22-1
   Viewing a list of information sources ............................................................. 22-2
   Editing information sources ........................................................................... 22-2
      Editing a Device Manager server .............................................................. 22-2
      Editing an instance of Application Agent ................................................. 22-3
      Editing an instance of Business Continuity Manager or Mainframe Agent 22-3
   Removing information sources ..................................................................... 22-4
      Removing information sources workflow ................................................. 22-5
      Removing Device Manager servers ......................................................... 22-5
      Removing instances of Business Continuity Manager or Mainframe Agent 22-6
      Removing instances of Application Agent ................................................ 22-6
   Acquiring the latest configuration information (configuration refresh) ......... 22-7
      Updating registered configuration information workflow ....................... 22-7
      Example of updating information registered in Replication Manager ........ 22-8

23 Managing application replicas ............................................................................... 23-1
   About application replicas ........................................................................... 23-3
   Managing generations (replica rotation) ...................................................... 23-3
   About storage groups and information stores ............................................. 23-6
   Check replica configuration workflow ....................................................... 23-6
   Precautions for replica operations .............................................................. 23-7
   Replica data types and configuration requirements ..................................... 23-20
   Software that should not be used during replica operations ....................... 23-26
   About creating application replicas ............................................................ 23-27
      Create application replica workflow ......................................................... 23-27
   About the Create Replica Wizard ................................................................. 23-28
   Launching the Create Replica Wizard ......................................................... 23-28
   Creating an application replica .................................................................... 23-29
   Restoring application replicas ...................................................................... 23-30
      Roll-forward versus point-in-time restores ............................................. 23-31
      Restoring in units of information stores (Exchange 2007) ....................... 23-34
      Restore application replica workflow ...................................................... 23-36
   About the Restore Replica Wizard ............................................................... 23-36
   Restoring the latest application replica (simple restore) ............................ 23-36
   Restoring an application replica from the Replica History ......................... 23-38
   Restoring an SQL Server replica to a remote site ...................................... 23-38
      Recovering a database from a remote site to local .................................. 23-39
      Revealing secondary volumes prior to a remote restore operation .......... 23-39
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Database Availability Groups (DAGs)</td>
<td>23-40</td>
</tr>
<tr>
<td>About Database Availability Groups (DAGs)</td>
<td>23-42</td>
</tr>
<tr>
<td>About SQL database and service status</td>
<td>23-43</td>
</tr>
<tr>
<td>Using Agent backup scripts (tape backups)</td>
<td>23-45</td>
</tr>
<tr>
<td>Performing tape backups and restores</td>
<td>23-52</td>
</tr>
<tr>
<td>Replica operations in an SQL Server replication configuration</td>
<td>23-57</td>
</tr>
<tr>
<td>Mounting and unmounting application replicas</td>
<td>23-60</td>
</tr>
<tr>
<td>Checking the status of application replicas</td>
<td>23-61</td>
</tr>
<tr>
<td>Check status of a replica workflow</td>
<td>23-61</td>
</tr>
<tr>
<td>Confirming application resources</td>
<td>23-62</td>
</tr>
<tr>
<td>24 Handling errors</td>
<td>24-1</td>
</tr>
<tr>
<td>About handling errors</td>
<td>24-2</td>
</tr>
<tr>
<td>Monitoring events using event logs</td>
<td>24-2</td>
</tr>
<tr>
<td>About event logs</td>
<td>24-2</td>
</tr>
<tr>
<td>Event log management functions</td>
<td>24-3</td>
</tr>
<tr>
<td>Explorer menu (event logging)</td>
<td>24-3</td>
</tr>
<tr>
<td>Viewing a list of event log data</td>
<td>24-3</td>
</tr>
<tr>
<td>Icons for messages</td>
<td>24-3</td>
</tr>
<tr>
<td>Troubleshooting the replication environment</td>
<td>24-4</td>
</tr>
<tr>
<td>Troubleshooting the replication environment workflow</td>
<td>24-5</td>
</tr>
<tr>
<td>About MIB definition files</td>
<td>24-5</td>
</tr>
<tr>
<td>25 Exporting management information</td>
<td>25-1</td>
</tr>
<tr>
<td>About exporting management information</td>
<td>25-2</td>
</tr>
<tr>
<td>Management information export functions</td>
<td>25-2</td>
</tr>
<tr>
<td>Explorer menu (exporting management information)</td>
<td>25-3</td>
</tr>
<tr>
<td>Exporting alert history</td>
<td>25-3</td>
</tr>
<tr>
<td>Exporting event log data</td>
<td>25-3</td>
</tr>
<tr>
<td>Exporting the history of C/T delta</td>
<td>25-4</td>
</tr>
<tr>
<td>Exporting the history of journal volume usage for each copy group</td>
<td>25-4</td>
</tr>
<tr>
<td>Exporting the history of journal volume usage for each journal group</td>
<td>25-5</td>
</tr>
<tr>
<td>Exporting the history of pool volume usage</td>
<td>25-6</td>
</tr>
<tr>
<td>Exporting the history of sidefile usage</td>
<td>25-6</td>
</tr>
<tr>
<td>26 System maintenance</td>
<td>26-1</td>
</tr>
<tr>
<td>About system maintenance</td>
<td>26-2</td>
</tr>
<tr>
<td>Functions for Replication Manager maintenance</td>
<td>26-2</td>
</tr>
<tr>
<td>Explorer menu items for Replication Manager maintenance</td>
<td>26-2</td>
</tr>
<tr>
<td>About operation modes</td>
<td>26-3</td>
</tr>
<tr>
<td>Viewing the operation mode</td>
<td>26-3</td>
</tr>
<tr>
<td>Changing the operation mode</td>
<td>26-3</td>
</tr>
<tr>
<td>27 Replication Manager CLI tools</td>
<td>27-1</td>
</tr>
<tr>
<td>About the installation base path</td>
<td>27-2</td>
</tr>
<tr>
<td>Using the GetCTDelta command</td>
<td>27-2</td>
</tr>
<tr>
<td>Requirements</td>
<td>27-2</td>
</tr>
<tr>
<td>Location</td>
<td>27-3</td>
</tr>
<tr>
<td>Syntax</td>
<td>27-3</td>
</tr>
<tr>
<td>Examples</td>
<td>27-5</td>
</tr>
</tbody>
</table>
This document describes how to use the Replication Manager software.

Notice: The use of Hitachi Replication Manager and all other Hitachi Data Systems products is governed by the terms of your agreements with Hitachi Data Systems.

This preface includes the following information:

- Intended audience
- Product version
- Release notes
- Document organization
- Referenced documents
- Document conventions
- Convention for storage capacity values
- Accessing product documentation
- Getting help
- Comments
Intended audience

This manual is intended for system administrators who use Replication Manager to operate and manage storage systems. The manual assumes that the reader has the following types of knowledge:

Knowledge of storage systems and related software

- A basic knowledge of SANs (Storage Area Networks) and management software used to operate storage systems
- Knowledge of storage system volume replication functionality (such as ShadowImage or TrueCopy)

Knowledge of prerequisite products

- Ability to use a prerequisite operating system and a Web browser
- A basic knowledge of Device Manager
- A basic knowledge of Business Continuity Manager or Mainframe Agent (if managing a mainframe system)

Product version

This document revision applies to Hitachi Replication Manager v8.4.1 or later.

Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on Hitachi Data Systems Support Connect: https://support.hds.com/en_us/documents.html

Document organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1, Introduction on page 1-1</td>
<td>Provides an overview of Replication Manager features and architecture.</td>
</tr>
<tr>
<td>Chapter 2, Getting started on page 2-1</td>
<td>Describes initial settings needed to begin Replication Manager operations and procedures for setting up the prerequisite environment for pair management.</td>
</tr>
<tr>
<td>Chapter 3, Replication Manager console on page 3-1</td>
<td>Describes the Replication Manager console and its main features.</td>
</tr>
<tr>
<td>Chapter</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Chapter 4, Setting up information sources on page 4-1</strong></td>
<td>Describes tasks for setting up information sources.</td>
</tr>
<tr>
<td><strong>Chapter 5, Discovering volumes on page 5-1</strong></td>
<td>Describes how to discover volumes using Replication Manager.</td>
</tr>
<tr>
<td><strong>Chapter 6, Setting up authorities on page 6-1</strong></td>
<td>Describes how to configure access control in Replication Manager.</td>
</tr>
<tr>
<td><strong>Chapter 7, Organizing resources on page 7-1</strong></td>
<td>Describes different ways to organize resources within Replication Manager.</td>
</tr>
<tr>
<td><strong>Chapter 8, Setting up storage systems on page 8-1</strong></td>
<td>Describes the tasks for preparing the replication environment and setting up storage systems.</td>
</tr>
<tr>
<td><strong>Chapter 9, Customizing monitoring parameters on page 9-1</strong></td>
<td>Describes how to set up alerts, refresh intervals and data retention periods.</td>
</tr>
<tr>
<td><strong>Chapter 10, Managing pair life cycle on page 10-1</strong></td>
<td>Describes tasks for defining copy pairs and performing pair operations.</td>
</tr>
<tr>
<td><strong>Chapter 11, Refreshing management information on page 11-1</strong></td>
<td>Describes ways to refresh configuration information and copy pair status information.</td>
</tr>
<tr>
<td><strong>Chapter 12, System monitoring on page 12-1</strong></td>
<td>Describes the different types of system monitoring functions supported by Replication Manager.</td>
</tr>
<tr>
<td><strong>Chapter 14, Managing resources on page 14-1</strong></td>
<td>Describes different methods for managing resources.</td>
</tr>
<tr>
<td><strong>Chapter 13, Managing My Copy Groups on page 13-1</strong></td>
<td>Describes tasks for managing My Copy Groups.</td>
</tr>
<tr>
<td><strong>Chapter 15, Managing storage systems on page 15-1</strong></td>
<td>Describes tasks for managing storage systems.</td>
</tr>
<tr>
<td><strong>Chapter 16, Managing sites on page 16-1</strong></td>
<td>Describes tasks for managing sites.</td>
</tr>
<tr>
<td><strong>Chapter 17, Managing alerts on page 17-1</strong></td>
<td>Describes tasks for managing alerts.</td>
</tr>
<tr>
<td><strong>Chapter 18, Managing licenses on page 18-1</strong></td>
<td>Describes tasks for license managing licenses.</td>
</tr>
<tr>
<td><strong>Chapter 19, Managing users and permissions on page 19-1</strong></td>
<td>Describes tasks for managing users and permissions, user profiles, and user authentication.</td>
</tr>
<tr>
<td><strong>Chapter 21, Managing security on page 21-1</strong></td>
<td>Describes tasks for managing security.</td>
</tr>
<tr>
<td><strong>Chapter 20, Managing resource groups on page 20-1</strong></td>
<td>Describes the tasks for Resource Group management.</td>
</tr>
</tbody>
</table>
Chapter | Description
--- | ---
**Chapter 22, Managing information sources on page 22-1** | Describes tasks for managing information sources.

**Chapter 23, Managing application replicas on page 23-1** | Describes how to manage application replicas using Replication Manager.

**Chapter 24, Handling errors on page 24-1** | Describes error handling mechanisms supported by Replication Manager.

**Chapter 25, Exporting management information on page 25-1** | Describes tasks for exporting management information.

**Chapter 26, System maintenance on page 26-1** | Describes the system maintenance functions supported by Replication Manager.

**Chapter 27, Replication Manager CLI tools on page 27-1** | Describes the command line tools available as an alternative to the GUI.

**Appendix A, Icons on page A-1** | Provides a listing of icons and their descriptions.

**Appendix B, Exceptions on page B-1** | Provides information about complex system configuration scenarios.

**Appendix C, Display formats on page C-1** | Provides information on supported display formats.

**Referenced documents**

The following referenced documents can be found on Hitachi Data Systems Support Connect ([https://support.hds.com/en_us/documents.html](https://support.hds.com/en_us/documents.html)):

- *Hitachi Command Suite Replication Manager Configuration Guide*, MK-98HC151
- *Hitachi Command Suite System Administrator Guide*, MK-90HC175
- *Hitachi Command Suite Replication Manager Application Agent CLI Reference Guide*, MK90HC181
- *Hitachi Command Suite Replication Manager Application Agent CLI User Guide*, MK90HC189
- *Hitachi Command Suite Messages*, MK-90HC178
- *Hitachi Command Suite Business Continuity Manager Installation Guide*, MK-95HC104
Document conventions

This document uses the following typographic conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold</strong></td>
<td>• Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example: Click <strong>OK</strong>.</td>
</tr>
<tr>
<td></td>
<td>• Indicates a emphasized words in list items.</td>
</tr>
<tr>
<td><strong>Italic</strong></td>
<td>• Indicates a document title or emphasized words in text.</td>
</tr>
<tr>
<td></td>
<td>• Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: pairdisplay -g <strong>group</strong></td>
</tr>
<tr>
<td></td>
<td>(For exceptions to this convention for variables, see the entry for angle brackets.)</td>
</tr>
<tr>
<td><strong>Monospace</strong></td>
<td>Indicates text that is displayed on screen or entered by the user. Example: pairdisplay -g <strong>oradb</strong></td>
</tr>
<tr>
<td><strong>&lt; &gt; angled brackets</strong></td>
<td>Indicates a variable in the following scenarios:</td>
</tr>
<tr>
<td></td>
<td>• Variables are not clearly separated from the surrounding text or from other variables. Example: Status-&lt;report-name&gt;&lt;file-version&gt;.csv</td>
</tr>
<tr>
<td></td>
<td>• Variables in headings.</td>
</tr>
<tr>
<td><strong>[ ] square brackets</strong></td>
<td>Indicates optional values. Example: [ a</td>
</tr>
<tr>
<td><strong>{ } braces</strong></td>
<td>Indicates required or expected values. Example: { a</td>
</tr>
<tr>
<td>**</td>
<td>vertical bar**</td>
</tr>
<tr>
<td></td>
<td>{ a</td>
</tr>
</tbody>
</table>

This document uses the following icons to draw attention to information:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Note</td>
<td>Calls attention to important or additional information.</td>
</tr>
<tr>
<td>!</td>
<td>Tip</td>
<td>Provides helpful information, guidelines, or suggestions for performing tasks more effectively.</td>
</tr>
<tr>
<td>!</td>
<td>Caution</td>
<td>Warns the user of adverse conditions or consequences (for example, disruptive operations).</td>
</tr>
</tbody>
</table>
**Convention for storage capacity values**

Physical storage capacity values (for example, drive capacity) are calculated based on the following values:

<table>
<thead>
<tr>
<th>Physical capacity unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilobyte (KB)</td>
<td>1,000 (10^3) bytes</td>
</tr>
<tr>
<td>1 megabyte (MB)</td>
<td>1,000 KB or (1,000^2) bytes</td>
</tr>
<tr>
<td>1 gigabyte (GB)</td>
<td>1,000 MB or (1,000^3) bytes</td>
</tr>
<tr>
<td>1 terabyte (TB)</td>
<td>1,000 GB or (1,000^4) bytes</td>
</tr>
<tr>
<td>1 petabyte (PB)</td>
<td>1,000 TB or (1,000^5) bytes</td>
</tr>
<tr>
<td>1 exabyte (EB)</td>
<td>1,000 PB or (1,000^6) bytes</td>
</tr>
</tbody>
</table>

Logical storage capacity values (for example, logical device capacity) are calculated based on the following values:

<table>
<thead>
<tr>
<th>Logical capacity unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 block</td>
<td>512 bytes</td>
</tr>
</tbody>
</table>
| 1 cylinder            | Mainframe: 870 KB  
                        | Open-systems:  
                        | • OPEN-V: 960 KB  
                        | • Others: 720 KB  |
| 1 KB                  | \(1,024 \times \ checmark \) \(2^{10}\) bytes |
| 1 MB                  | 1,024 KB or \(1,024^2\) bytes |
| 1 GB                  | 1,024 MB or \(1,024^3\) bytes |
| 1 TB                  | 1,024 GB or \(1,024^4\) bytes |
| 1 PB                  | 1,024 TB or \(1,024^5\) bytes |
| 1 EB                  | 1,024 PB or \(1,024^6\) bytes |

**Accessing product documentation**

Product documentation is available on Hitachi Data Systems Support Connect: [https://support.hds.com/en_us/documents.html](https://support.hds.com/en_us/documents.html). Check this site
for the most current documentation, including important updates that may have been made after the release of the product.

**Getting help**

Hitachi Data Systems Support Connect is the destination for technical support of products and solutions sold by Hitachi Data Systems. To contact technical support, log on to Hitachi Data Systems Support Connect for contact information: [https://support.hds.com/en_us/contact-us.html](https://support.hds.com/en_us/contact-us.html).

Hitachi Data Systems Community is a global online community for HDS customers, partners, independent software vendors, employees, and prospects. It is the destination to get answers, discover insights, and make connections. **Join the conversation today!** Go to [community.hds.com](http://community.hds.com), register, and complete your profile.

**Comments**

Please send us your comments on this document to doc.comments@hds.com. Include the document title, and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Data Systems Corporation.

**Thank you!**
Introduction

This chapter provides an overview of Replication Manager features and architecture. It also provides an introduction to supported system configurations and an operations roadmap.

- About Replication Manager
- Replication Manager features
- Architecture and components
- System configurations
- Replication Manager operations roadmap
- Units used for calculating capacity and displaying values
About Replication Manager

Replication Manager is a business continuity management framework that allows you to centrally configure, monitor, and manage in-system or remote business continuity products, for both mainframe and open environments. This uniquely integrated solution allows you to closely monitor critical storage components and better manage Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO) objectives.

This software tool simplifies replication management and optimizes the configuration, operations, and monitoring of the critical storage components of the replication infrastructure. It leverages the volume replication capabilities of supported storage systems to reduce the workload involved in management tasks such as protecting and restoring system data. In addition, Replication Manager reduces the need for manual configuration and provides true replication function management and workflow capabilities.

Related topics
- Replication Manager features on page 1-3
- Architecture and components on page 1-4

Example of a replication environment

The following figure illustrates an example of a replication environment in which a number of separate sites are linked together.
Replication Manager features

Replication Manager provides the following features to assist storage administrators:

- Centralized management of a replication environment on page 1-3
- Integrated database backup management on page 1-3
- Visual representation of replication structures on page 1-3
- Monitoring and immediate notification of error information on page 1-3
- Modification of replication structures on page 1-4
- Monitoring and analyzing remote copy performance (write delay time) on page 1-4
- Continuing business during site maintenance or a failure on page 1-4

Note: If Replication Manager is installed without a license (or the existing license expires), only basic pair configuration functions will be available. This mode of operation provides key functions in support of Device Manager Server. For more information, see the Hitachi Command Suite User Guide.

Centralized management of a replication environment

Replication Manager can be used to manage storage systems and hosts at different sites. The status of the large number of copy pairs incorporated in these systems, the progress of copy operations, and performance information such as data transfer delays between copy pairs and buffer usage when copying volumes, can be centrally managed from a single console.

Integrated database backup management

Replication Manager supports creating backups of databases. Known as application replicas, these snapshots are managed as a series of secondary volumes that are rotated on a scheduled basis. Replication Manager manages the relationships between backup objects and their associated logical units within storage devices, the relationships between primary and secondary volumes, and the backup history. Replicas can be mounted and dumped to tape using scripts executed through Replication Manager.

Visual representation of replication structures

Replication Manager provides a centralized workspace where administrators can visually check the structure of copy pairs configured across multiple storage systems. Host and storage system relationships and copy pair definitions can be visualized on different functional views. Copy pairs in complex configurations such as multi-target configurations and cascade configurations can be viewed as lists.

Monitoring and immediate notification of error information

Replication Manager provides capabilities to specify monitoring conditions for designated copy pairs and sidefiles. Alerts can be automatically generated
when the conditions are satisfied. You can continue monitoring the system even when not logged in to Replication Manager because alerts can be reported in the form of email messages or SNMP traps. The status of application replicas is tracked and reflected in summary form so that the administrator knows to what extent the application databases are protected. These monitoring features allow you to work out advance strategies to handle potential problems such as the deterioration of transfer performance due to insufficient network capacity or pairs being blocked due to buffer overflows.

**Modification of replication structures**

Replication Manager provides capabilities to configure additional copy pairs as business operations expand and improve performance by expanding buffer capacity for copying volumes. You can also change pair states manually after error recovery. Using the wizards provided in the GUI, you can set up pairs while visually keeping track of complex replication structures.

**Monitoring and analyzing remote copy performance (write delay time)**

When using Universal Replicator, you can check copy performance visually using the Replication tab of the Device Manager GUI.

---

**Note:** Use of the Replication tab requires licenses for Device Manager and Tuning Manager.

When a drop in performance occurs, you can analyze the cause by checking the detailed information provided by the Replication tab. For more information, see the *Hitachi Command Suite User Guide*.

**Continuing business during site maintenance or a failure**

When a site is undergoing maintenance or affected by a failure, you can continue business by using the Replication Manager GUI to allow another site to inherit processing.

---

**Tip:** You can manage replications between multiple sites by using the Replication tab of Device Manager. For details on operations for the Replication tab, see the *Hitachi Command Suite User Guide*. For details on the settings to use the replication management functionality of the Replication tab, see the *Hitachi Command Suite Administrator Guide*.

**Related topics**

- [Understanding the console layout on page 3-2](#)

**Architecture and components**

Replication Manager works in conjunction with programs such as Device Manager, Business Continuity Manager, and Mainframe Agent. Replication Manager can be deployed using different system configurations depending on
the type of hosts (open system or mainframe system). Replication Manager can also be used in mixed environments that include both types of hosts.

To view examples of system configurations (where Replication Manager of each management server is in a cluster configuration between sites), see System configurations on page 1-6.

For specific system configurations and the system requirements, see the Hitachi Command Suite Replication Manager Configuration Guide.

A typical system configuration comprises the following components:

- **Management client**: The machine on which the GUI for Replication Manager runs. Because the GUI accesses the instance of Replication Manager on the management server through a Web browser, no programs need to be installed on the management client.

- **Management server**: The management server at the local site is a machine running Replication Manager and its prerequisite program, the Device Manager server. The management server provides management information about Replication Manager in response to requests from management clients.

  In an open system, the management server at the remote site is a machine running the Device Manager server, which manages information about the hosts and pair management server at the remote site. You can have Replication Manager manage the Device Manager server of the remote site by registering the Device Manager server as an information source. (The Device Manager server at the local site is automatically registered as an information source when you install Replication Manager.)

  In a mainframe system, when the Device Manager server is installed on the management server at the remote site and is managing the mainframe host, you can acquire detailed information about the managed storage systems in Replication Manager by registering this Device Manager server as an information source.

- **Pair management server**: A server used for collecting management information, such as copy pair statuses and remote copying performance information. In an open system, CCI and a Device Manager agent need to be installed on this server. The pair management server can also serve as a host. In a mainframe system, the host plays the same role as the pair management server in an open system. For this reason, the mainframe host is sometimes called a pair management server.

- **Host (application server)**: A machine on which application programs are installed and uses a storage system as an external storage device.

  By installing a Device Manager agent on each host in an open system, you can use Replication Manager to view information such as each host's IP address, mount point, and linked copy groups. In a mainframe system, Business Continuity Manager or Mainframe Agent needs to be installed on the hosts. You can have Replication Manager manage the hosts by registering the instance of Business Continuity Manager or Mainframe Agent installed on each host in the local and remote sites as an information source.
• **Database and backup servers**: To manage database replicas, the system requires two servers: a database server that manages the primary volume, and a backup server with the secondary volume. Installing Application Agent on both servers allows Replication Manager to create and restore replicas between the primary volume on the database server and the secondary volume on the backup server.

• **Storage system**: An external storage device connected to a host. Copy pairs are typically set up on the volumes in the storage systems using volume replication functionality. Replication Manager manages the configuration and copy status of these copy pairs. Storage system information is provided to Replication Manager by the following methods:
  - The management server collects the storage system information directly.
  - The pair management server collects the storage system information and provides it to the management server.

**Related topics**
-  [System configurations on page 1-6](#)

**System configurations**

The following figures are examples of typical system configurations illustrating the components making up the system. For specific system configurations and the system requirements for using Replication Manager, see the *Hitachi Command Suite Replication Manager Configuration Guide*. 

---

1-6  
Introduction  
Hitachi Replication Manager User Guide
Figure 1-1 Two site configuration in an open system
Figure 1-2 Example system configuration in a mainframe system (using Business Continuity Manager)
Figure 1-3 Example system configuration in a mainframe system (using Mainframe Agent)
Replication Manager operations roadmap

The following figure shows the flow of tasks during system configuration, operation, and maintenance.
Tip: If you want to change the system configuration or the Replication Manager settings during operation, you should back up the database before and after making any changes. For details on system configuration, system maintenance, and database backup, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

**Units used for calculating capacity and displaying values**

The following rules apply to the capacity calculation units and display formats unless otherwise noted in the item description:

- The unit displayed varies depending on the capacity magnitude. When the capacity exceeds 1 GB, the unit changes from MB to GB. Similarly, when the capacity exceeds 1 TB, the unit changes to TB.
- All capacities are rounded to 2 decimal places.
- Commas are displayed in capacities that exceed three digits.

The following table shows the units used for calculating capacity.

**Units for calculating capacity**

<table>
<thead>
<tr>
<th>Display item name</th>
<th>Calculation unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW Capacity</td>
<td>KB</td>
</tr>
<tr>
<td>Allocated Capacity</td>
<td>KB</td>
</tr>
<tr>
<td>Cache Size</td>
<td>MB</td>
</tr>
<tr>
<td>Capacity</td>
<td>KB</td>
</tr>
<tr>
<td>Total Capacity</td>
<td>KB</td>
</tr>
</tbody>
</table>
Getting started

This chapter describes initial settings needed to begin Replication Manager operations and procedures for setting up the prerequisite environment for pair management. It also includes quick references to typical operations performed using Replication Manager.

- Using the Help system
- Initial setup
- Setting up redundant pair management server configurations
- Confirming the prerequisite environment
- Logging in and out
- Quick start
Using the Help system

The Replication Manager online help system is context-sensitive; when you click Help from within a window or dialog box in the Web client, information specific to the task you are performing displays.

From any help topic, click Show TOC to launch the navigation pane and access the contents, index, search function, and glossary.

In this Help, books are used to group topics that are related to the subject of the book. By default, when you launch the Help navigation pane, all books are closed. When you open a book, topic content is displayed in the right viewing pane. The topic content is displayed in the viewing pane until you open another book or topic.

Navigating topics

- Navigate between topics by using the navigation pane, or right-click on a topic and select Back or Forward.
- Use the breadcrumbs at the top of each topic to identify your location or to return to a higher-level topic.
- Use the links under Related topics to find more information for a specific topic.

Using the navigation buttons

- Contents
  Open book icons in the navigation pane to reveal topic entries and sub sections. As you move through the Help, the current topic is highlighted.
- Index
  Choose from an alphabetical list of topics. Click an index entry to display one or more topics. Or enter a keyword in the text box to find specific index entries.
- Search
  Search for occurrences of a word or phrase. Click search results to display topics.
- Glossary
  Click a glossary term to display a brief explanation of the term.

Printing Help topics

You can print information in topics by right-clicking in the topic and selecting This Frame, and then Print Frame, or by choosing Print from your browser menu.

You can also print information in topics by clicking the Print icon located in the top right of your Help window.
Initial setup

After Replication Manager has been installed on a management server, you must configure initial settings needed to begin operations.

Initial settings configuration workflow

The following figure shows the task flow of the initial configuration settings.

Setting up redundant pair management server configurations

Redundant pair management server configurations allow remote copy operations even when a remote pair management server is unavailable (whether due to maintenance or hardware failure). Redundancy can be defined in a variety of configurations, such as N:1 (N-to-one) and 1:M (one-to-many).

Pair management servers can be selected and registered (as a primary/secondary pair) during copy group creation. Once registered, a pair of primary/secondary pair management servers is known as a node. Nodes can be added or deleted as necessary without having to disband and reconstruct the copy group.

This module includes the following topics:

- About redundant pair management server configurations on page 2-4
- Registering redundant pair management server nodes (while creating a copy group) on page 2-5
- Registering redundant pair management servers manually on page 2-6
- Adding pair management server nodes on page 2-6
- Deleting pair management server nodes on page 2-6
About redundant pair management server configurations

You can set up multiple pair management servers in any of four redundant configurations.

**WARNING:** N:M and 1:M configurations are intended for use in disaster recovery. N:M and 1:M configurations cannot be used to create or restore application replicas.

Table 2-1 Pair management server configurations

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N:1</td>
<td>A configuration in which the same configuration definition file that defines the primary volume on the primary site is managed by multiple servers, and the configuration definition file that defines the secondary volume on the secondary site is managed by a single server.</td>
</tr>
<tr>
<td>1:M</td>
<td>A configuration in which the same configuration definition file that defines the primary volume on the primary site is managed by a single server, and the configuration definition file that defines the secondary volume on the secondary site is managed by multiple servers.</td>
</tr>
<tr>
<td>N:M</td>
<td>A combination of the N:1 and 1:M configurations.</td>
</tr>
<tr>
<td>N:N</td>
<td>A configuration in which the configuration definition files that define the primary and secondary volumes on the primary and the secondary sites are managed by multiple servers. The pair management servers must recognize command devices on both the primary and secondary sites.</td>
</tr>
</tbody>
</table>

The following figure depicts an example configuration.
Registering redundant pair management server nodes (while creating a copy group)

You register the initial primary/secondary pair management servers when creating a new copy group from the Group Management page of the Pair Configuration Wizard:

1. Click **Create Group**.
2. Enter the **Group Name**.
3. Select the **Site** and **Server Name** for the primary and secondary pair management servers. (Select **Others** for storage systems that are not associated with a site.)
4. Select or specify an **Instance** number. (You must provide a **UDP Port** if you specify an instance number.)

5. Click **Add** to register the pair management server combination that manages the configuration file.

6. To delete one or more entries from the **Pair Management Server List**, select them and click **Delete**.

7. You can select an **MU Number**, or use the **Auto** setting.

### Registering redundant pair management servers manually

If you are constructing the redundant pair management server configuration manually, be sure and do the following:

1. Use a CCI command to change the configuration of the copy pair.
2. Set up the HORCM configuration files so that each primary HORCM file has all secondary targets and vice versa.
3. In the Storage System view of Replication Manager, select the storage system where the operations were performed and click **Refresh Configuration**.

---

**Caution:** If the redundant configuration definition files have different copy group or copy pair names, the error message RPM-00045 is displayed when the Pair Configuration Wizard is started. Redundant configurations must have the same copy group or copy pair name.

---

### Adding pair management server nodes

You can register additional primary and secondary pair management servers (nodes) when modifying an existing copy group from the Group Management page of the Pair Configuration Wizard:

1. Click **Add Node**.
2. To add a new node, select the **Site** and **Server Name** for the primary and secondary pair management servers. (Select **Others** for storage systems that are not associated with a site.)
3. Select or specify an **Instance** number. (You must provide a **UDP Port** if you specify an instance number.)
4. Click **Add** to register the new pair of pair management server nodes that manage the configuration file.
5. To delete one or more entries from the **Pair Management Server List**, select them and click **Delete**.

### Deleting pair management server nodes

You can delete primary and secondary pair management servers (nodes) when modifying an existing copy group from the Group Management page of the Pair Configuration Wizard:

1. Click **Delete Node**.
2. Select one or more entries from the **Pair Management Server List** and click **Delete**.

**Identifying a pair management server associated with a copy group**

You can determine the pair management server associated with a copy group by putting the cursor over a copy pair in any topology display (such as My Copy Groups).

**Confirming the prerequisite environment**

The following conditions need to be met before Replication Manager can be used. For more information, see *Hitachi Command Suite Replication Manager Configuration Guide*.

- Prerequisite products for Replication Manager are installed and their environment settings are configured
- Replication Manager is installed on the management server, and an environment is set up
- If you plan to create replicas, make sure the Application Agent is installed on the database and backup servers
- A Replication Manager license is set up

**Logging in and out**

**To log in to Replication Manager:**

1. In the Web browser's address bar, enter the login URL for the management server where Replication Manager is installed. The Back To Login window appears, followed by the User Login window.

   **Tip:** Login URL:

   [http://IP-address-or-host-name: port-number-of-HBase-64-Storage-Mgmt-Common-Service/ReplicationManager/](http://IP-address-or-host-name:port-number-of-HBase-64-Storage-Mgmt-Common-Service/ReplicationManager/)

   Examples:

   SSL not used: [http://127.0.0.1:22015/ReplicationManager/](http://127.0.0.1:22015/ReplicationManager/)

   SSL used: [https://127.0.0.1:22016/ReplicationManager/](https://127.0.0.1:22016/ReplicationManager/)

2. Enter a user ID and password.

   When you log in to Replication Manager for the first time, you must use the built-in default user account and then specify Replication Manager user settings. The user ID and password of the built-in default user account are as follows:

   - **User ID:** System
   - **Password:** manager (default)

   If Replication Manager user settings have already been specified, you can use the user ID and password of a registered user to log in. If you...
enabled authentication using an external authentication server, use the password registered in that server.

**Tip:** As a protection against illegal login, successive login failures might automatically lock the user account. A user with the Admin (user management) permission can set whether to enable automatic account locking and the number of successive login failures allowed before the account is locked. For details about how to configure automatic locking, see Changing settings for automatic account locking on page 21-4. For details about how to unlock an account, see Unlocking user accounts on page 19-13.

3. Click **Login**.
   The main window opens.

If you are logged in to another Hitachi Command Suite product, you can also start Replication Manager using the **GO** link for **HRpM** displayed in the **Dashboard** menu.

**To log out from Replication Manager**

To exit the GUI, click **Logout**.

If you are also logged in to Hitachi Command Suite products other than Replication Manager, this operation logs you out from all such products. If you want to exit only Replication Manager, click **Close**.

**Related topics**
- Unlocking user accounts on page 19-13
- About user authentication on page 19-14
- Changing settings for automatic account locking on page 21-4

**Quick start**

The following table provides links to procedures for the basic operations you will perform using Replication Manager.

<table>
<thead>
<tr>
<th>Operations</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 4, Setting up information sources on page 4-1</td>
<td>How to register information sources in Replication Manager.</td>
</tr>
<tr>
<td>Chapter 5, Discovering volumes on page 5-1</td>
<td>How to perform volume discovery, which is a prerequisite for defining and managing copy pairs.</td>
</tr>
<tr>
<td>Chapter 6, Setting up authorities on page 6-1</td>
<td>How to specify user account settings and permissions to restrict the scope of operations allowed for each user.</td>
</tr>
<tr>
<td>Chapter 7, Organizing resources on page 7-1</td>
<td>How to organize resources such as hosts and storage systems into logical sites for easier management, and identify frequently monitored resource groups.</td>
</tr>
</tbody>
</table>

2-8

Getting started

Hitachi Replication Manager User Guide
<table>
<thead>
<tr>
<th>Operations</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 8, Setting up storage systems on page 8-1</td>
<td>How to perform prerequisite settings before replicating volumes.</td>
</tr>
<tr>
<td>Chapter 9, Customizing monitoring parameters on page 9-1</td>
<td>How to customize Replication Manager by configuring alert notification settings, refresh intervals, and data retention periods.</td>
</tr>
<tr>
<td>Chapter 10, Managing pair life cycle on page 10-1</td>
<td>How to create copy pairs and perform daily pair operations and volume replication using the configured pairs.</td>
</tr>
<tr>
<td>Chapter 12, System monitoring on page 12-1</td>
<td>How to monitor the operating status of the replication environment, such as monitoring frequently viewed copy groups, and checking pair status, pair configurations, and performance of remote copies.</td>
</tr>
</tbody>
</table>
Replication Manager console

This chapter describes the Replication Manager console and its main features. This chapter also provides descriptions of various functional views available in the Replication Manager console.

- Understanding the console layout
- Functional views
Understanding the console layout

Replication Manager provides a simple, easy-to-use, centralized management console for monitoring and visualizing volume replication configurations and status information. The following example is an illustration of Replication Manager console layout. For details about each console component, see the following:

- Global tasks bar area on page 3-2
- Explorer menu on page 3-3
- Dashboard menu on page 3-5
- Application bar area on page 3-5
- Navigation area on page 3-5
- Object tree on page 3-5
- Dialog box on page 3-6

Global tasks bar area

The global tasks bar area contains menus and action buttons for Replication Manager functions, and also contains information about the logged-in user. A triangle icon is provided to show or hide the Explorer and Dashboard menus.
Global tasks bar area menu items

<table>
<thead>
<tr>
<th>Menu</th>
<th>Close</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
<td>Close</td>
<td>Closes the window, but does not log the user out from Replication Manager and other active Hitachi Command Suite products.</td>
</tr>
<tr>
<td>Logout</td>
<td>Log out</td>
<td>Logs the user out from Replication Manager and other active Hitachi Command Suite products.</td>
</tr>
<tr>
<td>Go</td>
<td>Download</td>
<td>Displays the dialog box used to download the Device Manager agent.</td>
</tr>
<tr>
<td>Links</td>
<td>Links</td>
<td>Displays the dialog box used to start a link target (the Device Manager server on a remote site).</td>
</tr>
<tr>
<td>Help</td>
<td>Online Manual</td>
<td>Displays the contents page of the Hitachi Command Suite Replication Manager Help.</td>
</tr>
<tr>
<td></td>
<td>About</td>
<td>Displays the dialog box that is used to check the version information or change the license information.</td>
</tr>
</tbody>
</table>

Global tasks bar area action buttons

<table>
<thead>
<tr>
<th>Action button</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>Closes the window but does not log the user out from Replication Manager and other active Hitachi Command Suite products.</td>
</tr>
<tr>
<td>Logout</td>
<td>Logs the user out from Replication Manager and other active Hitachi Command Suite products.</td>
</tr>
</tbody>
</table>

Explorer menu

The Explorer menu is the Replication Manager operations menu. This menu comprises multiple drawers with options. When a menu option is chosen, the appropriate information is displayed in the navigation area and the application area. A triangle icon is provided to show or hide the Explorer menu.

Explorer menu items

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>Displays resources such as application servers or hosts, storage systems, and pair management servers managed by Replication Manager.</td>
</tr>
<tr>
<td></td>
<td>* Hosts: Displays information about the hosts managed by Replication Manager (hosts view).</td>
</tr>
<tr>
<td></td>
<td>* Storage Systems: Displays information about the storage systems managed by Replication Manager (Storage Systems view).</td>
</tr>
<tr>
<td></td>
<td>* Pair Configurations: Displays information about the copy pair configuration definitions managed by Replication Manager (pair configurations view).</td>
</tr>
<tr>
<td>Menu item</td>
<td>Explanation</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Applications</strong></td>
<td>Displays information about the applications managed by Replication Manager (Applications view).</td>
</tr>
</tbody>
</table>
| **Shared Views** | Displays site information  
• **Sites**: Displays hosts and storage systems grouped by purpose.                                                                                                                                  |
| **My Groups** | Displays **My Copy Groups** information. **My Copy Groups** displays the configuration and status of copy pairs in a single window. This can be used to group copy pairs to be monitored.  
• **My Copy Groups**: Displays the configuration and status of copy pairs in one window. The copy groups displayed can be determined by each user. |
| **Administration** | Provides options for administrative purposes such as creating users, assigning permissions, setting passwords, creating and managing resource groups, and managing event logs.  
**Users and Permissions**: Allows you to perform the following operations that involve specifying settings for users:  
• Creating and deleting user accounts  
• Specifying user permission settings  
• Changing user passwords  
• Locking and unlocking accounts  
• Changing the method for user authentication  
**Security**: Allows you to perform the following operations that involve specifying security information:  
• Setting and managing passwords  
• Specifying the settings for automatically locking accounts  
• Specifying the warning banner settings  
**Resource Groups**: Allows you to set up resource groups for resource access management.  
**User Roles**: Allows you to grant role-based privileges to users (rather than blanket permissions).  
**Event Logs**: Displays all of the Replication Manager operating information (event log data), including user operations and the results of automatic updates.  
**Maintenance**: Switches the Replication Manager to maintenance mode.  
**Information Source**: Allows you to set up the Device Manager servers, instances of Business Continuity Manager or Mainframe Agent, or Application Agent as information sources.  
**Data Retention**: Allows you to set the retention period of the data managed by Replication Manager. |
| **Tasks** | **Tasks**: Displays the tasks scheduled for copy pairs.  
**Workflows**: Displays the workflow generated for copy pairs.                                                                                                                                   |
| **Alerts** | **Alerts**: Allows you to check alerts or edit alert settings.                                                                                                                                              |
| **Settings** | **User Profile**: Allows you to check or edit user information.  
**License Info**: Sets the Replication Manager license information.                                                                                                                                  |
<table>
<thead>
<tr>
<th>Menu item</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refresh Setting</td>
<td>Allows you to update the information managed by Replication Manager and set the interval for updating the information.</td>
</tr>
</tbody>
</table>

**Dashboard menu**

The Dashboard menu displays a list of Hitachi Command Suite products on the same management server. You can launch products (that are not grayed out) using the **GO** link.

The current operating mode and the number of received alerts are displayed under **HRpM**. The number of alerts are displayed for each item being monitored. The number of alerts are updated when a new alert is received or when the status of received alerts is updated in the Alert subwindow. A triangle icon is provided to show or hide the **Dashboard** menu.

**Application bar area**

The Application bar area displays the buttons appropriate for the information displayed in the Application Area. For example, buttons for updating or reconfiguring the information displayed in the Application Area may be displayed.

Clicking **Help** in the Application bar area displays the Online help page that describes the items displayed in this area.

**Navigation area**

The navigation area contains a tree view that displays objects chosen from the **Explorer** menu. Clicking **Refresh Tree** refreshes the information displayed in the navigation and application areas. A triangle icon is provided to show or hide the navigation area.

**Application area**

The Application Area displays information for the item selected in the **Explorer** menu or object tree. The Application Area that displays the information about a specific object is called the **object-name** subwindow.

**Object tree**

A tree view displayed in the navigation area. Expanding the tree and selecting an object displays information about the selected object in the application area.
Dialog box

A dialog box is a pop-up window displayed when an action button is clicked. The window displayed when a specific action button is clicked is called the action-name dialog box.

Clicking Help in a dialog box displays the online help page that describes the items displayed in the dialog box.

Functional views

Replication Manager provides the following functional views that allow you to visualize pair configurations and status of the replication environment from different perspectives.

Note: Mainframe system resources managed by CCI are displayed as mainframe system resources on the Storage Systems view, and are displayed as open system resources on other views.

- **Hosts** view: A view of open and mainframe hosts using copy pairs. The Hosts view allows you to confirm pair status summaries for each host. The display includes physical hosts, virtualization servers, and virtual machines on the virtualization servers with volumes for which paths have been defined.

- **Storage Systems** view: A view of storage systems containing the pairs. This view lists open and mainframe storage systems and allows you to confirm pair status summarized for each storage system. A storage system serving both mainframe and open system pairs is recognized as two different resources in order to differentiate open copy pairs and mainframe copy pairs.

- **Pair Configurations** view: A view of hosts managing the pairs. This view lists open and mainframe hosts managing copy pairs with CCI or BCM and allows you to confirm pair status summarized for each host. This view also provides a tree structure along with the pair management structure.

- **Applications** view: A view of applications (in this example, Exchange servers) being managed. This view lists the application and data protection status. This view also provides a tree structure along with the servers and their associated objects. In the case of Exchange, the objects are: storage groups (Exchange 2007 only), information stores, and mount points. For SQL, the objects are database instances.

Related topics

- Viewing a list of hosts on page 14-5
- Viewing a list of storage systems on page 14-5
- Viewing a list of copy pair configurations on page 14-4
- Icons representing copy pair statuses on page A-2
Hosts subwindow

The Hosts subwindow lets you view hosts that use paired volumes and related information.

### Hosts

<table>
<thead>
<tr>
<th>Host</th>
<th>Indicates a host name. When you select host-name, the host-name subwindow (open systems) or host-name subwindow (mainframe systems) appears.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address</td>
<td>Displays the IP address of the host. If the host has both an IPv4 address and an IPv6 address, the order of the addresses displayed is IPv4 and then IPv6.</td>
</tr>
<tr>
<td>Information Source</td>
<td>Displays the name (nickname) of the Device Manager server, instance of Business Continuity Manager, or instance of Mainframe Agent.</td>
</tr>
<tr>
<td>Refresh Hosts button</td>
<td>Refreshes the copy pair statuses related to volumes of the hosts whose check boxes are selected. When you click this button, a dialog box opens, asking you whether you want to refresh information. This button is disabled in maintenance mode. In this case, switch to normal mode and then perform the operation.</td>
</tr>
<tr>
<td>Filter button</td>
<td>Sets filtering condition of Hosts list. Opens the Filter - Hosts List dialog.</td>
</tr>
<tr>
<td>Filter Off button</td>
<td>Cancels the current filtering condition.</td>
</tr>
</tbody>
</table>

**Structure of the Hosts view**

The figure below shows the structure of the Hosts view with the list of hosts as the starting point. The subwindow changes according to the hierarchy displayed in this structure.
Storage Systems subwindow

The Storage Systems subwindow lets you view storage systems containing paired volumes and the copy licenses registered for each storage system.

For details on the meanings of the icons, see Icons representing the management target on page A-3 or Display formats used when no pertinent information is available on page C-2.
### Storage Systems

<table>
<thead>
<tr>
<th>Storage System</th>
<th>Displays the storage system name.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage System Type</td>
<td>Displays the types of the storage systems. For mainframe systems, you can identify the type of a storage system only when the storage system is registered in the Device Manager server and that server is registered as an information source. If you cannot identify the type, the storage system family is displayed.</td>
</tr>
<tr>
<td>Licensed Copy Type</td>
<td>Displays the copy types for which licenses are registered in open systems or mainframe systems. The icon of the copy type is displayed if the storage system supports that copy type.</td>
</tr>
<tr>
<td>• SI</td>
<td>Indicates the ShadowImage copy type.</td>
</tr>
<tr>
<td>• TCA / TCE</td>
<td>Indicates the TrueCopy Async or TrueCopy Extended Distance copy type.</td>
</tr>
<tr>
<td>• TCS</td>
<td>Indicates the TrueCopy Sync copy type.</td>
</tr>
<tr>
<td>• COW / TI</td>
<td>Indicates the Copy-on-Write Snapshot/Thin Image copy type.</td>
</tr>
<tr>
<td>• UR</td>
<td>Indicates the Universal Replicator copy type.</td>
</tr>
<tr>
<td>• GAD</td>
<td>Indicates the global-active device copy type.</td>
</tr>
<tr>
<td>Information Source</td>
<td>Displays the name (nickname) of the Device Manager server, instance of Business Continuity Manager, or instance of Mainframe Agent.</td>
</tr>
<tr>
<td>Refresh Storage System button</td>
<td>Refreshes the information for the selected storage systems. Clicking this button opens a dialog box asking you to confirm that you wish to perform a refresh. This button is disabled in maintenance mode. In this case, switch to normal mode and then perform the operation.</td>
</tr>
</tbody>
</table>

#### Structure of the Storage Systems view

The figure below shows the structure of the Storage Systems view with the list of storage systems as the starting point. The subwindow changes according to the hierarchy displayed in this structure.
**Pair configurations subwindow**

The Pair Configurations subwindow lets you view pair management servers with copy pair definitions (CCI configuration definition file) and related information.

**Pair Management Servers**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair Management Server</td>
<td>Displays the name of the pair management server that issues instructions to storage systems to perform a copy pair operation. Selecting the name opens either the <code>pair-management-server-name</code> subwindow (open systems) or <code>pair-management-server-name</code> subwindow (mainframe systems).</td>
</tr>
<tr>
<td>IP Address</td>
<td>Displays the IP address of the pair management server. If the host has both an IPv4 address and an IPv6 address, the order of the addresses displayed is IPv4 and then IPv6.</td>
</tr>
<tr>
<td>Information Source</td>
<td>Displays the name (nickname) of the Device Manager server, instance of Business Continuity Manager, or instance of Mainframe Agent.</td>
</tr>
</tbody>
</table>

**Structure of the Pair Configurations view**

The figure below shows the structure of the Pair Configurations view with the list of copy pair configuration definitions as the starting point. The subwindow changes according to the hierarchy displayed in this structure.
Tip: For mainframe pair configurations, the tree structure of the pair configurations appears differently for copy groups within containers and copy groups that are not.

- For copy groups not within a container, the copy group nodes are displayed directly under the prefix nodes and the node name of the copy groups is consistent with the dataset names.
- For copy groups within containers, the container nodes are displayed directly under the prefix nodes and the copy group nodes are displayed under the container nodes. In this latter case, the node name of containers is consistent with the dataset names and the node name of
copy groups are displayed with a CTGID/JNLDGID (Primary) storage system name prefix.

Applications subwindow

The Applications subwindow lists the managed applications and the current protection status.

For details on the meanings of the icons, see Icons for executing operations on page A-2 or Display formats used when no pertinent information is available on page C-2.

Applications

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Displays Exchange or SQL.</td>
</tr>
<tr>
<td>Data Protection Status</td>
<td>Displays the status icon that represents the current state of protection.</td>
</tr>
<tr>
<td></td>
<td>See About data protection status on page 12-22 for a list of icons and their meanings.</td>
</tr>
</tbody>
</table>

Structure of the Applications view

The figure below shows the structure of the Applications view with the list of applications (Exchange or SQL) as the starting point. The subwindow changes according to the hierarchy displayed in this structure.
Setting up information sources

Before you can use Replication Manager to manage resources, you must register an information source. In open systems, this information source is the Device Manager server. In mainframe systems, this information source is either Business Continuity Manager or Mainframe Agent. Once the information sources are registered, you can view information about hosts, connected storage systems, and copy pair configurations as Replication Manager resources. You can register a maximum of 100 information sources.

This chapter describes tasks for setting up information sources.

- About information sources
- Registering information sources
- Setting up Application Agent
About information sources

Replication Manager can be used to comprehensively manage information about resources managed by Device Manager servers, instances of Business Continuity Manager, Mainframe Agent, or Application Agent installed at a number of different sites. These programs provide information to Replication Manager and are called *information sources*.

Registering information sources

You can register the Device Manager servers installed on the management servers at remote sites or instances of the following (local and remote) information sources:

- Business Continuity Manager
- Mainframe Agent
- Application Agent

**Tip:** You do not need to register the management server at the local site where Replication Manager is installed (the Device Manager server) as an information source. This Device Manager server is registered automatically when Replication Manager is installed; it is displayed as *local HDvM* in the list of information sources.

Prior to registering information sources, confirm that you have the prerequisite environment. Ensure that the above instances have been installed on the management server and hosts at each site and the proper environment settings are configured. For details on system configuration, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

For details on how to register information sources, see the following:

- [Adding a Device Manager server on page 4-3](#)
- [Adding an instance of Business Continuity Manager or Mainframe Agent on page 4-4](#)
- [Adding an instance of Application Agent on page 4-6](#)

**Tip:** If you register Device Manager servers, you can configure links for invoking the instances of registered Device Manager servers from Replication Manager. You can register links to the servers in the **Go** menu of the global tasks bar area. You can set the link by executing the `hcmds64link` command on the management server. For details on this command, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

After registering information sources with Replication Manager, be sure and acquire the latest configuration information by choosing **Settings** and then **Refresh Setting** from the **Explorer** menu.

Related topics

- [About information sources on page 4-2](#)
• When multiple Replication Manager servers manage the same information source on page B-9

Registering information sources workflow

The following figure shows the task flow for registering information sources.

Adding a Device Manager server

Tip: Only a user who has the Admin permission can add a Device Manager server.
To add a Device Manager server:

1. Ensure that you have the following information:
   - IP address or host name
   - Protocol to be used for communication with Replication Manager (HTTP or HTTPS)
   - Port number (the `server.http.port` value in the `server.properties` file for the Device Manager server)
   - User ID and password where you can log in to the Device Manager server

2. From the Explorer menu, choose Administration and then Information Source.
   - The Information Source subwindow appears.

3. Expand the object tree, and then select Device Manager.
   - The Device Manager subwindow appears.

4. Click Add HDvM.
   - The Add Device Manager dialog box appears.

5. Enter the Device Manager server information you collected in step 1.

6. If you do not want to refresh configuration information, clear the Acquire the pair configuration managed by the Device Manager during the registration check box.

   **Tip:** When you add multiple information sources at one time, you can postpone acquiring configuration information from the newly added Device Manager servers until you are finished. This will facilitate the registration process. For details on how to acquire configuration information for multiple information sources, see About refreshing configuration information on page 11-12.

7. Click OK to register the Device Manager server.
   - The information in the display is updated.

**Related topics**

- [About information sources on page 4-2](#)

**Adding an instance of Business Continuity Manager or Mainframe Agent**

**Caution:** If you have a Business Continuity Manager environment where multiple BCM instances have overlapping copy group or disk configuration definition files, see When multiple BCM instances have overlapping configuration definition files on page 4-6 first.
To add an instance of Business Continuity Manager or Mainframe Agent:

1. Make sure you have the following information from the host on which Business Continuity Manager or Mainframe Agent is being installed (or that you have the IBM HTTP Server information in the case of IPv6):
   - IP address (or host name). If you use IPv6 to connect to Business Continuity Manager or Mainframe Agent, specify the IP address (or host name) and port number for IBM HTTP Server.
   - Port number (used for communication with Replication Manager)
   - User ID and Password (if you are planning to connect to BCM using the HTTPS protocol instead of HTTP). To use the HTTPS protocol, IHS (IBM HTTP Server) bundled with WebSphere Application Server for z/OS must be configured on the mainframe host.

2. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.

3. Expand the object tree, and then select BC Manager / Mainframe Agent.
   The BC Manager / Mainframe Agent subwindow appears.

4. Click Add BCM / MFA.
   The Add BC Manager / Mainframe Agent dialog box appears.

5. Enter the Business Continuity Manager or Mainframe Agent information you prepared in step 1.

Tip: When you add multiple information sources at one time, you can postpone acquiring configuration information from them until you are finished. This will facilitate the registration process. To do this, clear the Acquire the pair configuration managed by the BC Manager / Mainframe Agent during the registration check box. For details on how to acquire configuration information for multiple information sources, see About refreshing configuration information on page 11-12.

6. Click OK to register the instance of Business Continuity Manager or Mainframe Agent.
   A confirmation dialog box with information about the new instance is displayed.

7. Review the information and click Confirm.
   Upon successful registration, a completion dialog box is displayed.

8. Click Close to finish registration.

Once an instance of BCM is registered, Replication Manager loads the configuration information associated with the BCM for the purposes of scanning the volumes as described in About mainframe volume discovery on page 5-2.

Related topics
- About information sources on page 4-2
When multiple BCM instances have overlapping configuration definition files

If you have an environment where multiple BCM instances have overlapping copy group or disk configuration definition files, you must use Replication Manager to distribute configuration definition files from the primary server to the secondary server.

If you do not do this, Replication Manager will recognize existing overlapping configuration definition files as different configuration definition files. (Under normal circumstances, configuration definition files on the secondary side should be hidden.)

Setting up Application Agent

The topics in this module describe how to set up Application Agent:

- About application discovery on page 4-6
- Adding an instance of Application Agent on page 4-6
- Setting Application Agent options on page 4-8
- About concealing/revealing replica volumes on page 4-10
- Parallel verification count and number of backup servers on page 4-11
- About VDI generation timeout on page 4-14
- Refreshing Application Agent on page 4-14

About application discovery

Application discovery is the process by which Replication Manager identifies the resources associated with an application server and the backups server where the replicas are to be stored.

Once an instance of Application Agent is registered and the pair configuration (primary and secondary volumes) set up, the discovery process proceeds and the resource information is collected or refreshed.

Related topics

- Adding an instance of Application Agent on page 4-6
- Setting Application Agent options on page 4-8

Adding an instance of Application Agent

To add an instance of Application Agent:

1. Make sure you have the following information concerning the host where Application Agent has been installed:
   - Name of Application Agent identified by Replication Manager
- **Host ID.** For a physical host (stand-alone), the IP address or host name of production server where the agent is running. (IPv4 and IPv6 addresses are supported.) For a cluster, the IP address or host name of virtual server

- **Port** number (used for communication with Replication Manager)

- **Host Type** (database or backup server)

- **Configuration type** (physical or virtual host)

- For a cluster, the Virtual Host, which must be a name (and not an IP address), along with the Host ID of all nodes in the cluster

---

**Tip:** If you use IPv6 to connect to Application Agent, specify the IP address (or host name) and port number for IBM HTTP Server.

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.

2. Expand the object tree, and then select Application Agent.
   The Application Agent subwindow appears.

3. Click Add Agent.
   The Add Application Agent dialog box appears.

4. Specify the Application Agent information you prepared in step 1.

---

**Tip:** When you add multiple information sources at one time, you can quickly complete the registration process by deferring the acquisition of configuration information from the instances of Application Agent. To do this, clear the Acquire the application configuration managed by the Application Agent during the registration check box.

5. Click OK to register the instance of Application Agent.

6. Review the information and click Confirm.

7. Upon successful registration, a completion dialog box is displayed.

---

**Related topics**

- Setting Application Agent options on page 4-8
- Editing an instance of Application Agent on page 22-3
- Refreshing Application Agent on page 4-14
Setting Application Agent options

After adding an instance of Application Agent, you must configure the options for the agent before the application discovery process can proceed. The options differ depending on whether the host is a database or backup server.

Note: When the settings of a backup server are changed, any backups based on existing scheduled jobs might fail. Restoring existing replicas can be affected as well.

To set the options for an instance of Application Agent:

1. From the **Explorer** menu, choose **Administration** and then **Information Source**.
   The Information Source subwindow appears.

2. Expand the object tree, and then select **Application Agent**.
   The Application Agent subwindow appears.

3. Select a server from the Application Agent Setting List.

4. Click **Setup Agent**.
   The Setup Application Agent window opens.

5. In **Target Instance** of the **Server Options** tab, set up the HORCM instances managing the primary and secondary volumes. You can choose existing HORCM instances or specify the HORCM number and the type (primary or secondary).

Note: Database and backup servers require the setting of **CCI Installation path** for each node.

You can also set the following options:

- For Exchange backup servers, because it is possible to have multiple secondary instances, you have the option of designating a specific instance with **Perform VSS Backup on this server**.
- For database servers, you can set the **Backup Server** options to manage replicas with a single or separate servers.
- For database servers, you can deselect the **Refresh application configuration when finishing the setup** check box if you plan to skip the application discovery when the setup process is complete.

6. For cluster configurations, the **Cluster Options** tab is displayed. This tab sets the required **Shared Data Path** (location of the application configuration information used by Application Agent) and selects the **Restore Mode** (whether or not to keep cluster resources online).

Note: If you change **Shared Data Path** later, any existing replica creation tasks that use the following advanced options will fail:

- **Export a replica catalog file on the secondary server for tape backup**
- **Execute pre/post jobs**
You must delete such tasks and then recreate them in the Create Replica Wizard. If you attempt to execute an existing task without first deleting and recreating it, an error will occur.

7. For instances of SQL Server, the **SQL Options** tab allows you to configure SQL instances and set the following parameters for creating and restoring database servers:
   - The **VDI Meta File Generation Timeout** setting is required and can be adjusted according to system usage as described in *About VDI generation timeout on page 4-14*.
   - Use the default **VDI Meta File Location** or specify the path.
   - You can **Enable restoration with stand-by status** and supply the **UNDO Log File Location**.

8. The **Replica Options** tab can be used to set the following:
   - For database servers: **Protection Status Options** (to set the status of old replicas to “Critical”), **Replica Task Options** (to define the behavior when a task fails), and **Email Options** (for notification of task status).
   - For backup servers: **Replica Task Options** (to prevent the backup server from accessing mounted replicas and control whether secondary volumes are concealed from the backup server) and **VSS Options** (to enable multiple servers to perform verifications as described in *Parallel verification count and number of backup servers on page 4-11*).

**Tip:** For backup servers, after creating copy pairs be sure to set the **Conceal Replicas** option. If concealment is disabled, the pair information of all instances managed by the backup server is visible. Therefore, if you want to disable concealment to stop parts of the backup operation, disable concealment, delete the copy pairs, then re-enable concealment of remaining volumes.

9. Click **OK** when your choices are complete.
   A dialog box summarizing all the tab settings is displayed.

10. Check the settings that will be applied and click **Confirm**.

Replication Manager then configures the parameters on the physical servers or cluster nodes, and discovers the application resources on the server or active node of the cluster.

**Related topics**
- *Adding an instance of Application Agent on page 4-6*
- *Refreshing Application Agent on page 4-14*
- *Removing instances of Application Agent on page 22-6*
Settings for virtual hosts and cluster configurations

For the settings below, any settings applied to a physical host are automatically applied to all virtual hosts running on the physical host. This applies to cluster configurations as well.

Server Options tab:
- Target Instance
- CCI installation path

Cluster Options tab:
- Cluster Options>Restore Mode

Replica Options tab:
- Replica Task Options>Pair operation on replica task failure
- Email Options

About concealing/revealing replica volumes

Replica operations support the use of multiple generations (copies) of application replicas. In this scenario, copy pairs are created where a single primary volume is linked to multiple secondary volumes. These secondary volumes must be concealed (hidden) from the backup server, or they will cause a conflict when mounted on the backup server. Conversely, such volumes must be revealed (made visible again) before their associated copy pairs or groups can be deleted.

Note: Before creating a new HORCM instance and copy groups, set up Application Agent on the database server with the Refresh application configuration when finishing the setup selected in the Server Options tab of the Setup Application Agent dialog box. After that, add the HORCM instance to the database server or the backup server, go back and clear the Refresh application configuration when finishing the setup option.

Automatic operation

You can configure volumes to be concealed or revealed automatically for each instance of Application Agent. To do this:

1. Follow the procedure described in Setting Application Agent options on page 4-8.
2. Go to the Replica Task Options in the Replica Options tab.
3. Choose Prohibit backup server from accessing unmounted replicas.
4. From the list displayed below Perform the following operation when finishing the setup, choose Conceal Replicas or Reveal Replicas.

WARNING: Do not choose Reveal Replicas while the backup server is active; this will reveal all generations of S-VOLs to the backup server and can cause data loss. If you need to reveal volumes while the backup server is active, use the manual method.
Manual operation

When a task has been created through the Pair Configuration Wizard with the Applications view, you can conceal or reveal volumes manually when adding or deleting pair groups. In the Edit Task[s] dialog box, go to the Pair Operation section of the Pair Setting tab.

The Reveal Secondary Volumes option is displayed when an attempt is made to delete a copy pair or group definition, and Conceal Secondary Volumes option is displayed for a creation operation.

Note: If the Prohibit backup server from accessing unmounted replicas check box was not selected when setting up the instance of Application Agent, the Conceal Secondary Volumes option is unavailable.

Related topics

• Setting Application Agent options on page 4-8
• Creating pairs and pair groups on page 10-21
• Deleting copy pairs from copy groups on page 10-82

Parallel verification count and number of backup servers

The parallel verification count controls the number of hosts that can perform backup verifications simultaneously. The default value is 1, meaning that when executing a backup for one backup server with multiple database servers at the same time, all concurrent backups remain in standby until the backup for each database server is finished. The parallel verification count (known hereafter as parallel count) can be increased, but there are performance considerations.

You can also use the parallel verification count in a calculation to determine the number of backup servers necessary. See Estimating the number of backup servers on page 4-12 for more information.

Parallel performance

The verification performance is dependent on S-VOL disk I/O, which is in turn dependent on the following devices:

• HBA of the backup server performing the verification
• FC-SW used between the backup server and storage
• Storage port, controller, and disk

When setting the parallel count to 2 or more, you need to increase the number of disk I/O paths between the backup server and storage and distribute the disk I/O load from the S-VOL of each database server to prevent performance bottlenecks in the above devices.

We recommend setting the parallel count to a value at or below the number of disk I/O paths on the backup server. However, if the parallel count is increased but the disk I/O becomes concentrated and performance
bottlenecks occur, the performance of the verification process may not increase.

**Increasing the number of FC ports**

When performing a concurrent execution of the verification process, disk I/O creates the greatest performance bottleneck.

During the verification process, even if the process for one FC port is multiplexed, the performance of the I/O that can be processed by that FC port is limited to the bandwidth of the FC port even at the maximum value.

Therefore, to execute the verification process in parallel and increase the performance, it is ideal to increase the number of FC ports connecting the server and storage and provide a configuration to enable multiple processing of I/O with respect to the disk.

The number of FC ports that can be mounted on one server is as follows:

\[
\text{number-of-FC-ports} = \text{number-of-FC-ports-per-HBA} \times \text{number-of-expansion-slots-that-can-be-used-to-mount-HBA}
\]

**Estimating the number of backup servers**

You can use the following procedure (a series of calculations) to estimate the required number of backup servers necessary for efficient backup operations.

1. Collect/estimate values for all the parameters shown in Table 4-1 Parameters for backup server calculations on page 4-13. For best results, collect the data from your database server with the largest configuration.

2. Calculate the time necessary to back up a database using this formula:

\[
\text{DB_BACKUP_TIME} = \left(\frac{\text{IS}}{\text{IS_VERIFY}} \times \text{IS_NUM} + \frac{\text{LOG_NUM}}{\text{LOG_VERIFY}}\right) \times \text{SG_NUM} + \text{RESYNC_TIME}
\]

**Note:** Be aware of the following:

- When comparing the backup time required per database server to the total time required by the system to perform backup processing, use the backup time required for the largest database server in the configuration.
- Because the variables IS_VERIFY and LOG_VERIFY are highly dependent on server and storage I/O performance, use the actual performance of the equipment to verify the backup time.

3. Compare the time allowed for the backup process with the time required to back up a database server:

   - If the SYSTEM_BACKUP_TIME value is less than or equal to the DB_BACKUP_TIME value, decrease the number of storage groups and/or information stores per database server and repeat the calculation in step 2.
If the **SYSTEM_BACKUP_TIME** value is greater than the **DB_BACKUP_TIME** value, calculate the number of backup servers using the following formula:

\[ \text{BK_SERVER} = \frac{\text{DB_SERVER}}{\text{VERIFY_PARA}} \]

Round this value to the nearest whole number.

### Table 4-1 Parameters for backup server calculations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS</td>
<td>Size of a the database file per information store to be backed up (MB)</td>
<td>You must supply this value.</td>
</tr>
<tr>
<td>LOG_NUM</td>
<td>Number of transaction log files per storage group to be backed up</td>
<td>You must supply this value.</td>
</tr>
<tr>
<td>IS_NUM</td>
<td>Number of information stores per storage group (Exchange Server 2007), or per database server (Exchange Server 2010/2013/2016)</td>
<td>You must supply this value.</td>
</tr>
<tr>
<td>SG_NUM</td>
<td>Number of storage groups to back up per database server (for Exchange Server 2010/2013/2016, use a value of 1)</td>
<td>You must supply this value. Because storage groups are not supported in Exchange Server 2010/2013/2016, use a value of 1 in this case.</td>
</tr>
<tr>
<td>DB_SERVER</td>
<td>Number of database servers</td>
<td>You must supply this value.</td>
</tr>
<tr>
<td>SYSTEM_BACKUP_TIME</td>
<td>Time allowed for backing up the entire system (seconds)</td>
<td>You must supply this value.</td>
</tr>
<tr>
<td>VERIFY_PARA</td>
<td>Parallel verification count</td>
<td>You must supply this value based on Parallel performance on page 4-11.</td>
</tr>
<tr>
<td>IS_VERIFY</td>
<td>Verification performance of the information store (MB/ second)</td>
<td>Depends on the performance of the storage and the server. A value of 50 MB per second is assumed for the calculation.</td>
</tr>
<tr>
<td>LOG_VERIFY</td>
<td>Verification performance of the transaction log file (per second)</td>
<td>Depends on the performance of the storage and the server. A value of 7 per second is assumed for the calculation.</td>
</tr>
<tr>
<td>RESYNC_TIME</td>
<td>Time required to re-synchronize the pair to back up per database server (seconds)</td>
<td>You must supply this value. Depends on the performance of the storage and the server.</td>
</tr>
</tbody>
</table>

### Related topics
- [Setting Application Agent options on page 4-8](#)
About VDI generation timeout

The **VDI Meta File Generation Timeout** setting is located in the **SQL Option** tab in the Setup Application Agent dialog box. It indicates the time it will take to back up or restore an SQL Server database. If an inappropriate timeout value is specified, the following problems might occur:

- If too small a timeout value is specified, the backup fails due to a timeout, resulting in a failure to back up the database.
- If too large a timeout value is specified, a client application connecting to SQL Server will time out before the backup itself fails by timing out.

Specify a value of at least 20 minutes, or follow this procedure to determine a timeout value suitable for your operating environment:

1. Set the VDI generation timeout to a large initial value, such as 3600 seconds.
2. Perform a backup.
3. Refer to **Time for Completion** in the Task Log dialog box and estimate the time it will take to complete a normal backup.
4. Because the time it will take to complete the backup depends on the state of the system resources, revise the VDI generation timeout to a value slightly greater than the time calculated in step 3.

Refreshing Application Agent

After updating an instance of Application Agent, you need to refresh the data. Replication Manager then retrieves the following information:

- Application Agent component version
- Parameters displayed on the setup windows

**To refresh the Application Agent data:**

1. From the **Explorer** menu, choose **Administration** and then **Information Source**.
   The Information Source subwindow appears.
2. Expand the object tree, and then select **Application Agent**.
   The Application Agent subwindow appears.
3. Select the check box each server desired and click **Refresh Agent**.
   The confirmation dialog box displayed.
4. Confirm that you wish to perform the refresh and click **Confirm**.

The operation may take several minutes.

**Related topics**

- [Adding an instance of Application Agent on page 4-6](#)
- [Setting Application Agent options on page 4-8](#)
- [Removing instances of Application Agent on page 22-6](#)
Discovering volumes

Before you can use Replication Manager to define or manage copy pairs, it is necessary to discover volumes. As a result of this discovery process, Replication Manager identifies a list of volumes that can be used for pair definition.

This chapter describes how to discover volumes.

- Discovering volumes (open systems)
- Discovering volumes (mainframe systems)
Discovering volumes (open systems)

Open systems volumes are discovered by refreshing configuration information after registering an information source. Configuration information is stored in the Device Manager database. Refreshing configuration information synchronizes the Replication Manager and Device Manager databases.

**Note:** The Device Manager and Replication Manager databases are automatically synchronized for the local instance of Device Manager. Only remote instances of Device Manager require a manual refresh.

For details on how to refresh configuration information manually for each information source, see Refreshing configuration information manually for each information source on page 11-17.

Discovering volumes (mainframe systems)

Mainframe volumes are discovered by performing a series of volume scans. Volume scans are performed after information (such as (DADIDs and prefixes specified in BCM Agent initialization parameters) is loaded by Replication Manager. This information is available upon registration of an instance of Business Continuity Manager as an information source. After discovering mainframe volumes you can review information about discovered volumes.

This module describes how to discover mainframe volumes:

- About mainframe volume discovery on page 5-2
- Volume scans on page 5-3
- Distributing and managing disk configurations on page 5-7
- Reviewing mainframe volumes on page 5-11

About mainframe volume discovery

Mainframe volume discovery is the process by which Replication Manager identifies a list of volumes that can be used for pair definition. The discovery consists of three phases:

1. Replication Manager loads the following information when an instance of Business Continuity Manager is registered:
   - DADIDs (Gen’ed/Non Gen’ed/Remote) and prefixes specified in the initialization parameters of BCM Agent
   - Allocated data sets for disk configuration definition files and copy group definition files
   - Volume list described in the disk configuration definition file
   - Pair configurations (including copy groups and containers) described in the copy group definition file
2. Replication Manager uses this information to perform a series of scans to locate the volumes that can be used for pair configuration.
3. Replication Manager identifies the disk configuration and stores the list to the disk configuration definition file.

Tip: Although Device Manager provides common functions for Replication Manager operations, BCM is the sole source for mainframe information.

Related topics
- About volume scans on page 5-3
- Types of volume scans on page 5-4

Volume scans

This module provides information about types of volume scans and procedure for performing volume scans:
- About volume scans on page 5-3
- Setting volume ranges for volume scan on page 5-5
- Performing a volume scan on page 5-7

About volume scans

Volume scanning is part of the mainframe discovery process used by Replication Manager to identify a list of volumes for pair definition. There are three types of scans available for discovering mainframe volumes. For details about the three scanning methods, see Types of volume scans on page 5-4.

Related topics
- About mainframe volume discovery on page 5-2
- Types of volume scans on page 5-4
- Performing a volume scan on page 5-7
Example volume scan procedure

Replication Manager uses one of three available scanning methods to discover mainframe volumes:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local scan (Gen'ed)</strong></td>
<td>This method discovers volumes recognized by the mainframe host within a specified DEVN/VOLSER range.</td>
</tr>
<tr>
<td><strong>Local scan (Non Gen'ed)</strong></td>
<td>This method discovers volumes within a specified storage system and LDEV range. As a prerequisite, a local scan (Gen'ed) must be performed on the scan target storage system. This method discovers volumes even if the mainframe host does not recognize them.</td>
</tr>
<tr>
<td><strong>Remote scan</strong></td>
<td>This method discovers volumes within a specified storage system and LDEV range and requires configuration of the route list and CMD devices on the scan target storage system. This method discovers remote volumes even if BCM does not exist on the site.</td>
</tr>
</tbody>
</table>

Replication Manager prioritizes the scan type used for discovery of the volumes in the following order:

- Local scan (Gen'ed)
- Local scan (Non Gen'ed)
- Remote scan

**Related topics**

- [About volume scans on page 5-3](#)
Setting volume ranges for volume scan

You can set volume ranges for volume scan by adding or deleting volume ranges to a volume range list:

- Adding a volume range to a volume range list on page 5-5
- Restrictions for adding volume ranges for volume scans on page 5-6
- Deleting a volume range from a volume range list on page 5-6
- Restrictions for deleting volume ranges on page 5-7

Adding a volume range to a volume range list

To add a volume range to the volume range list:

1. Display the list of disk configuration definition files on the Disk Configs tab in the BC Manager / Mainframe Agent subwindow.
   For details on how to display disk configuration definition files, see Displaying disk configuration definition files on page 5-10.

2. On the Disk Configs tab, click the icon for the disk configuration definition file you want to edit.
   The Edit Disk Config - disk-config-name window appears.

3. In the Volume Range pane, select the range type in the Type dropdown list.
   The options in the Type dropdown list depend on the scan type (Local scan (Gen'ed), Local scan (Non Gen'ed), Remote scan). If scan type is Local scan (Gen'ed) then DEVN and VOLSER are displayed. If scan type is Local scan (Non Gen’ed) or Remote scan, then LDEV is displayed. For details on how Replication Manager determines scan type, see Types of volume scans on page 5-4.

4. Perform this step if the scan type is Local scan (Non Gen'ed) or Remote scan. In the Volume Range pane, select the storage system in the Storage System drop-down list.
   **Tip:** The Storage System drop-down list is disabled for Local scan (Gen'ed).

5. In the Volume Range pane, specify the start/end volume number in the Volume field.

6. Perform this step if the scan type is Local scan (Non Gen'ed) or Remote scan. In the Dummy DEVN pane, specify the start number of the dummy DEVN.
   **Tip:** The numbers available starting from the specified number of the dummy DEVN are automatically assigned.

7. Click Add.
   The specified volume range is added to the Volume Range List.
8. Click **OK**.

**Related topics**

- Restrictions for adding volume ranges for volume scans on page 5-6
- Performing a volume scan on page 5-7

**Restrictions for adding volume ranges for volume scans**

The following restrictions apply when volume ranges are added:

- Overlapping volume ranges cannot be specified.
- When Non Gen'ed scan or Remote scan is selected, a starting number of Dummy DEVN that would cause the value of Dummy DEVN to exceed FFFF during the volume scan cannot be specified.
- When using Business Continuity Manager 6.6.1, if a volume scan using Replication Manager is performed, an error (RPM-00539) occurs in Replication Manager.
- When Replication Manager is used to distribute disk configuration definitions files to a host linked with Business Continuity Manager 6.6.1, an error occurs (RPM-00568) in Replication Manager.

In the later two cases, Replication Manager cannot be used to edit the disk configuration definition files that were created by Business Continuity Manager 6.6.1. Instead, you must use Business Continuity Manager 6.7 or later to edit the disk configuration definition files and then perform volume scan or distribution with Replication Manager.

**Deleting a volume range from a volume range list**

**To delete a volume range from a volume range list:**

1. Display the list of disk configuration definition files on the **Disk Configs** tab in the **BC Manager / Mainframe Agent** subwindow.
   For details on how to display disk configuration definition files, see **Displaying disk configuration definition files on page 5-10**.

2. On the **Disk Configs** tab, click the icon for the disk configuration definition file you want to edit.
   The **Edit Disk Config - disk-config-name** window appears.

3. Click the **Volume Range List** tab.

4. In the **Volume Range List** pane, select the check boxes for the volume ranges you want to delete from the volume range list.

**Caution:** When you delete a volume range of a VOLSER volume range, ensure there are no volumes belonging to a copy group. Pair operations cannot be performed after these volumes are deleted.

5. Click **Delete**.
   The information in the display is updated.

6. Click **OK**.
Restrictions for deleting volume ranges

The following are restrictions apply to deleting volume ranges:

- A volume range that contains a volume that is in a copy group cannot be deleted.
- If the scanned disk configuration definition at the distribution destination is included in the copy group (there is a pair referencing the scanned information at the distribution destination), the relevant volume range at the distribution source cannot be deleted.
- A volume range that contains a reserved volume cannot be deleted.

Performing a volume scan

To perform a volume scan:

1. Display the list of disk configuration definition files managed by Replication Manager. For details, see Displaying disk configuration definition files on page 5-10.
2. Select a disk configuration definition file.
3. Set the volume range for the scan. For details, see Adding a volume range to a volume range list on page 5-5.
4. Select the target hosts for disk list distribution. For details, see Selecting targets for disk configuration distribution on page 5-10.
5. Check the information and click OK to begin the volume scan. The scanning process may take some time.

Related topics

- About volume scans on page 5-3
- About distributing disk configurations on page 5-8
- When Replication Manager handles multiple prefixes (mainframe systems) on page B-9
About distributing disk configurations

Replication Manager supports the distribution of disk configuration definition files to alternate hosts. This capability enables uninterrupted pair management in the event of disaster at the primary site. During mainframe volume discovery, you can select mainframe hosts/prefixes from a list of alternative host candidates. Upon completion of the volume discovery, Replication Manager distributes the disk configuration definition file to these distribution targets.

Related topics

- Prerequisites for distribution destination hosts (disk configuration definitions) on page 5-8

Example disk list distribution scenario

Prerequisites for distribution destination hosts (disk configuration definitions)

Business Continuity Manager or Mainframe Agent hosts (with disk configuration definition files) must satisfy the following conditions to be distribution destination candidates:

- The DADIDs of the distribution destination candidate host are the same as the origin of distribution.
- Except for the prefix portion, the names of the disk configuration definition files are the same at the origin and destination. The disk configuration definition files that can be candidates for distribution must be defined at the destination. For example, if there are six disk
configuration definition files defined at the origin, but only three of those are defined at the destination, only those three files can be distributed.

Related topics
- Selecting targets for disk configuration distribution on page 5-10

Conditions affecting displayed disk list information

The disk list information displayed in the Disk List drop-down list in the Criteria tab (on the 2. Pair Association page) differ depending on the copy type, volume type, and whether the volume has been added to a pair. The following table shows the information displayed under various conditions.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Copy type</th>
<th>Volume type</th>
<th>Information displayed when no restrictions apply to resource groups</th>
<th>Information displayed when restrictions apply to resource groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
<td>Local Copy (SI)</td>
<td>Primary</td>
<td>Only the DADID of the volume added to the pair is displayed.</td>
<td>Only the DADID of the volume added to the pair is displayed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Copy (TC, TCA, UR)</td>
<td>Primary</td>
<td></td>
<td>A DADID that satisfies the following conditions is displayed:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The DADID satisfies one of the conditions on the left and is owned by a BCM that has access permissions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The DADID satisfies one of the conditions on the left and has access permissions for one or more storage systems whose volumes are in the DAD.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No</strong></td>
<td>Local Copy (SI)</td>
<td>Primary</td>
<td>The DADID that was selected when Pair Configuration wizard was started.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>The DADID of the P-VOL or the DADID of the Non Gen’ed volume that corresponds to the P-VOL DADID.</td>
<td></td>
</tr>
<tr>
<td>Remote Copy (TC, TCA, UR)</td>
<td>Primary</td>
<td>The DADID that was selected when the Pair Configuration Wizard was started.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Secondary</td>
<td>All DADIDs contained under the same prefix as that for the P-VOL.</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
*: An attempt has been made to add a volume to the primary or secondary volumes to which one or more volumes have already been added.
Selecting targets for disk configuration distribution

To select disk list distribution targets:

1. Display the list of disk configuration definition files on the Disk Configs tab in the BC Manager / Mainframe Agent subwindow. For details on how to display disk configuration definition files, see Displaying disk configuration definition files on page 5-10.

2. On the Disk Configs tab, click the icon for the disk configuration definition file you want to edit. The Edit Disk Config - disk-config-name window appears.

3. Click the Distribution Hosts tab. A list of candidate distribution hosts is displayed in the Candidate Distribution Hosts pane.

4. Using the check boxes, select the distribution hosts you want to add as disk list distribution targets.

5. To delete a distribution target, deselect the check box for the candidate distribution host.

Tip: The copy group definition file will not be distributed if you deselect a host registered as a distribution target.

6. To distribute the disk configuration definition file when the disk list is created, select the Distribute the disk config when creating the list check box. (Uncheck this check box when you want to skip disk list distribution.)

7. Click OK.

Related topics
- About distributing disk configurations on page 5-8
- Prerequisites for distribution destination hosts (disk configuration definitions) on page 5-8

Displaying disk configuration definition files

You can confirm the list of disk configuration definition files managed by Replication Manager on the Disk Configs tab in the BC Manager / Mainframe Agent subwindow.

To confirm the list of disk configuration definition files:

1. From the Explorer menu, choose Administration and then Information Source. The Information Source subwindow appears.

2. Expand the object tree, and select BC Manager / Mainframe Agent. The BC Manager / Mainframe Agent subwindow appears.

3. Click the Disk Configs tab. The list of disk configuration definition files managed by Replication Manager are displayed in the Disk Configs tab.
Tip: Disk configuration definition files are created per storage system. The disk configuration definition files which have the same DADID are displayed as one file in the disk configuration file list on the Disk Configs tab.

Related topics

- About distributing disk configurations on page 5-8
- Editing disk configuration definition files on page 5-11

Editing disk configuration definition files

You can edit a disk configuration definition file by adding or deleting volume ranges in the volume range list. You can also select or deselect target hosts for disk list distribution.

To edit a disk configuration definition file:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and select BC Manager / Mainframe Agent.
   The BC Manager / Mainframe subwindow appears.
3. Click the Disk Configs tab.
   The list of disk configuration definition files managed by Replication Manager are displayed in the Disk Configs tab.
4. Click the icon for the disk configuration definition file you want to edit.
   The Edit Disk Config - Config File Name window appears.
5. On the Volume Range List tab, edit the volume ranges to be included in the volume scan.
   For details on how to add a volume range to the volume range list, see Adding a volume range to a volume range list on page 5-5. For details on how to delete a volume range from a volume range list, see Deleting a volume range from a volume range list on page 5-6.

Tip: When the information about volumes that contain command devices is deleted from a remotely scanned disk configuration definition file, performing another remote scan for that disk configuration definition file requires that the target route list definition file and command device definition file be deleted and then created again.

6. On the Distribution Hosts tab, select distribution targets from the list of candidate distribution hosts. For details on how to select distribution targets, see Selecting targets for disk configuration distribution on page 5-10.

Reviewing mainframe volumes

After a volume scan is completed, you can confirm the volumes discovered by Replication Manager.
For details on how to confirm discovered volumes, see:

- Reviewing paired DEVN list on page 5-12
- Reviewing paired LDEV list on page 5-12
- Reviewing unpaired DEVN list on page 5-13
- Reviewing unpaired LDEV list on page 5-13

**Reviewing paired DEVN list**

**To review the paired DEVN list:**

1. From the Explorer menu, choose Resources and then Hosts.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a host under Hosts.
   The host-name subwindow appears.
3. Under the DEVNs tab, select the Paired tab.
   The paired DEVN list is displayed. This list also displays copy types associated with established copy pairs.
4. Review the information in the paired DEVN list.

**Related topics**

- Reviewing unpaired DEVN list on page 5-13
- Reviewing unpaired LDEV list on page 5-13

**Reviewing paired LDEV list**

**To review the paired LDEV list:**

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. On the CUs tab, select a control unit number.
   The CU-number subwindow appears.
4. Under the LDEVs tab, select the Paired tab.
   The paired LDEVs list is displayed. This list also displays copy types associated with established copy pairs.
5. Review the information in the paired LDEVs list.

**Related topics**

- Reviewing paired DEVN list on page 5-12
- Reviewing unpaired LDEV list on page 5-13
**Reviewing unpaired DEVN list**

**To review the unpaired DEVN list:**

1. From the **Explorer** menu, choose **Resources** and then **Hosts**.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a host under **Hosts**.
   The *host-name* subwindow appears.
3. Under the **DEVNs** tab, select the **Unpaired** tab.
   All Mainframe volumes scanned by the host are listed. The volumes on
   the distributed disk configuration are not displayed.
4. Review the information on the unpaired DEVN list.

**Related topics**

- [Reviewing paired DEVN list on page 5-12](#)
- [Reviewing paired LDEV list on page 5-12](#)

**Reviewing unpaired LDEV list**

**To review the unpaired LDEV list:**

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The *storage-system-name* subwindow appears.
3. On the **CUs** tab, select a control unit number.
   The *CU-number* subwindow appears.
4. Under the **LDEVs** tab, select the **Unpaired** tab.
   All Mainframe volumes located on the storage system are listed.
5. Review the information on the unpaired LDEV list.

**Related topics**

- [Reviewing paired DEVN list on page 5-12](#)
- [Reviewing paired LDEV list on page 5-12](#)
Setting up authorities

Before you can use Replication Manager, you must specify user account settings and permissions to restrict the scope of operations allowed for each user. Replication Manager controls access by using resource groups that restrict accessible ranges, and user management roles that restrict user operations. To control access to Replication Manager resources, you need to create resource groups and associate users with resources.

This chapter describes how to configure access control.

- Adding users and assigning permissions
- Setting up resource groups
Adding users and assigning permissions

Before you can use Replication Manager, you must add user accounts and assign appropriate permissions. In addition to new users, you can also add users who use more than one Hitachi Command Suite product. If you want to allow existing Hitachi Command Suite product users to also use Replication Manager, you must grant Replication Manager management permissions to those users.

About users, permissions, and roles

Replication Manager controls access using roles and user permissions. You can specify user account settings and permissions to restrict the scope of operations allowed for each user. For tighter system security, you can also use the account lock function to temporarily prevent specific users from logging in. If you want to integrate user account authentication with other application programs, you can link to an external authentication server (the LDAP directory server or RADIUS server for user authentication).

Tip: If the exauth.properties file of a management server has been edited to link to an external authentication server, additional users will be authenticated using the external authentication server by default. For details on the exauth.properties file, see the Hitachi Command Suite System Administrator Guide.

When you install Replication Manager, a built-in account that is assigned the ID System is set up in the system. The System account lets you manage all users and Hitachi Command Suite. You cannot change or delete this user ID or its permissions.

Tip: All users can set up personal profiles and Replication Manager licenses, regardless of their permission levels.

Permissions and management roles

In addition to the built-in account (user ID: System), there are permissions that grant access to all Replication Manager functions. Permissions can be allocated in any combination, but are broad in nature and do not control access to individual functions. The following table groups the permissions into two categories known as management roles.

<table>
<thead>
<tr>
<th>Management role</th>
<th>Permission</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Management</td>
<td>Admin</td>
<td>This role permits the user to log in to and use all Hitachi Command Suite products and to set up users. By default, users who have the Admin (user management) permission cannot perform any Replication Manager operations other than user management. To perform other operations, such users must be granted the Replication Manager Management permissions.</td>
</tr>
<tr>
<td>Management role</td>
<td>Permission</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Replication Manager Management</td>
<td>Admin</td>
<td>This role is used to set up Replication Manager resources and the accessible ranges (resource groups) for all users, including oneself. This role also permits the user to perform all administrative tasks within the resource groups except specifying user settings.</td>
</tr>
<tr>
<td>Modify</td>
<td></td>
<td>This role permits the user to manage the resources in resource groups set up by users who have the Admin permission of the Replication Manager Management role.</td>
</tr>
<tr>
<td>View</td>
<td></td>
<td>This role permits the user to view the resources in resource groups set up by users who have the Admin permission of the Replication Manager Management role.</td>
</tr>
</tbody>
</table>

**User roles**

*User roles* permit more granular assignment of privileges to users (access to specific functions in Replication Manager rather than entire areas of administration). For example, one user can be authorized to create backups (replicas), but not restore them. To understand user roles and how they are assigned, see *About user roles on page 6-3* and *About permissions and user roles on page 6-5*.

**Resource groups**

In addition to management roles and user permissions, access control is implemented in the form of *resource groups*, which restrict the range of resources that specific users can access. For details, see *Relationships between resource groups and user permissions on page 6-14*.

**Related topics**

- Explorer menu items for user management on page 19-2
- Changing user roles on page 19-5
- User management functions on page 19-2

**About user roles**

User roles make it possible to grant privileges that are more granular than permissions. Rather than blanket privileges like Admin, each user role has a specific set of operations that are permitted. Roles are fixed and cannot be customized. The user roles and their capabilities are shown in the following table.
Table 6-1 User roles

<table>
<thead>
<tr>
<th>User Role</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage administrator</td>
<td>Responsible for all replication tasks, including resource allocation (S-VOLs).</td>
</tr>
<tr>
<td>Copy pair administrator</td>
<td>Responsible for all replication tasks, except resource allocation.</td>
</tr>
<tr>
<td>Application administrator</td>
<td>Responsible for data protection of applications, but cannot change pair configurations.</td>
</tr>
<tr>
<td>Application operator</td>
<td>Responsible for application maintenance. Allowed to create replicas, but not to perform restores.</td>
</tr>
</tbody>
</table>

Operations permitted for each role are marked with an X the following tables.

**Tip:** By default, Storage Administrator is assigned to users with Modify permission. However, if you change such a user to have Admin or View permission and later restore the Modify permission, the previous user role is retained.

Table 6-2 Pair definition and replica operations

<table>
<thead>
<tr>
<th>Role</th>
<th>Pair definition</th>
<th>Replica creation/restore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Allocate S-VOLs</td>
<td>Define copy groups</td>
</tr>
<tr>
<td>Storage administrator</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Copy pair administrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application administrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application operator</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6-3 Pair operations

<table>
<thead>
<tr>
<th>Role</th>
<th>Basic (mainframe and open)</th>
<th>Advanced (open only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create</td>
<td>Delete</td>
</tr>
<tr>
<td>Storage administrator</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Copy pair administrator</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Tip: In most cases, assignment of the roles determines whether a function can be performed by disabling the control or button on a given window (for example, by dimming the Create button). For some functions, the controls may not be displayed at all.

Table 6-4 Pair operations (GAD copy type)

<table>
<thead>
<tr>
<th>Role</th>
<th>Basic (mainframe and open)</th>
<th>Advanced (open only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create</td>
<td>Delete</td>
</tr>
<tr>
<td>Application administrator</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Application operator</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Note: Replica operations are not supported for GAD, therefore the Application administrator and operator roles do not apply.

Related topics
- Changing user roles on page 19-5
- About permissions and user roles on page 6-5

About permissions and user roles
User permissions that apply to all Hitachi Command Suite products provide Admin, Modify, or View authorization for individual users. User roles are currently implemented just for Replication Manager and are only effective when the user has Modify permission. This means:
• Admin permission allows all operations, regardless of user roles assigned.
• Modify permission permits settings based on user roles.
• View permission disallows any operations other than viewing, regardless of user roles assigned.

Related topics
• About user roles on page 6-3
• Changing user roles on page 19-5

About user roles and wizards

The availability of wizards according to user role is shown in this table.

### Table 6-5 User roles and wizard operations

<table>
<thead>
<tr>
<th>Role</th>
<th>Launch Pair Configuration Wizard (Allocate S-VOLs)</th>
<th>Launch “Edit Workflow” window (Define Copy Groups)</th>
<th>Launch Change Pair Status Wizard (Create/delete copy pairs, restore copy pairs)</th>
<th>Launch Restore Replica Wizard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Administrator</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Enabled</td>
</tr>
<tr>
<td>Copy Pair Administrator</td>
<td>Disabled</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Enabled</td>
</tr>
<tr>
<td>Application Administrator</td>
<td>Disabled</td>
<td>Disabled</td>
<td>Enabled&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Enabled</td>
</tr>
<tr>
<td>Application Operator</td>
<td>Disabled</td>
<td>Disabled</td>
<td>Enabled&lt;sup&gt;1,2&lt;/sup&gt;</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

Legend:
1. Create/delete operation is not available; restricted operations are not listed on the Operations field of the Change Pair Status Wizard.
2. Restore operation is not available.

Related topics
• About user roles on page 6-3
• About permissions and user roles on page 6-5
• Changing user roles on page 19-5

Adding users

**Tip:** You do not need to add users who log in by linking to an external authorization server because such users are managed per authorization group.
Before performing this operation, make sure that you are logged in with the built-in account (user ID: System) or have the Admin (user management) permission.

**To add users:**

1. From the **Explorer** menu, choose **Administration** and then **Users and Permissions**.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select **Users**.
   The Users subwindow appears.
3. Click **Add User**.
   The Add User dialog box appears.
4. Register the information about the users to be added.
   The information is updated in the display.

**Related topics**

- [Viewing a list of users on page 19-3](#)
- [Editing user profiles (managing users and permissions) on page 19-5](#)

**Changing user permissions**

You can specify the permissions required to use a specific Hitachi Command Suite product for each registered user. To allow existing Hitachi Command Suite product users to also use Replication Manager, you must grant Replication Manager management permissions to those users.

**Note:** You cannot set permissions for users who log in by linking to an external authorization server because the accounts of such users have not been registered in Hitachi Command Suite products. For details about how to set permissions for users who log in by linking to an external authorization server, see [Using an external authorization server (authorization groups) on page 19-16](#).

From Replication Manager, you can also grant the permissions required to use Hitachi Command Suite products other than Replication Manager.

**Caution:** The following notes apply to Device Manager:

- The target for setting the permission is not the user account, so the following procedure cannot be used to change the permission for Device Manager. For details about how to change the permission for Device Manager, see the **Hitachi Command Suite User Guide**.
- Do not change the user permissions of the user account that is used for communication between Device Manager agents and the Device Manager server (default: HaUser).

**To change user permissions:**

1. From the **Explorer** menu, choose **Administration** and then **Users and Permissions**.
The Users and Permissions subwindow appears.

2. Expand the object tree, and then select a user ID link under **Users**.
   The *user-ID* subwindow appears.

3. Click **Change Permission**.
   The Change Permission-*user-ID* dialog box appears.

4. Change the permissions, and then update the information.
   The permissions displayed in the *user-ID* subwindow are refreshed.

**Related topics**
- [About users, permissions, and roles on page 6-2](#)
- [Viewing a summary of user permissions on page 19-8](#)
- [Viewing a list of user permissions on page 19-7](#)

**Setting up resource groups**

Replication Manager controls access by using resource groups that restrict the range of resources that can be accessed by users. To control access to Replication Manager resources, you need to create resource groups and associate users with resources.

**About resource groups**

A *resource group* is a collection of applications or sites that are grouped together and associated with specific users to restrict the resources that users can access. Specifying a range of resources on which a user can perform operations prevents users from inadvertently performing operations on unmanaged resources. A user can be associated with multiple resource groups to increase the range of operations that he or she can perform. All resources managed by Replication Manager are automatically set to the default resource group, *All Resources*. This group is assigned to users permitted to operate all resources without access restrictions.

**Caution:** The display of resource group information is dependent on the presence of a Replication Manager license. See [Device Manager versus Replication Manager resource groups on page 6-9](#) for more information.

The following are instances when resource groups are useful:

- An administrator is assigned to hosts and storage systems that are grouped on a site or department basis.
- An administrator who manages more than one department is assigned to multiple groups.

To view an example of resource groups, see [Example of resource groups on page 6-10](#).

The following are the rules for setting up resource groups:
Multiple resources can be registered in each resource group, but each resource can be registered in only one resource group.

A user can be granted access permissions for multiple resource groups (that is, the user can be associated with more than one resource group).

The default group All Resources cannot be deleted or renamed. A new resource group named All Resources cannot be added.

All resources are automatically registered in the All Resources group.

Because a user logged in with the built-in account System is permitted to access all resources, the user is automatically registered in the All Resources group.

Any user can be added to the All Resources group if they do not belong to another resource group.

Other than a user logged in as System (the built-in account), users with the Admin (user management) permission can belong to resource groups only when they also have the Admin, Modify, or View (Replication Manager management) permission.

Tip: If the association between a logged in user and a resource group is changed, the change is applied the next time the user logs in. If the WWN/iSCSI name of the host was changed after registering these resources in resource groups, you must add these resources to resource groups again.

Related topics

- Creating resource groups on page 6-12

Device Manager versus Replication Manager resource groups

As of 7.1.0, Device Manager and Replication Manager use separate resource groups. If you have not registered a license for Replication Manager and assigned user permissions, only resource groups that can be referenced according to the settings of Device Manager are eligible for display or modification. The following table lists the windows affected.

<table>
<thead>
<tr>
<th>Replication Manager windows with resource group information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Command Devices Wizard</td>
</tr>
<tr>
<td>Pair Configuration Wizard</td>
</tr>
<tr>
<td>Change Pair Status Wizard</td>
</tr>
<tr>
<td>Create Pool Wizard</td>
</tr>
<tr>
<td>Configuration setting subwindow</td>
</tr>
<tr>
<td>information-source-name (Device Manager) subwindow</td>
</tr>
<tr>
<td>copy-group-name or snapshot-group-name subwindow (open systems) (checking in the pair configurations view)</td>
</tr>
<tr>
<td>CCI-configuration-definition-file-name subwindow (open systems)</td>
</tr>
</tbody>
</table>
### Replication Manager windows with resource group information

<table>
<thead>
<tr>
<th>Window Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>host-name subwindow (open systems)</td>
<td></td>
</tr>
<tr>
<td>copy-group-name or snapshot-group-name subwindow (open systems) (checking in the hosts view)</td>
<td></td>
</tr>
<tr>
<td>Port/Host Group/LUN subwindow (Hosts view) (open systems)</td>
<td></td>
</tr>
<tr>
<td>Open subwindow</td>
<td></td>
</tr>
<tr>
<td>storage-system-name subwindow</td>
<td></td>
</tr>
<tr>
<td>Port/Host Group/LUN subwindow (Storage Systems view) (open systems)</td>
<td></td>
</tr>
<tr>
<td>Create Group dialog box</td>
<td></td>
</tr>
<tr>
<td>Edit Task dialog box (while creating a task)</td>
<td></td>
</tr>
<tr>
<td>Storage Systems subwindow</td>
<td></td>
</tr>
<tr>
<td>Tasks subwindow</td>
<td></td>
</tr>
<tr>
<td>Workflows subwindow</td>
<td></td>
</tr>
<tr>
<td>Exchange Server subwindow</td>
<td></td>
</tr>
<tr>
<td>SQL Server subwindow</td>
<td></td>
</tr>
</tbody>
</table>

### Example of resource groups

The following figure shows an example of resource groups.
All resources (hosts and storage systems) and the user logged in with the built-in account are automatically registered.

Resource groups in which resources (hosts and storage systems) and users are registered manually.

Legend:
- : Resource group
Creating resource groups

To create resource groups:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Click Create Group.
   The Create Resource Group dialog box appears.
3. Register the information about the resource group you want to create.
   The created resource group is displayed in the Resource Groups subwindow.
4. You can then add resources to the resource group as desired.

Related topics
- About resource groups on page 6-8
- Adding hosts to a resource group on page 6-12
- Adding users to a resource group on page 6-13
- Adding storage systems to a resource group on page 6-12
- Adding applications to a resource group on page 6-15

Adding hosts to a resource group

You can add hosts as resources to existing resource groups.

Tip: You cannot register the same host in more than one resource group. In addition, you cannot add hosts to the All Resources group (where all hosts are registered automatically).

To add hosts to a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. On the Hosts page, click Add Hosts.
   The Add Hosts - resource-group-name dialog box appears.
4. Select the hosts you want to add, and then add them.
   The added hosts are displayed on the Hosts page.

Related topics
- About resource groups on page 6-8

Adding storage systems to a resource group

You can add storage systems to existing resource groups.
Tip: You cannot register the same storage system in more than one resource group. In addition, you cannot add storage systems to the All Resources group, which is the resource group where all storage systems are automatically registered.

To add storage systems to a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
   The Add Storage Systems - resource-group-name dialog box appears.
4. Select the storage systems you want to add, and then add them.
   The added storage systems are displayed on the Storage Systems page.

Related topics

• About resource groups on page 6-8
• Removing storage systems from a resource group on page 20-5

Adding users to a resource group

You can add users to existing resource groups. To permit a user to access all resources, register the user in the All Resources group. You can also register a single user in multiple resource groups other than the All Resources group.

Tip: Because the user System (the built-in account) is automatically registered in the All Resources group, you do not need to register this user.

To add a user to a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups or the All Resources group.
   The resource-group-name subwindow or the All Resources subwindow appears.
3. On the Users page, click Add Users.
   The Add Users - resource-group-name dialog box appears.
4. Select the users you want to add, and then add them.
   The added users are displayed on the Users page.

Related topics

• About resource groups on page 6-8
Relationships between resource groups and user permissions

The following figure shows the relationships between resource groups and user permissions.

User A
(Replication Manager Management role with Admin permission, and a member of the All Resources group)

User 1
(Replication Manager Management role with Modify permission)

User 2
(Replication Manager Management role with Modify permission)

User 3
(Replication Manager Management role with View permission)

Legend:

- - - - ->: Manage
- - - - -: View
- - - - -: Resource group

User A can manage all resources and resource groups.
User 1 can manage the resources that belong to resource group A.
User 2 can manage the resources that belong to resource groups B and C.
User 3 can view the resources that belong to resource groups C, D, and E.
Adding applications to a resource group

You can add hosts/applications as resources to existing resource groups.

Tip: You cannot register the same host/application in more than one resource group. In addition, you cannot add hosts/applications to the All Resources group (where all hosts are registered automatically).

To add hosts/applications to a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. On the Applications page, click Add Hosts.
   The Add Hosts - resource-group-name (Applications) dialog box appears.
4. Select the hosts/applications you want to add, and then add them.
   The added hosts/applications are displayed on the Applications page.

Related topics

• [About resource groups on page 6-8](#)
In Replication Manager you can organize resources such as hosts and storage systems into logical sites for easier management. You can also designate frequently monitored resource groups as My Copy Groups.

This chapter describes different ways to organize resources.

- About resources
- Setting up sites
- Setting up My Copy Groups
About resources

Resources are entities managed by Replication Manager. These include application servers, storage systems, and pair management servers that constitute the replication environment. By registering Device Manager servers, instances of Business Continuity Manager, or instances of Mainframe Agent as information sources, you can have Replication Manager manage the information about the hosts, storage systems, and pair management servers, plus information about volumes or copy pair definitions contained in any of these hosts, storage systems, or servers.

The maximum number of resources that can be managed by Replication Manager depends on the setting specified for the memory heap size (Small, Medium, or Large). For details on the maximum number of resources that can be managed by Replication Manager, see Relationship between managed resources and memory heap size on page 10-70. To increase the number of managed resources it is necessary to increase the memory heap size. For details, see the Hitachi Command Suite Replication Manager Configuration Guide.

Replication Manager provides the following display formats (views) for viewing resources from a variety of perspectives:

- Hosts view
- Storage Systems view
- Pair Configurations view
- Applications view

You can use these views to check the status, configuration, and performance of managed copy pairs, copy groups, or applications.

Tip: If the copy pair or copy group is part of a cascade configuration, these views can display the status and configuration of all the related copy pairs or copy groups.

Related topics

- Explorer menu items for resource management on page 14-4
- Resource group management functions on page 20-2

Setting up sites

Sites allow you to manually group resources under one name for easier management. You can define your own site and register resources such as hosts and storage systems. Grouping of resources into logical sites is especially useful when you have remote sites. Although you can define logical sites with any combination of resources, managing many resources from the web interface is easier when logical sites are created based on the resources of actual sites.

To set up logical sites, from the Explorer menu, choose Shared Views and then Sites.
For details on how to add sites, see Adding sites on page 7-4.

Related topics
- Adding storage systems to a site on page 7-6
- Adding hosts to a site on page 7-5
- Adding pair management servers to a site on page 7-7

About sites
With Replication Manager, you can define logical sites in the GUI just as you would define actual physical sites (actual data centers). If you set up separate sites, you can manage resources more efficiently because it is easier to locate a required resource among many resources displayed in the GUI.

Hosts, storage systems, copy pair configuration definitions (pair management servers), and applications can be specified for any site. Although more than one resource can be specified for each site, a particular resource cannot be specified for more than one site.

Sites are managed by users with the Admin (Replication Manager management) permission. Each user can view the resources that belong to any site within the range of resource groups assigned to that user for access control.

To view the relationships between sites and resource groups, see Relationship between sites and resource groups on page 7-3.

Related topics
- About site administration on page 16-2

Relationship between sites and resource groups
The following figure shows the relationships between sites and resource groups.
Adding sites

To add sites:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Click Add Site. The Add Site dialog box appears.
3. Enter information about the sites you want to add, and then add them.
The added sites are displayed in the Sites subwindow.

4. After sites have been added, specify the resources for the sites. For details on how to specify resources, see the following:

- Adding hosts to a site on page 7-5
- Adding storage systems to a site on page 7-6
- Adding pair management servers to a site on page 7-7
- Adding application servers to a site on page 7-7

Related topics

- About sites on page 7-3
- Viewing a list of sites on page 16-4
- Viewing individual site information on page 16-4

Adding information sources to sites workflow

The following figure shows how information sources are added or deleted when a site is added or deleted.

Adding hosts to a site

You can add hosts to existing sites.
Tip: You cannot specify the same host for more than one site.

To add hosts to a site:
1. From the Explorer menu, choose Shared Views and then Sites.
   The Sites subwindow appears.
2. Expand the object tree, and then select a site by clicking on the site name in the Site List.
   The site-name subwindow appears.
3. Click the Hosts link.
   The Hosts subwindow appears.
4. Click Add Hosts.
   The Add Hosts dialog box appears.
5. Select the hosts you want to add, and then add them.
   The added hosts are displayed in the Hosts subwindow.

Related topics
• Editing sites on page 16-4
• Adding storage systems to a site on page 7-6
• Adding pair management servers to a site on page 7-7

Adding storage systems to a site
You can add storage systems to existing sites.

Tip: You cannot specify the same storage system for more than one site.

To add storage systems to a site:
1. From the Explorer menu, choose Shared Views and then Sites.
   The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites.
   The site-name subwindow appears.
3. Click the Storage Systems link.
   The Storage Systems subwindow appears.
4. Click Add Storage Systems.
   The Add Storage Systems dialog box appears.
5. Select the storage systems you want to add, and then add them.
   The added storage systems are displayed in the Storage Systems subwindow.

Related topics
• Editing sites on page 16-4
• Adding hosts to a site on page 7-5
Adding pair management servers to a site

You can add pair management servers to existing sites. After pair management servers have been added, the copy pair configuration definitions managed by the servers can be accessed from the nodes under the site.

For open systems, if you need to use a pre-existing host as a pair management server (that is, you already added the host to the site), you must add the host to the site again as a pair management server. For mainframe systems, adding a pre-existing a host as a pair management server allows the copy group definition file (prefix) managed by that host to be accessed from the nodes under the site.

Tip: You cannot specify the same pair management server (host) for more than one site.

To add pair management servers to a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. On the Resource List pane, click the Pair Configurations link. The Pair Configurations subwindow appears.
4. Click Add Hosts. The Add Hosts dialog box appears.
5. Select the pair management servers you want to add, and then add them. The added pair management servers are displayed in the Pair Configurations subwindow.

Related topics

• Editing sites on page 16-4
• Adding storage systems to a site on page 7-6
• Adding hosts to a site on page 7-5

Adding application servers to a site

Tip: You cannot specify the same host for more than one site.

To add application servers to a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site by clicking on the site name in the Site List. The site-name subwindow appears.
3. Click the **Applications** link.  
The Applications subwindow appears.
4. Click the link for the desired application server.  
The **Hosts** list is displayed.
5. Click **Add Hosts**.  
The Add Hosts dialog box appears.
6. Select the hosts you want to add, and then add them.  
The added application servers are displayed in the **Hosts** list.

**Related topics**
- [Editing sites on page 16-4](#)
- [Adding storage systems to a site on page 7-6](#)
- [Adding pair management servers to a site on page 7-7](#)

### Setting up My Copy Groups

Replication Manager can be used to monitor the volume associations, configurations, and copy pair status of selected copy groups by assigning them as **My Copy Groups**.

For details, see [Creating My Copy Groups on page 7-13](#).

### About My Copy Groups

If you want to regularly monitor specific copy groups, you can register them as **My Copy Groups**. Using **My Copy Groups** allows you to visualize pair configurations in a topological view and check the relationship between copy groups and the copy pair status in a single window. **My Copy Groups** can be set for each user.

Using **My Copy Groups**, you can:
- Monitor multiple copy groups in one window
- Focus on specific copy groups when monitoring copy groups
- Register multiple copy groups to **My Copy Groups**
- Check detailed status information of each copy group
- Refresh the pair status of all the displayed copy groups
- Check the details of a specific copy group by clicking the group's link

You can create your **My Copy Groups** using any of the copy groups in the resource groups with which you are associated. You can register a maximum of 300 copy groups.

---

**Tip:** If you re-create a copy pair with volumes whose primary-secondary relationship is the opposite of that of the original copy pair, the new copy pair is no longer recognized as the same copy pair and **n/a** is displayed in **My**
Copy Groups. To display the contents of My Copy Groups correctly, remove and then re-register the copy group.

Related topics
- Explorer menu items for My Copy Groups management on page 13-2
- My Copy Groups management functions on page 13-2

Examples of My Copy Groups

The following figure shows a display example of My Copy Groups.

Display example of My Copy Groups

If the copy groups registered in My Copy Groups have a multi-target configuration or cascade configuration, the relationships among the copy groups are displayed as described below.

If the copy groups are arranged in a row

The secondary volume of the copy group displayed on the left is the primary volume of the copy group displayed on the right.
In this example, the secondary volume of Copy Group A is the primary volume of Copy Group B, and the secondary volume of Copy Group B is the primary volume of Copy Group C.

**If a single copy group branches out to multiple copy groups**

When a single copy group branches out to multiple copy groups to the right, the secondary volume of the copy group on the left is the primary volume of the multiple copy groups on the right.

![Diagram](image1)

In this example, the secondary volume of Copy Group A is the primary volume of Copy Group B and Copy Group C.

**If a single copy group is connected to multiple copy groups**

The secondary volume of the multiple copy groups on the left is the primary volume of the single copy group on the right.

![Diagram](image2)

In this example, the secondary volume of Copy Group A and Copy Group B is the primary volume of Copy Group C.

**If a 3DC multi-target configuration is used**

In a 3DC multi-target configuration that uses the delta resync function, the copy group displayed on the right of the upper line branches to the right, and this copy group is displayed as being connected to the one on the lower line. In this case, the copy group displayed on the right of the upper line shares a primary volume with the copy group displayed on the lower line. Additionally, the secondary volume of the copy group displayed on the left of the upper line is the primary volume of the copy group displayed on the right of the
upper line, and the copy group displayed on the right of the upper line shares a secondary volume with the copy group displayed on the lower line.

In this example, Copy Group A and Copy Group C share a primary volume, the secondary volume of Copy Group A is the primary volume of Copy Group B, and Copy Group B and Copy Group C share a secondary volume.

If a 3DC multi-target configuration further connects to other copy groups

A 3DC multi-target configuration that uses the delta resync function can further connect to other copy groups that are managed by ShadowImage (or Copy-on-Write Snapshot/Thin Image). In this case, a volume in the 3DC multi-target configuration is used as the primary volume and the volumes displayed on the right are used as the secondary volumes. The following three examples illustrate this pattern.

Example (1)

In this example, the secondary volume of Copy Group C is used as the primary volume of Copy Group D, the copy type of which is ShadowImage.

Example (2)

In this example, the secondary volume of Copy Group A is used as the primary volume of Copy Group D and Copy Group E, both of which have the ShadowImage copy type.
Example (3)

In this example, the primary volume of Copy Group_A is also used as the primary volume of Copy Group_D and Copy Group_E, both of which have the ShadowImage copy type.
Creating My Copy Groups

To create My Copy Groups:

1. From the Explorer menu, choose My Groups and then My Copy Groups.
   The My Copy Groups subwindow appears.
2. Click Edit My Copy Groups.
   The Edit My Copy Groups dialog box appears.
3. In the list, select the copy groups you want to display in My Copy Groups.
4. Click OK to update My Copy Groups.
   The information displayed in the My Copy Groups subwindow is refreshed.

Related topics
- About My Copy Groups on page 7-8
- Checking My Copy Groups on page 13-2
Setting up storage systems

You can use Replication Manager to replicate volumes or change copy pair definitions. It is necessary to configure prerequisite settings before replicating volumes. You can specify the prerequisite settings centrally from Replication Manager, for many storage systems across multiple sites.

This chapter describes the tasks for preparing the replication environment and setting up storage systems.

- About setting up storage systems
- Prerequisite settings for replicating volumes
- Setting up V-VOLs
- Setting up command devices
- Setting up remote paths
- Setting up DMLUs
- Setting up pool volumes
- Setting up journal groups
About setting up storage systems

For open systems, you can configure your settings centrally, without having to configure them separately for each storage system across multiple sites.

**Tip:** If the Device Manager used to set up the storage system is not on the same management server as Replication Manager, you must synchronize the configuration information. For details, see About refreshing configuration information on page 11-12.

You can use Replication Manager to specify the following items for open volumes:

- **Command devices**
  If you want to set up copy pairs or change the copy pair status from Replication Manager, you need to use CCI. You must first set a storage system volume as a command device.

- **DMLU**
  To replicate volumes on midrange storage systems, you use an area called a DMLU for storing the differential data. Before you do that, you must set a storage system volume as a DMLU.

- **Remote paths**
  If you are using volume replication functionality such as TrueCopy, Universal Replicator, or global-active device to perform remote copying (replication of volumes between storage systems), you must first set up a logical path (remote path) to link the storage systems.

- **Pools**
  When Copy-on-Write Snapshot/Thin Image or TrueCopy Extended Distance is used to replicate volumes, a pool that stores differential data for the primary volume is required to create snapshot images (virtual volumes). Define this pool by setting any available storage system volume as a pool volume beforehand.

- **Journal groups**
  When Universal Replicator is used to replicate volumes, journal volumes are required as buffers for copying volumes. The journal volumes on the primary side are used after being grouped with the primary volume, and the journal volumes on the secondary side are used after being grouped with the secondary volume. Therefore, define this journal group in advance by setting any available storage system volumes as journal volumes.

- **V-VOLs**
  When Copy-on-Write Snapshot/Thin Image is used to replicate volumes with Replication Manager, a virtual volume (V-VOL) is used as the S-VOL. A V-VOL is a snapshot image of the volume virtually created from the difference data stored in the pool and the P-VOL. The V-VOL definition must correspond to the P-VOL.

For a list of available storage system setup functions and required user permissions (Replication Manager management), see Storage system setup functions on page 8-3.
Note: For mainframe systems: Depending on the copy types to be configured, some of the storage system setup operations need to be performed with Storage Navigator. For details, see the Hitachi Command Suite Replication Manager Configuration Guide.

Related topics
- Explorer menu items for setting up storage systems on page 8-4
- Setting up command devices on page 8-11
- Setting up pool volumes on page 8-20

Storage system setup functions

The following table shows the functions for setting up storage systems, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Adding command devices</td>
<td>Y</td>
</tr>
<tr>
<td>Editing command devices</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting command devices</td>
<td>Y</td>
</tr>
<tr>
<td>Adding DMLUs</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting DMLUs</td>
<td>Y</td>
</tr>
<tr>
<td>Creating remote paths</td>
<td>Y*</td>
</tr>
<tr>
<td>Editing remote paths</td>
<td>Y*</td>
</tr>
<tr>
<td>Deleting remote paths</td>
<td>Y</td>
</tr>
<tr>
<td>Adding pools</td>
<td>Y</td>
</tr>
<tr>
<td>Editing pools</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting pools</td>
<td>Y</td>
</tr>
<tr>
<td>Adding journal groups</td>
<td>Y</td>
</tr>
<tr>
<td>Editing journal groups</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting journal groups</td>
<td>Y</td>
</tr>
<tr>
<td>Editing maximum initial copy activities (UR)</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be used with this permission.
N: Cannot be used with this permission.
*: If a user cannot access a remote storage system (the local storage system is in a resource group associated with the user, but the remote storage system is not), that user cannot do the following:
• Link to it from the list of remote paths
• Create a new remote path
• Add a remote port for an existing remote path.

Tip: Each function can be used only for the resources in resource groups associated with the user.

Explorer menu items for setting up storage systems

The following table shows the Explorer menu items that are related to setting up storage systems, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Resources</td>
<td>Storage Systems</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.

Prerequisite settings for replicating volumes

The following figures show the task flow for specifying prerequisite settings required before replicating volumes.
Flow of specifying the settings required before replicating volumes
(enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, and HUS VM)

Start

Prepare the prerequisite environment

Acquire the latest configuration information
(configuration updating)

Specify the command device settings

Set up a remote path

Set up a pool

Set up a NLG

Configure V-VOLs

Set the alert conditions for performance information and
copy license usage (alert settings)

End

Legend:

Required task
Optional task
Volume replication functionality that is used

SI : ShadowImage
TCA : TrueCopy Async
TCS : TrueCopy Sync
GAD : global-active device
UR : Universal Replicator
COW : Copy-on-Write Snapshot
JNLG : Journal group
TI : Thin Image
Flow of specifying the settings required before replicating volumes (midrange storage systems)

Setting up V-VOLs

Replication Manager supports creation of V-VOLs on storage system configurations. This function is only supported for Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, and VSP F1500 storage systems. Using the Create V-VOL Wizard, you can create V-VOLs and associate them with volume pools.

For details see Creating V-VOLs on page 8-9.

About creating V-VOLs

Replication Manager supports creation of V-VOLs on storage system configurations. After creating V-VOLs, it is necessary to assign LUNs to them in order to create copy pairs. Assignment of LUNs should be done using Device Manager. Replication Manager provides a wizard for creating V-VOLs and associating them with volume pools.
Related topics

- Permitted V-VOL operations based on CVS installation on page 8-8
- Creating V-VOLs on page 8-9
- About the Create V-VOL Wizard on page 8-8
- Launching the Create V-VOL Wizard on page 8-9

V-VOL limits

The maximum number of V-VOL groups that can be created for each storage system is 65,280. For Universal Storage Platform V/VM storage systems, the maximum number of V-VOLs in a V-VOL group is 1024.

For Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500 storage systems, the default maximum number of V-VOLs that can be created at one time with the Create V-VOL Wizard is 900. (Exceeding this limit will fail with the error RPM-01014.) To increase this value, you must modify the server.http.entity.maxLength property in the server.properties file of the Device Manager server.

By increasing the value of server.http.entity.maxLength to 141,500 or greater, the limit on the number of V-VOLs that can be created at one time for Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500 storage systems is increased to 1,024.

For details about editing the server.properties file, see the Hitachi Command Suite Administrator Guide.

Prerequisites for creating V-VOLs

The following prerequisite conditions must be satisfied before creating V-VOLs:

- The storage device is a Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or Universal Storage Platform V/VM storage system.
- A Copy-on-Write Snapshot/Thin Image license has been registered on the storage device.
- The platform used for setting and displaying V-VOLs is open system.

Conditions for primary volumes that can be added (V-VOL Creation)

The following are the requirements for volumes that are displayed as P-VOL candidate volumes in the 2. Select Primary LDEVs page of the Create V-VOL Wizard:

- The volume must not be a Copy-on-Write/Thin Image S-VOL.
- Volume types including command devices, pool volumes, journal volumes, DMLUs, system volumes, and V-VOLs must not be set.
- The volume attributes must not include POOL.
- The volume attributes must not include V-VOL.
• The volume attributes must not include LUSE.
• The volume attributes must not include PoolOnly.
• The emulation type must be OPEN-V.
• A path must be defined.
• For VSP Gx00 models, VSP Fx00 models, VSP G1000, VSP G1500, or VSP F1500 storage systems, the capacity must be between 46 MB and 256 TB.
• For storage systems other than VSP Gx00 models, VSP Fx00 models, VSP G1000, VSP G1500, or VSP F1500, the capacity must be between 46 MB and 4 TB.

**Permitted V-VOL operations based on CVS installation**

The operations that can be performed on V-VOLs depend on whether CVS (Open Volume Management) has been installed. V-VOLs can be added or deleted from an existing V-VOL group only when CVS has been installed. The following table lists the conditions and restrictions when creating V-VOL groups.

> **Note:** The maximum number of V-VOLs on Virtual Storage Platform, VSP G1000, VSP G1500, and VSP F1500 storage systems are not restricted based on CVS installation.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>CVS has been installed</th>
<th>CVS has not been installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of P-VOLs that can be added (in the Select Primary LDEV-Target LDEVs window)</td>
<td>No limit</td>
<td>1</td>
</tr>
<tr>
<td>Number of Copy-on-Write Snapshot/Thin Image copy generations (in the Primary LDEVs-Count of Snapshot window)</td>
<td>1024</td>
<td>1 (inactive)</td>
</tr>
</tbody>
</table>

**About the Create V-VOL Wizard**

Replication Manager includes a Create V-VOL Wizard for creating V-VOLs and associating them with volume pools.

The Create V-VOL Wizard provides the following functions:

• Setting up V-VOL groups
• Selecting primary LDEVs to be replicated with V-VOLs
• Specifying the count of snapshots for each LDEV, when creating multiple V-VOLs for the selected LDEVs
• Selecting V-VOLS by specifying CU and LDEV, if the starting number for CU:LDEV is specified
Launching the Create V-VOL Wizard

To launch the Create V-VOL Wizard:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. Click the Pools tab.
5. Within the Pools tab, click the V-VOLS tab.
6. On the V-VOLS tab, click Create V-VOLS.
   The Create V-VOL Wizard starts.

Related topics

- About creating V-VOLs on page 8-6
- About the Create V-VOL Wizard on page 8-8

Creating V-VOLs

To create V-VOLs:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. Under the Pools tab, display the V-VOLS tab.
5. Click Create V-VOLS.
   The Create V-VOLs Wizard is launched.

Note: Steps 7 and 8 only apply to Universal Storage Platform V/VM storage systems. For Virtual Storage Platform, VSP G1000, VSP G1500, and VSP F1500 storage systems, the V-VOL Group ID pane becomes disabled, and only the emulation type and CLPR can be selected.

7. To create a new V-VOL Group, in the V-VOL Group ID pane, check the Create New Group option.
8. To add V-VOLs to an existing V-VOL Group, in the **V-VOL Group ID** pane, check the **Select Existing Group** option and specify a V-VOL Group ID.

9. Specify Emulation Type and CLPR.

10. Click **Next**.
    The 2. Select Primary LDEVs page is displayed.

11. In the **Target LDEVs** tab on the 2. Select Primary LDEVs page, filter and select primary LDEVs to be replicated with V-VOLs.

12. Click **Add**.
    The primary LDEVs selected in the **Candidate LDEVs** pane are displayed in the **Target LDEVs** pane.

13. To create multiple V-VOLs for LDEVs for multiple generations of snapshots, select the **Count of Snapshot** tab and specify a generation number.

14. Click **Next**.
    The 3. Setup V-VOLs page is displayed.

15. On the 3. Setup V-VOLs page, assign LDEV numbers to the V-VOLs by selecting the **Specify start number of V-VOL(s)** check box and specifying the start numbers of CU and LDEV. If the **Specify start number of V-VOL(s)** check box is not selected, the CU:LDEV of the V-VOLs will be automatically assigned during the creation. If the specified number is an LDEV number being used as a non-representative LDEV of a LUSE in Device Manager, V-VOL creation may fail.

16. Click **Next**.
    The 4. Confirm page is displayed.

17. Review all parameters of the V-VOLs and click **Confirm**.
    The 5. Finish page is displayed.

**Tip:** The time taken to complete this operation depends on the count and size of the primary LDEVs, and the specified **Count of Snapshot**. For five 1 GB primary LDEVs, it takes approximately 20 minutes. For one 1 GB primary LDEV and 1024 snapshots, it takes approximately 40 minutes. This operation can take longer when a large number of primary LDEVs are selected.

18. Confirm that the V-VOLs created are listed on the **V-VOLs** tab in the Storage Systems view.

**Tip:** The size of created V-VOLs are exactly the same as the size of target LDEVs.

**Related topics**

- About creating V-VOLs on page 8-6
- Prerequisites for creating V-VOLs on page 8-7
- Conditions for primary volumes that can be added (V-VOL Creation) on page 8-7
Setting up command devices

A command device is necessary for CCI (a prerequisite product for Replication Manager) to communicate with storage systems.

You can set up command devices using a wizard on the **Cmd Devs** tab in the Storage Systems view.

**Tip:** The command devices that you are setting up must be recognized by the pair management server. If you use the central management method, disable the command device security function. If the command device security function is enabled, copy pairs can be set only for the volumes that are recognized by the pair management server.

For details on how to add command devices, see **Adding command devices on page 8-13**.

**Related topics**

- About the Add Command Devices Wizard on page 8-13

About command devices

Command devices are necessary for CCI to communicate with storage systems.

**Related topics**

- About the Add Command Devices Wizard on page 8-13
- Setting up command devices on page 8-11
- Editing command devices on page 15-3
- Deleting command devices on page 15-3

Storage system types and volume requirements (command devices)

Replication Manager allows you to set up command devices in open systems if the storage system type is Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series, VSP Gx00 models, VSP Fx00 models, Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, or HUS VM.

Volumes that meet the requirements listed here are displayed as candidate volumes in Replication Manager.
### Storage system types and requirements for using volumes as command devices

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series</th>
<th>Universal Storage Platform V/VM, VSP, VSP G1000, VSP G1500, VSP F1500, HUS VM, VSP Gx00 models, VSP Fx00 models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must be at least 33 MB</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Not a paired volume</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not an external volume</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a V-VOL</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a pool volume</td>
<td>Y1</td>
<td>Y</td>
</tr>
<tr>
<td>Not part of a LUSE volume</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>GUARD must not be specified</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Volume type must be set to “None”</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Must be recognized by host</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Not a virtual storage machine</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Not a PoolOnly volume</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Not a Data Direct Mapping volume</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>The Attribute of the virtual volume is not GAD Reserved</td>
<td>N</td>
<td>Y2</td>
</tr>
<tr>
<td>Not a volume created when the drive type is FMC with volumes that belong to a parity group for which Accelerated Compression is enabled</td>
<td>N</td>
<td>Y2</td>
</tr>
<tr>
<td>Not an NAS Platform (User LU) volume</td>
<td>N</td>
<td>Y4</td>
</tr>
</tbody>
</table>

**Legend:**

- **Y**: This requirement applies.
- **N**: This requirement does not apply.

1. This requirement does not apply if the storage system is HUS100 series and the copy type is Copy-on-Write Snapshot or TrueCopy Extended Distance (because no pool volume is created).
2. Applies to VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, and VSP Fx00 models.
3. Applies to VSP Gx00 and VSP Fx00 models.
4. Applies to VSP Gx00 and VSP Fx00 models equipped with an HAS module.
Command device settings for virtual machines

The Replication Manager command device configuration function cannot be used to set a volume as a command device if the volume has been allocated for a VMware virtual machine.

To set a command device for the virtual machine:

1. Use Storage Navigator, Storage Navigator Modular or Storage Navigator Modular 2 to set the volume as a command device.
2. Use Storage Navigator, Storage Navigator Modular or Storage Navigator Modular 2 to add the command device in (1) to a VMware host group and set a path for the command device.
3. Perform VMware Raw Device Mapping, and then make sure that the command device in (1) is recognized by the virtual machine.

About the Add Command Devices Wizard

Replication Manager includes an Add Command Devices Wizard for registering volumes as command devices. The wizard provides the following functions:

- Filters for narrowing down the volumes to be registered as command devices
- List of candidate volumes that can be registered as command devices
- List of newly configured command devices

Launching the Add Command Devices Wizard

To launch the Add Command Devices Wizard:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the Cmd Devs page, click Add Cmd Devices.
   The Add Command Devices Wizard starts.

Related topics

- About the Add Command Devices Wizard on page 8-13

Adding command devices

To add command devices:

1. From the Explorer menu, choose Resources and then Storage Systems.
The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under Storage Systems.
The storage-system-name subwindow appears.

3. Click the Open link.
The Open subwindow appears.

4. On the Cmd Devs page, click Add Cmd Devices.
The Add Command Devices Wizard starts.

5. Add command devices as instructed by the wizard.
The added command devices are displayed in the Open subwindow.

Related topics
- About command devices on page 8-11
- About the Add Command Devices Wizard on page 8-13
- Storage system types and volume requirements (command devices) on page 8-11

Setting up remote paths

If you use TrueCopy Async, TrueCopy Sync, Universal Replicator, or global-active device to replicate volumes, you must set up a logical path (called a remote path) to link the MCU (or primary DKC) of the local storage system to the RCU (or secondary DKC) of the remote storage system. You can set up a remote path by starting the wizard that is available under the Remote Paths tab of the Storage Systems view.

Related topics
- Conditions for specifying remote paths on page 8-15
- About the Create Remote Path Wizard on page 8-16
- Creating a remote path on page 8-16

About remote paths

Remote Paths are port connections between local and remote storage systems. These logical routes are used by remote copy pairs for copying data from a P-VOL to an S-VOL. Replication Manager allows remote path configuration for different replication technologies. You must set up a remote path before you can use any of the following volume replication functions:

- TrueCopy
  For enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, or HUS VM: Based on the copy direction, you specify the port for the local storage system CU (MCU) and the port for the remote storage system CU (RCU). Initiator and RCU Target are set automatically as the attributes of the specified ports. You can specify either CU Free (to connect only from the local storage system to a remote storage system...
using a dynamically assigned MCU-RCU pair) or CU Specific (to connect each path using a specified MCU and RCU).

For midrange storage systems: Based on the copy direction, you specify the port for the local storage system and the port for the remote storage system.

- Universal Replicator and global-active device
  Using CU Free, you can specify the port for the local storage system and the port for the remote storage system. You must set paths for both directions. Initiator and RCU Target are set automatically as the attributes of the specified ports.

**Tip:** Remote path names in Storage Navigator Modular and those in Replication Manager point to different attributes. Therefore, there may be cases when the remote path names do not match.

### TrueCopy Modular Distributed (TCMD)

Replication Manager supports the fan-in/fan-out function of Hitachi AMS2000 and HUS100 series. This function allows 1:N and N:1 remote path creation. The distributed mode is used to distinguish 1 (hub) from N (edge) when using a 1:N configuration:

- When the local device is hub, multiple edge array devices and remote paths can be set.
- When the local device is edge, one hub, edge, or normal array device and one remote path can be set (the default mode when TCMD is enabled).

**Note:** The following points apply to TCMD:

- Only viewing distributed mode is supported; it cannot be changed.
- The Hitachi WMS series does not support this feature.

**Related topics**

- [Conditions for specifying remote paths on page 8-15](#)

### Conditions for specifying remote paths

You can use Replication Manager to specify remote paths if all of the following conditions apply:

- An open system is being used.
- The storage system type is Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series, Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM.

For details about combination of storage systems for which a remote path can be set, see [Storage system conditions for pair configuration definition on page 10-16](#).
Note: If you specify a remote path, the port types (Fibre channel, Fibre Channel Over Ethernet, or iSCSI) of the primary and secondary storage systems must match. If the port types differ, the remote path cannot be specified. Fibre Channel can be used for a remote path on midrange systems, but iSCSI cannot. If the local storage system is Hitachi AMS/WMS, the port attributes cannot be changed.

About the Create Remote Path Wizard

Replication Manager includes a Create Remote Path Wizard for defining remote paths between storage systems. This wizard allows you to manage primary and secondary devices independently and also helps avoid creation of invalid configurations.

The Create Remote Path Wizard provides the following functions:

- Setting the copy type that uses the remote path and storage systems that will be used for the remote path
- Configuring settings such as remote path label and port

Related topics

- [About remote paths on page 8-14](#)
- [Conditions for specifying remote paths on page 8-15](#)
- [Deleting a remote path on page 15-6](#)

Creating a remote path

To create a remote path:

1. From the **Explorer** menu, select **Resources**, and then **Storage Systems**.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The *storage-system-name* subwindow appears.
3. Click the **Open** link.
   The Open subwindow appears.
4. Under the **Remote Paths** tab, click **Create Path**.
   The Create Remote Path Wizard starts.
5. Follow the instructions provided by the wizard to create a remote path.
   The remote path you created is displayed in the Open subwindow.

Related topics

- [Conditions for specifying remote paths on page 8-15](#)
- [About remote paths on page 8-14](#)
Setting up DMLUs

DMLUs are areas used for storing differential data.

This module includes the following topics:

- About DMLUs on page 8-17
- Setting up a DMLU on page 8-18
- Storage system types and volume requirements (DMLU) on page 8-18
- Units used for calculating capacity and displaying values on page 1-11
- About Add DMLUs Wizard on page 8-19
- Launching the Add DMLUs Wizard on page 8-19
- Adding a DMLU on page 8-19
- Adding DMLU capacity on page 8-20

About DMLUs

A Differential Management Logical Unit (DMLU) is an area used for storing differential data when you replicate volumes on midrange storage systems. You must set up a DMLU before you can use any of the following volume replication functions:

- ShadowImage (when creating copy pairs that span multiple generations)
- TrueCopy Sync
- TrueCopy Extended Distance
- Copy-on-Write Snapshot/Thin Image

**Note:** For the HUS100 series, the first two copy types require a DMLU.

You can use Replication Manager to set up a DMLU if all of the following conditions are satisfied:

- An open system is being used.
- The storage system type is Hitachi AMS/WMS, or Hitachi AMS2000, or HUS100 series.
- The Device Manager server, which is the information source, is v6.1 or later.

For Hitachi AMS/WMS and Hitachi AMS2000, you can specify a maximum of two DMLUs for each storage system. In a TrueCopy Extended Distance system, there may be up to two DMLUs configured per array. For Copy-on-Write Snapshot/Thin Image and ShadowImage, the DMLU is an exclusive volume used for storing data when the array system is powered down.

**Note:** The HUS100 series supports one DMLU. For Copy-on-Write Snapshot/Thin Image and TrueCopy Extended Distance, pair operations can be performed without a DMLU.
A volume must meet applicable requirements in order to be specified as a DMLU. To view storage system types and requirements for using volumes as DMLUs, see *Storage system types and volume requirements (DMLU) on page 8-18*.

**Related topics**
- Adding a DMLU on page 8-19
- About Add DMLUs Wizard on page 8-19
- Storage system types and volume requirements (DMLU) on page 8-18

**Setting up a DMLU**

On midrange storage systems, you must set up a DMLU as the area used to store the differential data during the volume copy operation. You can set up the DMLU by starting the wizard that is available under the **DMLUs** tab in the Storage Systems view.

For details on how to add DMLUs, see Adding a DMLU on page 8-19.

**Related topics**
- About DMLUs on page 8-17
- About Add DMLUs Wizard on page 8-19
- Storage system types and volume requirements (DMLU) on page 8-18

**Storage system types and volume requirements (DMLU)**

**Storage system types and requirements for using volumes as a DMLU**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hitachi AMS/WMS</th>
<th>Hitachi AMS2000</th>
<th>HUS100 series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>5 GB or more</td>
<td>10 GB or more</td>
<td>10-128 GB</td>
</tr>
<tr>
<td>Volume type not specified (None)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Volume not a paired volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>A path to the volume is not set</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>GUARD must not be specified</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Volume not an external volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Volume not a virtual volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: This requirement applies.
About Add DMLUs Wizard

Replication Manager includes an Add DMLUs Wizard for registering Differential Management Logical Units (DMLUs).

The Add DMLUs Wizard provides the following functions:

- Candidate Devices pane for selecting candidate devices to be registered as DMLUs
- Target Devices pane for viewing details of newly configured DMLUs

Related topics

- About DMLUs on page 8-17
- Launching the Add DMLUs Wizard on page 8-19
- Adding a DMLU on page 8-19

Launching the Add DMLUs Wizard

To launch the Add DMLUs Wizard:

1. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. Under the DMLUs tab, click Add DMLUs.
   The Add DMLUs Wizard starts.

Related topics

- About Add DMLUs Wizard on page 8-19

Adding a DMLU

To add a DMLU:

1. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. Under the DMLUs tab, click Add DMLUs.
The Add DMLUs Wizard starts.
5. Follow the instructions provided by the wizard to add a DMLU.
The DMLU you added is displayed in the Open subwindow.

Related topics
• About DMLUs on page 8-17
• Storage system types and volume requirements (DMLU) on page 8-18

Adding DMLU capacity

Use the Add DMLU Capacity Wizard to expand the capacity of a DMLU by entering the new size.

Note: This feature applies to HUS100 series only.

To expand the capacity of a DMLU:
1. From the Explorer menu, select Resources, and then Storage Systems.
The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
The storage-system-name subwindow appears.
3. Click the Open link.
The Open subwindow appears.
4. Under the DMLUs tab, select a DMLU, and then click Add DMLU Capacity.
The Add DMLU Capacity Wizard starts.
5. The existing capacity is displayed. Input a value for the New Capacity.

Note: If the DMLU is a DP volume, the parity group list is not displayed and the next step does not apply.
6. Select a parity group from the candidate list.
7. Click Next and follow the prompts to confirm and commit your changes.

Related topics
• About DMLUs on page 8-17
• Storage system types and volume requirements (DMLU) on page 8-18

Setting up pool volumes

Replication technologies such as Hitachi Copy-on-Write Snapshot/Thin Image software and Hitachi TrueCopy Extended Distance use an area called a pool to store the differential data for the primary volume in order to create a snapshot image (virtual volume).
You can specify the pool volume settings using a wizard on the **Pools** tab in the Storage Systems view.

For details on how to add pools, see [Adding pools on page 8-24](#).

**Related topics**

- [About pool volumes on page 8-21](#)
- [Storage system types and volume requirements (pools) on page 8-21](#)
- [About the Create Pool Wizard on page 8-24](#)

### About pool volumes

A pool is an area used to create a snapshot image (virtual volume) for storing differential data from a primary volume. You must set up a pool before you can use any of the following volume replication functions:

- TrueCopy Extended Distance
- Copy-on-Write Snapshot/Thin Image

Hitachi Dynamic Provisioning software uses HDP pools to allocate “virtual” storage capacity based on their anticipated future capacity needs, using “virtual volumes” as opposed to a physical drive.

**Note:** As of Replication Manager 7.1.1, mainframe HDP volumes are supported for the Virtual Storage Platform. As of Replication Manager 8.0.0, mainframe HDP volumes are supported for the VSP G1000, VSP G1500, and VSP F1500 platform.

In enterprise class storage systems, separate pools are used for Copy-on-Write Snapshot/Thin Image and Dynamic Provisioning. With the exception of the HUS100 series, midrange storage systems use a single pool that is shared between Copy-on-Write Snapshot/Thin Image data and differential data for TrueCopy Extended Distance. (The HUS100 series uses DP pools instead of volume pools.)

For a volume to be used as a pool volume, the volume must meet the applicable requirements for the storage system type. For information on volume requirements for storage system types, see [Storage system types and volume requirements (pools) on page 8-21](#).

For each pool, you can specify the threshold value for pool usage to determine when the status changes to the warning status. For more information, see [Pool usage threshold values on page 12-20](#).

**Related topics**

- [Editing pools on page 15-8](#)
- [Deleting pools on page 15-9](#)

### Storage system types and volume requirements (pools)

Volumes that meet the requirements listed here are displayed as candidate volumes in Replication Manager.
• The system is an open system
• The storage system is VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, VSP, USP V/VM, HUS VM, Hitachi AMS2000, or Hitachi AMS/WMS.
• A Copy-on-Write Snapshot/Thin Image or TrueCopy Extended Distance license has been registered to the system.

Additionally the volume that will be used for a pool volume must meet the requirements in the following table.

### Storage system types and requirements for using volumes as pool volumes

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Hitachi AMS/WMS</th>
<th>Hitachi AMS2000</th>
<th>Universal Storage Platform V/VM</th>
<th>Virtual Storage Platform VSP G1000</th>
<th>VSP G1500</th>
<th>VSP F1500</th>
<th>VSP Gx00 models</th>
<th>VSP Fx00 models</th>
<th>HUS VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of volumes per pool</td>
<td>64</td>
<td>64</td>
<td>1024</td>
<td>1024</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>20 GB or more</td>
<td>N</td>
<td>8 GB to 4 TB</td>
<td>8 GB to 4 TB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emulation type</td>
<td>N</td>
<td>N</td>
<td>OPEN-V</td>
<td>OPEN-V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a paired volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a journal volume</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a command device</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a LUSE volume</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>y2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a V-VOL</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guard not specified</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a reserved attribute volume for volume migration</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not an On Demand volume</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A path to the volume is not set</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not on the system drive</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status must be normal</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status must be normal or Normal (Quick Format)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you edit the pool and the volume is internal, then SSD, FC, and SATA cannot coexist</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirement</td>
<td>Hitachi AMS/WMS</td>
<td>Hitachi AMS2000</td>
<td>Universal Storage Platform V/VM</td>
<td>Virtual Storage Platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you edit the pool, FC and SATA cannot coexist</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you edit the pool, SAS and SATA cannot coexist</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If you edit the pool, CLPR must be same as the selected pool</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>γ²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a DP-VOL</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a DP-pool-VOL</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a Quorum drive</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encrypted and non-encrypted volumes cannot coexist</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Must have the same RAID level as that of added pool volumes</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>γ¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a PoolOnly volume</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>γ³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a Data Direct Mapping volume</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>γ³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not a volume created when the drive type is FMC with volumes that belong to a parity group for which Accelerated Compression is enabled</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>γ³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:

Y: This requirement applies.

N: This requirement does not apply.

1. Only Copy-on-Write Snapshot pools are checked. Thin Image is not checked. (Does not apply to VSP G1000, VSP G1500, VSP F1500, and HUS VM storage systems.)
2. This restriction does not apply to VSP G1000, VSP G1500, and VSP F1500 storage systems.
3. This restriction does not apply to VSP and HUS VM storage systems.
About the Create Pool Wizard

Replication Manager includes a Create Pool Wizard for registering pool volumes. The wizard includes the following elements:

- A Pool ID drop-down list to select a pool ID to be assigned to a new pool
- Filters to narrow down the volumes to be registered as pool volumes
- A list of candidate volumes to be registered as pool volumes
- A list of volumes to be registered as pool volumes
- A Pool Option to set warning threshold for pool capacity usage rate

Related topics
- Launching the Create Pool Wizard on page 8-24

Launching the Create Pool Wizard

To launch the Create Pool Wizard:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the Pools tab, click Create Pool.
   The Create Pool Wizard starts.

Related topics
- About the Create Pool Wizard on page 8-24

Adding pools

To add a pool:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the Pools page, click Create Pool.
   The Create Pool Wizard starts.
5. Create a pool as instructed by the wizard.
The added pool is displayed in the Open subwindow.

Related topics

- About pool volumes on page 8-21
- Storage system types and volume requirements (pools) on page 8-21
- Pool usage threshold values on page 12-20

Setting up journal groups

Universal Replicator uses journal volumes as volume copy buffers. You must set up journal groups before creating Universal Replicator volume pairs. Journal Groups are used to keep the journal data for asynchronous data transfer. Journal groups must be set in each storage system on both the primary and secondary side. The journal volume for the primary site and the primary volume, and the journal volume for the secondary site and the secondary volume, are defined as journal groups.

You can set journal volumes and journal groups by using a wizard on the JNLGs tab in the Storage Systems view.

For details on how to add journal groups, see Adding journal groups on page 8-30.

About journal groups

Journal Groups are used to keep the journal data for asynchronous data transfer and must be set up before creating Universal Replicator volume pairs. Journal groups must be set in each storage system on both the primary and secondary side.

Replication Manager allows you to specify journal groups when all of the following conditions are met:

- An open system is being used.
- The storage system type is Universal Storage Platform V, Universal Storage Platform VM, VSP, VSP G1000, VSP G1500, VSP F1500.
- A license has been registered for Universal Replicator.

For a volume to be used as a journal volume, the volume must meet the applicable requirements for the storage system type. For more information, see Storage system types and volume requirements (journal) on page 8-26.

For each journal group, you can specify journal options. Specify each item according to the journal group status. To view items that can be specified as journal options, see Items permitted for journal options on page 8-27.

Related topics

- About the Create Journal Group Wizard on page 8-28
Storage system types and volume requirements (journal)

Volumes that meet the requirements listed here are displayed as candidate volumes in Replication Manager.

- The system is an open system
- The storage system is VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, VSP, USP V/VM, or HUS VM.
- A Universal Replicator license has been registered to the system.

Additionally the volume that will be used for a journal volume must meet the requirements in the following table.

### Storage system types and requirements for using volumes as journal volumes

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Universal Storage Platform V/VM</th>
<th>VSP and HUS VM</th>
<th>VSP G1000 VSP G1500 VSP F1500 VSP Gx00 models VSP Fx00 models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulation type</td>
<td>OPEN-V</td>
<td>OPEN-V</td>
<td>OPEN-V</td>
</tr>
<tr>
<td>Not a paired volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Path is not set</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a pool volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a command device</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a LUSE volume</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a V-VOL</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Guard not specified</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a reserved attribute volume for volume migration</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not an On Demand volume</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Not on the system drive</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Status must be normal</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Not a DP VOL</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Must be a DP-pool VOL</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>If you edit the journal group, all volumes are in the same CLPR partition for the journal group</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Encrypted and non-encrypted volumes cannot coexist</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
### Items permitted for journal options

<table>
<thead>
<tr>
<th>Item</th>
<th>Initial</th>
<th>Journal Group on the Primary Side (Master)</th>
<th>Journal Group on the Secondary Side (Restore)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Active</td>
<td>Stop</td>
</tr>
<tr>
<td>Inflow Control</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Data Overflow Watch Time</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Path Watch Time</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Forward Path Watch Time</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: This requirement applies.

N: This requirement does not apply.
### Items permitted for mirror options

The **mirror** option is available for Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, and HUS VM storage systems.

#### About the Create Journal Group Wizard

Replication Manager includes a Create Journal Group Wizard for creating journal groups.

The Create Journal Group Wizard provides the following functions:
- List to choose an available journal group ID for a new journal group
- CU, Capacity, and Parity Group filters to find the candidate journal volumes to assign to journal groups
- Functions to set the following journal group options:
  - Inflow Control
  - Path Watch Time*
  - Forward Path Watch Time*
  - Use of Cache
  - Speed of Line*
  - Delta resync Failure*
  - Copy Pace (mirror option)

The items marked with an asterisk (*) are displayed for Universal Storage Platform V/VM storage systems.

**Related topics**
- [Launching the Create Journal Group Wizard on page 8-29](#)

**Create journal group workflow**

The following figure illustrates the workflow for creating journal groups.

To launch the Create Journal Group Wizard:

1. In the **Explorer** menu, choose **Resources** and then **Storage Systems**.

     ![Create Journal Group Workflow Diagram](image-url)

Legend:
- : Required task
- : Optional task
The Storage Systems information is displayed in the Navigation area.

2. Expand a storage system, to open up the storage system information, and click **Open**.
   The storage system detailed information is displayed in the Application area.

3. In the **JNLGs** tab, click **Create JNLG**.
   The Create Journal Group Wizard starts.

**Related topics**
- [About the Create Journal Group Wizard on page 8-28](#)

**Adding journal groups**

**To add a journal group:**

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The *storage-system-name* subwindow appears.

3. Click the **Open** link.
   The Open subwindow appears.

4. On the JNLGs page, click **Create JNLG**.
   The Create Journal Group Wizard starts.

5. Create a journal group as instructed by the wizard.
   The added journal group is displayed in the Open subwindow.

**Related topics**
- [About journal groups on page 8-25](#)
- [Storage system types and volume requirements (journal) on page 8-26](#)
Customizing monitoring parameters

You can customize Replication Manager by configuring alert notification settings, refresh intervals, and data retention periods. You can set up alerts to monitor thresholds for copy pair status, performance metrics and copy license usage. You can also configure refresh intervals at which the latest storage system information is applied to the Replication Manager database and retention periods for data items such as received alerts, write delay time, and event logs.

This chapter describes how to set up alerts, refresh intervals and data retention periods.

- Setting up alerts
- Setting up refresh intervals
- Setting up data retention periods
Setting up alerts

You can set alert conditions for preventing buffer overflow errors and thereby ensure continuity of normal operation. Alert conditions can also be specified for copy pair status, copy license usage and performance thresholds for each copy group, journal group, sidefile, C/T Delta (Write Delay Time) or pool. Alerts can be set up using the Create Alert Setting Wizard.

For details on how to add alert settings, see the following:

- Setting the copy pair status monitoring conditions for each copy pair on page 9-8
- Setting the copy pair status monitoring conditions for each copy group on page 9-6
- Setting performance monitoring conditions for each copy group on page 9-9
- Setting performance monitoring conditions for each journal group on page 9-10
- Setting performance monitoring conditions for each pool on page 9-11
- Setting monitoring conditions for copy license usage on page 9-12

About alert settings

You can specify the following conditions for alerts:

- Copy pair status on page 9-3
- Performance threshold on page 9-3
- Copy license usage threshold on page 9-3

When an alert is issued, it is marked as **Not Completed** until the object leaves the monitored state subject to the alert. (If the status is unchanged when the next monitoring interval occurs, the alert is not re-sent.) Alerts are automatically marked as **Completed** according to the criteria described in Alert completion on page 9-3.

**Note:** An alert may be issued in the following condition regardless of the condition set by user:

- When a resource configuration is changed using the Replication Manager GUI.
- When the status of an information resource which was previously inaccessible becomes available again.

**Related topics**

- Alert retention on page 9-4
- Alert limits on page 9-4
- About the Create Alert Setting Wizard on page 9-5
- About handling errors on page 24-2
Copy pair status

An alert is sent when a copy pair or copy group achieves a specified status. For example, you can specify a condition for a copy group so that an alert is sent when an error status is detected. In this case, an alert is sent indicating the copy pairs of the group that are in error status. When all the constituent pairs attain **Completed** status, the copy group is given the **Completed** status.

⚠️ **Caution:** Even if the status of constituent pairs in the copy group changes again, the copy group remains in the **Completed** status.

Performance threshold

An alert is sent when a performance metric exceeds the preset threshold. You can specify the thresholds for the following performance metrics:

- Write delay time (C/T delta) in seconds on a copy group basis
- Pool volume usage on a pool basis (open systems)
- Sidefile usage on a copy group basis
  
  In open systems, you can specify the thresholds for the sidefiles on the primary and secondary volumes. In mainframe systems, you can only specify the threshold for the primary volume.

- Journal volume usage on a copy group basis
  
  In open systems, you can specify the journal volume usage thresholds for the primary and secondary volumes. In mainframe systems, you can also specify the thresholds for metadata.

Copy license usage threshold

An alert is sent when the copy license usage exceeds a preset threshold. Replication processes are disabled immediately once this threshold is exceeded. It is therefore necessary to set a license usage threshold value that provides enough time to add additional license capacity.

**Note:** You can specify the copy license usage threshold if the Device Manager server (acting as the information source) is v6.1 or later.

Alert completion

Alerts are automatically marked as **Completed** according to the criteria in the following table.

<table>
<thead>
<tr>
<th>Monitored condition</th>
<th>Completion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool usage for each pool</td>
<td>When current usage is less than or equal to the usage (%) specified for the alert.</td>
</tr>
<tr>
<td>Journal usage for each journal group</td>
<td></td>
</tr>
<tr>
<td>License usage</td>
<td></td>
</tr>
</tbody>
</table>
Monitored condition | Completion criteria
---|---
- Sidefile and journal volume usage | 
Write latency time (C/T delta) | The write latency time must be less than or equal to the time specified by the user for the alert to be completed.
Copy pair status | When the status of the copy pair transitions out of the state specified for the alert.
Copy group status | When all of the pairs contained in the copy group are marked Completed. (Even if the status of pairs in the copy group changes again, the copy group alert remains Completed.)

**Alert retention**

By default, alerts older than 30 days are routinely deleted regardless of whether they have been completed. As a result, **Not Completed** alerts older than 30 days are deleted and a new notification for the alert is sent during the next scheduled monitoring operation.

**Alert limits**

You can register a maximum of 1,000 alert settings. You can add monitoring targets to existing alert settings or edit existing alert settings (including deleting monitoring targets). If you specify multiple monitoring targets for a single alert, the total number of targets specified for all alerts cannot exceed 1,000. Templates can be used to specify alert settings (useful when specifying the same settings for many targets). You can register a maximum of 10 templates.

To reduce performance impact, the maximum number of detected pairs and pairs listed in an alert (or email notification) for a copy group is 10, displayed in ascending order of source IDs. When the number of pairs is greater than 10, the notice **More than 10 pairs were detected** is displayed in the output.

**Tip:** Note the following:

- The best practice is to configure alert settings before starting Replication Manager operations - either during initial setup or during re-configuration. If you set alerts or edit alert settings, we recommend that you perform a test before starting operation to make sure that the alerts are sent normally. See [Testing alert settings](#) for more information.
- If you use email or SNMP traps to send alerts, you can monitor the copy pair status and performance even when you are not logged in to Replication Manager.
- If you re-create a copy pair with volumes whose primary-secondary relationship is the opposite of that of the original copy pair, the new copy pair is no longer recognized as the same copy pair. If a copy pair included in the alert settings is re-created in this way, no alert is sent for the copy...
pair. To avoid this, remove the copy pair from the alert settings, and then re-register the copy pair.

**About the Create Alert Setting Wizard**

The Create Alert Setting Wizard allows you to configure alert settings to monitor the pair status or the performance information.

You can configure the following monitoring types depending on the resource type of the monitored target:

- **Pair Status Monitoring:** You can set alerts to monitor pair status when the resource type of the monitored target is a copy pair or copy group type.
- **Performance Monitoring:** You can set alerts to monitor performance information when the resource type is a copy group, pool, or journal group type.
- **Copy License Usage Monitoring:** You can set alerts to monitor copy license usage when the monitored target is the copy license.

You can select an alert creation mode depending on whether you create a new alert setting or add a resource to an existing alert setting. You can also set detailed information about the alert, such as a monitoring condition or an action for performance monitoring.

**Related topics**

- About alert settings on page 9-2
- Launching the Create Alert Setting Wizard on page 9-6

**Alert setting workflow**

The following figure illustrates the alert setting workflow.
Launching the Create Alert Setting Wizard

You can launch the Create Alert Setting Wizard from the following locations on the web interface depending on the monitored target:

- **Copy Groups** tab
- **Pools** tab
- **JNLGs** tab
- **Copy Licenses** tab

To launch the Create Alert Setting Wizard, click **Create Alerts** in the Application area.

**Related topics**
- [About the Create Alert Setting Wizard on page 9-5](#)

Setting the copy pair status monitoring conditions for each copy group

To set the conditions for monitoring copy pair status on a copy group basis:

1. If you intend to use SNMP traps to send alerts, first load the MIB definition files into the software that will receive the traps.
For the location of the Replication Manager MIB definition files, see About MIB definition files on page 24-5.

2. Display the information about the copy groups for which you want to set monitoring conditions.

**Tip:** The best way to access alert settings related to copy groups is with the **Copy Groups** tab of the Alerts Setting List of the Alerts subwindow. For more information, see Viewing alerts and settings on page 17-3.

For details on how to display this information, see the following:

- Viewing individual host information on page 14-6
- Viewing information about copy groups or snapshot groups belonging to a host on page 14-9
- Viewing copy pair configuration definition information on page 12-6
- Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8

3. Select the check boxes of the copy groups for which you want to set monitoring conditions and click **Create Alerts**. If the information about copy groups for which you want to set monitoring conditions is already displayed, simply click **Create Alerts**.

The Create Alert Setting Wizard starts with the 1. Introduction page displayed.

If you select the **Don’t show this message again** check box, this page is not displayed in the future.

4. Read the wizard page, and then click **Next**.

The 2. Select Monitoring Type page appears.

5. Select the **Pair Status Monitoring** option and click **Next**.

The 3. Select Alert Setting page appears.

6. Select the **Create New Alert Setting** option and click **Next**.

The 4. Edit Alert Action page appears.

7. Specify the alert notification conditions and method.

You can also save these settings as a template or use an existing template.

8. Click **Next**.

The 5. Confirm page appears.

9. Confirm the settings that will be applied and click **Confirm**.

The 6. Finish page appears.

10. Click **Finish**.

The settings specified in the wizard are registered in the list of alert settings.

To view this list, from the **Explorer** menu, choose **Alerts** and then **Alerts**.

**Related topics**

- Monitoring pair statuses using alerts on page 12-8
Setting the copy pair status monitoring conditions for each copy pair

To set the conditions for monitoring copy pair status on a copy pair basis:

1. If you intend to use SNMP traps to send alerts, load the MIB definition files into the software that will receive the traps. For the location of the Replication Manager MIB definition files, see About MIB definition files on page 24-5.

2. Display the information about the volume or copy group that contains the copy pair where you want to set monitoring conditions. For details on how to display this information, see the following:
   - Viewing information about copy groups or snapshot groups belonging to a host on page 14-9
   - Viewing information about volumes belonging to a storage system on page 14-12
   - Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8

3. Select the check boxes of the copy pairs for which you want to set monitoring conditions, and then click Create Alerts. The Create Alert Setting Wizard starts with the 1. Introduction page displayed.
   If you select the Don’t show this message again check box, this page is not displayed in the future.

4. Read the wizard page, and then click Next. The 2. Select Monitoring Type page appears.

5. Select the Pair Status Monitoring option, and then click Next. The 3. Select Alert Setting page appears.


7. Specify the alert notification conditions and method. You can also save these settings as a template or use an existing template.


9. Confirm the settings that will be applied and click Confirm. The 6. Finish page appears.

10. Click Finish. The settings specified in the wizard are registered in the list of alert settings. To view this list, from the Explorer menu, choose Alerts and then Alerts.
Setting performance monitoring conditions for each copy group

To set the performance monitoring conditions on a copy group basis:

1. If you intend to use SNMP traps to send alerts, load the MIB definition files into the software that will receive the traps.
   For the location of the Replication Manager MIB definition files, see About MIB definition files on page 24-5.

2. Display the information about the copy groups where you want to set monitoring conditions.
   For details on how to display this information, see the following:
   - Viewing individual host information on page 14-6
   - Viewing information about copy groups or snapshot groups belonging to a host on page 14-9
   - Viewing copy pair configuration definition information on page 12-6
   - Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8

3. Select the check boxes of the copy groups where you want to set monitoring conditions, and click Create Alerts. If the information about copy groups where you want to set monitoring conditions is already displayed, just click Create Alerts.
   The Create Alert Setting Wizard starts with the 1. Introduction page displayed.
   If you select the Don’t show this message again check box, this page is not displayed in the future.

4. Read the wizard page, and then click Next.
   The 2. Select Monitoring Type page appears.

5. Select the Performance Monitoring option, and then click Next.
   The 3. Select Alert Setting page appears.

6. Select the Create New Alert Setting option and click Next.
   The 4. Edit Alert Action page appears.

7. Specify the alert notification conditions and method.
   You can also save these settings as a template or use an existing template.

8. Click Next.
   The 5. Confirm page appears.

9. Confirm the settings that will be applied and click Confirm.
   The 6. Finish page appears.

10. Click Finish.
    The settings specified in the wizard are registered in the list of alert settings.
To view this list, from the Explorer menu, choose Alerts and then Alerts.

Related topics

- Setting performance monitoring conditions for each pool on page 9-11
- About performance monitoring on page 12-15

Setting performance monitoring conditions for each journal group

To set the performance monitoring conditions on a journal group basis:

1. If you intend to use SNMP traps to send alerts, load the MIB definition files into the software that will receive the traps.
   For the location of the Replication Manager MIB definition files, see About MIB definition files on page 24-5.
2. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
3. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed.
4. Click the Open link.
   The Open subwindow appears.
5. On the JNLGs page, select the check boxes of the journal groups where you want to set monitoring conditions, and then click Create Alerts.
   The Create Alert Setting Wizard starts with the 1. Introduction page displayed.
   If you select the Don’t show this message again check box, this page is not displayed in the future.
6. Read the wizard page, and then click Next.
   The 2. Select Monitoring Type page appears.
7. Select the Performance Monitoring option, and then click Next.
   The 3. Select Alert Setting page appears.
8. Select the Create New Alert Setting option, and then click Next.
   The 4. Edit Alert Action page appears.
9. Specify the alert notification conditions and method.
   You can also save these settings as a template or use an existing template.
10. Click Next.
    The 5. Confirm page appears.
11. Confirm the settings that will be applied, and then click Confirm.
    The 6. Finish page appears.
12. Click Finish.
The settings specified in the wizard are registered in the list of alert settings.
To view this list, from the Explorer menu, choose Alerts and then Alerts.

Related topics
- Setting performance monitoring conditions for each copy group on page 9-9
- Setting performance monitoring conditions for each pool on page 9-11
- About performance monitoring on page 12-15

Setting performance monitoring conditions for each pool

To set the performance monitoring conditions on a pool basis:
1. If you intend to use SNMP traps to send alerts, load the MIB definition files into the software that will receive the traps.
   For the location of the Replication Manager MIB definition files, see About MIB definition files on page 24-5.
2. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
3. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed.
4. Click the Open link.
   The Open subwindow appears.
5. On the Pools page, select the check boxes of the pools where you want to set monitoring conditions, and then click Create Alerts.
   The Create Alert Setting Wizard starts with the 1. Introduction page displayed.
   If you select the Don’t show this message again check box, this page is not displayed in the future.
6. Read the wizard page, and then click Next.
   The 2. Select Monitoring Type page appears.
7. Select the Performance Monitoring option, and then click Next.
   The 3. Select Alert Setting page appears.
8. Select the Create New Alert Setting option, and then click Next.
   The 4. Edit Alert Action page appears.
9. Specify the alert notification conditions and method.
   You can also save these settings as a template or use an existing template.
10. Click Next.
    The 5. Confirm page appears.
11. Confirm the settings that will be applied, and then click Confirm.
The 6. Finish page appears.
12. Click Finish.
   The settings specified in the wizard are registered in the list of alert settings.
   To view this list, from the Explorer menu, choose Alerts and then Alerts.

Related topics
- Setting performance monitoring conditions for each copy group on page 9-9
- Setting performance monitoring conditions for each journal group on page 9-10
- About performance monitoring on page 12-15

Setting monitoring conditions for copy license usage

To set monitoring conditions for copy license usage:

1. If you intend to use SNMP traps to send alerts, load the MIB definition files into the software that will receive the traps.
   For the location of the Replication Manager MIB definition files, see About alert management on page 17-2.
2. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
3. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed.
4. Click the Open link.
   The Open subwindow appears.
5. Under the Copy Licenses tab, select the check boxes of the copy types where you want to set monitoring conditions, and then click Create Alerts.
   The Create Alert Setting Wizard starts with the 1. Introduction page displayed. If you select the Don’t show this message again check box, this page is not displayed in the future.
6. Read the wizard page, and then click Next.
   The 2. Select Monitoring Type page appears.
7. Select the Copy License Usage Monitoring option, and then click Next.
   The 3. Select Alert Setting page appears.
8. Select the Create New Alert Setting option, and then click Next.
   The 4. Edit Alert Action page appears.
9. Specify the alert monitoring conditions and notification method.
   You can also save these settings as a template or select an existing template to apply to them.
10. Click **Next**.
   The **5. Confirm** page appears.
11. Confirm the settings to be applied, and then click **Confirm**.
   The **6. Finish** page appears.
12. Click **Finish**.
   The settings specified in the wizard are registered in the list of alert settings. To view this list, from the **Explorer** menu, select **Alerts**, and then **Alerts**.

**Related topics**
- [Viewing license information on page 18-3](#)

**Adding monitored targets**

**To add a monitored target:**

1. Select the resources you want to add as monitoring targets, and then click **Create Alerts**.
   The Create Alert Setting Wizard starts with the **1. Introduction** page displayed.
2. Read the wizard page, and then click **Next**.
   The **2. Select Monitoring Type** page appears.
3. Select the monitoring type you want to use, and then click **Next**.
   The **3. Select Alert Setting** page appears.
4. Select the **Select Existing Alert Setting** option, and then select the alert you want to use from the **Alert Setting List**.
5. Click **Next**.
   The **4. Edit Alert Action** page appears.
6. Check the alert notification conditions and method, and then change them if necessary.
7. Click **Next**.
   The **5. Confirm** page appears.
8. Confirm the settings that will be applied, and then click **Confirm**.
   The **6. Finish** page appears.
9. Click **Finish**.
   The settings specified in the wizard are registered in the list of alert settings. To view this list, from the **Explorer** menu, choose **Alerts** and then **Alerts**.

**Related topics**
- [About alert settings on page 9-2](#)
- [About the Create Alert Setting Wizard on page 9-5](#)
- [Viewing alerts and settings on page 17-3](#)
Setting up refresh intervals

You can automatically update configuration information and pair status information at specified intervals for each information source.

The following are the default settings for refresh intervals:

- Configuration information: Refreshed at 3:02 AM every day
- Pair status information: The refresh interval differs depending on the information source. The information from the Device Manager server is refreshed every 24 hours, and the information from the Device Manager agents and instances of Business Continuity Manager and Mainframe Agent is refreshed every five minutes.

To change the automatic updating settings, see Refreshing configuration information automatically (using the refresh settings) on page 11-16.

For details on how to refresh copy pair status, see Refreshing the copy pair status automatically for each information source on page 11-10.

Related topics

- About refreshing copy pair status on page 11-4

Calculating the copy pair status refresh interval

You should set refresh intervals values such that copy pair status refresh operations have minimal impact on management servers and pair management servers. The automatic refresh interval you specify should be greater than the time required for an individual pair management server to collect pair status.

To calculate the interval for refreshing the copy pair status:

1. From the Explorer menu, select Administration and then Event Logs. The event log data is listed in the Event Logs subwindow.
2. Use the message IDs in the event log to identify the date and time when an individual pair management server (host) started or ended the pair status collection.
   The following table lists message IDs that are output when copy pair status collection starts or ends:

<table>
<thead>
<tr>
<th>Type of system</th>
<th>Message ID</th>
<th>When the pair status collection is started</th>
<th>When the pair status collection is ended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open system</td>
<td>KAVN00123-I</td>
<td>KAVN00124-I</td>
<td></td>
</tr>
<tr>
<td>Mainframe system</td>
<td>KAVN00126-I</td>
<td>KAVN00127-I</td>
<td></td>
</tr>
</tbody>
</table>

3. Use the start and end time identified in step 2 to calculate the time required to collect the pair status for an individual pair management server (host).
4. Specify the refresh interval with a value greater than the time calculated in this step 3.

Related topics
- About refreshing copy pair status on page 11-4
- Refreshing the copy pair status automatically for each information source on page 11-10
- Refreshing copy pair status automatically for each pair management server on page 11-11

Setting up data retention periods

You can set the retention period for the alert data, event log data, task data, performance information, and other data managed by Replication Manager. Data is automatically deleted when its retention period expires. By default, the retention period is set to 30 days and automatic deletion is performed at 2:17 AM.

To change the default settings, from the Explorer menu, choose Administration and then Data Retention.

For details, see Editing the data retention period on page 9-16.

About data retention periods

Data retention periods can be set for the following types of data items:

- Received alerts
- Write delay time (C/T delta)
- Event log data
- Sidefile and journal volume usage
- Pool volume usage (open systems)
- Tasks

Tip: If the total number of data items (including alerts, C/T delta, event logs, sidefile, journal volume usage, and pool volume usage, but excluding tasks) exceeds 30,000,000, some of the old data might be deleted even if the retention period for the data has not expired. In this case, take either of the following actions:

- Disable the retention of unnecessary data, or shorten the retention period.
- Lengthen the refresh interval for management information.

Related topics
- Viewing the data retention period on page 9-16
- Editing the data retention period on page 9-16
Viewing the data retention period

You can view the data retention periods for the following types of data:

- Received alerts
- Write delay time (C/T delta)
- Event log data
- Sidefile and journal volume usage
- Pool volume usage (open systems)
- Tasks

To view the data retention period, from the Explorer menu, choose Administration and then Data Retention. The data retention period of each type of data is displayed in list format in the Data Retention subwindow.

Related topics
- About data retention periods on page 9-15

Editing the data retention period

To edit the data retention period:

1. From the Explorer menu, choose Administration and then Data Retention.
   The Data Retention subwindow appears.

2. Click the icon of the type of data whose retention period you want to edit.
   The Edit Data Retention - data-type-name dialog box appears.

3. Edit and update the data retention period settings.
   The data retention period settings displayed in the Data Retention subwindow are refreshed.

Related topics
- About data retention periods on page 9-15
Managing pair life cycle

You can use the pair configuration and pair life cycle management capabilities of Replication Manager to create and manage copy pairs. You can also perform daily pair operations and volume replication using the configured pairs.

This chapter describes tasks for defining copy pairs and performing pair operations.

- About pair life cycle management
- About the pair management wizards
- Pair configuration definition workflow
- Defining copy pairs and pair groups
- Defining copy groups
- Creating a container with multiple copy groups (mainframe systems)
- Defining multi-target and cascade configurations
- Using a GAD 3DC delta resync configuration
- Using snapshot groups
- Scheduling and managing tasks
- Distributing copy group definitions (mainframe)
- Creating and managing workflows
- Managing copy pair configuration definitions
- Performing pair operations
- Monitoring and managing storage systems using virtual command devices
- Monitoring and management of copy groups defined by device group
- Using global storage virtualization features with Replication Manager
**About pair life cycle management**

Replication Manager allows you to create or edit copy pairs (to accommodate increases in job size), perform volume replication, and change copy pair status after error recovery.

**Tip:** For mainframe systems, Replication Manager only supports the pair definition function for creating a copy pair configuration definition. Mainframe copy pairs are not automatically created after completion of pair configuration. Mainframe pair creation must be performed using Business Continuity Manager.

**Related topics**

- Explorer menu items for copy pair management on page 10-4
- About copy pair status on page 10-100
- About copy pair configuration definitions on page 10-11
- About copy pair states on page 10-109

**Copy pair management functions**

The following copy pair management functions are supported by Replication Manager:

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating copy pair configuration definitions</td>
<td>Y</td>
</tr>
<tr>
<td>Editing copy pair configuration definitions</td>
<td>Y</td>
</tr>
<tr>
<td>Changing the copy pair status</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing a list of tasks</td>
<td>Y</td>
</tr>
<tr>
<td>Editing tasks</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting tasks</td>
<td>Y</td>
</tr>
<tr>
<td>Canceling tasks</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing a list of workflows</td>
<td>Y</td>
</tr>
<tr>
<td>Editing workflows</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting workflows</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Tip:** Based on the Modify permission, you can also assign *user roles* that have greater granularity and give you more control over the tasks that users can perform. See *About user roles on page 6-3* for more information.

**Legend:**

- **Y:** Can be used with this permission.
- **N:** Cannot be used with this permission.
Tip: Users only have control over resources within their assigned resource group(s).

Explorer menu items for copy pair management

The following table shows the Explorer menu items that are related to copy pair management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Menu command</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td></td>
<td>Admin Modify View</td>
</tr>
<tr>
<td>Resources</td>
<td>Hosts</td>
<td>Y Y Y</td>
</tr>
<tr>
<td></td>
<td>Storage Systems</td>
<td>Y Y Y</td>
</tr>
<tr>
<td></td>
<td>Pair Configurations</td>
<td>Y Y Y</td>
</tr>
<tr>
<td>Tasks</td>
<td>Tasks</td>
<td>Y Y Y</td>
</tr>
<tr>
<td></td>
<td>Workflows</td>
<td>Y Y Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.

About the pair management wizards

Replication Manager provides two pair management wizards. The Pair Configuration Wizard is provided for the creation and editing of copy pair configuration definitions. The Change Pair Status Wizard allows you to change the copy pair status.

For details about pair management wizards, see the following:
- About the Pair Configuration Wizard on page 10-4
- About Change Pair Status Wizard on page 10-125

About the Pair Configuration Wizard

Replication Manager includes a Pair Configuration Wizard for defining pair structures and managing the entire topology of the desired pair structure from a single window. The wizard also allows you to manage primary and secondary devices independently and helps avoid creation of invalid configurations.

The Pair Configuration Wizard includes the following:

1. Topological view
   This view provides an intuitive graphical representation of the relationships between copy groups and allows you to specify complex pair structures easily.
2. Volume Filters
Criteria filters such as Site, Hosts, Storage System and Logical groups as filtering attributes quickly narrows the selection of candidate volumes.

The Pair Configuration Wizard provides graphical views for performing the following operations:

- Create a copy pair or copy group.
- Add a copy pair to an existing copy group.
- Add a new pair group to an existing copy group.
- Delete a copy pair in an existing copy group.
- Delete an existing copy group.
- Adding and deleting redundant pair management server nodes

When the wizard finishes processing, tasks and a workflow are registered automatically. A task is created for each copy group, and a workflow is created as a set of related tasks. When you create or edit copy pair configuration definitions, you can specify the execution schedule for the registered tasks and also edit or cancel registered tasks. You can also interrupt the Pair Configuration Wizard and temporarily save the incomplete definition as a workflow. You can then restart the wizard to continue work on the saved workflow. A temporarily saved workflow can also be used so an application server administrator can complete a definition started by a storage system administrator.

Related topics
- Pair configuration workflow on page 10-5
- Launching the Pair Configuration Wizard on page 10-6

Pair configuration workflow

The following figure illustrates the workflow for pair configuration.
Launching the Pair Configuration Wizard

You can launch the Pair Configuration Wizard from the following locations on the web interface:

- Unpaired LUN List: The Unpaired LUN list does not include copy pairs. The wizard can be launched from this list to configure new volume pairs.
- Paired LUN List: The Paired LUN list includes copy pairs. The wizard can be launched from this list to delete or modify existing volume pairs.
- Unpaired DEVNs List: The wizard can be launched from this list to configure new volume pairs.
- Paired DEVNs List: The Paired DEVNs list includes copy pairs. The wizard can be launched from this list to delete or modify existing volume pairs.
- Copy Pair List: The wizard can be launched from this list to delete or modify existing volume pairs.
- Copy Groups List: The wizard can be launched from this list to modify volume pairs using copy groups.

Tip: The default display of the 2. Pair Association page differs depending how the wizard is launched, but the functionality is the same.

To launch the Pair Configuration Wizard, click Pair Management in the bottom right of the Application area.

Related topics

- About the Pair Configuration Wizard on page 10-4
- Limitations for launching the Pair Configuration Wizard on page 10-6

Limitations for launching the Pair Configuration Wizard

The following limitations apply when launching the Pair Configuration Wizard:

Note: The term LUN (Logical Unit Number) only applies to open systems. For mainframe systems, the analogs are LDEV (Logical Device) and DEVN (Device Number).

<table>
<thead>
<tr>
<th>Method for launching the wizard</th>
<th>Conditions when the wizard cannot be launched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selecting an Unpaired LUN</td>
<td>• The LU has been reserved by another workflow.</td>
</tr>
<tr>
<td></td>
<td>• The LU is a virtual volume.</td>
</tr>
<tr>
<td></td>
<td>• If the LU is an internal volume to which an external volume is mapped, the host I/O suppression mode is enabled.</td>
</tr>
<tr>
<td></td>
<td>• Replication Manager is not aware of the pair management server that is identifying the associated storage system command device.</td>
</tr>
<tr>
<td></td>
<td>• A volume spanning multiple storage systems is selected.</td>
</tr>
<tr>
<td></td>
<td>• The volume is a DP-Pool-VOL.</td>
</tr>
<tr>
<td></td>
<td>• The volume is a journal volume.</td>
</tr>
<tr>
<td>Method for launching the wizard</td>
<td>Conditions when the wizard cannot be launched</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Selecting a copy group</td>
<td>• A copy group that belongs to the same cascade has been reserved by another workflow.</td>
</tr>
<tr>
<td>Selecting a Paired LUN</td>
<td>• A copy group that belongs to the same cascade contains pairs of multiple copy types.</td>
</tr>
<tr>
<td></td>
<td>• Replication Manager is not aware of the pair management server (on either the primary or secondary side) that manages copy groups belonging to the same cascade.</td>
</tr>
<tr>
<td></td>
<td>• A pair that has the same primary volume exists in a copy group belonging to the same cascade.</td>
</tr>
<tr>
<td></td>
<td>• A copy group belonging to the same cascade has more than one primary or secondary storage system.</td>
</tr>
<tr>
<td></td>
<td>• In a cascade configuration, the number of pairs in the parent group is less than the number of pairs in the child group.</td>
</tr>
<tr>
<td></td>
<td>• Any group in the topology is a copy group defined by device group.</td>
</tr>
<tr>
<td></td>
<td>• The copy group names or the pair names of the groups involved in the same duplicate configuration are different.</td>
</tr>
<tr>
<td></td>
<td>• The storage system is VSP G1000, VSP G1500, or VSP F1500 and the snapshot group includes copy pairs without an S-VOL assigned. You have a copy group or snapshot group of a cascade or multi-target configuration, and the topology includes copy pairs with and without S-VOLs assigned coexist in the snapshot groups.</td>
</tr>
<tr>
<td></td>
<td>• The snapshot group does not include a copy pair using a DP-VOL as an S-VOL (copy pairs with the clone attribute or corresponding to a cascade configuration).</td>
</tr>
<tr>
<td>Selecting a Paired LUN</td>
<td>• At least one of the selected volumes does not belong to the same copy group.</td>
</tr>
</tbody>
</table>

**Pair configuration definition workflow**

The following figure shows the flow for defining copy pairs and replicating volumes.
Defining copy pairs and pair groups

This module discusses how copy pair configuration definitions are created and tasks for defining copy pairs and pair groups:

- About copy pairs on page 10-9
- About copy pair configuration definitions on page 10-11
- About creating copy pair configuration definitions on page 10-12
- Creating pairs and pair groups on page 10-21
- Editing pair names on page 10-22
- About filtering candidate volumes on page 10-23
About copy pairs

A copy pair is a pair of volumes linked by the storage system's volume replication functionality (such as ShadowImage and TrueCopy). Copy pairs are also called paired volumes.

The following types of volumes make up a copy pair:

- Primary volume (P-VOL): The copy source volume.
- Secondary volume (S-VOL): The destination volume to which the contents of the primary volume are copied.
- Secondary-primary volume (SP-VOL): The volume located in the middle of a cascade configuration. A secondary-primary volume is both the secondary volume in an upper-level copy pair and the primary volume in a lower-level copy pair.

Related topics

- About pair life cycle management on page 10-3
- Copy pair management functions on page 10-3
- Explorer menu items for copy pair management on page 10-4
- About copy pair status on page 10-100
- About copy pair configuration definitions on page 10-11

Create copy pair workflow

The following figure shows the flow for creating a copy pair.
About copy pair configuration definitions

Copy pair configuration definitions are generated when a new copy group is created. Pre-existing copy pair configuration definitions can also be imported into Replication Manager.

New copy pair configuration definitions are created and edited using the Pair Configuration Wizard.

Related topics

• Pair configuration definition workflow on page 10-7
• About creating copy pair configuration definitions on page 10-12
• About configuration definition file formats on page 10-11
• Importing existing configuration definition files on page 10-83

About configuration definition file formats

New configuration definition files (HORCM configuration files) can be generated in either HORCM_LDEV format or HORCM_DEV format. Replication Manager allows you to specify the format for new configuration definition files using the server.agent.rm.pairDefinitionForm and server.agent.rm.cuLdevForm properties in the Device Manager agent server.properties file. (For detailed property file descriptions, see the Hitachi Command Suite Administrator Guide.)

By default, new configuration definition files are generated in the HORCM_DEV format. To change the default format to HORCM_LDEV, set the value of server.agent.rm.pairDefinitionForm to HORCM_LDEV.

Furthermore, HORCM_LDEV configuration files use the hexadecimal CU:LDEV format by default. If you wish to change this, you can set the value of server.agent.rm.cuLdevForm as described in the following table:

<table>
<thead>
<tr>
<th>Storage System Type</th>
<th>Value of server.agent.rm.cuLdevForm</th>
<th>HORCM_LDEV format (Decimal/Hex)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, and HUS VM</td>
<td>Empty (Default)</td>
<td>Decimal Hex(CU:LDEV)</td>
<td>15067 3A:DB 0x3ADB</td>
</tr>
<tr>
<td>Midrange storage systems</td>
<td>Invalid value</td>
<td>Hex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DECIMAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CULDEV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HEXA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midrange storage systems</td>
<td>Empty (Default)</td>
<td>Decimal</td>
<td>150</td>
</tr>
</tbody>
</table>
**Note:** The hex format is available only for enterprise-class storage systems.

To maintain consistency of configuration definition file formats, Replication Manager does not allow creation of configuration definition files with mixed formats. However, Replication Manager supports pre-existing configuration definition files that have mixed formats. When new copy pairs are added to an existing copy group, Replication Manager confirms the existing file format of the configuration definition file and applies the same format for the new copy pairs. If new copy pairs are added to a pre-existing configuration definition file that has mixed formats (HORCM_LDEV and HORCM_DEV formats), Replication Manager determines the format for the new copy pairs using the `server.agent.rm.pairDefinitionForm` property in the Device Manager agent `server.properties` file.

**Caution:** Use a physical ID to define a copy pair if you perform a remote copy between a VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models storage system and a storage system that does not support virtual storage machines.

### Default location of configuration definition files

The default location of configuration definition files is determined as follows:

**In Windows:** The system folder indicated by the `%WINDIR%` environment variable.

**In UNIX:** the `/etc` directory.

To change the folder or directory, edit the value of the `server.agent.rm.horcmSource` property of the `server.properties` file.

If you manage the replica (create or restore) in Windows, you must place the configuration definition file in the Windows system folder.

If you create a copy pair using Storage Navigator or other operation management software, no configuration definition file exists. Therefore, no configuration definition information is displayed in the Pair Configurations view.

### About creating copy pair configuration definitions

Replication Manager allows you to create copy pair configuration definitions in open systems where the storage system type is VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, Virtual Storage Platform, Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series, HUS VM, USP V/VM, or Virtual Storage Platform and in mainframe systems where the storage system type is Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500.

There are some requirements to be satisfied before creating copy pair configuration definitions. For information on copy pair configuration requirements, see [Copy pair configuration conditions on page 10-13](#). If the
defined configuration does not satisfy these requirements, an error will occur when the copy pair configuration task is executed.

In mainframe systems, there are additional prerequisites for pair configuration. For details about prerequisites for pair configuration in mainframe systems, see Prerequisites for pair configuration on page 10-15.

The maximum number of copy pairs that can be specified differs depending on the storage system and copy type. For details on this number, see the relevant storage system manual. For information on permitted copy types for copy pair configuration definitions for different storage system types, see Storage system conditions for pair configuration definition on page 10-16.

Tip: Use the latest versions of the storage system's microprogram and CCI.

Caution: While a copy pair configuration definition is being created, do not use storage system operation management software, such as Device Manager, CCI, Storage Navigator, Business Continuity Manager, to perform concurrent operations on a volume, copy group, or copy pair specified in that definition. Using this software may cause errors when Replication Manager executes tasks.

Related topics
- Pair configuration definition workflow on page 10-7
- Storage system conditions for pair configuration definition on page 10-16
- Copy pair configuration conditions on page 10-13
- Prerequisites for pair configuration on page 10-15
- Copy type requirements for pair configuration definitions on page 10-33

Copy pair configuration conditions

You can use the Pair Configuration Wizard to define a copy pair configuration that satisfies the conditions listed in the following table. If the defined configuration does not satisfy these requirements (or exceeds the documented limits), an error occurs during task execution, even if the wizard finishes normally.

Table 10-2 Number of generations possible with multi-target configuration

<table>
<thead>
<tr>
<th>Storage system</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ShadowImage</td>
</tr>
<tr>
<td>Virtual Storage Platform</td>
<td>First layer: 3</td>
</tr>
<tr>
<td></td>
<td>Second layer: 2¹</td>
</tr>
<tr>
<td>VSP G1000, VSP G1500, or VSP F1500</td>
<td></td>
</tr>
</tbody>
</table>

Managing pair life cycle

10-13
Hitachi Replication Manager User Guide
### Storage system

<table>
<thead>
<tr>
<th>Storage system</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Storage Platform V/VM</td>
<td>ShadowImage: --, Thin Image: --, Copy-on-Write Snapshot: 64</td>
</tr>
<tr>
<td>VSP Gx00 models, VSP Fx00 models, HUS VM</td>
<td>First layer: 3, Second layer: 2, Copy group: 64, Snapshot group: 512²</td>
</tr>
<tr>
<td>HUS100 series Hitachi AMS 2000</td>
<td>8, --</td>
</tr>
<tr>
<td>Hitachi AMS/WMS</td>
<td>3, --</td>
</tr>
</tbody>
</table>

**Notes:**
1. Cascading to second layer is not possible for mainframe pair configurations.
2. The Device Manager CLI supports creating and displaying 1024 generations of snapshot groups (multiple generations per group). Replication Manager supports displaying 1024 generations of snapshot groups created using Device Manager (multiple generations per group), but can only manage 512 generations (1 generation per group).

### Table 10-3 Limits on primary volumes and copy generations

<table>
<thead>
<tr>
<th>Storage System</th>
<th>Number of primary volumes that can be added</th>
<th>Number of copy generations</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP G1000, VSP G1500, or VSP F1500</td>
<td>No limit</td>
<td>65,280</td>
</tr>
<tr>
<td>Virtual Storage Platform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Storage Platform V/VM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Storage Platform V/VM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Storage Platform V/VM (CVS not installed)</td>
<td>1</td>
<td>1 (inactive)</td>
</tr>
<tr>
<td>HUS VM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSP G200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSP G400, G600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSP F400, F600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSP G800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSP F800</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 10-4 Requirement for LUSE volumes when creating a copy pair

<table>
<thead>
<tr>
<th>Storage system</th>
<th>Maximum number of LUs</th>
<th>Other requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage systems other than HUS100, Hitachi AMS2000, or Hitachi AMS/WMS</td>
<td>--</td>
<td>If the primary and secondary volumes are LUSE volumes, they must have the same number of constituent LDEVs.</td>
</tr>
<tr>
<td>HUS100 series</td>
<td>128</td>
<td>• The capacity of the individual volumes must be 1 GB or more.</td>
</tr>
<tr>
<td>Hitachi AMS 2000</td>
<td></td>
<td>• If the primary and secondary volumes are LUSE volumes, they must have the same number of constituent LDEVs.</td>
</tr>
<tr>
<td>Hitachi AMS/WMS</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

### Prerequisites for pair configuration

The following items need to be verified before performing pair configuration operations.

**Open**

- The storage system P-VOL and S-VOL are registered to Device Manager and the Device Manager instance is registered as an information source. If using a copy type, a remote path is set.
  - If selecting an LU, it must not be associated with a device group.
- The storage system is midrange and a DMLU is set if required.
- LDEVs that are managed by CCI and LDEVs that are managed by Business Continuity Manager do not coexist.

**Mainframe**

- The disk configuration definition file for the volumes to be used as the P-VOL and S-VOL of the copy pair has been created using Replication Manager or from a volume scan by Business Continuity Manager.
- The created disk configuration definition file is stored under the same prefix on the same host.
- Datasets for storing a copy group definition file have been allocated under the same prefix.
- The versions of all instances of BCM registered as information sources in are 6.3 or later.

**Note:** Creating copy pairs using LUSE volumes and Thin Image and snapshot group pairs not supported
Support for UR x UR configurations

Cascade and multi-target configurations of UR x UR are supported in conjunction with Business Continuity Manager v7.3. BCM must be used to create the configuration; Replication Manager can only be used to update an existing UR x UR configuration.

Note: When attempting to delete copy pairs from a UR x UR configuration for a mainframe system, switch the status of all the copy pairs in the concatenated copy groups of the two instances to Suspend, and then delete the copy pairs.

Storage system conditions for pair configuration definition

The following tables describe the correspondence between the copy types that can be specified for copy pair configuration definitions and the storage system type.

Supported combinations of local copy types and storage systems (enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, and HUS VM)

<table>
<thead>
<tr>
<th>P-VOL</th>
<th>VSP G1000, VSP G1500, VSP F1500</th>
<th>VSP</th>
<th>USP V/VM</th>
<th>HUS VM</th>
<th>VSP Gx00 models, VSP Fx00 models</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP G1000, VSP G1500, VSP F1500</td>
<td>SI, TI¹</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>VSP</td>
<td>--</td>
<td>SI, TI/COW</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>USP V/VM</td>
<td>--</td>
<td>--</td>
<td>SI, COW</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HUS VM</td>
<td>--</td>
<td>--</td>
<td>SI, TI</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>VSP Gx00 models, VSP Fx00 models</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>SI, TI</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: If you define a mainframe system copy pair using CCI, you cannot specify the copy type of the local copy.

Legend:

--: Not applicable
SI: ShadowImage
TI: Thin Image
TI/COW: Thin Image or Copy-on-Write Snapshot

Notes:
1. Replication Manager only supports using V-VOLs (virtual volumes created from a Thin Image pool) as an S-VOL. To manage a snapshot group that includes a copy pair using a DP-VOL as an S-VOL (copy pairs with the clone attribute or corresponding to a cascade configuration), use Storage Navigator or CCI.

**Supported combinations of remote copy types and storage systems (enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, and HUS VM)**

<table>
<thead>
<tr>
<th>P-VOL</th>
<th>VSP G1000, VSP G1500, VSP F1500</th>
<th>S-VOL</th>
<th>USP V/VM</th>
<th>HUS VM</th>
<th>VSP Gx00 models</th>
<th>VSP Fx00 models</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP G1000 VSP G1500 VSP F1500</td>
<td>TCS, UR GAD</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
</tr>
<tr>
<td>VSP</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>USP V/VM</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, TCA, UR</td>
<td>TCS, UR</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>HUS VM</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
</tr>
<tr>
<td>VSP Gx00 models</td>
<td>TCS, UR</td>
<td>--</td>
<td>--</td>
<td>TCS, UR</td>
<td>TCS, UR, GAD</td>
<td>TCS, UR</td>
</tr>
<tr>
<td>VSP Fx00 models</td>
<td>TCS, UR</td>
<td>--</td>
<td>--</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
<td>TCS, UR</td>
</tr>
</tbody>
</table>

**Legend:**

---: Not applicable

TCS: TrueCopy Sync

TCA: TrueCopy Async

UR: Universal Replicator

GAD: global-active device
Supported combinations of local copy types and storage systems (midrange storage systems)

<table>
<thead>
<tr>
<th>P-VOL</th>
<th>S-VOL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HUS100</td>
</tr>
<tr>
<td>HUS100</td>
<td>SI, COW</td>
</tr>
<tr>
<td>Hitachi AMS2000</td>
<td>--</td>
</tr>
<tr>
<td>Hitachi AMS/WMS</td>
<td>--</td>
</tr>
</tbody>
</table>

Legend:

--: Not applicable

SI: ShadowImage

COW: Copy-on-Write Snapshot

Supported combinations of remote copy types and storage systems (midrange storage systems)

<table>
<thead>
<tr>
<th>P-VOL</th>
<th>S-VOL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HUS100</td>
</tr>
<tr>
<td>HUS100</td>
<td>TC</td>
</tr>
<tr>
<td>Hitachi AMS2000</td>
<td>TC</td>
</tr>
<tr>
<td>Hitachi AMS/WMS</td>
<td>TC</td>
</tr>
</tbody>
</table>

Note: Universal Replicator is not supported for midrange storage systems.

Legend:

--: Not applicable

SI: ShadowImage

COW: Copy-on-Write Snapshot

Conditions for volume selection

The following conditions apply for volume selection during pair definition:

- Conditions for volumes that can be added (open systems) on page 10-19
- Conditions for volumes that can be added (mainframe systems) on page 10-20
- Conditions for volumes that can be added (mainframe systems managed by CCI) on page 10-20

The following conditions apply for information displayed during pair definition:
Conditions for volumes that can be added (open systems)

To be displayed in the Candidate List pane on the 2. Pair Association page of the Pair Configuration Wizard, volumes must satisfy all of the following conditions:

- The volumes must not be command devices (whether local or remote).
- The volumes must not span multiple storage systems.
- The volumes must not be reserved by other workflows.
- The volumes must be internal volumes to which the external volumes are mapped, and the host I/O suppression mode must be disabled.
- Replication Manager must recognize the command device in the storage system.
- When volumes belong to an enterprise-class storage system and the copy type is Copy-on-Write Snapshot/Thin Image or Universal Replicator, the emulation type must be OPEN-V.
- When volumes belong to a VSP Gx00 models, VSP Fx00 models, or HUS VM storage system and the copy type is Thin Image or Universal Replicator, the emulation type must be OPEN-V.
- When volumes belong to the Hitachi AMS/WMS and the copy type is TrueCopy Async, TrueCopy Extended Distance, or Copy-on-Write Snapshot, the pool must be set in the default controller.
- The combination of copy type and storage system must satisfy the conditions described in Storage system conditions for pair configuration definition on page 10-16.

Note: When creating a copy pair using the volumes which the capacity saving function (dedup and compression) are enabled, it is possible that the performance of copying or Host I/O goes down. For the details, please see the manual of each volume replication function.

Conditions for primary volumes

- The volumes must belong to the same storage system displayed in the Pair List.
- The volumes must not be V-VOLs.
- The virtual volume attributes must not include GAD Reserved.

Conditions for secondary volumes

- The license registered in the storage system must be valid.
- The S-VOL Disable attribute must not be specified.
- When the copy type is Copy-on-Write Snapshot/Thin Image, the volumes must be V-VOLs.
When the copy type is ShadowImage, TrueCopy, Universal Replicator, or GAD, volumes must **not** be V-VOLs.

When the copy type is GAD, the volume attribute (internal volume, internal volume mapped to an external volume, or DP volume) is same as the volume attribute of the primary volume.

When the copy type is GAD, the volume attributes must include **GAD Reserved**.

When the copy type is not GAD, the volume attributes must **not** include **GAD Reserved**.

When volumes belong to the Hitachi AMS/WMS and the copy type is TrueCopy Async, TrueCopy Extended Distance, or Copy-on-Write Snapshot, the default controller must match the current controller.

**Conditions for volumes that can be added (mainframe systems)**

To be displayed in the **Candidate List** pane on the **2. Pair Association** page of the Pair Configuration Wizard, volumes must satisfy all of the following conditions:

- All volumes are stored using the same prefix, DADID and host
- The volumes must not span multiple storage systems
- The volumes must not be reserved by another workflow
- The volumes must not be DP pool or journal volumes
- The combination of copy type and storage system must satisfy the conditions described in **Storage system conditions for pair configuration definition on page 10-16**.

**Conditions for primary volumes**

- The volumes must belong to the same storage system displayed in the **Pair List**

**Conditions for volumes that can be added (mainframe systems managed by CCI)**

To be displayed in the **Candidate List** pane on the **2. Pair Association** page of the Pair Configuration Wizard, volumes must satisfy all of the following conditions:

- The volumes must not span multiple storage systems
- The volumes must not be reserved by another workflow
- Replication Manager must recognize the command device in the storage system
- The volumes must not be open system volumes
- The volumes must not be mainframe system journal volumes
- The combination of copy type and storage system must satisfy the conditions described in **Storage system conditions for pair configuration definition on page 10-16**.
Conditions for primary volumes

- The volumes must belong to the same storage system displayed in the Pair List

Creating pairs and pair groups

To define copy pair configurations, you should first register a new pair group and define a list of volume pairs to assign to the pair groups. Pair groups can be created on the 2. Pair Association page of the Pair Configuration Wizard.

Tip: If you need to stop the wizard before the copy pair configuration definition is completed, it can be temporarily saved as a workflow. For more information, see Saving workflows on page 10-66.

To create pairs and pair groups:

1. Display the information about the host or storage system on which you want to create a copy pair. For details on how to display the information, see Viewing individual host information on page 14-6 or Viewing individual storage system information on page 14-7.
2. In the displayed subwindow, select the Unpaired tab under the LUNs, DEVNs, or LDEVs tabs.
3. On the Unpaired tab, select the primary volumes from which to create a copy pair, and then click Pair Management. The Pair Configuration Wizard starts with the 1. Introduction page displayed.

Tip: Multiple unpaired LUs or DADs can be selected as primary volumes.

4. Read the wizard page, and then click Next. The 2. Pair Association page appears.
5. In the Copy Topology pane, select the volume object and click Add Group.
   The Add Pair Group dialog box appears.
6. Specify a pair group name and copy type, and click OK to register the new pair group.
   The registered pair group is displayed in the Copy Topology pane.
7. Select a pair group in the Copy Topology pane.
8. Define a list of copy pairs to include in the pair group under Detail of pair-group-name pane.

To define a copy pair:

1. In the Pairs pane under Detail of pair-group-name pane, select a primary volume.
2. In the Criteria tab under the Candidate List pane, specify the volume type and optional filtering criteria for obtaining a list of candidate volumes. For details, see About filtering candidate volumes on page 10-23.
3. Click Apply.
The filtered list of candidate volumes is displayed on the **Result** tab.

4. From the displayed tree structure on the **Results** tab, select the candidate volumes that you want to assign as the primary volume or secondary volumes for the new copy pairs.
   You can select multiple volumes on the **Result** tab. For details, see Selecting multiple candidate volumes on page 10-24.

5. Click **Add** or **Add All**.
   The selected volumes are assigned as secondary volumes and the defined copy pair is displayed in the **Pair List** pane. Repeat this operation for each pair group you create.

   **Note:** A volume capacity check is performed when the volumes are added. See About volume capacity checking on page 10-24 for more information.

You can click the icon or the icon to expand the **Candidate List** and **Pair List** panes.

6. Click **Next** to continue creating the copy pair configuration definition or click **Save** to temporarily save the workflow.
   The primary and secondary volumes need to be configured in a one-to-one correspondence before you can continue pair configuration.

**Related topics**
- About creating copy pair configuration definitions on page 10-12
- About multi-target and cascade copy pair configurations on page 10-32
- Copy pair configuration conditions on page 10-13
- Storage system conditions for pair configuration definition on page 10-16
- Conditions for volume selection on page 10-18
- About concealing/revealing replica volumes on page 4-10

**Editing pair names**

**Note:**
- A pair name is generated automatically by the Pair Configuration Wizard. You have the option to override this name, but you cannot change the pair name once the pair has been created. The option to override the automatic pair name is supported only for open systems pair configurations.
- Editing a copy group name might change a copy topology name displayed in the **Replication** tab of Device Manager.

**To override the automatic pair names generated during pair configuration:**

1. On the 3. Group Management page of the Pair Configuration Wizard, select the copy pair(s) to be renamed from the Pair List.
   You can select multiple copy pairs for renaming at the same time.
2. Click **Edit Pair Name**.
   The Edit Pair Name dialog box appears.

3. In the **Pair Name Setting** pane, specify the new pair name for the selected pair.

4. If you are renaming multiple copy pairs, select a suffix start number.

5. Click **Refresh**.
   The new pair name is displayed in the Pair List pane in the Edit Pair Name dialog box.

6. Click **OK**.
   The pair name is updated in the Copy Group pane on the 3. Group Management page.

**Related topics**
- [Associating pair groups with copy groups](#) on page 10-30

**About filtering candidate volumes**

When defining pairs you can specify filtering criteria to filter the list of candidate volumes for easier volume selection. Filtering criteria can be specified on the **Criteria** tab under the **Candidate List** pane in the 2. **Pair Association** page. The list of available filtering criteria varies for pair configuration in open and mainframe environments.

**Related topics**
- [Selecting multiple candidate volumes](#) on page 10-24
- [Creating pairs and pair groups](#) on page 10-21

**Conditions affecting displayed storage system information**

The storage system information displayed in the **Storage System** drop-down list in the **Criteria** tab (on 2. **Pair Association** page) differ depending on multiple conditions. The following table shows the information displayed based on various conditions:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Information displayed when no restrictions apply to resource groups</th>
<th>Information displayed when restrictions apply to resource groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>No volumes selected.</td>
<td>A storage system containing the volumes in the DAD selected in the Disk List.</td>
<td>All storage systems that satisfy either of the conditions on the left are displayed in the list.</td>
</tr>
<tr>
<td>One or more volumes selected.</td>
<td>A storage system that satisfies the condition described in (No volumes selected) and that</td>
<td>The displayed information on the left from which the storage systems without access permissions have been removed, are displayed in the list.</td>
</tr>
</tbody>
</table>
### Selecting multiple candidate volumes

Replication Manager identifies a list of candidate secondary volumes using the filtering criteria specified on the **Criteria** tab under the **Candidate List** pane. These candidate volumes are grouped and displayed as nodes in a tree structure on the **Results** tab. By selecting the parent node of a group, you can select up to 100 candidate volumes in a single operation.

**Related topics**

- [About filtering candidate volumes on page 10-23](#)
- [Creating pairs and pair groups on page 10-21](#)

### About volume capacity checking

A volume capacity check is conducted when the Pair Configuration Wizard is used to create or edit mainframe copy pairs. This is done to help the administrator avoid difficulties with Reverse-Resync operations involving primary and secondary volumes of mismatched sizes. (Although it is possible to create such copy pairs, an I/O error occurs if you execute a Reverse-Resync operation under this condition. Because there is no recovery method available to make a Reverse-Resync operation executable, storage volumes must be recreated from scratch.)

Volume capacity is expressed in the number of cylinders. This information is acquired from Business Continuity Manager when the volume is scanned and when the configuration is refreshed.

If the Pair Configuration Wizard detects a discrepancy between the capacity of the selected primary and secondary volumes, a warning message is displayed prompting the administrator to check the configuration. (A similar message is displayed if no information about the volume capacity can be acquired.)

**Note:** The number of cylinders cannot be obtained when using Business Continuity Manager versions prior to 6.7.0.

### Defining copy groups

This module discusses information about copy groups and tasks for defining copy groups:

- [About copy groups on page 10-25](#)
About copy groups

A copy group consists of a number of copy pairs that have been grouped for management purposes. By grouping the copy pairs of volumes that are used for the same operations and purposes, you can perform batch operations on all the copy pairs in that copy group. For example, by performing an operation such as changing the copy pair status on a copy group, you can change the copy pair status of all copy pairs in the copy group in a single operation.

Mainframe copy pairs can be grouped into two types of copy groups for maintaining data consistency during replication. Copy groups can be defined without a container, in which case data consistency is maintained per copy group. Copy groups can also be defined with a container, where each container consists of multiple copy groups. In the latter case, data consistency is maintained per container. There are limitations on the permitted combinations of copy group and container. For details on these limitations, see Supported copy group and container combinations on page 10-32.

Related topics

- Creating copy groups on page 10-28
- Supported copy group and container combinations on page 10-32

Copy group requirements for pair configuration (mainframe systems)

The following copy group requirements must be satisfied when creating or editing mainframe pair configurations:

- The copy group must contain the DADIDs of both the primary and secondary volumes for the created pair group.
- The primary and secondary volumes of all pairs in the pair group to be added must belong to the same storage system as the primary and secondary volumes of the existing copy group. If the storage systems are different, the CTG of an existing group should be set.
- The instance of BCM that owns the copy group must have access permissions.
- The copy group must be a primary host copy group.
- The copy group must be one for which the pair association has not been executed yet.
About assigning CTGID/JNLGID for copy pairs

Consistency groups and Journal groups can be configured for any asynchronous copy pair. Replication Manager allows you to assign CTGID/JNLGID for copy pairs during pair creation (when associating a pair group to a copy group). In order to change a CTGID/JNLGID, it is necessary to delete and recreate the copy pair.

Tip: Take note of the following:

- CTGID/JNLGIDs are independent among storage systems. Replication Manager assigns a new ID on the storage system if the storage system of the new copy group is different from that of the original copy groups.
- For mainframe systems, Replication Manager allows you to specify EXCTG options to maintain consistency among multiple JNLGIDs in a Universal Replicator copy group.

Related topics

- Conditions for creating local copy pairs with the CTG option on page 10-26
- Copy group settings options (mainframe) on page 10-78

Conditions for creating local copy pairs with the CTG option

The following conditions apply when creating local copy pairs with the CTG (At-Time Split) option:

- The CTG option is available only when the prerequisite product versions are later than appropriate version, so that Device Manager agent/CCI can accept CTG option for local copy.
- Pairs created with the At-Time Split option (-m grp) and pairs created without this option must not be mixed in the same group defined in the CCI configuration file. If such pairs are mixed, the pairsplit operation might end abnormally, or S-VOLs of the P-VOLs in the same consistency group might not be created correctly at the time when the pairsplit request is received.

Related topics

- About assigning CTGID/JNLGID for copy pairs on page 10-26

Configuring open and mainframe consistency groups

The use of consistency groups across open and mainframe systems is supported for the TCS copy type when using Business Continuity Manager on Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500 storage systems.
**When creating new pairs**

1. In the Pair Configuration Wizard (open system), specify the **Assign CTG** option in the Edit Task dialog box (**4. Task Management** page) when creating the open TCS pairs.

2. Open the *copy-group-name* subwindow (open systems) and confirm the CTGID assigned for the open TCS pairs you created.

3. Use the Pair Configuration Wizard (mainframe) to define the mainframe TCS pairs. On the **3. Group Management** page, perform the following:
   a. Assign the same CTGID as the one you confirmed in step 2.
   b. Specify the **Enable Open/MF CTG** option in the Edit Group dialog box.

4. Use Business Continuity Manager to create pairs for the pair definition configured in step 3.

**When configuring existing pairs**

1. Confirm the mainframe and open TCS pairs share the same CTGID.

2. Open the Pair Configuration Wizard for the mainframe pairs and specify the **Enable Open/MF CTG** option in the Edit Group dialog box (**3. Group Management** page).

3. Using the Change Pair Status Wizard, split the mainframe TCS pairs and then resync them with the **Assign CTG** option enabled (**3. Select Pair Operation** page).

**Related topics**

- [About assigning CTGID/JNLGID for copy pairs on page 10-26](#)
- [Conditions for creating local copy pairs with the CTG option on page 10-26](#)

**About HORCM instances**

A HORCM instance is the service (daemon process) that receives CCI commands and is started for each configuration definition. A HORCM instance is identified by the instance number given to the configuration definition file name.

Replication Manager identifies available HORCM instance numbers and displays the smallest number of available instance as the default HORCM instance when creating a new copy group. Depending on availability of instances, the displayed instance number is updated automatically when you change the primary or secondary pair management server.

The `server.agent.rm.exclusion.instance` parameter in the Device Manager agent `server.properties` file can be edited for the following purposes:

- To specify the HORCM instance number that you want to exclude from Replication Manager or Device Manager copy operations. Multiple HORCM
instances can be specified for this parameter by separating them with commas.

- To specify the existing HORCM instances for which you do not want Replication Manager or Device Manager to add or delete copy pairs or change copy pair statuses. You can view configuration information for copy groups and copy pairs included in the specified instance but cannot perform any copy pair operations.

Tip: HORCM instances created external to Replication Manager are not recognized and therefore not provided in the list of candidate instances in the Create Group dialog box. You will need to perform a configuration refresh for these instances to be recognized.

Related topics

- Creating copy groups on page 10-28

Creating copy groups

A copy group is created by assigning copy pairs to a pair group. For open systems pair configuration, copy groups can be created on the 3. Group Management page of the Pair Configuration Wizard.

Tip: If you need to stop the wizard before the copy pair configuration definition is completed, it can be temporarily saved as a workflow. For more information, see Saving workflows on page 10-66.

To create a copy group:

1. Perform the following steps if you are creating a copy pair configuration definition from a saved workflow:
   a. From the Explorer menu, choose Tasks and then choose Workflows. A list of saved workflows is displayed.
   b. Select a saved workflow and click Edit Workflow.

2. On the 3. Group Management page of the Pair Configuration Wizard, select a pair group, and then click Create Group. The Create Group dialog box appears.

3. Specify a copy group name and the following configuration definition file information:
   - Combination of primary and secondary nodes of pair management server
   - Primary and secondary path group IDs
   - MU number
   - Primary and secondary definition formats

Tip: When managing a copy pair using a virtual ID:

- For local copy: specify only primary format (because primary and secondary physical DKCs are common).
For remote copy: specify primary and secondary format (because primary and secondary physical DKCs are different).

4. To specify a node of the pair management server, select an existing HORCM instance, or create a new one. To create a new HORCM instance, you need to specify the instance number, UDP port number, and the host name or IP address used in communications between server instances.

**Note:** If you are creating a redundant configuration for the pair management server, specify the primary and secondary node combination of the pair management server.

For details about how HORCM instances are managed by Replication Manager, see About HORCM instances on page 10-27.

5. Specify the path group ID or MU number.

**Tip:** We recommend specifying same value for both primary and secondary path group IDs.

By default, Replication Manager automatically assigns an MU Number, which identifies the generation number for backup volumes. To change this value, choose another from the drop-down list.

**Note:** For HUS100 series, you can specify 0-39 as the MU number, in spite of the range of MU number allowed by the storage system specification.

For more information on the MU Number, see Managing generations (replica rotation) on page 23-3.

6. Click OK to create a new copy group. The created copy group is displayed in the Copy Group pane.

7. Click Next to continue creating the copy pair configuration definition or click Save to temporarily save the workflow.

**Related topics**

- Associating pair groups with copy groups on page 10-30
- About copy groups on page 10-25
- About configuration definition file formats on page 10-11
- Defining copy groups in a multi-target or cascade configuration on page 10-39
- Creating a TCS/UR 3DC multi-target configuration on page 10-40

**Changing copy group names**

You can edit an existing copy group name using the Group Management screen of the Pair Configuration Wizard.

**To edit a copy group name:**

1. Display the information about the desired copy group using the Host view or the Copy Group Configuration view.

For details on how to display this information, see the following:
Select a copy group from the displayed window, or confirm that the copy group information is displayed and click **Pair Management**.

3. Check the information displayed in the 1. Introduction page and click **Next** to continue to the 2. Pair Association window.

---

**Tip:** If the copy group status is simplex, select the copy type in the 2. Pair Association window.

4. Click **Next** to continue to the 3. Group Management window.

5. Select the copy group you are going to edit.

6. Click **Edit Group**.
   
The Edit Group dialog is displayed.

7. Specify a new copy group name.

8. Click **OK**. The Copy Group field displays the specified group name.

---

**Associating pair groups with copy groups**

**To associate pair groups with a copy group:**

1. If you are creating a copy pair configuration definition from a saved workflow, perform the following:
   
a. From the Explorer menu, choose **Tasks** and then choose **Workflows**.
      
      A list of saved workflows is displayed.
   
b. Select a saved workflow and click **Edit Workflow**.

2. On the 3. Group Management page of the Pair Configuration Wizard, select the pair group to be associated with the copy group.

3. In the **Copy Group** pane, select the target copy group or container in the **Copy Group** field.

---

**Tip:** When defining mainframe pair configurations, the copy groups listed in the **Copy Group** field are determined by the datasets allocated on the mainframe host. If you do not allocate the dataset or if Replication Manager does not retrieve this information, the related copy groups do not appear in the list.

4. For mainframe pair configuration, in the **CTGID/JNLGID** field, specify CTGID/JNLGID for copy pairs.
   
   For details, see **About assigning CTGID/JNLGID for copy pairs on page 10-26**.

5. Click **Apply**. The copy pairs belonging to the associated pair group are displayed in the **Pair List** pane.
Tip: For mainframe pair configuration, copy pairs displayed in the **Pair List** are aggregated per CTGID/JNLGID. When there are multiple IDs assigned for the container, copy groups will be promoted to the container.

6. Click **Next**.
   The tasks that correspond to specific copy groups are displayed on the Task Management page.

   To release a pair group assigned to a copy group, select the pair group to be released in the **Pair List** and click **Release**.

**Related topics**

- Editing pair names on page 10-22
- Conditions for creating local copy pairs with the CTG option on page 10-26
- Copy group requirements for pair configuration (mainframe systems) on page 10-25

**Creating a container with multiple copy groups (mainframe systems)**

**To create a container with multiple copy groups:**

1. Select a volume without a copy pair configuration and launch the Pair Configuration Wizard. For details on how to launch the Pair Configuration Wizard, see Launching the Pair Configuration Wizard on page 10-6.

2. Create a pair group and associate it with a copy group. When performing the association, specify the consistency group ID and journal group ID. For details on how to create pair groups, see Creating pairs and pair groups on page 10-21. For details on how to associate pair groups with copy groups, see Associating pair groups with copy groups on page 10-30.

3. Select a volume without a copy pair configuration and launch the Pair Configuration Wizard.

4. Create pair groups and associate them with the previously added copy groups. When applying the association, specify a consistency group ID or journal group ID.
   If the storage system and volume selected for the second copy pair configuration are the same as the storage system and volume selected for the initial copy pair configuration, specify a different CTGID/JNLGID from the CTGID/JNLGID specified first.

**Related topics**

- About copy groups on page 10-25
- Supported copy group and container combinations on page 10-32
Supported copy group and container combinations

In the following discussion, the term *target group* refers to the initial copy group or container in a cascade configuration (cascade source group). The term *following group* refers to the subsequent copy group or container cascaded with the initial copy group or container (cascade destination group).

The following are supported combinations of copy groups and containers when defining cascade configurations:

- If the target group is a local copy group, it can only be combined with a following group that is a remote copy group.
- If the target group is a local copy group container, it can be combined with a following group that is a remote copy group container.
- If the target group is a remote copy group, it can be combined with a following group that is a local copy group or a remote copy group.
- If the target group is a remote copy group container, it can be combined with a following group that is a local copy group container or a remote copy group container. In addition, the target remote copy group container can also be combined with a following group that is a local copy group.

Related topics

- Creating a container with multiple copy groups (mainframe systems) on page 10-31
- Changing the copy pair status for each copy group, snapshot group, or container on page 10-128

Defining multi-target and cascade configurations

This module discusses information about multi-target and cascade configurations and procedures for creating them. The following topics are included in this module:

- About multi-target and cascade copy pair configurations on page 10-32
- About TCS/UR 3DC delta resync on page 10-38
- Defining copy groups in a multi-target or cascade configuration on page 10-39
- Creating a TCS/UR 3DC multi-target configuration on page 10-40

About multi-target and cascade copy pair configurations

When you add a new copy group to an existing copy pair, this is known as a *multi-target* or *cascade* configuration. (When created on the primary side, it is a multi-target configuration. On the secondary side, it is a cascade.) The Pair Configuration Wizard allows you to define these configurations in a single sequence of operations.

The following figure depicts sample multi-target and cascade configurations.
You can create such a configuration using the Copy Topology pane of the 2.Pair Association page of the Pair Configuration Wizard. Click the icon of the primary volume (for a multi-target) or the secondary volume (for a cascade) of the original pair group, and then click Add Group.

**Note:** The copy type of the original pair group and the copy types of the associated pair groups must be compatible. For details, see Copy type requirements for pair configuration definitions on page 10-33.

### Related topics

- Copy type requirements for pair configuration definitions on page 10-33
- Permitted topologies for cascade and multi-target configurations on page 10-38

### Copy type requirements for pair configuration definitions

The following requirements must be satisfied in order for copy types of pair groups added in multi-target or cascade configurations, to be compatible with the copy type of the original pair group.

### Requirements for the copy type when creating a multi-target configuration (open system) (enterprise-class storage systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shadow Image</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>Copy-on-Write Snapshott/Thin Image</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>global-active device</td>
<td>Shadow-Image</td>
</tr>
<tr>
<td>Copy type of the original pair group</td>
<td>Copy type of the pair group to be connected by group addition</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot / Thin Image</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Y</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
</tr>
<tr>
<td>global-active device</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: This type of pair group can be connected.

N: This type of pair group cannot be connected.

Notes:

1. A GAD pair cannot be added to S-VOL of an SI pair.
2. A GAD pair cannot be added to S-VOL of a TI pair.
3. A CoW Snapshot pair cannot be added to both volumes of a GAD pair.

Requirements for the copy type when creating a multi-target configuration (HUS VM, VSP Gx00 models, or VSP Fx00 models)
<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>global-active device</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: This type of pair group can be connected.

N: This type of pair group cannot be connected.

Notes:

1. A global-active device pair cannot be added to S-VOL of an SI pair.
2. A global-active device pair cannot be added to S-VOL of a TI pair.

Requirements for the copy type when creating a multi-target configuration (midrange storage systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>Y</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot</td>
<td>Y^1</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Extended Distance</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:

Y: This type of pair group can be connected.

N: This type of pair group cannot be connected.

Notes:

1. Not supported on Hitachi AMS/WMS series.
## Requirements for the copy type when creating a multi-target configuration (mainframe systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
<th>Shadow Image</th>
<th>TrueCopy Sync</th>
<th>TrueCopy Async</th>
<th>Universal Replicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shadow-Image</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

**Legend:**

**Y:** This type of pair group can be connected.

**N:** This type of pair group cannot be connected.

## Requirements for the copy type when creating a cascade configuration (enterprise-class storage systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
<th>Shadow Image</th>
<th>Copy-on-Write Snapshot / Thin Image</th>
<th>TrueCopy Sync</th>
<th>TrueCopy Async</th>
<th>Universal Replicator</th>
<th>global-active device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shadow-Image</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y(^1)</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot / Thin Image</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y(^2)</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>global-active device</td>
<td>Y</td>
<td>Y(^3)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

**Legend:**

**Y:** This type of pair group can be connected.

**N:** This type of pair group cannot be connected.
## Requirements for the copy type when creating a cascade configuration (midrange storage systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>N</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Extended Distance</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
- Y: This type of pair group can be connected.
- N: This type of pair group cannot be connected.

Notes:
1. Not supported on Hitachi AMS/WMS series.

## Requirements for the copy type when creating a cascade configuration (HUS VM, VSP Gx00 models, or VSP Fx00 models)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>Y</td>
</tr>
<tr>
<td>Thin Image</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
</tr>
<tr>
<td>global-active device</td>
<td>Y³</td>
</tr>
</tbody>
</table>

Legend:
- Y: This type of pair group can be connected.
- N: This type of pair group cannot be connected.

1. A global-active device pair cannot be added to S-VOL of an SI pair.
2. A global-active device pair cannot be added to S-VOL of a TI pair.
3. A CoW Snapshot pair cannot be added to both volumes of a global-active device pair.

Requirements for the copy type when creating a cascade configuration (mainframe systems)

<table>
<thead>
<tr>
<th>Copy type of the original pair group</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Y</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: This type of pair group can be connected.
N: This type of pair group cannot be connected.

Permitted topologies for cascade and multi-target configurations

The following restrictions apply when creating cascade or multi-target configurations or deleting copy pairs or copy groups in cascade or multi-target configurations:

- When creating a cascade configuration, it is necessary to first create a higher-level copy pair or copy group. Higher-level copy pairs or copy groups cannot be added to lower-level copy pairs or copy groups.
- When creating a cascade configuration, copy types and pair statuses of related copy pairs or copy groups must be compatible.
- When deleting copy pairs or copy groups from a cascade configuration, you must first delete all lower-level copy pairs or copy groups before deleting a higher-level copy pair or copy group.
- The number of pairs that can be created varies depending on the storage system and copy type.

About TCS/UR 3DC delta resync

In a 3DC multi-target configuration, there is one primary site and two secondary sites. TrueCopy Synchronous and Universal Replicator are used to copy storage system volumes among the three sites (called a data center). Universal Replicator provides the primary site and TrueCopy Synchronous and Universal Replicator provide the secondary sites. Replication Manager can be used to configure a Delta Resync pair using the two secondary sites. Delta
Resync pairs are stand-by pairs for providing additional redundancy in 3DC multi-target configurations.

Universal Replicator provides the delta resync operation as a way to recover from failures in the primary site. If a failure occurs at the primary site in a 3DC multi-target configuration, the CCI horctakeover command is used to reconfigure the TrueCopy Synchronous secondary site as the primary site. If the delta re-synchronization function is used between the primary and secondary sites, journal-copying of only the minimum data required is performed following a failure, minimizing the recovery time.

Related topics
- Creating a TCS/UR 3DC multi-target configuration on page 10-40
- Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems) on page 10-39

Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems)

The following limitations and resolutions are to be noted when performing 3DC configuration pair operations:

- When operating Delta Resync, it is necessary to switch the direction of TrueCopy in advance. Because Replication Manager does not switch the direction automatically, it is necessary to switch the direction manually.
- The Force option cannot be added when executing Delta Resync.
- Delta Resync can be executed for copy groups only. It cannot be executed for CTGs or copy pairs.
- If a related UR is deleted, the Delta UR pair transitions to Simplex status. However, the Delta UR pair information is not updated in Replication Manager. The Delta UR pair information will be deleted when a configuration update is performed. To resolve this, it is first necessary to delete the Delta UR and then delete the related UR pair.

Defining copy groups in a multi-target or cascade configuration

To define copy groups in a multi-target or cascade configuration:

1. Perform the pair group registration operations.
2. To create a multi-target configuration, select a primary volume, and then click Add Group. To create a cascade configuration, select a secondary volume, and then click Add Group.
3. For each pair group, define a list of copy pairs that you want to include in the pair group.
4. On the 3. Group Management page, create a copy group and assign a pair group to the copy group.
5. Repeat the operations for creating a copy group and assigning a pair group to the copy group.

Related topics
Creating a TCS/UR 3DC multi-target configuration

To create a TCS/UR 3DC multi-target configuration that uses the delta resync function:

1. Create TrueCopy Synchronous and Universal Replicator pair groups in a multi-target configuration.
2. With the secondary volume of the TrueCopy Synchronous pair selected, click Add Group.
3. Specify the copy type option as UR (3DC Delta).

Related topics

- About TCS/UR 3DC delta resync on page 10-38
- Creating pairs and pair groups on page 10-21
- Creating copy groups on page 10-28
- Defining copy groups in a multi-target or cascade configuration on page 10-39

Using a GAD 3DC delta resync configuration

This module describes how to manage a high availability system that uses copy pairs of a global-active device, Universal Replicator, and Delta Universal Replicator among three storage systems. This is known as a GAD 3DC delta resync configuration.
About GAD 3DC delta resync configurations

With a GAD 3DC delta resync configuration, even if a failure occurs at the primary site, the secondary volumes of the global-active device and Universal Replicator automatically perform delta resync, and journal-copying of Universal Replicator can continue.
Figure 10-2 Supported GAD 3DC delta resync configuration
In addition to the primary site, the local site (secondary site at a short distance), and the remote site (secondary site at a long distance), a quorum site is required to manage the global-active device copy pair.

You can also build the following configurations for backup:

- A multi-target configuration in which the primary volume of the global-active device is connected to a ShadowImage or Thin Image copy pair.
- A configuration in which the secondary volume of the global-active device is cascaded with a ShadowImage or Thin Image copy pair.
- A configuration in which the secondary volumes of Universal Replicator and Delta Universal Replicator are cascaded with a ShadowImage or Thin Image copy pair.

**GAD 3DC delta resync requirements**

In addition to the system requirements for Replication Manager described in the *Hitachi Command Suite Replication Manager Configuration Guide*, the following requirements apply:

- The primary and secondary storage systems of the GAD pair are:
  - One of a VSP G1000, VSP G1500, or VSP F1500 and one of a VSP G1000, VSP G1500, or VSP F1500
  - VSP G800 and VSP G800
  (The available storage system models for secondary storage systems of a UR pair are VSP G1000, VSP G1500, VSP F1500, or VSP G800.)
- The available storage system models for the sites are a VSP G1000, VSP G1500, or VSP F1500 or VSP G800.
- Command Control Interface version 01-32-03/07 is installed on the server of each site.
- Quorum disks that have a common quorum disk ID are externally connected to the storage systems of the primary site and the local site.

Copy pairs to be used in a GAD 3DC delta resync configuration must meet the following requirements:

- The copy pairs of the global-active device belong to the same consistency group.
- The Universal Replicator copy pair and Delta Universal Replicator copy pair are defined by physical IDs in the configuration definition files.

**Precautions for GAD 3DC delta resync configurations**

- If you build or operate a GAD 3DC delta resync configuration, the Delta Universal Replicator, the copy pair status might become Error. In this case, an alert is issued (if one is configured). If the Delta Universal Replicator copy pair is successfully created, the copy pair status automatically becomes Suspend when a Universal Replicator copy pair is created or synchronized, and thus no action is required.
To verify that a Delta Universal Replicator copy pair was created successfully, check the mirroring status in the JNLGs tab in the Storage System view. If the information in the JNLGs tab is not up to date, click Refresh JNLG Info.

- If the mirroring status is Active, the copy pair was created successfully.
- If the mirroring status is Stop or Stopping, an error occurred with respect to the copy pair.

- If you load a configuration definition file without using Replication Manager, copy pairs in the Simplex status might be configured in the wrong copy direction.
  If a copy pair is configured in the wrong copy direction, use the Reverse Copy Direction option in the Change Pair Status Wizard. If you fail to correct the copy direction, pair operations might fail.

Creating a GAD 3DC delta resync configuration

To create a GAD 3DC delta resync configuration, follow this procedure:

1. In the Host view or the Storage System view, select the information of the host or storage system of the primary site.
2. In the displayed subwindow, select the Unpaired tab under the LUNs tab.
3. In the Unpaired tab, select the primary volume for the copy pair to be created, and then click Pair Management.
   The Pair Configuration Wizard starts, and the 1. Introduction page is displayed.
4. Read the information in the wizard, and then click Next.
   The 2. Pair Association page opens.
5. Define a pair group.
   In the Copy Topology pane, create a pair group as follows:
   a. Define a pair group of the global-active device as being from a volume at the primary site to a volume at the local site.
   b. Define a pair group of Universal Replicator using a volume at the primary site and a volume at the remote site. Alternatively, define a pair group of Delta Universal Replicator using a volume at the local site and a volume at the remote site.
   When you define the Universal Replicator or Delta Universal Replicator pair group, the pair group of the other copy type is defined automatically.
   To create a pair group, in the Copy Topology pane, select the icon of a volume to be defined as the primary volume, and then click the Add Group button.
6. In the Detail of pair-group-name pane, define the list of copy pairs to be added to each pair group.
a. In the Filter pane, select Primary from the Volume Type drop-down list, and then select the primary volume.
b. In the Candidate List tab under the Criteria pane, specify a volume type and optional filter criteria for obtaining candidate volumes.
c. Click Apply. The list of filtered candidate volumes is displayed in the Results tab.
d. From the list displayed in the Results tab, select a volume to be allocated as the secondary volume of the copy pair.
e. Click Add.
   The selected volume is allocated as the secondary volume, and the defined copy pair is displayed in the Pair List pane.
   Repeat this procedure as many times as the number of copy pairs to be created.

7. Click Next.
The created copy pairs are displayed in the 3. Group Management page.

8. To allocate the created copy pairs to a new copy group:
   a. Select a pair group to be associated with a copy group, and then click the Create Group button.
      The Create Group dialog box appears.
   b. Specify a copy group name and configuration definition file information. As the information of the configuration definition file, specify the MU number and the combination of the primary and secondary nodes of the pair management server.
   c. Click OK.
      A new copy group is created and displayed in the Copy Group pane.
   d. Click Apply.
      The pair group associated with the copy group is displayed in the Pair List pane.

To allocate a created copy pair to an existing copy group:
   a. Select a pair group to be associated with a copy group.
   b. In the Copy Group drop-down list, select a target copy group.
   c. Click Apply.
      The pair group associated with the copy group is displayed in the Pair List pane.

9. Click Next.
   Tasks that correspond to the selected copy group are displayed in the 4. Task Management page.

10. In the 4. Task Management page, click the Edit icon.
    The Edit Task dialog box appears.

11. In the Edit Task dialog box, select the Assign CTG check box, and then from the CTGID drop-down list, select a consistency group ID.

12. Click OK.
    The system returns to the 4. Task Management page...
13. Click **Next**.
   The 5. Confirm page appears.

14. Check the configuration definitions and tasks of the specified copy pair, and then click **Confirm**.
   The 6. Finish page appears.

15. Click **Finish**.
   The settings specified in this wizard are registered as tasks and a workflow.

You can view the status of the registered tasks in the Task subwindow. To display the Task subwindow, from the Explore menu, select Task, and then Task.

**Deleting a GAD 3DC delta resync configuration**

Follow the procedure in [Deleting copy groups on page 10-80](#) and delete the copy groups or copy pairs in the following order for each copy type:

1. Universal Replicator or Delta Universal Replicator
2. Global-active device

When you delete the Universal Replicator or Delta Universal Replicator pair group, the pair group of the other copy type is automatically deleted.

**Troubleshooting GAD 3DC delta resync errors**

If an error occurs with global-active device copy pairs in a GAD 3DC delta resync configuration, follow the procedures described here for the primary and local sites.

**Error at the primary site**

If copying the global-active device cannot continue due to an error with the storage system of the primary site, the global-active device status becomes error status. At this time, the Universal Replicator connected to the primary volume of the global-active device becomes delta UR, the delta UR connected to the secondary volume of the global-active device becomes Universal Replicator, and the resynchronization of the Universal Replicator pair is performed.

To recover the data in the secondary volume of the global-active device as the latest data, follow the procedure below to troubleshoot:

1. Perform appropriate troubleshooting and refresh the configuration information and storage system information if necessary.
2. Delete the delta UR connected to the primary volume of the global-active device
3. Create the delta UR connected to the primary volume of the global-active device
4. Execute a takeover-recovery (resync) operation with respect to the
global-active device copy pairs.
5. Execute a swap operation with respect to the Universal Replicator copy
pairs.
   When all Universal Replicator copy pairs within the consistency group are
   in the sync status, you can restart the operation of the 3DC delta resync
   configuration.

For details about how to use the Change Pair Status Wizard, see Changing
copy pair status on page 10-113.

Error at the local site

To recover the data in the primary volume of the global-active device as the
latest data when copying the global-active device cannot continue due to an
error, use the Change Pair Status Wizard and follow the procedure below to
troubleshoot.

1. Execute a split operation with respect to the global-active device copy
   pairs.
2. Address the problem that created the error.
3. Execute a resync operation with respect to the global-active device copy
   pairs.
4. Execute a resync operation for the Universal Replicator copy pairs.
   When all Universal Replicator copy pairs within the consistency group are
   in the sync status, you can resume operation of the 3DC delta resync
   configuration.

For details about how to use the Change Pair Status Wizard, see Changing
copy pair status on page 10-113.

Using snapshot groups

This module describes the use of snapshot groups:

- About snapshot groups on page 10-47
- Snapshot group requirements on page 10-48
- Snapshot group configuration workflow on page 10-49
- Creating a snapshot group on page 10-50
- Viewing or modifying snapshot groups on page 10-51
- Deleting a snapshot group on page 10-51
- Migrating copy groups to snapshot groups on page 10-52

About snapshot groups

A snapshot group is a group of pairs created using the Thin Image copy type.
Like copy groups, snapshot groups allow the same operation to be applied to
more than one pair at a time.
For most configurations, the number of generations supported for copy groups is 64 or (less). Snapshot groups support either 512 or 1,024 generations depending on how they are created. Replication Manager can only be used to configure a maximum of 512 generations (one generation per snapshot group). Configurations up to 1,024 (multiple generations per snapshot group) created outside of Replication Manager will be correctly accessed and displayed, but are not recommended.

**Note:** Replication Manager only supports using V-VOLs (virtual volumes created from a Thin Image pool) as an S-VOL. To manage a snapshot group that includes a copy pair using a DP-VOL as an S-VOL (copy pairs with the clone attribute or corresponding to a cascade configuration), use Storage Navigator or CCI.

Snapshot groups differ from normal copy groups in the following ways:

- Like device groups, snapshot groups are managed in the storage system rather than a configuration definition file.
- Snapshot groups store copy pairs (snapshots) directly.
- Snapshot groups require Storage Navigator 2 to set the authentication mode of the command device. In turn, you must use `raidcom -login` on the pair management server prior to performing snapshot group operations.
- The Change Pair Status Wizard is only used to change pair status of snapshot groups. The Pair Configuration Wizard is used exclusively for creation and deletion.
- Snapshot group names cannot be changed.
- MU (generation) numbers are assigned to snapshot groups automatically and cannot be specified.

**Note:** When the constituent copy pairs are modified individually (rather than as a group), the snapshot group may have multiple MU numbers as a result.

- Although consistency groups are supported, the CTG ID is assigned automatically by the storage system and cannot be specified.
- Because there is no pair/copy status associated with Thin Image management, alerts and use of [My Copy Groups](#) do not apply. Instead, only TI pool usage monitoring applies.

### Related topics

- [Snapshot group requirements on page 10-48](#)
- [Creating a snapshot group on page 10-50](#)

### Snapshot group requirements

Snapshot groups require the following:

- The platform type must be Open.
- The storage system must be Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM.
- Only Thin Image snapshots can be registered in a snapshot group. (Copy-on-Write snapshots cannot be registered.)
- An in-band connection to the storage system is required (virtual command devices are not supported).
- The primary and secondary storage system type must be the same.
- The Storage Administrator role is required to perform snapshot group configuration operations.
- You must have a Thin Image license.
- V-VOLs must have a LUN path defined.
- Snapshot groups and copy groups cannot be mixed.
- Assignment of snapshot groups can only be performed when new copy pairs are configured (you cannot assign a snapshot group definition to existing copy pairs).
- If you manage copy pairs using a snapshot group on Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, and HUS VM, a pair management server for the snapshot group needs to be configured in advance. This server must have user authentication enabled for the command device. If you use a pair management server to which multiple command devices are connected, each must have authentication enabled.

**Related topics**

- [About snapshot groups on page 10-47](#)
- [Creating a snapshot group on page 10-50](#)

**Snapshot group configuration workflow**

The following figure shows the task flow for snapshot group configuration.
Creating a snapshot group

This topic explains how to create a new snapshot group.

**Caution:** Do not execute a task to create snapshot group pair and a task to create copy group pair simultaneously, or a duplicate CTGID error might occur.

**Prerequisites**

- Be sure you have enabled the user authentication mode for the command device using Storage Navigator 2.
- Choose a pair management server as described in [Changing the pair management server for snapshot groups on page 10-51](#).
- Create a Thin Image pool as described in [Adding pools on page 8-24](#).

**To create a new snapshot group:**

1. On the pair management server, use the `raidcom -login` command to perform authentication for the command device.
2. Start the Pair Configuration Wizard as described in [Creating pairs and pair groups on page 10-21](#).
3. On the **2. Pair Association**, click **Add Group**.
4. Enter a name for the snapshot group and select **TI (Snapshot Group)** for the copy type.
Note: You cannot specify the MU number. Although you can enable CTG, you cannot specify the CTGID. To display the CTGID that is automatically assigned from the Replication Manager GUI, you need to refresh the storage system information.

5. Define the necessary copy pairs and complete the wizard.

Tip: In the case of server failure or maintenance during the task execution, you can follow the procedure described in Changing the pair management server for snapshot groups on page 10-51 and simply re-execute the orphaned tasks.

Related topics

- About snapshot groups on page 10-47
- Snapshot group requirements on page 10-48

Viewing or modifying snapshot groups

You can access the list of snapshot groups in two ways:

- Storage Systems view: select the Snapshot Groups tab.
- Hosts view: select the Copy Group tab. Snapshot groups are listed along with the copy groups.

After selecting the copy group, click Pair Management to start the Change Pair Status Wizard.

Related topics

- About snapshot groups on page 10-47
- Creating a snapshot group on page 10-50

Deleting a snapshot group

To delete a snapshot group, select it from the appropriate tab in the Hosts or Storage Systems view and click Pair Management to start the Pair Configuration Wizard. Follow the procedure described in Deleting copy groups on page 10-80.

Related topics

- About snapshot groups on page 10-47
- Creating a snapshot group on page 10-50

Changing the pair management server for snapshot groups

Follow this procedure to define a pair management server for a snapshot group:

1. In the Storage System view of Replication Manager, expand the object tree.
2. Select a storage system from the tree. The storage-system-name subwindow is displayed.
3. Click Edit Snapshot Group Setting. The Edit Snapshot Groups Setting dialog box is displayed.
4. Specify Pair management server for snapshot group.
5. Click OK.
6. Check the displayed settings and then click Confirm.
7. Click Close when the completion dialog is displayed.
8. The pair management server displayed in the storage-system-name subwindow is updated.

Related topics
- About snapshot groups on page 10-47
- Creating a snapshot group on page 10-50

Migrating copy groups to snapshot groups

The following is an outline for migrating copy groups to snapshot groups:
- Save the existing data using an appropriate backup product.
- Delete the existing copy groups.
- Follow the procedure described in Creating a snapshot group on page 10-50.

Note: Any existing backup operations that use scripts with CCI commands must be revised to use raidcom commands.

Related topics
- About snapshot groups on page 10-47
- Creating a snapshot group on page 10-50

Scheduling and managing tasks

This module discusses information about tasks and procedures for scheduling and managing tasks:
- About tasks on page 10-53
- About task statuses on page 10-55
- About task types (open systems) on page 10-55
- About task types (mainframe systems) on page 10-57
- Scheduling tasks on page 10-57
- Viewing a list of tasks on page 10-60
- Canceling tasks on page 10-60
- Deleting tasks on page 10-61
About tasks

A *task* is a type of operation, such as changing the status of a copy pair or creating a copy pair or copy group based on a specified schedule. Tasks are managed based on copy groups as functional units. Multiple tasks created for the same copy group using the Pair Configuration Wizard are collectively known as *associated tasks*.

There are three methods to execute operations defined in a task:

- Immediate execution
- Scheduled execution
- Execution using CLI

**Note:** If Replication Manager is not running when a task is scheduled to execute, the task will be executed as follows:

- For tasks *with* an execution interval specified, the task is run at the next execution time after startup occurs.
- For tasks *without* an execution interval, the task is run immediately after startup occurs.

For example, if you create copy groups A and B, which constitute a multi-target configuration, and copy groups C and D, which constitute a cascade configuration, Replication Manager generates two tasks, each on a copy group basis, for each workflow.
Tip: For situations such as when storage system resources and host applications are managed by different administrators, the work status at any point during copy pair creation by a wizard can be saved as a workflow and passed from one administrator to the next. In this case, a new task is generated when the wizard finishes and the saved workflow is overwritten.

Because associated tasks have an execution order, a task that must be executed prior to another task is known as a **prerequisite task**. If an execution problem occurs, error messages are displayed indicating when a prerequisite task has failed and the steps necessary to correct the problem.

Tip: You need to re-create the task if all the following conditions are satisfied:

- The port number, host group, or pair management server WWN/iSCSI was changed after the task was created.
• The task was created by the Pair Configuration or Change Pair Status Wizards, the task status is Ready, and the execution type is Immediate or Schedule.

Related topics
• About task statuses on page 10-55
• About task types (open systems) on page 10-55
• About task types (mainframe systems) on page 10-57

About task statuses
Tasks can be in one of the following execution statuses:
• Ready: Indicates that the task is waiting to execute.

Note: If there are multiple tasks created by the Pair Configuration Wizard and they deal with same resources, the tasks cannot be executed simultaneously. The tasks are executed in ascending order of task ID. For this reason, if you specify immediate execution to multiple tasks or specify the same execution time to multiple tasks, statuses of some tasks might be still Ready although the execution time has passed.

• Executing: Indicates that the task is executing.
• Cancel: Indicates that the task was canceled.
• Failure: Indicates that the task failed. When you select Failure, an error window appears. Read the message in the error window.
• Success: Indicates that the task was successful.
• Warning: Indicates that the system timed out while waiting for the task to finish processing, or indicates that the cancellation of an Executing task has completed. When you select Warning, an error window appears. Read the message in the error window.

Related topics
• About tasks on page 10-53
• Viewing a list of tasks on page 10-60
• Canceling tasks on page 10-60
• Editing tasks on page 10-58

About task types (open systems)
The following task types are displayed for open systems:
• modify file: Creates or edits the CCI configuration definition file. This operation does not create a copy pair.
• modify file + create: Creates or edits the CCI configuration definition file and creates a copy pair. This type also applies to creating a snapshot pair.
- **modify file + delete**: Edits the CCI configuration definition file and dissolves a copy pair. This type also applies to deleting a snapshot pair.
- **create**: Creates a copy pair. This operation does not edit the configuration definition file.
- **split**: Splits a copy pair. This operation does not edit the configuration definition file.
- **resync**: Re-synchronizes data from the primary volume to the secondary volume. This operation does not edit the configuration definition file.
- **syncwait**: Waits until the P- and S-VOLs are synchronized before execution.
- **restore**: Re-synchronizes data from the secondary volume to the primary volume. This operation does not edit the configuration definition file.
- **delete**: Dissolves a copy pair. This operation does not edit the configuration definition file.
- **take snapshot**: Re-synchronizes data from the primary volume to the secondary volume and splits the copy pair. This operation does not edit the configuration definition file.
- **modify file (add node)**: Adds a node to an existing copy group.
- **modify (delete node)**: Deletes a node from a copy group.
- **create replica (Exchange)**: Creates an Exchange application replica on the backup server.
- **create replica (SQL)**: Creates an SQL application replica.
- **restore replica (Exchange)**: Restores an Exchange application replica from the backup server to the database server.
- **restore replica (SQL)**: Restores an SQL application replica.
- **takeover**: For performing an S-VOL takeover (does not edit the configuration definition file).
- **force-split**: For performing an P-VOL takeover (does not edit the configuration definition file).
- **swap**: For reversing the P-VOL and S-VOL (does not edit the configuration definition file).
- **takeover-recovery (resync)**: Performed for an S-VOL with the split (SSWS) status. Restores the copy pair. The S-VOL that had the split (SSWS) status becomes the P-VOL (does not edit the configuration definition file.)
- **takeover-recovery (recreate)**: Executed when a P-VOL has a status of Simplex (SMPL) and the copy pair cannot be recovered using a takeover-recovery (resync) operation (does not edit the configuration definition file).
- **modify (edit group name)**: Executed when a copy group name is changed.
- **modify (path group ID)**: Changes the existing PathGroupID setting specified in the configuration definition file.
- **create volume**: Creates a new volume.
- **delete volume**: Deletes a volume.
- **allocate volume**: Sets a LUN path that connects a volume and a host.
- **unallocate volume**: Deletes a LUN path that connects a volume and a host.

**Related topics**
- [About task types (mainframe systems) on page 10-57](#)
- [About tasks on page 10-53](#)

**About task types (mainframe systems)**

The following are task types displayed for mainframe systems:

- **modify file (create)**: Adds a pair definition to a copy group definition file. This type of task only creates or edits a copy group definition file. It does not create the defined pair.
- **modify file (delete)**: Deletes a pair from a copy group definition file. This type of task only deletes or edits a copy group definition file. It does not delete the defined pair.
- **distribute file**: Distributes a copy group definition file.
- **change primary host**: Changes the management host.
- **split**: Splits a copy pair. This type of task is used to indicate both splitting of suspended pair and swapped pair.
- **resync**: Re-synchronizes a copy pair. This type of task is used to indicate both re-synchronizing of suspended pair and swapped pair.
- **restore**: Reverse synchronizes a copy pair by synchronizing data from the secondary volume to the primary volume.
- **delete**: Deletes a copy pair.

**Related topics**
- [About task types (open systems) on page 10-55](#)
- [About tasks on page 10-53](#)

**Scheduling tasks**

You can edit the execution schedule or copy pair settings for tasks registered either during pair configuration or at the completion of Pair Configuration Wizard processing. The **Execution Request Time** options can be configured to determine if the task should be executed immediately or at a scheduled date and time. For open systems, you can also specify the settings to only modify the CCI definition (HORCM configuration file) without creating pairs.

**Modifying task execution schedule**

You can edit the execution schedule for tasks registered at the completion of Pair Configuration Wizard processing.
Tip: Note the following points:

- For mainframe pair configurations, the execution time set for a task is applied to all the related tasks for the same copy group.
- If multiple tasks are scheduled for immediate execution or execution at the same date and time, the tasks with the smaller task IDs are executed before the tasks with the larger task IDs.
- Actual task execution time may be delayed by as much as five minutes.

### To edit tasks:

1. From the Explorer menu, choose Tasks and then Tasks. The Tasks subwindow appears.

2. To edit a single task, click the associated icon. To edit multiple tasks, select the check box of each task you want to edit and click Edit Tasks. The Edit Task(s) dialog box appears.

3. Specify the following options on the Task Options tab:

<table>
<thead>
<tr>
<th>Execution Request Time</th>
<th>Executes the task at a specified date and time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify Pair Configuration File Only (Do not create Pair) check box</td>
<td>Specifies whether to create a pair or only modify the CCI configuration definition file. For mainframe tasks, this option is automatically selected and cannot be changed because mainframe pairs cannot be created by Replication Manager.</td>
</tr>
</tbody>
</table>

4. Update the task(s). The information displayed in the Tasks subwindow is refreshed.

### Editing tasks

You can edit the execution schedule and pair options for a registered task, provided that the task does not match any of the following conditions:

- The task was created using the Restore Replica Wizard.
- The task was created to operate mainframe volumes by the Change Pair Status Wizard.
- The task was created to operate open system volumes by the Change Pair Status Wizard, and the task type is delete or Advanced Operations.
- The task was created by the Change Pair Status Wizard or Create Replica Wizard, and the task status is Executing.
- The task was created by the Pair Configuration Wizard, and the task status is Executing, Success, or Warning.
- The task was created by the Change Pair Status Wizard, the task type is create, and the task status is Success or Warning.

If the task was created to operate mainframe copy pairs, the execution time you specified to a task is applied to all associated tasks in the copy group.

For details about task status and task type, see:
Note: When invoked for multiple tasks (Pair Configuration Wizard - open systems only), the behavior of drop-down lists, check boxes, and radio buttons varies depending on what (if any) values the tasks have in common. When the tasks have values that differ:

- Drop-down lists start with an empty value, followed by common values that can be selected.
- Check boxes are only half-selected (gray).
- Pairs of radio buttons are unselected.

Any changes made with these controls are applied to all selected tasks. For example, selecting a half-selected check box makes it turn black and the other check boxes are de-selected. If no changes are made and the OK button is clicked, the original values for the tasks are retained.

To make changes to one or more tasks on the 4. Task Management page:

1. To edit a single task, click the associated icon. To edit multiple tasks, they must be of the same copy type. Select the check boxes of the tasks you want to edit and click Edit Tasks. The Edit Task(s) dialog box appears. In this dialog box, you can set up execution options to modify pair creation.

   Tip: The Pair Setting tab is not displayed when editing tasks for mainframe systems.

2. On the Task Options tab, edit the execution schedule by selecting Execution Request Time options.

   Note: The actual time when the task is executed might differ from the time specified.

3. Enable the Modify Pair Configuration File Only (Do not create Pair) option if you do not wish to create the pairs. This option is always enabled during mainframe pair configuration because only pair configuration definition can be performed by Replication Manager. Mainframe copy pairs are not created by Replication Manager upon completion of pair configuration definition.

4. For open systems pair configuration, on the Pair Setting tab, select target copy pairs and enable or disable options for copy pair settings.

   Tip: The Assign CTG for At-Time Split option only applies to ShadowImage or Copy-on-Write/Thin Image copy types. For details, see About assigning CTGID/JNLGID for copy pairs on page 10-26 and Conditions for creating local copy pairs with the CTG option on page 10-26.
Caution: When you create a Universal Replicator copy pair, you must select an unused JNLGID rather than a used one from the JNLG ID (P) or JNLG ID (S) drop-down lists. If you select a used JNLGID, the task execution will fail with the error message KAVN00469-E. You can confirm a journal group is unused by checking the JNLGs tab in the Open subwindow. (A journal group with the Attribute Initial is an unused journal group.)

5. Click Next. The 5. Confirm page appears.
6. Confirm the configuration definition and tasks for the copy pairs you have specified, and then click Confirm. The 6. Finish page appears.
7. Click Finish.

Viewing a list of tasks

The Task List displays the tasks related to operations performed on copy pairs that are registered when the Pair Configuration Wizard or the Change Pair Status Wizard completes an operation, or when a copy pair associated with a remote path is deleted. The maximum number of tasks is 1,000. In this list, you can check information such as the task type (type of copy pair operation), execution status, and owner.

To view a list of tasks, from the Explorer menu, choose Tasks and then Tasks. A list of tasks is displayed in the Tasks subwindow.

Tip: You can also acquire task information using the Replication Manager CLI. See Using the task commands on page 27-6 for details.

Related topics
- About tasks on page 10-53
- About task statuses on page 10-55
- About task types (mainframe systems) on page 10-57
- About task types (open systems) on page 10-55

Canceling tasks

You can cancel registered tasks if they meet the following conditions:
- The task status is Ready.
- The task is created by Pair Configuration Wizard, the task status is Executing, and the task type is modify file + create.
- The task is created by Change Pair Status Wizard, the task status is Executing, and the task type is create.
- The task is created by Change Pair Status Wizard, Create Replica Wizard, or Restore Replica Wizard, and the task status is Success, Warning, or Failure.
To cancel tasks:
1. From the **Explorer** menu, choose **Tasks**.
   The Tasks subwindow appears.
2. Select the check boxes of the tasks you want to cancel, and then click **Cancel Tasks**.
   The Cancel Tasks dialog box appears.
3. Confirm the tasks that will be canceled, and then cancel them.
   The information in the **Status** and **Execution Request Time** columns for the tasks displayed in the Tasks subwindow is refreshed.

**Related topics**
- [Deleting tasks on page 10-61](#)
- [About task statuses on page 10-55](#)

**Deleting tasks**

You can delete tasks related to operations on copy pairs that were registered when the Pair Configuration Wizard or the Change Pair Status Wizard completed an operation, or when a copy pair associated with a remote path was deleted. You can only delete tasks that have the Cancel, Failure, Warning or Success status. When a task is deleted the task information is deleted from the repository. Resources reserved by a task are released when all the related workflows are deleted.

Once a task has completed and the retention period has expired, it is automatically deleted from the Task List. Users with the Admin (Replication Manager management) permission can manage the retention period. For details on how to check the retention period of a task, see [Viewing the data retention period on page 9-16](#).

To delete tasks:
1. From the **Explorer** menu, choose **Tasks** and then **Tasks**.
   The Tasks subwindow appears.
2. Select the check boxes of the tasks you want to delete, and then click **Delete Tasks**.
   The Delete Tasks dialog box appears.
3. Confirm your selections, and then delete them.
   The information in the display is updated.

**Related topics**
- [Viewing a list of tasks on page 10-60](#)

**Distributing copy group definitions (mainframe)**

This module discusses copy group list distribution:
- [About distributing copy group definitions on page 10-62](#)
About distributing copy group definitions

Replication Manager supports the distribution of copy group configuration definition files to alternate hosts. This capability enables uninterrupted pair management in the event of disaster at the primary site. During pair configuration using the Pair Configuration Wizard, you can select Mainframe hosts from a list of alternate host candidates identified by Replication Manager. Upon completion of pair configuration, Replication Manager distributes the copy group list created during pair configuration to these distribution targets.

The following two types of copy group definition file distribution are possible:

- **Normal distribution**: Distribution of copy group definition file from the user-selected BCM or Mainframe Agent host to the target BCM or Mainframe Agent host. The copy group definition file is distributed to all hosts that satisfy the distribution prerequisites. For details of copy group distribution prerequisites, see Prerequisites for distribution destination hosts (copy group definitions) on page 10-63. The copy group definition file can be distributed to multiple destination hosts (targets). This distribution occurs when the Distribute the configuration to all the candidates of primary host when creating the file check box is selected in the Edit Group window.

- **Pre-distribution**: Distribution of the latest copy group definition file from the current primary host to the copy group that will be the next primary host. The file can be distributed to only one user-selected primary host (destination). This distribution occurs when the primary host is being changed and the copy group definition of the original primary host does not match the copy group definition of the new primary host. For details, see About pre-distribution of copy group definition files on page 10-64.

Related topics

- About pre-distribution of copy group definition files on page 10-64
- Prerequisites for distribution destination hosts (copy group definitions) on page 10-63
Example of copy group definition distribution scenario

Prerequisites for distribution destination hosts (copy group definitions)

Business Continuity Manager or Mainframe Agent hosts must satisfy the following conditions to be copy group distribution destination candidates:

- A copy group definition file with the same copy group name must exist on the distribution destination BCM or Mainframe Agent host. The copy group definition file is empty or the copy group definition file has been distributed.
- The primary and secondary DADID(s) defined in the copy group definition file at the origin must be defined in the copy group definition file at the destination.
- The disk configuration definition files must already be distributed to the distribution destination host before the copy group definition files can be distributed.
- The distribution destination BCM or Mainframe Agent host has required access permissions.

Conditions for changing copy group distribution primary host

The following condition must be satisfied before a copy group distribution primary host can be changed:

- The copy group definition file must be previously distributed from the primary host by Replication Manager. (This implies a distribution relationship must already exist between the copy groups.)
The following conditions occur when a copy group distribution primary host is changed:

- Alert monitoring for the copy group by the previous primary host is stopped. To continue alert monitoring after the primary host is changed, it is necessary to create an alert setting for the copy group of the new primary host.
- Copy group status is not displayed on the My Copy Groups view. To display the copy group status after changing the primary host, you must replace the copy group of previous primary host with that of new primary host on the Edit My Copy Groups window.

**Conditions that disrupt copy group distribution relationships**

Copy group linkage is disrupted if either of the following conditions occur:

- The distribution relationship of the primary side DADID and secondary side DADID used by the copy group is deleted
- The primary host of the copy group is deleted from the information source

If either of the conditions occur, the relevant copy group cannot be a distribution target. In order to perform distribution again it is necessary to delete the distribution destination copy group and clear the copy group definition file.

**About pre-distribution of copy group definition files**

Pre-distribution of copy group definition files involves distribution of the latest copy group definition file from the current primary host to the copy group that will be the next primary host. This distribution occurs when the primary host is being changed and the copy group definition of the original primary host does not match the copy group definition of the new primary host.

During this distribution, the file can be distributed to only one user-selected primary host (destination).

Pre-distribution of copy group configuration definition files prevents the following problems:

- A copy group definition is no longer current because the primary host has changed.
- The primary host and copy group definition file are changed concurrently resulting in the primary host's configuration definition file being inconsistent before and after the change. In this case, if distribution of the copy group definition file starts after the primary host has been changed, the old copy group definition file is distributed.

**Caution:** There is no way to recover the latest copy group definition files once all the copies of the files have been replaced with old files. This situation can be avoided by excluding the primary hosts of any old copy group definition files from being the target primary host.

**Related topics**
Confirming distribution hosts

To confirm target distribution hosts and last distributed time:
1. Display the copy group information in the host or pair configurations view. For details on how to display this information, see Viewing copy group information in the Hosts view (open systems) on page 14-10.
2. Click the icon of the copy group for which you want to confirm target distribution hosts. The Distribution Hosts - copy group name window is displayed.
3. On the Distribution hosts pane, review target host information and last distributed time.
4. Click Close to exit the window.

Creating and managing workflows

This module describes tasks for creating and managing workflows:
- About workflows on page 10-65
- Saving workflows on page 10-66
- Viewing a list of workflows on page 10-66
- Editing workflows on page 10-67
- Deleting workflows on page 10-67

About workflows

A workflow is a series of tasks associated with the creation of a copy pair or copy group. Workflows are created automatically when you set up a copy pair or copy group using the Pair Configuration Wizard. Workflows are managed for all the copy groups that constitute multi-target configurations or cascade configurations.

**Tip:** For situations such as when storage system resources and host applications are managed by different administrators, the work status can be saved as a workflow at any point during copy pair creation and passed from one administrator to the next. In this case, a new task is generated when the wizard finishes, and the saved workflow is overwritten.
Saving workflows

A copy pair configuration definition may need to be saved under the following circumstances:

- The tasks performed in the wizard might be divided between a storage system administrator who manages the storage system resources and an application server administrator who sets up the allocated resources according to the application. In this scenario, the storage system administrator can save the wizard current settings as a workflow so that the application server administrator can inherit the copy pair list that has been created.

- When creating a copy pair configuration definition, it may be necessary to stop the wizard before the copy pair configuration definition is completed. In this scenario, the incomplete definition can be temporarily saved as a workflow, and then worked on again when the wizard is restarted.

If you want to temporarily save the configuration definition, click Save on any wizard page. When the Save Workflow dialog box appears, specify a workflow name, and then close the wizard.

To restart the wizard to work on a saved workflow, from the Explorer menu, choose Tasks and then Workflows. Next, select the check box of the workflow where you want to restart the wizard, and then click Edit Workflow.

Tip: A user with the Modify permission can inherit a workflow from another user only when the workflow has been saved on the 3. Group Management or 4. Task Management wizard page. A workflow saved on the 2. Pair Association wizard page can be edited only by the user who saved the workflow.

Related topics

- Pair configuration definition workflow on page 10-7
- Editing workflows on page 10-67
- Viewing a list of workflows on page 10-66

Viewing a list of workflows

You can view a list of workflows that were registered when Pair Configuration Wizard processing was completed or a list of workflows saved temporarily because they were incomplete. The maximum number of workflows is 100. In this list, you can check information such as the workflow step (the Pair Configuration Wizard page at which the workflow was saved), creation time, and owner.

To view a list of workflows, from the Explorer menu, choose Tasks and then Workflows. Tasks are listed in the Workflows subwindow.
Editing workflows

You can edit a workflow that was temporarily saved before it was completed in the Pair Configuration Wizard. When editing an unfinished workflow, you can restart the Pair Configuration Wizard from the step when the workflow was saved.

You can also edit a workflow after pair configuration is completed (that is, a workflow for which Finish is displayed in Steps). The following conditions must be satisfied for a workflow to be editable:

- Task associated with the workflow has completely failed (no pairs have been established) or has not yet been initiated.
- All tasks associated with the workflow have been deleted.

To edit a workflow:

1. From the Explorer menu, choose Tasks and then Workflows. The Workflows subwindow appears.
2. Select the check box of a workflow you want to edit, and then click Edit Workflow.
   
   Tip: A workflow that was saved in a step prior to the Pair Configuration Wizard (3. Group Management) page cannot be edited or deleted. Therefore, if you click either of these buttons, an error message (RPM-00451) appears.

A workflow that was saved in the Pair Configuration Wizard (3. Group Management) page or later can be edited or deleted. However, if you attempt to return to the previous page (by clicking Back), an error message (RPM-00451) appears.

The Pair Configuration Wizard starts.
3. Edit and update the workflow.
   The workflow information is refreshed.

Deleting workflows

You can delete both workflows registered as a result of completion of Pair Configuration Wizard processing and workflows saved temporarily because they were incomplete. Note that a workflow can be deleted only when all the tasks associated with it have already been deleted. If all of the tasks associated with a workflow are executed successfully, the workflow is deleted automatically.
To delete workflows:

1. From the **Explorer** menu, choose **Tasks** and then **Workflows**. The Workflows subwindow appears.
2. Select the check boxes of the workflows you want to delete, and then click **Delete Workflows**.

**Tip:** A workflow that was saved in a step prior to the Pair Configuration Wizard (3. Group Management) page *cannot* be edited or deleted. Therefore, if you click either of these buttons, an error message (RPM-00451) appears.

A workflow that was saved in the Pair Configuration Wizard (3. Group Management) page or later *can* be edited or deleted. However, if you attempt to return to the previous page (by clicking **Back**), an error message (RPM-00451) appears.

The Delete Workflows dialog box appears.
3. Confirm your selections, and then delete them. The information in the display is updated.

**Related topics**
- About workflows on page 10-65
- Viewing a list of workflows on page 10-66

**Managing copy pair configuration definitions**

This module describes tasks for managing copy pair configuration definitions:

- About editing copy pair configuration definitions on page 10-68
- Adding copy pairs (completed workflow) on page 10-70
- Editing copy groups or snapshot groups by associating new pair groups on page 10-71
- Editing copy groups or snapshot groups by associating new copy pairs on page 10-75
- Editing copy groups by setting copy type on page 10-76
- Editing copy group settings on page 10-77
- Editing a path group ID on page 10-80
- Deleting copy groups on page 10-80
- Deleting copy pairs from copy groups on page 10-82
- Importing existing configuration definition files on page 10-83
- Modifying imported configuration definition files on page 10-84

**About editing copy pair configuration definitions**

You can edit existing copy pair configuration definitions by first selecting an existing paired volume or copy group and starting the Pair Configuration Wizard. You can use the wizard to change the configuration of a copy pair or
related copy groups. The configuration of specific copy groups can be changed in the following ways:

- By creating new pair groups and associating with an existing copy group
- By adding pairs to an existing copy group

**Tip:** You cannot edit user-specified parameters such as copy group name, port number and instance number after the copy pair configuration definitions are created using the Pair Configuration Wizard. If these parameters need to be edited, it is necessary to manually modify the copy pair configuration definitions outside of Replication Manager.

A number of conditions can affect the copy pair configuration definition settings. Before you use the Pair Configuration Wizard to edit a copy pair configuration definition, check the conditions described in the following topics:

- [Copy pair configuration conditions on page 10-13](#)
- [Storage system conditions for pair configuration definition on page 10-16](#)
- [Copy type requirements for pair configuration definitions on page 10-33](#)
- [Prerequisites for changing copy pair configuration (mainframe systems) on page 10-70](#)

In mainframe systems, you cannot delete or edit all pairs that are already in an existing copy group. This restriction prevents deletion of copy groups with distribution relationships. For details of conditions that disrupt copy group linkage, see [Conditions that disrupt copy group distribution relationships on page 10-64](#).

**Caution:** Observe the following precautions:

- While a copy pair configuration definition is being edited, do not use storage system operation management software to perform operations on a volume, copy group, or copy pair specified in that definition. Doing so might cause errors when Replication Manager executes tasks.
- If you have specified the instance number in the `server.agent.rm.exclusion.instance` property of the `server.properties` file of the Device Manager agent running on the pair management server, you cannot modify the applicable configuration definition file, nor can you change the status of the copy pair that is defined in that configuration definition file. For details about the `server.agent.rm.exclusion.instance` property, see the [Hitachi Command Suite Administrator Guide](#).

**Related topics**

- [Editing copy groups or snapshot groups by associating new copy pairs on page 10-75](#)
- [Editing copy groups or snapshot groups by associating new pair groups on page 10-71](#)
- [Relationship between managed resources and memory heap size on page 10-70](#)
Prerequisites for changing copy pair configuration (mainframe systems)

The following are prerequisite settings for using Replication Manager to change a copy pair configuration for mainframe systems:

- A dataset must be allocated for the disk configuration definition file on BCM
- A dataset must be allocated for the copy group definition file on BCM
- A route list must be set when using a remote command device
- BCM initialization parameters (Gen'ed DADID, Non Gen'ed DADID, Remote DADID and a prefix corresponding to each DADID) must be set
- The startup mode values of BCM Agent initialization parameters must be set to EDIT (default value is MONITOR). If a configuration definition is updated or copy pair status is changed when the startup mode value is MONITOR, a BCM Agent error will occur.

Tip: If you want to use an IPv6 connection or SSL communication between Replication Manager and BCM, IHS must be set up. For details about setting up IHS, refer to the Hitachi Business Continuity Manager documentation.

Relationship between managed resources and memory heap size

It is necessary to set an appropriate memory heap size, depending on the maximum number for each resource. For details on the number of managed resources supported and how to change the memory heap size, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

Adding copy pairs (completed workflow)

After completing the initial pair configuration, you can add additional copy pairs to a copy pair configuration definition. This can be done only if all the associated tasks are in Ready status. You can edit the completed workflow created upon completion of the Pair Configuration Wizard.

To add copy pairs to a completed workflow:

1. In the **Explorer** menu, choose **Tasks** and then **Tasks**.
   A list of tasks is displayed in the Tasks subwindow.
2. Select the task associated with the pair configuration you want to edit.
3. Click **Cancel Tasks**.
4. Confirm the cancel operation in the confirmation dialog and cancel the task.
   The task is displayed in the Tasks subwindow with Cancel status.
5. Select the canceled task and click **Delete Tasks**.
6. Confirm the delete operation in the confirmation dialog and delete the task.
7. In the **Explorer** menu, choose **Tasks** and then **Workflows**.
   A list of workflows is displayed in the Workflows subwindow.
8. Select the workflow associated with the pair configuration you want to edit.

9. Click **Edit Workflows**.
   The Pair Configuration Wizard is launched. The page on which the selected workflow was saved is displayed.

10. Click **Back** until you reach the **2. Pair Association** page.

11. Define new copy pairs and complete pair configuration.

**Related topics**

- Editing workflows on page 10-67
- Saving workflows on page 10-66

**Editing copy groups or snapshot groups by associating new pair groups**

To edit an existing copy group or snapshot group by associating new pair groups:

1. In the Hosts view, Storage Systems view, or Pair Configurations view (copy groups only), display information about the copy/snapshot group you wish to edit.
   For details, see the following:
   - Viewing a list of hosts on page 14-5
   - Viewing a list of storage systems on page 14-5
   - Viewing a list of copy pair configurations on page 14-4

2. In the displayed subwindow, select a copy group or snapshot group. Alternatively, make sure that the desired group information is displayed, and then click **Pair Management**.
   The Pair Configuration Wizard starts with the **1. Introduction** page displayed.

3. Read the wizard page, and then click **Next**.
   The **2. Pair Association** page appears. The copy topology to which the copy group or snapshot group belongs is displayed in the Copy Topology pane.

4. Create a pair group in the Copy Topology pane.

5. Define a list of copy pairs that you want to include in the pair group, by selecting the primary and secondary volumes in the Candidate List pane. For details on how to define copy pairs, see Creating pairs and pair groups on page 10-21.
   The defined copy pairs are displayed in the Pair List pane.

6. Repeat steps 4 and 5 to create additional pair groups.
   You can click the [icon] or the [icon] to expand the Candidate List and Pair List display areas.

7. Click **Next**.
The 3. Group Management page appears.

8. Select the copy group you want to edit and the pair group to be associated with the copy group, and then click Apply.

The pair group registered on the 2. Pair Association page is assigned to the copy group.

9. Click Next.

The settings specified in the above steps are listed as tasks that correspond to copy groups on the 4. Task Management page.

10. Click Next.

The 5. Confirm page appears.

11. Confirm the configuration definition and tasks for the copy pairs you have specified, and then click Confirm.

The 6. Finish page appears.

12. Click Finish.

The settings specified in the wizard are registered as tasks and a workflow. If a workflow was temporarily saved earlier because it was incomplete, that workflow is overwritten.

13. To view the list of tasks, from the Explorer menu, choose Tasks and then Tasks. A list of tasks is displayed in the Tasks subwindow.

Related topics

- Associating pair groups with copy groups on page 10-30

Conditions for copy types to be displayed (open systems)

The copy types displayed in the Copy Type drop-down list differ depending on the storage system type or the copy types set to existing copy groups.

A copy type is displayed when the license for that copy type, which is registered in the storage system to which the primary volume belongs, is enabled.

For an enterprise class storage, the following conditions apply, depending on the copy type:

- **COW / TI** and **UR** are displayed when the emulation type of the primary volume is OPEN-V.

- **UR (3DC Delta Resync)** is displayed if all the following conditions are satisfied:
  - A multi-target configuration that uses TrueCopy Sync and Universal Replicator is defined.
  - The copy type is TrueCopy Sync, and the secondary volume of the copy group that is the base for a multi-target configuration is selected.
  - The selected copy group has the same number of copy pairs as belong to a Universal Replicator copy group.
  - The storage system for the selected copy group differs from that for a Universal Replicator copy group.
For the Hitachi AMS/WMS, **TCA / TCE** and **COW / TI** are displayed when the pools are set for the default controller for the primary volume.

When you add a new copy group to existing copy groups, copy types to be displayed differ depending on the copy types of the volumes selected in **Copy Topology**. The following tables show the correspondence between the copy type of the selected volume and the copy types to be displayed.

**Copy types available when adding a copy group to existing copy groups (enterprise-class storage systems)**

<table>
<thead>
<tr>
<th>Copy type of the selected volume</th>
<th>Copy types displayed in the drop-down list</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SI</td>
<td>TCA / TCE</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>Y</td>
<td>Y⁴</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot/Thin Image</td>
<td>Y</td>
<td>Y³,⁴</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>GAD</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
- **Y**: Displayed
- **N**: Not displayed

**Notes:**
1. Displayed for a configuration that supports 3DC delta resync.
2. Displayed if a secondary volume is selected. This information is not displayed when a primary volume is selected.
3. This copy type is displayed when the selected volume is the primary volume, and is not displayed when the selected volume is the secondary volume.
4. Not supported on Hitachi Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, and HUS VM.
5. A GAD pair cannot be added to S-VOL of an SI pair.
6. A GAD pair cannot be added to S-VOL of a TI pair.
7. A CoW Snapshot pair cannot be added to both volumes of a GAD pair.
Copy types available when adding a copy group to existing copy groups (midrange storage systems)

<table>
<thead>
<tr>
<th>Copy type of the selected volume</th>
<th>Copy types displayed in the drop-down list</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>Shadow Image</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>N</td>
</tr>
<tr>
<td>Copy-on-Write/Thin Image</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Extended</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
Y: Displayed
N: Not displayed

1. Supported for AMS2000 and HUS100 series only.

Conditions for copy types to be displayed (mainframe systems)

When you add a new copy group to existing copy groups, copy types to be displayed differ depending on the copy types of the volumes selected in Copy Topology. The following tables show the correspondence between the copy type of the selected volume and the copy types to be displayed.

Copy types that can be selected when a new copy group is added to existing copy groups

<table>
<thead>
<tr>
<th>Copy type of selected volume</th>
<th>Copy type of the pair group to be connected by group addition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>Shadow Image</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>N</td>
</tr>
<tr>
<td>TrueCopy Sync</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Async*</td>
<td>Primary</td>
</tr>
<tr>
<td>Secondary</td>
<td>Y</td>
</tr>
<tr>
<td>Copy type of selected volume</td>
<td>Copy type of the pair group to be connected by group addition</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Shadow Image</td>
</tr>
<tr>
<td>Universal Replicator Primary</td>
<td>Y</td>
</tr>
<tr>
<td>Secondary</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Displayed.
N: Not Displayed.
*: Not supported on Hitachi Virtual Storage Platform, VSP G1000, VSP G1500, and VSP F1500.

Editing copy groups or snapshot groups by associating new copy pairs

To edit existing copy groups or snapshot groups by associating new copy pairs:

1. In the Hosts view, Storage Systems view, or Pair Configurations view (copy groups only), display information about the copy group or snapshot group for which you want to edit a copy pair configuration definition. For details on the Hosts, Storage Systems, and Pair Configurations views, see the following:
   - Viewing a list of hosts on page 14-5
   - Viewing a list of storage systems on page 14-5
   - Viewing a list of copy pair configurations on page 14-4

2. In the displayed subwindow, select a copy group or snapshot group. Alternatively, make sure that the desired group information is displayed, and then click Pair Management. The Pair Configuration Wizard starts with the 1. Introduction page displayed.

3. Read the wizard page, and then click Next. The 2. Pair Association page appears. The copy topology to which the copy group or snapshot group belongs is displayed in the Copy Topology pane.

4. On the 2. Pair Association page, define volume pairs by selecting the primary and secondary volumes in the Candidate List pane. For details on how to define copy pairs, see Creating pairs and pair groups on page 10-21.

   You can click the [ ] icon or the [ ] icon to expand the Candidate List and Pair List display areas.

5. Click Add.
The new volume pair is assigned to the copy group and displayed in the Pair List pane.

6. Click Next.


7. Click Next.

A new task that correspond to the copy group is displayed on the 4. Task Management page. The Pair Operations field for the associated task displays the status "modify file + create".

8. Click Next.

The 5. Confirm page appears.

9. Confirm the configuration definition and tasks for the copy pairs you have specified, and then click Confirm.

The 6. Finish page appears.

10. Click Finish.

The settings specified in the wizard are registered as tasks and a workflow. If a previous workflow was saved earlier because it was incomplete, that workflow is overwritten.

11. To view the list of tasks, from the Explorer menu, choose Tasks and then Tasks. A list of tasks is displayed in the Tasks subwindow.

Related topics

- About editing copy pair configuration definitions on page 10-68

Edited copy groups by setting copy type

In open systems, you can specify the copy type for copy groups in simplex (SMPL) status. Copy groups are in simplex status when a configuration definition file is already defined on the host but a pair does not exist in the storage. The copy type and copy direction are therefore unknown for such copy groups. To create a pair with the Pair Configuration Wizard using a pre-existing configuration definition file, it is necessary to assign a copy type.

To specify a copy type for a copy group:

1. In the hosts view or pair configurations view, display information about the copy group for which you want to edit the copy type.

For details on displaying copy group information, see the following:

   - Viewing copy group information in the Hosts view (open systems) on page 14-10
   - Viewing copy group information in the Pair Configurations view (open systems) on page 14-9

2. Select a copy group with pairs in simplex status.

3. Click Pair Management to launch the Pair Configuration Wizard.

5. In the **Copy Topology** pane, click the copy type link (with copy type value "Unknown"). The **Edit Copy Group** window is displayed.

6. Select a copy type from the **Copy Type** drop down list.

---

**Caution:** Pair configuration can fail if the specified copy type is different from the one configured when pair configuration file was created.

7. Click **OK**. The copy type assigned to the copy group is displayed in the Copy Topology pane.

---

**Tip:** The copy type of the edited copy group cannot be edited after a copy type is assigned.

---

### Related topics

- [About editing copy pair configuration definitions on page 10-68](#)
- [Creating pairs and pair groups on page 10-21](#)

---

### Editing copy group settings

Copy group settings can be edited for copy groups in mainframe systems. You can edit copy group settings for existing copy groups or while defining new copy groups. (Replication Manager uses default values for copy group settings if the copy group settings are not edited when defining new copy groups.)

When copy group configuration definitions created in Business Continuity Manager are edited in Replication Manager, configuration options specified in BCM are inherited by Replication Manager. For details on how inherited options are used by Replication Manager, see [About inheritance of copy group configuration options from BCM on page 10-78](#).

---

### To edit copy group settings

**Tip:** If you want to edit copy group settings for a new copy group (during pair configuration), start at step 5.

1. In the hosts view or pair configurations view, display information about the copy group for which you want to edit copy group settings. For details on displaying copy groups, see the following:
   - [Viewing copy group information in the Pair Configurations view (open systems) on page 14-9](#)
   - [Viewing copy group information in the Pair Configurations view (mainframe systems) on page 14-9](#)

2. Select a copy group for which you want to edit copy group settings.

3. Click **Pair Management** to launch the Pair Configuration Wizard.

5. In the Edit Group window, edit the parameters of the copy group configuration definition file by specifying the following settings:

- Mainframe host managing the copy group configuration definition file
- Alternative host for managing the copy groups
- Copy group setting options dependent on copy types
- Option to distribute the copy group configuration definition file when creating the configuration definition file

For details, see Conditions for changing copy group distribution primary host on page 10-63.

Tip: Note the following points:

- The check box for the copy group configuration definition file distribution is selected by default.
- Replication Manager assumes that the JNLGIDs and CTGIDs are already assigned during storage system setting.

6. Click OK.

Related topics

- Copy group settings options (mainframe) on page 10-78

About inheritance of copy group configuration options from BCM

When copy group configuration definition files created in Business Continuity Manager are edited in Replication Manager, configuration options specified in BCM are inherited by Replication Manager. These inherited option values are displayed in the Edit Group window, when settings for copy groups (that use the relevant configuration definition file) are edited using the Pair Configuration Wizard.

Even if the copy group settings are not edited when creating copy groups (using the relevant configuration definition file), the inherited options are still used for copy group configuration. The only exception when the inherited options are not used is for copy groups of copy type UR for which the EXCTG ID, Super DKC or ArbCmdDevice option values are specified. If these option values are specified, they will be deleted from the copy group configuration definition file when the option is changed during pair addition, deletion or editing.

Copy group settings options (mainframe)

The copy group settings options available on the Edit Group window depend on the copy type of the pair group associated with the copy group. The following table lists options that can be set for different copy types:
<table>
<thead>
<tr>
<th>Copy type</th>
<th>Option name</th>
<th>Displayed items</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Replicator</td>
<td>Mirror ID</td>
<td>Integer values from 0 to 3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> If you want to concurrently use Universal Replicator and TrueCopy copy groups in a 3DC Cascade or 3DC Multi-target configuration, you cannot specify a value of 0 for Mirror ID. For a 3DC Multi-target configuration, a duplicate mirror ID (already assigned to another UR copy group) cannot be specified.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protect Mode</td>
<td>Protect, Permit</td>
<td>Protect</td>
</tr>
<tr>
<td></td>
<td>Error Level</td>
<td>Group, Volume</td>
<td>Group</td>
</tr>
<tr>
<td>TrueCopy Synchronous</td>
<td>Protect Mode</td>
<td>Protect, Permit</td>
<td>Protect</td>
</tr>
<tr>
<td></td>
<td>Fence Level</td>
<td>Data, Status, Never</td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td>Freeze SCP</td>
<td>No value, Yes, No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Time Stamp Mode</td>
<td>No value, Yes, No</td>
<td>No value</td>
</tr>
<tr>
<td></td>
<td>Enable Open/MF CTG*</td>
<td>check mark</td>
<td>No value</td>
</tr>
<tr>
<td></td>
<td>HS*</td>
<td>check mark</td>
<td>No value</td>
</tr>
<tr>
<td>TrueCopy Asynchronous</td>
<td>Protect Mode</td>
<td>Protect, Permit</td>
<td>Protect</td>
</tr>
<tr>
<td></td>
<td>Error Level</td>
<td>Group, Volume</td>
<td>Group</td>
</tr>
<tr>
<td></td>
<td>Flow Control</td>
<td>Yes, No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Timer Type (Forward)</td>
<td>System, Local, None</td>
<td>System</td>
</tr>
<tr>
<td></td>
<td>Timer Type (Reverse)</td>
<td>System, Local, None</td>
<td>System</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>Protect Mode</td>
<td>Permit, Protect</td>
<td>Protect</td>
</tr>
<tr>
<td></td>
<td>Preset Mode</td>
<td>No value, Normal, UR. This is displayed only if the selected copy group has CTGID.</td>
<td>No value</td>
</tr>
</tbody>
</table>

Legend:

*: By default the check box is not checked. However, if the user is editing an already existing group, the state of the check box is the same as that when the group was saved or created. This option applies only to Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, and VSP F1500 storage systems.
The EXCTG options are available on the **Edit Group** window, when multiple CTGIDs exist on the Universal Replicator copy group. These options enable consistency to be maintained among multiple CTGIDs. The following table lists the EXCTG options available:

<table>
<thead>
<tr>
<th>Option name</th>
<th>Displayed item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable EXCTG among multiple CTGIDs</td>
<td>Check box</td>
<td>This option must be specified when Forward or Reverse or both are specified.</td>
</tr>
<tr>
<td>EXCTG ID</td>
<td>No value or 0 to 3</td>
<td></td>
</tr>
<tr>
<td>Secondary Storage Systems</td>
<td>All secondary storage systems that belong to the container are displayed.</td>
<td></td>
</tr>
<tr>
<td>Primary Storage Systems</td>
<td>All primary storage systems that belong to the container are displayed.</td>
<td></td>
</tr>
<tr>
<td>Super DKC</td>
<td>Radio buttons</td>
<td>Only one radio button can be selected</td>
</tr>
<tr>
<td>Arbitration CMD</td>
<td>3 to 5 characters in the <strong>XX:XX</strong> (**CU-number:**CCA) format. You can use the following characters: A to F, a to f, 0 to 9 and :.</td>
<td>The text box next to the selected Super DKC is disabled. Values can be entered in the other text boxes.</td>
</tr>
</tbody>
</table>

### Editing a path group ID

You can edit the path group ID using the Pair Configuration Wizard.

1. In the hosts view or pair configurations view, display information about the copy group for which you want to edit the path group ID.
   For details on displaying copy groups, see **Viewing copy group information in the Pair Configurations view (open systems) on page 14-9**.
2. Click **Pair Management** to launch the Pair Configuration Wizard.
3. On the **3. Group Management** page, click **Edit Group**.
4. In the **Edit Group** window, edit the primary or secondary path group ID.

   **Tip:** We recommend specifying same value for both primary and secondary path group IDs.
5. Click **OK** and proceed through the remaining pages to finish the Pair Configuration Wizard.

### Deleting copy groups

You can delete an existing copy group using the Pair Configuration Wizard.
Tip: Before you delete mainframe copy groups (with EXCTG specification) using the Pair Configuration Wizard, you should first delete all pairs using the Change Pair Status Wizard. When copy groups are deleted by CTG or pair units, the consistency of the EXCTG configuration is not guaranteed and task execution might fail.

To delete a copy group:

1. In the Hosts view, Storage Systems view, or Pair Configurations view, display information about the copy group for which you want to edit a copy pair configuration definition.
   For details on the Hosts view, Storage Systems view, and Pair Configurations view, see the following:
   - Viewing a list of hosts on page 14-5
   - Viewing a list of storage systems on page 14-5
   - Viewing a list of copy pair configurations on page 14-4

2. In the displayed subwindow, select a copy group or select one or more volumes that belong to the copy group to be deleted. Alternatively, make sure that copy group information is displayed, and then click Pair Management.
   The Pair Configuration Wizard starts with the 1. Introduction page displayed.

3. Read the wizard page, and then click Next.
   The 2. Pair Association page appears. The copy topology (configuration of the related copy groups) to which the copy group belongs is displayed under Copy Topology.

4. To delete a copy group, click the Delete Group button under Copy Topology. The dialog box for confirming deletion appears.

5. Click Next.
   The 3. Group Management page appears. The deleted pairs are displayed under Pair List.

6. Click Next.
   In the Task List on the 4. Task Management page, the Pair Operations field for the deleted copy group displays one of the following values:
   - In the case of open systems, modify file + delete is displayed.
   - In the case of mainframe systems, modify file(delete) is displayed.

7. Click Next.
   The 5. Confirm page appears.

8. Confirm the task for the deleted copy group, and then click Confirm.
   The 6. Finish page appears.

9. Click Finish.
   To view the task for the deleted copy group, from the Explorer menu, choose Tasks and then Tasks. The task is displayed in the Tasks subwindow.
Deleting copy pairs from copy groups

You can delete pairs from an existing copy group using the Pair Configuration Wizard.

Tip: In mainframe systems, you cannot delete all pairs that are in an existing copy group. This restriction prevents deletion of copy groups with distribution relationships. For details of conditions that disrupt copy group linkage, see Conditions that disrupt copy group distribution relationships on page 10-64.

To delete copy pairs from a copy group:

1. In the Hosts view, Storage Systems view, or Pair Configurations view, display information about the copy group for which you want to edit a copy pair configuration definition.
   For details on the Hosts view, Storage Systems view, and Pair Configurations view, see the following:
   - Viewing a list of hosts on page 14-5
   - Viewing a list of storage systems on page 14-5
   - Viewing a list of copy pair configurations on page 14-4

2. In the displayed subwindow, select a copy group. Alternatively, make sure that copy group information is displayed, and then click Pair Management.
   The Pair Configuration Wizard starts with the 1. Introduction page displayed.

3. Read the wizard page, and then click Next.
   The 2. Pair Association page appears. The copy topology (configuration of the related copy groups) to which the copy group belongs is displayed under Copy Topology.

4. To delete copy pairs, select the pairs to be deleted and click Delete (for copy pairs and primary volumes). The dialog box for confirming deletion appears.

5. Click Next.
   The 3. Group Management page appears. The deleted pairs are displayed under Pair List.

6. Click Next.
   The 4. Task Management page is displayed. The Pair Operations field for the deleted copy group in the Task List displays one of the following values:
   - For open systems, modify file + delete
   - For mainframe systems, modify file(delete)
7. Click **Next**.
The 5. Confirm page appears.

8. Confirm the task for the deleted copy group and click **Confirm**.
The 6. Finish page appears.

9. Click **Finish**.
To view the task for the deleted copy group, from the **Explorer** menu, choose **Tasks** and then **Tasks**. The **modify file + delete** task is displayed in the Tasks subwindow.

**Related topics**
- About concealing/revealing replica volumes on page 4-10
- Creating pairs and pair groups on page 10-21

**Importing existing configuration definition files**

**To import existing copy group configuration definition files:**

1. Confirm the following prerequisites:
   - Ensure the file specification format is supported by Device Manager agent. Verify that the parameters in the configuration definition file satisfy the settings restrictions for each parameter. For details about configuration definition file formats supported by Device Manager agent and settings restrictions for each parameter in the configuration definition files, see the **Hitachi Command Suite Administrator Guide**.
   - Place the files in the target folder for files to be loaded into Replication Manager. In Windows, the target folder for loading files is the System folder (represented by environment variable %windir%). In UNIX systems, the target folder for loading files is the /etc directory.

2. Perform a storage system refresh to load configuration definition files into Device Manager and Replication Manager. Refresh all the storage systems associated with both P-VOL and S-VOL.
   
   Refreshing of storage systems can be performed in the following ways:
   - Manually refreshing storage systems in Replication Manager. For details, see **Refreshing configuration information manually for each storage system on page 11-18**.
   - Executing a storage system refresh operation in Device Manager and then refreshing the configuration in Replication Manager. You can execute either a manual refresh or allow the automated refresh to update changes from the Device Manager database. For details, see **Refreshing configuration information manually for each information source on page 11-17**.

   **Tip:** It is necessary to perform a storage system refresh each time the configuration definition files are updated outside of Replication Manager.

3. If Replication Manager is unable to recognize copy pairs after loading configuration definition files, you should troubleshoot the operation. For
details of the troubleshooting procedure, see *Hitachi Command Suite Replication Manager Configuration Guide*.

**Related topics**

- [About copy pair configuration definitions on page 10-11](#)
- [About configuration definition file formats on page 10-11](#)

**Modifying imported configuration definition files**

You can modify imported configuration definition files by performing any of the following:

- Adding copy pairs to an existing copy group. For details, see [Editing copy groups or snapshot groups by associating new copy pairs on page 10-75](#).
- Deleting copy pairs from an existing copy group. For details, see [Deleting copy pairs from copy groups on page 10-82](#).
- Creating new copy groups using an existing configuration definition file. For details, see [Creating copy groups on page 10-28](#).

Replication Manager supports pre-existing configuration definition files with mixed formats (HORCM_LDEV and HORCM_DEV formats). When modifying a configuration definition file with mixed formats, Replication Manager modifies the file as follows:

- When new copy pairs are added to a pre-existing configuration definition file that has mixed formats, Replication Manager determines the format for the new copy pairs using the `server.agent.rm.pairDefinitionForm` property in the Device Manager `agent server.properties` file. The pre-existing format parameters are left as is. After modification, both HORCM_LDEV and HORCM_DEV formats are supported in the same configuration definition file.
- When deleting pairs, Replication Manager deletes the pair definition from the configuration definition file without regard to format.

We recommend that you use the Pair Configuration Wizard to modify imported configuration definition files. If updates are made directly to the files, an out-of-sync condition may occur. If this occurs, you will need to reload the existing configuration definition files by doing a manual storage system refresh from Replication Manager.

**Performing pair operations**

This module describes supported pair operations and procedures for changing copy pair status:

- [About copy pair operations on page 10-85](#)
- [About copy pair states on page 10-109](#)
- [About changing copy pair status on page 10-113](#)
- [Confirming copy status during task execution on page 10-132](#)
About copy pair operations

You may need to perform operations that change the copy pair status (such as splitting and re-synchronizing copy pairs), when errors occur in managed resources or when you backup data.

The following operations can be performed to change the copy pair status.

### Basic operations for changing the copy pair status

<table>
<thead>
<tr>
<th>Operation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>create</td>
<td>Creates a copy pair based on the configuration definition file (the initial copying of a copy pair in simplex status is performed).</td>
</tr>
<tr>
<td>split</td>
<td>Splits a copy pair.</td>
</tr>
<tr>
<td>resync</td>
<td>Performs data re-synchronization from the primary volume to the secondary volume.</td>
</tr>
<tr>
<td>restore</td>
<td>Performs data re-synchronization from the secondary volume to the primary volume.</td>
</tr>
<tr>
<td>syncwait</td>
<td>Waits until the synchronization of P- and S-VOLs is complete.</td>
</tr>
<tr>
<td>delete</td>
<td>Dissolves a copy pair (the copy pair is placed in simplex status).</td>
</tr>
<tr>
<td>take snapshot</td>
<td>Performs data re-synchronization from the primary volume to the secondary volume and splits the copy pair.</td>
</tr>
</tbody>
</table>

### Advanced operations for changing the copy pair status

<table>
<thead>
<tr>
<th>Operation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>takeover</td>
<td>If the detailed pair status of the primary volume is Unknown: The pair status becomes suspend and the detailed pair status of the secondary volume becomes Split(SSWS). If the detailed pair status of the primary volume is not Unknown: Reverses the primary and secondary volumes.</td>
</tr>
<tr>
<td>force-split</td>
<td>Splits the secondary volume to make the primary volume usable when the primary volume is not writable because of secondary volume failure. (The pair status becomes suspend or error.)</td>
</tr>
<tr>
<td>swap</td>
<td>Reverses the primary and secondary volumes.</td>
</tr>
<tr>
<td>takeover-recovery(resync)</td>
<td>Reverses the primary and secondary volumes and re-synchronizes data from the primary volume to the secondary volume. (The pair status becomes sync.)</td>
</tr>
<tr>
<td>takeover-recovery(recreate)</td>
<td>Reverses the primary and secondary volumes and recreate the copy pair. (The pair status becomes sync.)</td>
</tr>
</tbody>
</table>

### Related topics

- [About changing copy pair status on page 10-113](#)
Option items for copy pair operations (open systems)

The option items available for each copy pair operation vary depending on the copy type.

<table>
<thead>
<tr>
<th>Copy pair operation</th>
<th>Option</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TCS</td>
</tr>
<tr>
<td>create</td>
<td>Copy Pace</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Fence Level</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Pool ID</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Pool ID (P)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Pool ID (S)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>JNLG ID (P)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>JNLG ID (S)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>No Copy</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Split</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Quick Split</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Read Disable</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>(secondary)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Assign CTG</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>for At-Time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Split</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assign CTG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CTGID^8</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Conceal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volumes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reverse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Copy Direction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quorum Disk</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>ID</td>
<td></td>
</tr>
<tr>
<td>split</td>
<td>Copy Pace</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Force Suspend</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Swap Suspend</td>
<td>N</td>
</tr>
<tr>
<td>Copy pair operation</td>
<td>Option</td>
<td>Copy type</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TCS</td>
</tr>
<tr>
<td></td>
<td>Quick Split</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Secondary Mode</td>
<td>Y</td>
</tr>
<tr>
<td>resync</td>
<td>Copy Pace</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Quick Restore</td>
<td>N</td>
</tr>
<tr>
<td>restore</td>
<td>Copy Pace</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Quick Restore</td>
<td>N</td>
</tr>
<tr>
<td>syncwait</td>
<td>Timeout time</td>
<td>N</td>
</tr>
<tr>
<td>delete</td>
<td>Force Delete</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Reverse Direction</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Reveal Secondary Volumes</td>
<td>Y</td>
</tr>
<tr>
<td>take snapshot</td>
<td>Copy Pace</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Quick Mode</td>
<td>N</td>
</tr>
<tr>
<td>takeover</td>
<td>Data forward timeout time</td>
<td>N</td>
</tr>
<tr>
<td>swap takeover recovery (resync)</td>
<td>Copy Pace</td>
<td>Y</td>
</tr>
<tr>
<td>takeover recovery (recreate)</td>
<td>Copy Pace</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Fence Level</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>JNLG ID (P)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>JNLG ID (S)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>No Copy</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Legend:**

- **TCS**: TrueCopy Sync
- **TCA**: TrueCopy Async
- **TCE**: TrueCopy Extended Distance
- **UR**: Universal Replicator
GAD: global-active device  
SI: ShadowImage  
COW/TI: Copy-on-Write Snapshot or Thin Image

Y: Can be set.  
N: Cannot be set.

Notes:
1. Can be set only on midrange storage systems.  
2. Can be set when the copy type is Copy-on-Write Snapshot or Thin Image.  
4. You set either the Split option or the Assign CTG for At-Time Split option. You cannot set both at the same time.  
5. The setting cannot be changed when the copy type is Copy-on-Write Snapshot/Thin Image, but the option is always enabled.  
6. Can be set for Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, HUS VM, Universal Storage Platform V/VM, and midrange storage systems.  
7. Can be set for Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, HUS VM, Universal Storage Platform V/VM, HUS100 series, and Hitachi AMS2000.  
8. The combinations and values differ depending on the copy type and storage system. For the combinations that can be specified and the maximum CTGID values, see the table below.  
9. Disabled when the you attempt to execute this for a 3DC delta UR pair configuration.  
10. Create and delete operations are not available for snapshot groups.

Copy type and storage system combinations for which CTGID operation options can be set

<table>
<thead>
<tr>
<th>Storage System</th>
<th>Copy types and maximum CTGID values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCS</td>
</tr>
<tr>
<td>VSP G1000, VSP G1500, VSP F1500</td>
<td>255</td>
</tr>
<tr>
<td>HUS VM</td>
<td>127</td>
</tr>
<tr>
<td>Virtual Storage Platform</td>
<td></td>
</tr>
<tr>
<td>Universal Storage</td>
<td>127</td>
</tr>
<tr>
<td>Storage System</td>
<td>Copy types and maximum CTGID values</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
<td>TCS</td>
</tr>
<tr>
<td>Platform V/VM</td>
<td></td>
</tr>
<tr>
<td>VSP G200</td>
<td>15</td>
</tr>
<tr>
<td>VSP G400, G600</td>
<td>63</td>
</tr>
<tr>
<td>VSP F400, F600</td>
<td></td>
</tr>
<tr>
<td>VSP G800</td>
<td>127</td>
</tr>
<tr>
<td>VSP F800</td>
<td></td>
</tr>
<tr>
<td>HUS100 series</td>
<td>255</td>
</tr>
<tr>
<td>Hitachi AMS2000</td>
<td>15</td>
</tr>
<tr>
<td>Hitachi SMS</td>
<td>N</td>
</tr>
<tr>
<td>Hitachi AMS/WMS</td>
<td></td>
</tr>
<tr>
<td>Hitachi TMS</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** CTGID values start at 0. If the maximum CTGID values of primary and secondary storage systems are different, the smaller one is applied. Also, the CTGID option cannot be specified for Delta Resync, Copy-on-Write Snapshot/Thin Image, or snapshot groups.

**Legend:**

N: Cannot be set.

**Option items for copy pair operations (mainframe systems)**

The option items for a copy pair operation differ depending on the copy type. The following table shows the option items that can be set for each copy type.

**Copy pair operation options that can be set for each copy type**

<table>
<thead>
<tr>
<th>Copy Pair Operation Option Values</th>
<th>Copy Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>split</td>
<td>Quick Split</td>
<td>On, Off(*)</td>
</tr>
<tr>
<td>Copy Pair Operation Option Values</td>
<td>Copy Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>TCS</td>
<td>TCA</td>
</tr>
<tr>
<td>Force</td>
<td>On, Off(*)</td>
<td>If the value is Off, the status will be changed to Split after all the updated data in the P-VOLs are copied.</td>
</tr>
<tr>
<td>Direction</td>
<td>Forward, Reverse</td>
<td>The Forward value should be set in order to perform the resync operation after the split operation is performed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronization</td>
<td>Flush, Purge</td>
<td>If the value is Flush, the split operation is performed after data synchronization is completed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Mode</td>
<td>Read Only(*), Read Write</td>
<td>If the value is Read Only, the S-VOLs will be read only after the split operation is done.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>resync</td>
<td>On, Off(*)</td>
<td>If the value is On, the status will be changed to Pair immediately.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>On, Off(*)</td>
<td>If the value is On, the resync operation will be issued to all the target pairs regardless of their status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply MF/ Open CTG</td>
<td>On, Off(*)</td>
<td>If the value is On, a CTG is applied to the target pairs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overwrite ONLINE target volume</td>
<td>On, Off(*)</td>
<td>If the value is On, pairs will be resynchronized even if their S-VOLs are ONLINE.</td>
</tr>
<tr>
<td>Copy Pair Operation Option Values</td>
<td>Copy Type</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>restore</td>
<td><strong>TCS</strong></td>
<td></td>
</tr>
<tr>
<td>Quick Restore</td>
<td><strong>On, Off</strong></td>
<td><strong>Y</strong></td>
</tr>
<tr>
<td>Force</td>
<td><strong>Y</strong></td>
<td><strong>Y</strong></td>
</tr>
<tr>
<td>Overwrite ONLINE target volume</td>
<td><strong>Y</strong></td>
<td><strong>Y</strong></td>
</tr>
<tr>
<td>delete</td>
<td><strong>Y</strong></td>
<td><strong>Y</strong></td>
</tr>
</tbody>
</table>

**Legend:**

*: Default value
Y: Can be set.
--: Cannot be set.

**Tip:** When the YKRESYNC command is entered in BCM, you should specify either the FORWARD or REVERSE parameter. Whether you use the YKRESYNC FORWARD command to perform a Resync operation or use the YKRESYNC REVERSE command to perform a Restore operation depends on whether YKSUSPND FORWARD or YKSUSPND REVERSE was specified when the pair was suspended. You can also suspend a pair without specifying that a Resync or Restore operation will be performed. In this case, a Resync operation can be performed if the copy direction at the time of suspension was FORWARD. A Restore operation can be performed if the copy direction at the time of suspension was REVERSE.
### Display details of direction option and synchronization option

<table>
<thead>
<tr>
<th>Copy type</th>
<th>Operation target is copy group</th>
<th>Operation target is copy pair or C/T Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction</td>
<td>Synchronization</td>
</tr>
<tr>
<td>TrueCopy</td>
<td>Forward(*), Reverse</td>
<td>-</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td>Blank(*), Forward, Reverse</td>
<td>Blank, Flush(*), Purge</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td>Blank(*), Forward, Reverse</td>
<td>Blank, Flush(*), Purge</td>
</tr>
</tbody>
</table>

**Legend:**

*: Default value

-: Option is not displayed

#: If there are different directions in the selected pair, Replication Manager determines the direction using rules in the table below.

### Method by which copy direction displayed by the TrueCopy (Pair, C/T Group) operation is determined

<table>
<thead>
<tr>
<th>Copy direction</th>
<th>Present copy direction</th>
<th>Value displayed in Direction option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Forward</td>
<td>Forward</td>
<td>Forward</td>
</tr>
<tr>
<td>Only Reverse</td>
<td>Reverse</td>
<td>Reverse</td>
</tr>
<tr>
<td>Only No direction</td>
<td>No direction</td>
<td>Forward</td>
</tr>
<tr>
<td>Forward + No direction</td>
<td>Forward</td>
<td>Forward</td>
</tr>
<tr>
<td>Reverse + No direction</td>
<td>Reverse</td>
<td>Reverse</td>
</tr>
<tr>
<td>Forward + Reverse</td>
<td>Forward</td>
<td>Forward</td>
</tr>
<tr>
<td>Forward + Reverse + No direction</td>
<td>Forward</td>
<td>Forward</td>
</tr>
</tbody>
</table>

**Tip:** The Direction or Synchronization option should be specified, but not at the same time. The Direction option is available only when the copy type is TrueCopy. For TrueCopy Asynchronous and Universal Replicator, both options are available.
Details of copy pair operation options (mainframe systems)

**Copy type: TC**

<table>
<thead>
<tr>
<th>Pair command</th>
<th>Options</th>
<th>Item specified</th>
<th>Specifiable values</th>
<th>Default value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>split</td>
<td>Direction</td>
<td>The copy direction of the pair when re-synchronization is performed.</td>
<td>Forward, Reverse</td>
<td>Forward</td>
<td><strong>Forward</strong>: The SUSPOP status is set so that the copy direction after re-synchronization is from the primary site to the secondary site. <strong>Reverse</strong>: The SUSPOP status is set so that the copy direction after re-synchronization is from the secondary site to the primary site. <strong>Note</strong>: This option cannot be specified if the operation target is a copy pair or a C/T Group. This option can be specified when the operation target is a copy group.</td>
</tr>
<tr>
<td>force</td>
<td></td>
<td>on, off</td>
<td>off</td>
<td>SELECT(ALL),VOLUNIT is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. <strong>Note</strong>: The Force option affects all pairs, regardless of their individual statuses.</td>
<td></td>
</tr>
<tr>
<td>Secondary Mode</td>
<td>Whether to permit writing to the S-VOL after the split operation.</td>
<td>Read Only, Read Write</td>
<td>Read Only</td>
<td>The values &quot;Read Only&quot; and &quot;Read Write&quot; are displayed in this order.</td>
<td></td>
</tr>
<tr>
<td>resync</td>
<td>force</td>
<td>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</td>
<td>on, off</td>
<td>off</td>
<td>SELECT(ALL),VOLUNIT is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. <strong>Note</strong>: The Force option affects all pairs, regardless of their individual statuses.</td>
</tr>
<tr>
<td>Overwrite ONLINE target volume</td>
<td>Whether to create a copy pair when the copy destination</td>
<td>on, off</td>
<td>off</td>
<td><strong>on</strong>: A copy pair is created even when the S-VOL (or P-VOL when Reverse is specified) is online.</td>
<td></td>
</tr>
<tr>
<td>Pair command</td>
<td>Options</td>
<td>Item specified</td>
<td>Specifiable values</td>
<td>Default value</td>
<td>Remarks</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>----------------</td>
<td>-------------------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>volume is online.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Note:** Overwrite ONLINE target volume makes up a copy pair even if the primary volume in the configuration definition is online. Ensure that the primary volume is not being used.

<table>
<thead>
<tr>
<th>restore</th>
<th>force</th>
<th>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</th>
<th>on, off</th>
<th>off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SELECT(ALL),VOLUNIT is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The <strong>Force</strong> option affects all pairs, regardless of their individual statuses.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overwrite ONLINE target volume</th>
<th>Whether to create a copy pair when the copy destination volume is online.</th>
<th>on, off</th>
<th>off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>on:</strong> A copy pair is created even when the S-VOL (or P-VOL when <strong>Reverse</strong> is specified) is online.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>off:</strong> A copy pair is not created if the S-VOL (or P-VOL when <strong>Reverse</strong> is specified) is online.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the volume is online, no error occurs during an operation performed on C/T groups, but an error message is issued during an operation performed on pairs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Overwrite ONLINE target volume makes up a copy pair even if the primary volume in the configuration definition is in the Online status. Ensure that the primary volume is not being used.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>delete</th>
<th>force</th>
<th>Whether to set the pair status to Simplex from the S-VOL.</th>
<th>on, off</th>
<th>off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>When specified:</strong> YKRECOVER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>When not specified:</strong> YKDELETE.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The command cannot be used during a planned shutdown (during switching of the P-VOL and S-VOL).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair command</strong></td>
<td><strong>Options</strong></td>
<td><strong>Item specified</strong></td>
<td><strong>Specifiable values</strong></td>
<td><strong>Default value</strong></td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
<td>--------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Copy type: TCA/UR

<table>
<thead>
<tr>
<th><strong>Pair command</strong></th>
<th><strong>Options</strong></th>
<th><strong>Item specified</strong></th>
<th><strong>Specifiable values</strong></th>
<th><strong>Default value</strong></th>
<th><strong>Remarks</strong></th>
</tr>
</thead>
</table>
| split            | Direction   | The copy direction of the pair when re-synchronization is performed. | Forward, Reverse | Blank            | **Forward:** The SUSPOP status is set so that the copy direction after re-synchronization is from the primary site to the secondary site.  
**Reverse:** The SUSPOP status is set so that the copy direction after re-synchronization is from the secondary site to the primary site.  
**Notes:**  
- This option cannot be specified if the operation target is a copy pair or a C/T Group. This option can be specified when the operation target is a copy group.  
- Either the **Direction** option or the **Synchronization** option needs to be specified for the **split** command. (Both options cannot be specified at the same time.) |
| Synchronization  | Force       | Whether to suspend the copy pair after the data is synchronized. | Flush, Purge      | Flush            | **Flush:** The copy pair is suspended after the data is synchronized.  
**Purge:** The copy pair is suspended at the moment that a suspend request is issued, even when there is data that has not been synchronized yet.  
**Notes:**  
- Either the Direction option or the Synchronization option needs to be specified for the split pair command. (Both options cannot be specified at the same time.)  
- When a split operation is performed on UR pairs or C/T groups, Purge cannot be selected. |
<table>
<thead>
<tr>
<th>Pair command</th>
<th>Options</th>
<th>Item specified</th>
<th>Specifiable values</th>
<th>Default value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The Flush option is not displayed when the following two conditions are both satisfied: - The operation target is TCA. - The primary volume is in the remote site. In this case the default value of the Synchronization is &quot;Purge&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</td>
<td>on, off</td>
<td>off</td>
<td>SELECT(ALL),VOLUNIT is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. <strong>Notes:</strong> • The <strong>Force</strong> option affects all pairs, regardless of their individual statuses. • When <strong>Purge</strong> is selected for a split operation to be performed on UR copy groups, the <strong>Force</strong> option is inactive. • When a split operation is performed on TCA or UR copy groups, if the value specified for the <strong>Direction</strong> option is different from the current copy direction, the <strong>Force</strong> option is inactive.</td>
</tr>
<tr>
<td>Secondary Mode</td>
<td>Whether to permit writing to the S-VOL after the split operation.</td>
<td>Read Only, Read Write</td>
<td>Read Only</td>
<td>The values &quot;Read Only&quot; and &quot;Read Write&quot; are displayed in this order.</td>
<td></td>
</tr>
</tbody>
</table>
| resync | Force | The operation is performed on a volume basis. The command is executed for all pairs regardless of their status. | on, off | off | SELECT(ALL),VOLUNIT is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. **Notes:** • The **Force** option affects all pairs, regardless of their individual statuses. • The **Force** option will be disabled when this operation is selected for Delta UR pairs.
<table>
<thead>
<tr>
<th>Pair command</th>
<th>Options</th>
<th>Item specified</th>
<th>Specifiable values</th>
<th>Default value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overwrite ONLINE target volume</td>
<td></td>
<td>Whether to create a copy pair when the copy destination volume is online.</td>
<td>on, off</td>
<td>off</td>
<td>on: A copy pair is created even when the S-VOL (or P-VOL when Reverse is specified) is online. &lt;br&gt; off: A copy pair is not created if the S-VOL (or P-VOL when Reverse is specified) is online. If the volume is online, no error occurs during an operation performed on C/T groups, but an error message is issued during an operation performed on pairs. &lt;br&gt; Note: Overwrite ONLINE target volume makes up a copy pair even if the primary volume in the configuration definition is online. Ensure that the primary volume is not being used.</td>
</tr>
<tr>
<td></td>
<td>restore</td>
<td>Force</td>
<td>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</td>
<td>on, off</td>
<td>off</td>
</tr>
<tr>
<td>Overwrite ONLINE target volume</td>
<td></td>
<td>Whether to create a copy pair when the copy destination volume is online.</td>
<td>on, off</td>
<td>off</td>
<td>on: A copy pair is created even when the S-VOL (or P-VOL when Reverse is specified) is online. &lt;br&gt; off: A copy pair is not created if the S-VOL (or P-VOL when Reverse is specified) is online. If the volume is online, no error occurs during an operation performed on C/T groups, but an error message is issued during an operation performed on pairs. &lt;br&gt; Note: Overwrite ONLINE target volume makes up a copy pair even if the primary volume in the configuration definition is online. Ensure that the primary volume is not being used.</td>
</tr>
<tr>
<td>delete</td>
<td>force</td>
<td>Whether to set the pair status to Simplex from the S-VOL.</td>
<td>on, off</td>
<td>off</td>
<td>When specified: YKRECVER. When not specified: YKDELETE. The command cannot be used during a planned shutdown (during switching of the P-VOL and S-VOL). &lt;br&gt; Note: The Force Delete option changes the status of the secondary</td>
</tr>
<tr>
<td>Pair command</td>
<td>Options</td>
<td>Item specified</td>
<td>Specifiable values</td>
<td>Default value</td>
<td>Remarks</td>
</tr>
<tr>
<td>---------------</td>
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<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>volume to simplex, but does not affect the status of the primary volume.</td>
</tr>
</tbody>
</table>

**Copy type: SI**

<table>
<thead>
<tr>
<th>Pair command</th>
<th>Options</th>
<th>Item specified</th>
<th>Specifiable values</th>
<th>Default value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>split</td>
<td>Quick split</td>
<td>Whether to immediately perform a split.</td>
<td>on, off</td>
<td>off</td>
<td><strong>on</strong>: The pair status is immediately set to SUSPOP, even when the data is being copied. <strong>off</strong>: The pair status is set to SUSPOP when the data copy has finished.</td>
</tr>
<tr>
<td>force</td>
<td></td>
<td>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</td>
<td>on, off</td>
<td>off</td>
<td><strong>SELECT(ALL),VOLUNIT</strong> is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. <strong>Note</strong>: The <strong>Force</strong> option affects all pairs, regardless of their individual statuses.</td>
</tr>
<tr>
<td>Secondary Mode</td>
<td></td>
<td>Whether to permit writing to the S-VOL after the split operation.</td>
<td>Read Only, Read Write</td>
<td>Read Only</td>
<td>The values <strong>Read Only</strong> and <strong>Read Write</strong> are displayed in this order.</td>
</tr>
<tr>
<td>resync</td>
<td>Quick Resync</td>
<td>Whether to immediately perform re-synchronization.</td>
<td>on, off</td>
<td>off</td>
<td><strong>on</strong>: The pair status is immediately set to DUPLEX. <strong>off</strong>: The pair status is set to DUPLEX when the data copy has finished.</td>
</tr>
<tr>
<td>force</td>
<td></td>
<td>The operation is performed on a volume basis. The command is executed for all pairs regardless of their status.</td>
<td>on, off</td>
<td>off</td>
<td><strong>SELECT(ALL),VOLUNIT</strong> is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible. <strong>Note</strong>: The <strong>Force</strong> option affects all pairs, regardless of their individual statuses.</td>
</tr>
<tr>
<td>Pair command</td>
<td>Options</td>
<td>Item specified</td>
<td>Specifiable values</td>
<td>Default value</td>
<td>Remarks</td>
</tr>
<tr>
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<td>---------</td>
</tr>
</tbody>
</table>
| Overwrite ONLINE target volume | | Whether to create a copy pair when the copy destination volume is online. | on, off | off | **on:** A copy pair is created even when the S-VOL (or P-VOL when **Reverse** is specified) is online.  
**off:** A copy pair is not created if the S-VOL (or P-VOL when **Reverse** is specified) is online. If the volume is online, no error occurs during an operation performed on C/T groups, but an error message is issued during an operation performed on pairs.  
**Note:** **Overwrite ONLINE target volume** makes up a copy pair even if the primary volume in the configuration definition is online. Ensure that the primary volume is not being used. |
| restore | Quick Restore | Whether to immediately perform restoration. | on, off | off | **on:** The pair status is immediately set to DUPLEX.  
**off:** The pair status is set to DUPLEX when the data copy has finished. |
| force | | The operation is performed on a volume basis. The command is executed for all pairs regardless of their status. | on, off | off | **SELECT(ALL),VOLUNIT** is specified in the BCM command. The command is also executed for pairs whose status is not available for the command. The command is executed on a pair basis even though execution by group is possible.  
**Note:** The **Force** option affects all pairs, regardless of their individual statuses. |
| Overwrite ONLINE target volume | | Whether to create a copy pair when the copy destination volume is online. | on, off | off | **on:** A copy pair is created even when the S-VOL (or P-VOL when **Reverse** is specified) is online.  
**off:** A copy pair is not created if the S-VOL (or P-VOL when **Reverse** is specified) is online. If the volume is online, no error occurs during an operation performed on C/T groups, but an error message is issued during an operation performed on pairs.  
**Note:** **Overwrite ONLINE target volume** makes up a copy pair even if the primary volume in the configuration definition is online. Ensure that the primary volume is not being used. |
<table>
<thead>
<tr>
<th>Pair command</th>
<th>Options</th>
<th>Item specified</th>
<th>Specifiable values</th>
<th>Default value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>delete</td>
<td>(No Option)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>BCM command: YKDELETE. The command cannot be used during a planned shutdown (during switching of the P-VOL and S-VOL).</td>
</tr>
</tbody>
</table>

**Notes:**

1. When a split operation is performed on TC, TCA, or UR pairs or C/T groups, the **Direction** option is inactive because the reverse direction to the current copy direction cannot be specified.

2. When a split operation is performed on TCA or UR copy groups, if the value specified for the **Direction** option is different from the current copy direction, **Synchronization** cannot be specified.

3. The default value displayed for the **Secondary Mode** option is the value defined for the copy group to which the target copy pair belongs.

4. When a split operation is performed during I/O processing of the primary volume, it might result in incomplete data in the secondary volume. Make sure that I/O processing for the primary volume is not being performed.

**When performing operations on EXCTGs (mainframe systems)**

The following conditions apply when performing operations on an EXCTG:

- You must execute the operation on the EXCTG per EXCTG. If you execute the operation per pair or per CTG, the consistency of the EXCTG configuration might be compromised.

- When you execute the Delete operation on the EXCTG, do not specify the Force option. If you specify the Force option, the consistency of the EXCTG configuration might be compromised.

**About copy pair status**

*Copy pair status* is a value that indicates the status of a copy pair, as defined by Replication Manager. To view a list of copy pair statuses, see [Copy pair status categories on page 10-101](#).

The copy pair statuses displayed are determined by the combination of the copy pair states of the primary and secondary volumes. Although two copy pairs might have the same copy pair status, the combination of copy pair states of their primary and secondary volumes might differ. For details on copy pair statuses and combinations of copy pair states for primary and secondary volumes, see [Conditions for determining copy pair status on page 10-101](#).

The copy pair status can be displayed at various levels: for example, for an individual copy group, or for the type of volume replication functionality (the copy type). The status of the copy pair within that grouping that has the most serious (highest priority) status is referred to as the *summary pair status*. 
The priority of copy pair statuses, starting from the most serious, is as follows:

1. error
2. suspend
3. copying
4. sync
5. simplex
6. unknown

By looking at the most significant copy pair status, you can identify which problems should be resolved first.

Related topics
- About changing copy pair status on page 10-113
- About copy pair states on page 10-109

### Copy pair status categories

<table>
<thead>
<tr>
<th>Icon</th>
<th>Copy pair status</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄️</td>
<td>error</td>
<td>An error occurred in the copy pair.</td>
</tr>
<tr>
<td>⚡</td>
<td>suspend</td>
<td>The copy pair is split.</td>
</tr>
<tr>
<td>🔄️</td>
<td>copying</td>
<td>The copy pair is being copied in a forward or reverse direction.</td>
</tr>
<tr>
<td>✅</td>
<td>sync</td>
<td>The copy pair is in a synchronized state.</td>
</tr>
<tr>
<td>🏘️</td>
<td>simplex</td>
<td>Definition information for the copy pair exists, but the copy pair structure itself does not.</td>
</tr>
</tbody>
</table>
| 🕵️    | unknown          | The pair status cannot be determined for one of the following reasons:  
  • The status of the copy pair cannot be determined because of its current settings.  
  • The status of the copy pair cannot be determined because of its structure.  
  • Configuration information has been acquired, but no copy pair information has. |

### Conditions for determining copy pair status

The copy pair status displayed in Replication Manager is determined by the combination of primary and secondary volume copy pair states. This status varies according to the copy type. The tables that follow are organized by copy types.

Note: Be aware that the tables are divided into two or more parts.
### Conditions for determining copy pair status 1/3 (for TrueCopy Async, TrueCopy Sync, TrueCopy Extended Distance, Universal Replicator, and global-active device)

<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Invalid</strong></td>
<td><strong>Invalid</strong></td>
</tr>
<tr>
<td><strong>Error (PSUE or HLDE)</strong></td>
<td><strong>Error (SUSPER)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPER)</strong></td>
<td><strong>Error (SUSPCU)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPCU)</strong></td>
<td><strong>Error (PDUB)</strong></td>
</tr>
<tr>
<td><strong>Error (PDUB)</strong></td>
<td><strong>Split (PFUS)</strong></td>
</tr>
<tr>
<td><strong>Split (PFUS)</strong></td>
<td><strong>Split (SWAP PING)</strong></td>
</tr>
<tr>
<td><strong>Invalid</strong></td>
<td><strong>Invalid</strong></td>
</tr>
<tr>
<td><strong>Error (PSUE or HLDE)</strong></td>
<td><strong>Error (SUSPER)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPER)</strong></td>
<td><strong>Error (SUSPCU)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPCU)</strong></td>
<td><strong>Error (PDUB)</strong></td>
</tr>
<tr>
<td><strong>Error (PDUB)</strong></td>
<td><strong>Split (PFUS)</strong></td>
</tr>
<tr>
<td><strong>Split (PFUS)</strong></td>
<td><strong>Split (SWAP PING)</strong></td>
</tr>
<tr>
<td><strong>Invalid</strong></td>
<td><strong>Invalid</strong></td>
</tr>
<tr>
<td><strong>Error (PSUE or HLDE)</strong></td>
<td><strong>Error (SUSPER)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPER)</strong></td>
<td><strong>Error (SUSPCU)</strong></td>
</tr>
<tr>
<td><strong>Error (SUSPCU)</strong></td>
<td><strong>Error (PDUB)</strong></td>
</tr>
<tr>
<td><strong>Error (PDUB)</strong></td>
<td><strong>Split (PFUS)</strong></td>
</tr>
<tr>
<td><strong>Split (PFUS)</strong></td>
<td><strong>Split (SWAP PING)</strong></td>
</tr>
</tbody>
</table>

**Notes:**
- **SUSPER**: SUSPended
- **SUSPCU**: SUSPended/ERROR
- **SUSPOP**: SUSPended
- **SUSPOP**: SUSPended
- **HOLD**: SUSPended
- **COPY or PAIR**: SUSPended
- **TRANS**: SUSPended
- **PAIR or PFUL**: SUSPended
- **PFUL**: SUSPended
- **SIMPLEX**: SUSPended
- **DUPLEX**: SUSPended

---

10-102  
Managing pair life cycle  
Hitachi Replication Manager User Guide
## Conditions for determining copy pair status 2/3 (for TrueCopy Async, TrueCopy Sync, TrueCopy Extended Distance, and Universal Replicator)

<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Invalid</td>
</tr>
<tr>
<td>Unknown</td>
<td>error</td>
</tr>
</tbody>
</table>

Legend:

--: Not applicable

*: suspend is displayed for a mainframe system, and error for an open system.
<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Split (NODELTA)</td>
</tr>
<tr>
<td>Deleting (COPY or PAIR)</td>
<td>--</td>
</tr>
<tr>
<td>Suspending (COPY or PAIR)</td>
<td>--</td>
</tr>
<tr>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td>copying</td>
</tr>
<tr>
<td>Pair (PFUL)</td>
<td>--</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL)</td>
<td>--</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL) or Pair (DUPLEX)</td>
<td>copying</td>
</tr>
<tr>
<td>Simplex (SMPL) or Simplex (SIMPLEX)</td>
<td>error</td>
</tr>
<tr>
<td>Unknown</td>
<td>error</td>
</tr>
</tbody>
</table>

Legend:
--: Not applicable

**Conditions for determining copy pair status 3/3 (for TrueCopy Async, TrueCopy Sync, TrueCopy Extended Distance, and Universal Replicator)**

<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deleting (COPY or PAIR)</td>
</tr>
<tr>
<td>Invalid</td>
<td>copying</td>
</tr>
<tr>
<td>Copy pair state of the secondary volume</td>
<td>Copy pair state of the primary volume</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Deleting (COPY or PAIR)</td>
<td><strong>Deleting</strong> (COPY or PAIR)</td>
</tr>
<tr>
<td>Suspending (COPY or PAIR)</td>
<td><strong>Suspending</strong> (COPY or PAIR)</td>
</tr>
<tr>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td><strong>Pair</strong> (PFUL) or Pair (PAIR or PFUL) or Pair (PAIR or PFUL or Pair (DUPLEX))</td>
</tr>
<tr>
<td>Simplex (SMPL) or Simplex (SIMPLEX)</td>
<td><strong>Unknown</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error (PSUE or HLDE)</th>
<th>error</th>
<th>error</th>
<th>error</th>
<th>error</th>
<th>error</th>
<th>error</th>
<th>simplex</th>
<th>error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error (SUSPER)</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>simplex</td>
<td>error</td>
</tr>
<tr>
<td>Error (SUSPCU)</td>
<td>--</td>
<td>--</td>
<td>error</td>
<td>--</td>
<td>--</td>
<td>error</td>
<td>simplex</td>
<td>error</td>
</tr>
<tr>
<td>Error (PDBU)</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>simplex</td>
<td>error</td>
</tr>
<tr>
<td>Split (PFUS)</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>error</td>
<td>simplex</td>
<td>error</td>
</tr>
<tr>
<td>Split (SSWS)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>suspend/copying*</td>
<td>simplex</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (SUSPOP)</td>
<td>--</td>
<td>--</td>
<td>copying</td>
<td>--</td>
<td>--</td>
<td>copying</td>
<td>simplex</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (HOLD)</td>
<td>--</td>
<td>--</td>
<td>copying</td>
<td>--</td>
<td>--</td>
<td>copying</td>
<td>copying</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (PSUS or HOLD)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>simplex</td>
<td>suspend</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>simplex</td>
<td>copying</td>
</tr>
<tr>
<td>Deleting (COPY or PAIR)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
</tr>
<tr>
<td>Suspending (COPY or PAIR)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>simplex</td>
<td>copying</td>
</tr>
<tr>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>simplex</td>
<td>copying</td>
</tr>
<tr>
<td>Pair (PFUL)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>sync</td>
<td>simplex</td>
<td>sync</td>
</tr>
</tbody>
</table>

*Copying* if the leading Copy Pair command is not being used.

Managing pair life cycle

Hitachi Replication Manager User Guide

10-105
### Conditions for determining copy pair status 1/2 (for ShadowImage and Copy-on-Write Snapshot/Thin Image)

<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Invalid</strong></td>
<td>Error (PSUE or HLDE)</td>
</tr>
<tr>
<td>Invalid</td>
<td>error</td>
</tr>
<tr>
<td>Error (PSUE or HLDE)</td>
<td>error</td>
</tr>
<tr>
<td>Error (SUSPER)</td>
<td>error</td>
</tr>
<tr>
<td>Split (PFUS)</td>
<td>error</td>
</tr>
<tr>
<td>Copy pair state of the secondary volume</td>
<td>Copy pair state of the primary volume</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Invalid</td>
<td>Error (PSUE or HLDE)</td>
</tr>
<tr>
<td>Split (SUSPVS)</td>
<td>suspend error error suspend suspend suspend copying</td>
</tr>
<tr>
<td>Split (SUSPOP)</td>
<td>suspend -- error error suspend suspend -- copying</td>
</tr>
<tr>
<td>Split (PSUS or HOLD)</td>
<td>suspend error error error suspend -- suspend copying</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)</td>
<td>copying error error error suspend suspend copying</td>
</tr>
<tr>
<td>Deleting (COPY orPAIR)</td>
<td>copying error error error suspend -- suspend copying</td>
</tr>
<tr>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td>copying error error error suspend suspend suspend copying</td>
</tr>
<tr>
<td>Copying (RCPY) or Copying (Resync-R)</td>
<td>copying error error error suspend suspend suspend suspend copying</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL)</td>
<td>sync error error error suspend suspend suspend suspend copying</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL) or Pair (DUPLEX)</td>
<td>sync error error error suspend suspend suspend suspend copying</td>
</tr>
<tr>
<td>Simplex (SMPL) or Simplex (SIMPLEX)</td>
<td>simplex error error error suspend suspend suspend suspend copying</td>
</tr>
<tr>
<td>Unknown</td>
<td>error error error suspend suspend suspend suspend copying</td>
</tr>
</tbody>
</table>

Legend:

---: Not applicable
## Conditions for determining copy pair status 2/2 (for ShadowImage and Copy-on-Write Snapshot/Thin Image)

<table>
<thead>
<tr>
<th>Copy pair state of the secondary volume</th>
<th>Copy pair state of the primary volume</th>
<th>Copying</th>
<th>Copying</th>
<th>Copying</th>
<th>Copying</th>
<th>Copying</th>
<th>Copying</th>
<th>Simplex</th>
<th>Simplex</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deleting (COPY or PAIR)</td>
<td>Deleting (COPY or PAIR)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>simplex</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Error (PSUE or HLDE)</td>
<td>Error (PSUE or HLDE)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Error (SUSPER)</td>
<td>Error (SUSPER)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (PFUS)</td>
<td>Split (PFUS)</td>
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<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (SUSPVS)</td>
<td>Split (SUSPVS)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (SUSPOP)</td>
<td>Split (SUSPOP)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>suspend</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Split (PSUS or HOLD)</td>
<td>Split (PSUS or HOLD)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>copying</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Deleting (COPY or PAIR)</td>
<td>Deleting (COPY or PAIR)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>error</td>
<td>copying</td>
<td>suspend</td>
</tr>
<tr>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td>Copying (COPY) or Copying (Pending or Resync)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>copying</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Copying (RCPY) or Copying (Resync-R)</td>
<td>Copying (RCPY) or Copying (Resync-R)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>copying</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL) or Pair (DUPLEX)</td>
<td>Pair (PAIR or PFUL) or Pair (DUPLEX)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>error</td>
<td>sync</td>
<td>suspend</td>
<td>suspend</td>
</tr>
<tr>
<td>Simplex (SMPL) or Simplex (SIMPLEX)</td>
<td>Simplex (SMPL) or Simplex (SIMPLEX)</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>simplex</td>
<td>simplex</td>
<td>simplex</td>
<td>simplex</td>
</tr>
<tr>
<td>Unknown</td>
<td>Unknown</td>
<td>copying</td>
<td>copying</td>
<td>copying</td>
<td>sync</td>
<td>sync</td>
<td>simplex</td>
<td>unknown</td>
<td>suspend</td>
<td>suspend</td>
</tr>
</tbody>
</table>

**Legend:**

\[\text{--}:\] Not applicable
About copy pair states

*Copy pair state* is a value that indicates the statuses of the primary and secondary volumes in a copy pair. The copy pair states displayed in Replication Manager correspond to the copy pair statuses used in Device Manager, CCI, storage system operation management software (Storage Navigator and Storage Navigator Modular), and Business Continuity Manager.

For details, see Correspondence between copy pair states and the copy pair statuses in prerequisite products on page 10-109.

Related topics
- About copy pair status on page 10-100

Correspondence between copy pair states and the copy pair statuses in prerequisite products

The copy pair state displayed in Replication Manager corresponds to the copy pair status displayed by prerequisite products (such as Device Manager, CCI, and Business Continuity Manager), and by storage system operation management software (such as Storage Navigator and Storage Navigator Modular). The following tables show the correspondence between the copy pair states in Replication Manager and the copy pair statuses of various products, classified by open systems and mainframe systems.

### Table 10-5 Correspondences between copy pair states and statuses (open systems)

<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>Copy pair status in Device Manager</th>
<th>Copy pair status in CCI</th>
<th>Copy pair status in Storage Navigator</th>
<th>Copy pair status in Storage Navigator Modular</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error (PSUE or HLDE)</td>
<td>Error</td>
<td>PSUE</td>
<td>PSUE</td>
<td>PSUE</td>
<td>SI/COW/TI/TCS/TCA/TCE/UR/GAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HLDE</td>
<td>--</td>
</tr>
<tr>
<td>Error (PDUB)</td>
<td>Error in LUSE</td>
<td>PDUB</td>
<td>PDUB</td>
<td>--</td>
<td>TCS/TCA/TCE</td>
</tr>
<tr>
<td>Split (PFUS)(^1)</td>
<td>Split</td>
<td>PFUS</td>
<td>PFUS</td>
<td>--</td>
<td>COW/TI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PFUS</td>
<td>PSUS</td>
<td>--</td>
<td>TCA/TCE</td>
</tr>
<tr>
<td>Split (SSWS)(^1)</td>
<td>SSWS</td>
<td>PSUS</td>
<td>--</td>
<td>TCA/TCE/UR</td>
<td></td>
</tr>
<tr>
<td>Split (PSUS or HOLD)(^1)</td>
<td>PSUS</td>
<td>PSUS</td>
<td>PSUS</td>
<td>SI/COW/TI/TCS/TCA/TCE/UR/GAD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HOLD</td>
<td>--</td>
</tr>
</tbody>
</table>

\(^1\) The split status displayed in Replication Manager is the same as the status of the primary volume.

Managing pair life cycle 10-109

Hitachi Replication Manager User Guide
<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>Copy pair status in Device Manager</th>
<th>Copy pair status in CCI</th>
<th>Copy pair status in Storage Navigator</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copying (COPY)</td>
<td>Copying</td>
<td>COPY</td>
<td>COPY</td>
<td>COW/TI/TCS/TCA/TCE/UR/GAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SI/COW/TI</td>
</tr>
<tr>
<td>Copying (RCPY)</td>
<td>Reverse-Copying</td>
<td>RCPY</td>
<td>COPY(RS-R)</td>
<td>SI/COW/TI</td>
</tr>
<tr>
<td>Copying (COPY)</td>
<td>Suspending</td>
<td>COPY</td>
<td>Suspending</td>
<td>TCA/TCE/UR</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pair (PAIR)²</td>
<td>Deleting</td>
<td>COPY</td>
<td>Deleting</td>
<td>TCA/TCE/UR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair (PAIR)²</td>
<td></td>
<td>PAIR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copying (COPY)</td>
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<td>COPY</td>
<td></td>
<td>SI</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Pair (PAIR)²</td>
<td></td>
<td>PAIR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair (PAIR)²</td>
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<td>PAIR</td>
<td></td>
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</tr>
<tr>
<td>Simplex (SMPL)</td>
<td>Simplex</td>
<td>SMPL</td>
<td>SMPL</td>
<td>SI/COW/TI/TCS/TCA/TCE/UR/GAD</td>
</tr>
<tr>
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<td>Unknown</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Legend:

---: Not applicable

SI: ShadowImage

COW / TI: Copy-on-Write Snapshot/Thin Image

TCS: TrueCopy Sync

TCA: TrueCopy Async

TCE: TrueCopy Extended Distance

UR: Universal Replicator
GAD: global-active device

Notes:
1. Displayed as **Split** (PSUS or HOLD) for copy pairs created using storage system operation management software (Storage Navigator and Storage Navigator Modular).
2. Displayed as **Suspending** (COPY or PAIR) for copy pairs created using storage system operation management software.
3. Copy pair status when pairsplit is executed while the status is **COPY**.
4. Copy pair status when pairsplit is executed while the status is **PAIR**.
5. Displayed as **Deleting** (COPY or PAIR) for copy pairs created using storage system operation management software.
6. Copy pair status when pairsplit -S is executed while the status is **COPY**.
7. Copy pair status when pairsplit -S is executed while the status is **PAIR**.
8. Displayed as **Pair** (PAIR or PFUL) for copy pairs created using storage system operation management software.

**Table 10-6 Correspondences between copy pair states and statuses (mainframe systems)**

<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>Copy pair status in Business Continuity Manager</th>
<th>Copy pair status in Storage Navigator</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invalid</td>
<td>INVALID</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Error (SUSPCU)</td>
<td>SUSPCU1</td>
<td>Suspended</td>
<td>TCS/TCA/UR</td>
</tr>
<tr>
<td>Error (SUSPER)</td>
<td>SUSPER2</td>
<td>Suspended</td>
<td>TCS/TCA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suspend</td>
<td>SI/UR</td>
</tr>
<tr>
<td>Error (HOLDER)</td>
<td>HOLDER</td>
<td>Hide</td>
<td>UR</td>
</tr>
<tr>
<td>Split (SWAPPING)</td>
<td>SWAPPING</td>
<td>Suspended</td>
<td>TCS/TCA/UR</td>
</tr>
<tr>
<td>Split (SUSPOP)</td>
<td>SUSPOP</td>
<td>Suspended</td>
<td>TCS/TCA/UR</td>
</tr>
<tr>
<td>Split (SUSPOS)</td>
<td>SUSPOS</td>
<td>Split</td>
<td>SI</td>
</tr>
<tr>
<td>Split (SUSPVS)</td>
<td>SUSPVS</td>
<td>V-Split</td>
<td>SI</td>
</tr>
<tr>
<td>Split (NODELTA)</td>
<td>NODELTA</td>
<td>Hold</td>
<td>UR</td>
</tr>
<tr>
<td>Split (HOLD)</td>
<td>HOLD</td>
<td>Hold</td>
<td>UR</td>
</tr>
<tr>
<td>Split (CHKJNL)</td>
<td>CHKJNL</td>
<td>Hold</td>
<td>UR</td>
</tr>
<tr>
<td>Split (HOLDTRNS)</td>
<td>HOLDTRNS</td>
<td>Hold</td>
<td>UR</td>
</tr>
<tr>
<td>Copying (Pending or Resync)</td>
<td>PENDING³</td>
<td>Pending duplex</td>
<td>TCS/TCA/UR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pending</td>
<td>SI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resync</td>
<td>SI</td>
</tr>
<tr>
<td>Copying (Resync-R)</td>
<td>REVRSY</td>
<td>Resync-R</td>
<td>SI</td>
</tr>
<tr>
<td>Copy pair state</td>
<td>Copy pair status in Business Continuity Manager</td>
<td>Copy pair status in Storage Navigator</td>
<td>Copy type</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)⁴</td>
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<td>Suspending</td>
<td>TCA/UR</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)⁴</td>
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<td>SI</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)⁴</td>
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<td>Duplex</td>
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</tr>
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</tr>
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<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

**Tip:** As of Replication Manager v6.3, mainframe pair status information can be obtained using Device Manager (without Business Continuity Manager or Mainframe Agent installed). Detailed pair state information for mainframe pairs in Device Manager is equivalent to the information for open systems pairs shown in *Table 10-5 Correspondences between copy pair states and statuses (open systems) on page 10-109.*

**Legend:**

---: Not applicable

TCS: TrueCopy Sync

TCA: TrueCopy Async

UR: Universal Replicator

SI: ShadowImage

1. If Business Continuity Manager 5.0 is being used, the status of the primary volume is SUSPCU, and the status of the secondary volume is SWAPPING, the copy pair status is displayed as SUSPCU in Business Continuity Manager and Split (SW) in Replication Manager.

2. If Business Continuity Manager 5.0 is being used, the status of the primary volume is SUSPER, and the status of the secondary volume is SWAPPING, the copy pair status is displayed as SUSPER in Business Continuity Manager and Split (SW) in Replication Manager.

3. If Business Continuity Manager 5.0 is being used, the status of the primary volume is DUPLEX, and the status of the secondary volume is SWAPPING, the copy pair status is displayed as PENDING in Business Continuity Manager and Split (SW) in Replication Manager.

4. Suspending, Copying or Deleting (TRANS) is the actual status, but in Replication Manager this is abbreviated as Suspending or Deleting (TRANS).
Changing copy pair status

Replication Manager allows you to change the copy pair status in open systems and mainframe systems. Pair status change operations may be necessary to resume copy operations after recovery from an error or unexpected pair status changes.

Note: The Change Pair Status Wizard also supports site recovery operations for open systems. See Advanced pair operations and recovery scenarios on page 10-132 for more information.

Related topics
- About copy pair status on page 10-100
- About changing copy pair status on page 10-113
- Change pair status workflow on page 10-126
- Advanced pair operations and recovery scenarios on page 10-132

About changing copy pair status

Replication Manager allows you to change the copy pair status in open and mainframe systems. Pair status change operations may be necessary to resume copy operations after recovery from an error or unexpected pair status changes.

For open systems, you can perform the split, resync, restore, create and delete operations when the storage system type is Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series, VSP Gx00 models, VSP Fx00 models, HUS VM, Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500. You can perform the split, resync, and restore operations for the Hitachi SMS storage system.

For mainframe systems, you can perform the delete, split, resync and restore operations when the storage system type is Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500. The create operation is not supported. The above copy pair status change operations can be performed only when Business Continuity Manager is used. These operations cannot be performed when Mainframe Agent is used.

The pair status conditions where the current pair status can be changed differ depending on the copy type and the copy pair state when the operation is specified. They also differ depending on whether the target is a single or multiple copy pairs and whether the target is a copy group. For information, see the following:

- Pair status transitions (when the target is a single or multiple copy pairs) on page 10-120
- Pair status transitions (when the target is a copy group or snapshot group) on page 10-115
Precautions

Observe the following precautions when changing the status of copy pairs:

- If the storage system is VSP G1000, VSP G1500, or VSP F1500, S-VOLs must be assigned to the Thin Image copy pair. If no V-VOL is assigned to the copy pair or the copy pair includes a DP-VOL assigned as an S-VOL (copy pairs with the clone attribute or corresponding to cascade configuration), the Change Pair Status Wizard is not launched.

- If the Power Saving function is enabled on midrange storage systems, you must make sure that the parity group containing the target LU is in the spin-up status. If the parity group is in the spin-down status, use Storage Navigator Modular to restore it to spin-up status.

- While a copy pair configuration definition is being edited, do not use storage system operation management software, such as Device Manager, CCI, Storage Navigator, or Business Continuity Manager, to perform concurrent operations on a volume, copy group, or copy pair specified in that definition. Doing so may cause errors when Replication Manager executes tasks.

- If you have executed an operation that reverses the primary-secondary relationship of volumes, recreate the Change Copy Pair Status task. If the copy direction is reversed, the copy pair after the reversal is no longer recognized as being the same as the copy pair before the reversal so if a Change Copy Pair Status task created for the copy pair before the reversal is executed, the task execution will fail.

- Daylight savings time involves adjusting the system time of the Replication Manager management server for certain time periods. Operations scheduled for these time periods are handled in the following manner:
  - On the day that daylight savings time starts, a task scheduled for the skipped time period (for example, from 2:00 to 2:59) is executed one hour later. For example, a task scheduled for 2:30AM on that day is executed at 3:30AM.
  - When daylight savings time ends, an overlapping time period occurs and a task scheduled for that time is executed once. For example, if a task is scheduled for 1:30AM, the task is only executed for the first instance of 1:30AM and not the second (when the time change occurs).

For best results, do not use the Change Pair Status Wizard or Edit Task dialog box to schedule a task that will be executed when the system time will be adjusted for daylight savings time.

- If you change the configuration of a volume associated with a configuration definition file recognized by Replication Manager without editing the configuration definition file, you should restart the Device Manager agent. Specifically, this should be done if:
  - You perform a create operation using the Change Pair Status Wizard.
  - You create a copy pair using CCI.

If you do not restart the Device Manager agent, the status of the copy pair might not be acquired properly.
**Related topics**

- [About copy pair status on page 10-100](#)
- [Changing the copy pair status for each copy group, snapshot group, or container on page 10-128](#)
- [Changing the copy pair status for each copy pair on page 10-127](#)
- [Changing the copy pair status for multiple copy pairs (batch operation) on page 10-130](#)

**Pair status transitions (when the target is a copy group or snapshot group)**

The following table lists possible pair status transitions for each combination of copy pair state and copy type when the target is a copy group or snapshot group.

### Possible pair status transitions (1/2)

<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>Shadow-Image</th>
<th>TrueCopy Sync</th>
<th>TrueCopy Async</th>
<th>TrueCopy Extended Distance</th>
<th>global-active device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error (PSUE)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
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<td>restore</td>
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<td>syncwait</td>
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<td>take snapshot</td>
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<tr>
<td>Error (HOLDER)*</td>
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<td>Split (Full)</td>
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<td>Split (HOLD)*</td>
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<td>Copy pair state</td>
<td>Shadow-Image</td>
<td>TrueCopy Sync</td>
<td>TrueCopy Async</td>
<td>TrueCopy Extended Distance</td>
<td>global-active device</td>
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<tr>
<td>Copy pair state</td>
<td>Shadow-Image</td>
<td>TrueCopy Sync</td>
<td>TrueCopy Async</td>
<td>TrueCopy Extended Distance</td>
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<td>Pair</td>
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<td>resync</td>
<td>resync^1</td>
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<td>restore</td>
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<td>restore</td>
<td>restore</td>
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<td>delete</td>
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<tr>
<td>Simplex (SMPL)</td>
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<td></td>
<td>take snapshot</td>
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<td>delete</td>
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</tbody>
</table>

**Legend:**

resync: Indicates that the copy pair can be re-synchronized.

restore: Indicates that the copy pair can be re-synchronized in reverse (from the secondary volume to the primary volume).

create: Indicates that a copy pair can be created.

delete: Indicates that the copy pair can be dissolved.

split: Indicates that the copy pair can be split.

take snapshot: Indicates that the copy pair can be snapshotted.

--: Indicates that the copy pair status cannot be changed.

*: This is the copy pair state when a 3DC multi-target configuration is used.

**Notes:**

1. If the pair belongs to a GAD 3DC delta resync configuration, this operation is available only when the detailed pair status of the related UR is Split (SSWS).

**Tip:** Regarding pair status transitions:

- If a selected copy group includes a copy pair whose copy pair state is Error (PSUE) or Error in LUSE, the state of all copy pairs is assumed to be Error (PSUE).
- If a selected copy group includes copy pairs whose copy pair states differ, all copy pair statuses to which each copy pair can be changed are displayed as candidates. However, note that nothing is displayed if a copy pair whose pair status cannot be changed is included (and pair statuses cannot be changed on a copy group basis).
<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>Copy-on-Write / Thin Image</th>
<th>Universal Replicator</th>
<th>Delta UR</th>
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</thead>
<tbody>
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<td>Error (PSUE)</td>
<td>split</td>
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<td>split</td>
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<tr>
<td></td>
<td>resync</td>
<td>resync</td>
<td>resync²</td>
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<td>restore²</td>
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<td></td>
<td>delete¹</td>
<td>syncwait</td>
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<tr>
<td></td>
<td>take snapshot</td>
<td>delete</td>
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<tr>
<td>Error (HOLDER)³</td>
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<td>--</td>
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<td>restore</td>
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<td>delete¹</td>
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<td>restore</td>
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<td>delete¹</td>
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<td>Split (HOLD)</td>
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<td>split</td>
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</tr>
<tr>
<td></td>
<td>resync</td>
<td>resync</td>
<td>resync²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>restore</td>
<td>restore²</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>delete¹</td>
<td>syncwait</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>take snapshot</td>
<td>delete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suspending</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>--</td>
</tr>
<tr>
<td>Copy pair state</td>
<td>Copy-on-Write / Thin Image</td>
<td>Universal Replicator</td>
<td>Delta UR</td>
<td>n/a</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>---------</td>
<td>-----</td>
</tr>
<tr>
<td>Copying</td>
<td>resync restore delete¹ take snapshot</td>
<td>resync restore² syncwait delete</td>
<td>resync² restore² syncwait delete</td>
<td></td>
</tr>
<tr>
<td>Copying (Reverse)</td>
<td>split resync restore delete¹ take snapshot</td>
<td>split resync restore² syncwait delete</td>
<td>split resync² restore² syncwait delete</td>
<td>--</td>
</tr>
<tr>
<td>Pair (Full)</td>
<td>split resync restore delete¹ take snapshot</td>
<td>split resync restore² syncwait delete</td>
<td>split resync² restore² syncwait delete</td>
<td>--</td>
</tr>
<tr>
<td>Pair (PAIR or PFUL)</td>
<td>split resync restore delete¹ take snapshot</td>
<td>split resync restore² syncwait delete</td>
<td>split resync² restore² syncwait delete</td>
<td>--</td>
</tr>
<tr>
<td>Pair</td>
<td>split resync restore delete¹ take snapshot</td>
<td>split resync restore² syncwait delete</td>
<td>split resync² restore² syncwait delete</td>
<td>--</td>
</tr>
<tr>
<td>Simplex</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>create</td>
</tr>
<tr>
<td>Unknown</td>
<td>split resync restore delete¹ take snapshot</td>
<td>split resync restore² syncwait delete</td>
<td>split resync² restore² syncwait delete</td>
<td>--</td>
</tr>
</tbody>
</table>

**Legend:**

1. The delete operation is not available for snapshot groups.
2. This operation is not available if the pair belongs to a GAD 3DC delta resync configuration.

3. If the pair belongs to a GAD 3DC delta resync configuration, this operation is available only when the detailed pair status of the related UR is Split (SSWS).

Tip: Note about pair status transitions:

- If a selected copy group includes a copy pair whose copy pair state is Error (PSUE) or Error in LUSE, the state of all copy pairs is assumed to be Error (PSUE).
- If a selected copy group includes copy pairs whose copy pair states differ, all copy pair statuses to which each copy pair can be changed are displayed as candidates. However, note that nothing is displayed if a copy pair whose pair status cannot be changed is included (and pair statuses cannot be changed on a copy group basis).

Pair status transitions (when the target is a single or multiple copy pairs)

The following table lists possible pair status transitions for each combination of copy pair state and copy type, when the target is a single or multiple copy pairs.

<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>SI</th>
<th>TCS</th>
<th>TCA or TCE</th>
<th>COW/TI$^4$</th>
<th>UR</th>
<th>n/a</th>
<th>GAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error (PSUE)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
</tr>
<tr>
<td></td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td>take</td>
<td>snapshot</td>
<td>take</td>
<td>snapshot</td>
<td>take</td>
<td>take</td>
<td>take</td>
</tr>
<tr>
<td>Error in LUSE</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Error (HOLDER)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Error in LUSE</td>
<td>--</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
</tr>
<tr>
<td></td>
<td>restore</td>
<td>resync</td>
<td>resync</td>
<td>resync</td>
<td>resync</td>
<td>resync</td>
<td>resync</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>delete</td>
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<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td>syncwait</td>
<td>syncwait</td>
<td>syncwait</td>
<td>syncwait</td>
<td>syncwait</td>
<td>syncwait</td>
<td>syncwait</td>
</tr>
</tbody>
</table>

1. The Same Primary Volume Is Shared
2. The Same Primary Volume Is Not Shared
3. Error (HOLDER)
4. COW/TI
<table>
<thead>
<tr>
<th>Copy pair state</th>
<th>SI</th>
<th>TCS</th>
<th>TCA or TCE</th>
<th>COW/TI(^4)</th>
<th>UR</th>
<th>n/a</th>
<th>GAD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The Same Primary Volume Is Shared(^1)</td>
<td>The Same Primary Volume Is Not Shared(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Split (Full)</td>
<td></td>
<td></td>
<td></td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>take snapshot</td>
</tr>
<tr>
<td>Split (SW)</td>
<td></td>
<td></td>
<td></td>
<td>split resync</td>
<td>split resync</td>
<td>split resync</td>
<td>split resync</td>
</tr>
<tr>
<td>Split (HOLD)(^3)</td>
<td></td>
<td></td>
<td></td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
<td>delete</td>
</tr>
<tr>
<td>Split</td>
<td></td>
<td></td>
<td></td>
<td>split resync</td>
<td>split resync</td>
<td>split resync</td>
<td>split resync</td>
</tr>
<tr>
<td>Deletiing</td>
<td></td>
<td></td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Suspending</td>
<td></td>
<td></td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Copy pair state</td>
<td>SI</td>
<td>TCS</td>
<td>TCA or TCE</td>
<td>COW/TI&lt;sup&gt;4&lt;/sup&gt;</td>
<td>The Same Primary Volume Is Shared&lt;sup&gt;1&lt;/sup&gt;</td>
<td>The Same Primary Volume Is Not Shared&lt;sup&gt;2&lt;/sup&gt;</td>
<td>UR</td>
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<td>----------------</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
</tr>
<tr>
<td>Copying</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
</tr>
<tr>
<td></td>
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<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>delete</td>
<td>syncwait</td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td>take snapshot</td>
<td>take snapshot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copying (Reverse)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>--</td>
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<td>resync</td>
<td>restore</td>
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<td>restore</td>
<td>resync</td>
<td>restore</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>delete</td>
<td>syncwait</td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
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<tr>
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<td>take snapshot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair (Full)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>resync</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
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<td></td>
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<td>delete</td>
<td>syncwait</td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td>take snapshot</td>
<td>take snapshot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair (PAIR)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>resync</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
</tr>
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<td>delete</td>
<td>delete</td>
<td>syncwait</td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pair (PFUL)</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>split</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>resync</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
<td>resync</td>
<td>restore</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>delete</td>
<td>syncwait</td>
<td>delete</td>
<td>delete</td>
<td>take snapshot</td>
<td>delete</td>
</tr>
<tr>
<td></td>
<td>take snapshot</td>
<td>take snapshot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy pair state</td>
<td>SI</td>
<td>TCS</td>
<td>TCA or TCE</td>
<td>COW/TI&lt;sup&gt;4&lt;/sup&gt;</td>
<td>UR</td>
<td>n/a</td>
<td>GAD</td>
</tr>
<tr>
<td>----------------</td>
<td>----</td>
<td>-----</td>
<td>------------</td>
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<td>----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The Same Primary Volume Is Shared&lt;sup&gt;1&lt;/sup&gt;</td>
<td>The Same Primary Volume Is Not Shared&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>take snapshot</td>
<td></td>
<td></td>
<td></td>
<td>take snapshot</td>
<td>take snapshot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair</td>
<td>split</td>
<td>resync</td>
<td>restore</td>
<td>delete</td>
<td>take snapshot</td>
<td>split</td>
<td>resync</td>
</tr>
<tr>
<td>Simplicity</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unknown</td>
<td>split</td>
<td>resync</td>
<td>restore</td>
<td>delete</td>
<td>take snapshot</td>
<td>split</td>
<td>resync</td>
</tr>
</tbody>
</table>

**Legend:**

- **resync:** Indicates that the copy pair can be re-synchronized.
- **restore:** Indicates that the copy pair can be re-synchronized in reverse (from the secondary volume to the primary volume).
- **delete:** Indicates that the copy pair can be dissolved.
- **split:** Indicates that the copy pair can be split.
- **create:** Indicates that a copy pair can be created.
- **take snapshot:** Indicates that a copy pair can be snapshotted.
- **--:** Indicates that the copy pair status cannot be changed.

**Tip:** If copy pairs with types that differ are selected, you cannot change the copy status.
1. This column lists the selectable copy pair statuses when the copy group to which the selected copy pair belongs contains copy pairs that have the same primary volume.

2. This column lists the selectable copy pair statuses when the copy group to which the selected copy pair belongs does not contain copy pairs that have the same primary volume.

3. This is the copy pair state when a 3DC multi-target configuration is used.

4. If the TI pair belongs to a snapshot group, only split, resync, restore, and take snapshot operations are available.

**Supported operations for copy groups and copy pairs (mainframe systems)**

The following table lists the operations supported for mainframe copy groups and copy pairs, classified by copy pair statuses and copy types.

<table>
<thead>
<tr>
<th>Details of copy group or copy pair statuses</th>
<th>Shadow Image</th>
<th>TrueCopy Sync</th>
<th>TrueCopy Async</th>
<th>Universal Replicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invalid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Simplex (SIMPLEX)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unknown</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pair (DUPLEX)</td>
<td>Split Delete</td>
<td>Split Delete</td>
<td>Split Delete</td>
<td>Split Delete</td>
</tr>
<tr>
<td>Copying (Pending or Resync)</td>
<td>Split Delete</td>
<td>Split Delete</td>
<td>Split Delete</td>
<td>Split Delete</td>
</tr>
<tr>
<td>Split (SUSPOP)</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
</tr>
<tr>
<td>Error (SUSPCU)</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
</tr>
<tr>
<td>Error (SUSPER)</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
</tr>
<tr>
<td>Suspending or Deleting (TRANS)</td>
<td>Delete</td>
<td>Delete</td>
<td>Delete</td>
<td>Delete</td>
</tr>
<tr>
<td>Split (SUSPVS)</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
<td>Resync/Restore Delete</td>
</tr>
<tr>
<td>Split (SWAPPING)</td>
<td>Resync/Restore</td>
<td>Resync/Restore</td>
<td>Resync/Restore</td>
<td>Resync/Restore</td>
</tr>
<tr>
<td>Copying (Resync-R)</td>
<td>Delete</td>
<td>Delete</td>
<td>Delete</td>
<td>Delete</td>
</tr>
<tr>
<td>Split (HOLD)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Resync Delete</td>
</tr>
</tbody>
</table>
The operation that can be selected is determined based on the copy directions of the definition and entity and on the pair status. The Resync option or the Restore option is displayed for pair operations depending on whether the FORWARD or REVERSE option is specified when the SUSPEND status is set. For ShadowImage copy type, this check is not performed and you can select both the Resync and Restore options. For pairs in the Split (HOLD) and Split (NODELTA) statuses, specifying the Resync option disables the Force option. For pairs in the Split (HOLD) and Split (NODELTA) statuses, the Resync option is available only for operations on copy groups. If any of the pairs are in the Split (SWAPPING) status, the Delete option is unavailable.

The following table shows the correspondence between copy directions of the pair definition and entity and permitted pair operations for various pair statuses:

<table>
<thead>
<tr>
<th>Copy directions of pair definitions and entity</th>
<th>Pair status</th>
<th>Pair operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Match</td>
<td>Split (SUSPOP)</td>
<td>Resync</td>
</tr>
<tr>
<td></td>
<td>Error (SUSPCU)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Error (SUSPER)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Split (SUSPVS)</td>
<td></td>
</tr>
<tr>
<td>Match</td>
<td>Split (SWAPPING)</td>
<td>Restore</td>
</tr>
<tr>
<td>Differ</td>
<td>Split (SUSPOP)</td>
<td>Restore</td>
</tr>
<tr>
<td></td>
<td>Error (SUSPCU)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Error (SUSPER)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Split (SUSPVS)</td>
<td></td>
</tr>
<tr>
<td>Differ</td>
<td>Split (SWAPPING)</td>
<td>Resync</td>
</tr>
</tbody>
</table>

Tip: When there are multiple pair statuses for the selected group or pair, the status is displayed if at least one pair is operable.

**About Change Pair Status Wizard**

Replication Manager includes a Change Pair Status Wizard for changing the status of copy pairs. You can use this wizard to change the copy pair status on a copy pair or copy group basis. The wizard displays the available operations and options in drop-down lists based on the copy type and copy pair status.
Tip: Note the following:

- When the wizard finishes processing, a task is automatically registered for each copy group. You cannot edit these tasks because the copy pair status is changed immediately. However, if the processing takes time, you can check the task execution result later.

- You can register a maximum of 100 workflows and a total of 1,000 tasks, including the tasks for creating and editing copy pair configuration definitions and changing the copy pair status.

Related topics

- Change pair status workflow on page 10-126

Change pair status workflow

The following figure illustrates the task flow for changing the copy pair status.

Launching the Change Pair Status Wizard

You can launch the Change Pair Status Wizard either using the icon or using the Change Pair Status button.

To launch the Change Pair Status Wizard using the icon:

1. Display the information about the volume included in a copy pair whose status you want to change or display the information about the host or
configuration definition file where you want to change the status of copy pairs.

2. Click the icon of the copy pair whose pair status you want to change.

To launch the Change Pair Status Wizard using the Change Pair Status button:

1. Display the information about the group or container containing the copy pairs whose status you want to change.
2. Select the check boxes of the target copy pairs whose status you want to change, and then click Change Pair Status.

Related topics

• About Change Pair Status Wizard on page 10-125

Changing the copy pair status for each copy pair

To change the status of a single copy pair:

1. Display the information about an open or mainframe systems volume included in a copy pair whose status you want to change.
   For more information, see Viewing information about volumes belonging to a host on page 14-12 or Viewing information about volumes belonging to a storage system on page 14-12.
2. Click the icon of the copy pair whose pair status you want to change. The Change Pair Status Wizard starts with the Introduction page displayed.
3. Read the on-screen instructions, and then click Next. The Select Copy Pairs page appears.

Note: For open systems configured with redundant pair management servers: When the wizard is invoked from the Pair Relationship display of the Host or Storage System View, the Select Pair Management Server page appears first. In this case, select the combination of pair management servers to be used, and then click Next to proceed to the Select Copy Pairs page.

4. For open systems, select the check boxes of the copy pair(s) whose status you want to change in the Pair List pane, and then click Next. The Select Pair Operation page appears.
5. For mainframe systems, perform the following operations on the Select Copy Pairs page to select specific types of copy pairs:
   a. On the Criteria tab, specify parameters for filtering the copy pairs.
   b. Click Apply. The Results tab displays the list of filtered copy pairs.
   c. On the Results tab, select the check boxes of the copy pairs whose status you want to change.
   d. Click Next.
   The Select Pair Operation page appears.
6. Set the operation (Pair Operation) and options to change the pair status and click Next.
The Confirm page appears.

Caution: Check the following before confirming the pair status change operation:

- Before a Split operation is performed, ensure that I/O processing for the primary volume is not being performed because this operation might result in incomplete data in the secondary volume.
- Before a Resync operation, ensure that the data in the secondary volume is no longer required because this operation will overwrite the secondary volume data.
- Before a Restore operation is performed ensure that the data in the primary volume is no longer required because this operation will overwrite the primary volume data.
- Ensure the value of the copy pace is correct because this operation may take longer if an incorrect value is used.

7. Check the specified settings and click Confirm.
The Finish page appears.

8. Click Finish.
The settings specified in the wizard are registered as tasks. Check the Status column for the tasks to make sure that the status of the copy pair was changed successfully. To view the tasks, from the Explorer menu, select Tasks and then Tasks.

Tip: In 3DC Delta Resync configurations, executing pair operations against TCS or UR (Delta UR) changes the related copy group status. Refresh configuration after the Task execution. If the related copy group status is not changed, execute the Refresh Copy Group operation.

Related topics

- About changing copy pair status on page 10-113
- Change pair status workflow on page 10-126
- Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems) on page 10-39
- When performing operations on EXCTGs (mainframe systems) on page 10-100

Changing the copy pair status for each copy group, snapshot group, or container

When you change the pair status of copy pairs in a copy group or snapshot group, you must know all the pairs related to the copy pairs whose status you want to change. In Replication Manager, when you select a copy pair, all the related copy pairs are displayed in a list. From this list, you can select the copy pairs whose status you want to change.

1. For copy groups or containers: Display the information about the host or configuration definition file where you want to change the status of
copy pairs. For details on how to display this information, see Viewing individual host information on page 14-6 or Viewing copy pair configuration definition information on page 12-6.

For snapshot groups: Display the information about the storage system where you want to change the status of copy pairs. See Viewing storage system information (open systems) on page 14-15 for more information.

2. Click the icon that includes the copy pairs whose pair status you want to change.

The Change Pair Status Wizard starts.

3. Read the wizard page and click Next.

The 2. Select Copy Pairs page appears.

4. For open systems, select the check boxes of the copy pairs whose status you want to change in the Pair List pane, and then click Next.

The 3. Select Pair Operation page appears.

5. For mainframe systems, perform the following operations on the 2. Select Copy Pairs page to select specific types of copy pairs:

   ○ Before a split operation is performed, ensure that I/O processing for the primary volume is not being performed because this operation might result in incomplete data in the secondary volume.

   ○ Before a Resync operation, ensure that the data in the secondary volume is no longer required because this operation will overwrite the secondary volume data.

   ○ Before a Restore operation is performed ensure that the data in the primary volume is no longer required because this operation will overwrite the primary volume data.

   ○ Ensure the value of the copy pace is correct because this operation may take longer if an incorrect value is used.

6. On the Criteria tab, specify parameters for filtering the copy pairs.

7. Click Apply. The Results tab displays the list of filtered copy pairs.

8. On the Results tab, select the check boxes of the copy pairs whose status you want to change.

9. Click Next.

   The 3. Select Pair Operation page appears.

10. Set the operation (Pair Operation) and options to change the pair status, and then click Next.

   The 4. Confirm page appears.

Caution: Confirm the following before confirming the pair status change operation:

11. Check the specified settings, and then click Confirm.

   The 5. Finish page appears.

12. Click Finish.

   The settings specified in the wizard are registered as tasks. Check the Status column for the tasks to make sure that the pair status was
changed successfully. To view the tasks, from the **Explorer** menu, select **Tasks** and then **Tasks**.

**Related topics**

- [About changing copy pair status on page 10-113](#)
- [Change pair status workflow on page 10-126](#)
- [Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems) on page 10-39](#)
- [When performing operations on EXCTGs (mainframe systems) on page 10-100](#)

**Changing the copy pair status for multiple copy pairs (batch operation)**

**To change the status of multiple copy pairs:**

1. Display the information about the group containing the copy pairs whose status you want to change.
   
   For more information, see [Viewing information about copy groups or snapshot groups belonging to a host on page 14-9](#) or [Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8](#).

2. Select the check boxes of the copy pairs whose status you want to change, and then click **Change Pair Status**.
   
   The Change Pair Status Wizard starts with the **Introduction** page displayed.

3. Read the on-screen instructions, and then click **Next**.
   
   The **Select Copy Pairs** page appears.

---

**Note:** For open systems configured with redundant pair management servers: When the wizard is invoked from the **Pair Relationship** display of the Host or Storage System View, the **Select Pair Management Server** page appears first. In this case, select the combination of pair management servers to be used, and then click **Next** to proceed to the **Select Copy Pairs** page.

4. For open systems, select the check boxes of the copy pairs whose status you want to change in the **Pair List** pane, and then click **Next**.

---

**Tip:** For open systems, the check boxes for copy pairs selected when starting the Change Pair Status Wizard are selected by default. For mainframe systems, the check boxes for all copy pairs are selected by default.

The **Select Pair Operation** page appears.

5. For mainframe systems, perform the following operations on the **Select Copy Pairs** page.
   
   To select specific types of copy pairs:

   a. On the **Criteria** tab, specify parameters for filtering the copy pairs.
   
   b. Click **Apply**. The Results tab displays the list of filtered copy pairs.
c. On the Results tab, select the check boxes of the copy pairs whose status you want to change.
d. Click Next.
The Select Pair Operation page appears.
Only pair operations applicable to all selected pairs are displayed in the Pair Operation pane on this page.

6. Set the operation (Pair Operation) and options to change the pair status, and then click Next.
The Confirm page appears.

Caution: Confirm the following before confirming the pair status change operation:

- Before a split operation is performed, ensure that I/O processing for the primary volume is not being performed because this operation might result in incomplete data in the secondary volume.
- Before a Resync operation, ensure that the data in the secondary volume is no longer required because this operation will overwrite the secondary volume data.
- Before a Restore operation is performed, ensure that the data in the primary volume is no longer required because this operation will overwrite the primary volume data.
- Ensure the value of the copy pace is correct because this operation may take longer if an incorrect value is used.

7. Check the specified settings, and then click Confirm.
The Finish page appears.
8. Click Finish.
The settings specified in the wizard are registered as tasks. Check the Status column for the tasks to make sure that the pair status was changed successfully. To view the tasks, from the Explorer menu, select Tasks and then Tasks.

Tip: In 3DC Delta Resync configurations, executing pair operations against TCS or UR (Delta UR) changes the related copy group status. Refresh configuration after the Task execution. If the related copy group status is not changed, execute the Refresh Copy Group operation.

Related topics
- Change pair status workflow on page 10-126
- Limitations when performing 3DC TCS/UR configuration pair operations (mainframe systems) on page 10-39
- When performing operations on EXCTGs (mainframe systems) on page 10-100
Confirming copy status during task execution

To confirm copy status during task execution:

1. In the Explorer menu, choose Tasks and then Tasks.
   A list of tasks is displayed in the Tasks subwindow.
2. Select a task and click the copy group name hot link.
   The copy-group-name subwindow is displayed.
3. Confirm the copy progress and whether the pair is in Copying status.
4. After several minutes, click Refresh Copy Group.
5. Confirm whether the pair is in Pair status.
6. On the Tasks window, verify task has completed by checking if the task status is Success.

Related topics

- About copy pair status on page 10-100

Advanced pair operations and recovery scenarios

In addition to the basic pair operations (such as split and resync), the Change Pair Status Wizard supports several advanced operations for open system pairs. The relationship between the basic and advanced operations can be understood in terms of two scenarios:

- Takeover (the pair is split apart or swapped)
- Takeback (the pair is recovered)

The following table describes the relationship between basic and advanced operations.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Basic operation</th>
<th>Advanced operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>takeover</td>
<td>split</td>
<td>takeover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>swap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>force split</td>
</tr>
<tr>
<td>takeback</td>
<td>resync</td>
<td>swap</td>
</tr>
<tr>
<td></td>
<td>create</td>
<td>takeover-recovery (resync)</td>
</tr>
<tr>
<td></td>
<td>delete</td>
<td>takeover-recovery (recreate)</td>
</tr>
</tbody>
</table>

The basic operations are simple and low-level operations for splitting, resynchronizing and restoring specific copy pairs. The advanced operations are provided by the CCI horctakeover command and extend recovery to site-level operations:

- If a primary site is damaged and operation cannot continue, the takeover operation is used to immediately continue operations at a secondary site.
• When the damaged primary site is recovered, the takeback operation is used to immediately switch operations from the secondary site back to the primary site.

[Note: For more information on the underlying functions used by the advanced operations, see Advanced operations and corresponding CCI commands on page 10-144.]

The advanced operations are as follows:

• Takeover operation on page 10-133
• Swap operation on page 10-134
• Force-split operation on page 10-134
• Takeover-recovery operations (resync and recreate) on page 10-135

[Caution: Take note of the following:]

• Advanced operations can be performed per copy group or per copy pair. The only restriction is that they are not available for the TrueCopy Extended Distance copy type.
• Because the copy pair status cannot be retrieved in the event of a failure, it is not confirmed prior to executing an operation. (Under normal circumstances, copy pair status confirmation is required and is performed by the Device Manager agent.) In this instance, an error message is created based on the information sent from the agent and is output for the Change Copy Pair Status task.
• Takeover and swap operations cause the target copy pair or copy group to be treated as a different copy pair or copy group after the operation. See Alert settings and volume switching on page 10-141 for more information.

Related topics

• Restoring an application replica from the Replica History on page 23-38
• Advanced recovery use cases on page 10-136
• Recovering a copy pair configuration definition file (takeback) on page 10-140
• Alert settings and volume switching on page 10-141

Takeover operation

The takeover operation is used to switch to the secondary site when there is a failure at the primary. The resulting copy pair status depends on the environment where the takeover operation is executed. If the takeover operation is executed when there is damage to the primary site, or a failure in the primary site storage, the status of the secondary site will be Split (SSWS). In all other cases, the primary volume and secondary volume of the copy pair are switched. You can check the execution results based on the copy pair status and the relationship between the primary volume and secondary volume that make up the copy pair.
Note: Regarding pair status:

- If the copy pair state cannot be obtained from the Device Manager agent, the state is Unknown.
- When a failure occurs, it might not be possible to obtain the copy pair state of the target copy pair. After the operation, the copy pair has a split primary volume, and a writable secondary volume. As a result, the aggregate copy pair status is Suspend.

The takeover procedure is as follows:

1. If the copy pair state is Unknown, a failure may have occurred. Check for failures outside of Replication Manager.
2. Using the Change Pair Status Wizard, create a takeover Change Copy Pair Status task for the target copy group or copy pair.
3. Check the Task List window to confirm that the status of the task is Success.
4. View the target copy pair in the Pair Configurations view and check the task execution results (whether the primary and secondary volumes have switched, and whether the secondary volume has changed to Split (SSWS)).
5. If necessary, set up My Copy Group settings and alert settings, and recreate the Change Copy Pair Status task.

Swap operation

This operation is used to switch work from the primary site to the secondary site. When you execute this operation, the primary volume and secondary volume for the copy pair are switched.

The swap procedure is as follows:

1. Using the Change Pair Status Wizard, create a swap Change Copy Pair Status task for the target copy group or copy pair.
2. Check the Task List window to confirm that the status of the task is Success.
3. Check the copy pair status in the Pair Configurations view.
4. If necessary, set up My Copy Group settings and alert settings, and recreate the Change Copy Pair Status task.

Force-split operation

The force-split operation can be used when the copy type is TCS and the fence level is data or status. It is used when a failure at the secondary site prevents TCS-type copy pairs (with a fence level of data or status) from being written to the primary site. When a force-split operation is executed, it first attempts to put the primary volume into a special SUSPEND status. If it succeeds at putting the primary volume in a special SUSPEND status, the status of the primary volume will change to Split (PSUS or HOLD) or Error (PSUE or HLDE). If it fails to put the primary volume in a special SUSPEND
status, forced splitting of the primary and secondary volume is performed, and the primary volume is changed to a writable Simplex (SMPL) status.

---

**Caution:** Note the following:

- If a storage system failure occurs on the secondary site, the copy pair state cannot be obtained and it is shown as Unknown. In a remote copy circuit failure, the copy pair state is not limited to a specific status.
- The aggregate copy pair status after a force-split operation is either Suspend or Error.

---

**The force-split procedure is as follows:**

1. If the primary volume cannot be written to, an RC circuit or secondary site failure might have occurred. Check for the following in Replication Manager:
   - An abnormal remote path status (possibly an RC circuit failure)
   - An **Unknown** copy pair status in the secondary volume (possibly a secondary site failure)

2. Using the Change Pair Status Wizard, create a force-split Change Copy Pair Status task for the target copy group or copy pair.

3. Check the Task List window to confirm that the status of the task is **Success**.

4. Check the copy pair status in the Pair Configurations view.

---

**Takeover-recovery operations (resync and recreate)**

There are two types of takeover-recovery operations: takeover-recovery (resync) and takeover-recovery (recreate). A takeover-recovery operation is used as a recovery procedure when a user performs a takeover operation and the secondary volume changes to **Split (SSWS)**. The details of the executed takeover-recovery operation depend on the options specified, so you must check the copy pair status and select the options accordingly. The table below lists the options for the takeover-recovery operation and the status of the target copy pairs.

**Table 10-8 Operations and target copy pair states for takeover-recovery**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Target copy pair state</th>
</tr>
</thead>
<tbody>
<tr>
<td>takeover-recovery (resync)</td>
<td>Switches and synchronizes the primary and secondary volumes.</td>
<td>Not Simplex (SMPL)</td>
</tr>
<tr>
<td>takeover-recovery (recreate)</td>
<td>Recreates the copy pair from the secondary volume.</td>
<td>Simplex (SMPL)</td>
</tr>
</tbody>
</table>

---

**Caution:** Note the following:
- Use of takeover-recovery (resync) operation is only permitted when the S-VOL copy pair state is **Split (SSWS)**, regardless of the P-VOL state.
- The takeover-recovery (recovery) operation is only permitted in the following cases:
  - When the P-VOL copy pair state is **Simplex (SMPL)** and the P-VOL copy pair state is **Split (SSWS)**
  - When the S-VOL copy pair state is **Simplex (SMPL)** regardless of the P-VOL copy pair state

**The takeover-recovery procedure is as follows:**

1. Using the Change Pair Status Wizard, create a takeover-recovery Change Copy Pair Status task for the target copy group or copy pair.
2. Check the Task List window to confirm that the status of the task is **Success**.
3. Check the copy pair status in the Pair Configurations view.

**Advanced recovery use cases**

The following table lists the use cases for advanced recovery procedures and includes references to the diagrams in *Figure 10-3 Takeover workflow on page 10-139* and *Figure 10-4 Takeback workflow on page 10-140*.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Procedure using the Change Pair Status Wizard</th>
<th>Workflow reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performing maintenance on the primary site work server</td>
<td>To switch an application to the secondary site, execute an advanced swap operation. The volume at the secondary site becomes the primary volume, and the volume at the primary site becomes the secondary volume. Perform work on the secondary site while work server maintenance is carried out on the primary site.</td>
<td>Takeover: 3</td>
</tr>
<tr>
<td>Ending maintenance on the primary site work server</td>
<td>To switch an application to the primary site, execute an advanced swap operation. The secondary site volume becomes the secondary volume and the primary site volume becomes the primary volume.</td>
<td>Takeback: 3</td>
</tr>
<tr>
<td>Performing maintenance on the primary site storage</td>
<td>To switch an application to the secondary site, execute an advanced swap operation. The secondary site volume becomes the primary volume, and the primary site volume becomes the secondary volume. Next, perform a basic split to suspend the copy pair.</td>
<td>Takeover: 1</td>
</tr>
<tr>
<td>Ending maintenance on the primary site storage</td>
<td>Because application data written while the secondary site is active is not stored on the volume at the primary site, first execute a basic resync operation. To switch the application to the primary site, execute an</td>
<td>Takeback: 2</td>
</tr>
<tr>
<td>Scenario</td>
<td>Procedure using the Change Pair Status Wizard</td>
<td>Workflow reference</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Performing maintenance on a remote copy line</td>
<td>To allow for maintenance on the remote copy line, suspend the remote copy pair by executing a basic split operation.</td>
<td>Takeover: 5</td>
</tr>
<tr>
<td>Ending maintenance on a remote copy pair line</td>
<td>To return the remote copy pair to a normal pair status, execute a basic resync operation on the remote copy pair.</td>
<td>Takeback: 5</td>
</tr>
<tr>
<td>Performing maintenance on a remote site</td>
<td>To allow maintenance on the remote site, suspend the remote copy pair by executing a basic split operation.</td>
<td>Takeover: 5</td>
</tr>
<tr>
<td>Ending maintenance on a remote site</td>
<td>When you have finished maintenance on the remote site, return the remote copy pair to normal pair status by executing a basic resync operation.</td>
<td>Takeback: 5</td>
</tr>
<tr>
<td>Work server failure</td>
<td>To switch work to the secondary site, execute an advanced swap operation. The secondary site volume becomes the primary volume, and the primary site volume becomes the secondary volume.</td>
<td>Takeover: 3</td>
</tr>
<tr>
<td>Recovering from a work server failure</td>
<td>To switch work to the primary site, execute an advanced swap operation. The secondary site volume becomes the secondary volume, and the primary site volume becomes the primary volume.</td>
<td>Takeback: 3</td>
</tr>
<tr>
<td>Primary site storage failure (no loss of primary site data)</td>
<td>To switch work to the secondary site, execute an advanced takeover operation. The secondary site volume on the secondary site is changed to a writable Split (SSWS) status.</td>
<td>Takeover: 1</td>
</tr>
<tr>
<td>Recovering from a primary site storage failure</td>
<td>Execute a takeover-recovery (resync) operation to change the secondary site volume to the primary volume and the primary site volume to the secondary volume, and copy the data on the secondary site volume to the primary site volume. To move the application to the primary site, execute an advanced swap operation. The secondary site volume becomes the secondary volume, and the primary site volume becomes the primary volume.</td>
<td>Takeback: 1</td>
</tr>
<tr>
<td>Primary site damage (loss of primary site data)</td>
<td>To switch the application to the secondary site, execute an advanced takeover operation. The status of the secondary site volume on the secondary site is changed to Split (SSWS).</td>
<td>Takeover: 1</td>
</tr>
<tr>
<td>Recovery from primary site damage</td>
<td>Reconstruct the copy pair from the secondary volume by executing a takeover-recovery (recreate) operation. To move work to the</td>
<td>Takeback: 1</td>
</tr>
</tbody>
</table>

Managing pair life cycle
Hitachi Replication Manager User Guide
<table>
<thead>
<tr>
<th>Scenario</th>
<th>Procedure using the Change Pair Status Wizard</th>
<th>Workflow reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>primary site, execute an advanced swap operation. The secondary site volume becomes the secondary volume, and the primary site volume becomes the primary volume.</td>
<td></td>
</tr>
<tr>
<td>Forced takeover</td>
<td>To make the P-VOL on the primary site available, execute an advanced force-split operation. This makes the primary volume writable.</td>
<td>Takeover: 4</td>
</tr>
<tr>
<td>Disabling forced takeover status (when data on secondary site is not lost)</td>
<td>To return the remote copy pair to a normal pair status, change the remote copy pair to Sync status by executing a basic resync operation.</td>
<td>Takeback: 4</td>
</tr>
<tr>
<td>Disabling forced takeover status (when data in secondary site is lost)</td>
<td>Because data on the secondary site is not available, the basic resync function cannot be used to recover the remote copy pair. Therefore, you must perform a basic delete operation, followed by a basic create operation to change the remote copy pair to Sync status.</td>
<td>Takeback: 4</td>
</tr>
<tr>
<td>Failure on a secondary site storage or RC line</td>
<td>No takeover is necessary, because the primary volume on the primary site is available. However, the pair status for copy pair is disabled.</td>
<td>Takeover: 6</td>
</tr>
<tr>
<td>Recovery from failure on a secondary site storage or RC line</td>
<td>Change the remote copy pair to Sync status by executing a basic resync operation.</td>
<td>Takeback: 6</td>
</tr>
</tbody>
</table>

**Figure 10-3 Takeover workflow on page 10-139** describes the operations during a takeover. The numbers 1-5 in the figure correspond to the continuation points in **Figure 10-4 Takeback workflow on page 10-140**. This allows you to trace a recovery procedure from the takeover stage to the takeback portion.
Figure 10-3 Takeover workflow
Recovering a copy pair configuration definition file (takeback)

To perform a takeback operation as described in the flowchart, the appropriate configuration definition file must be available for a copy pair. This section describes how to prepare for the potential loss of a copy pair configuration definition file and how to recover it.

1. Make the following preparations:
   a. Make a backup of each copy pair configuration definition file (repeat for each pair management server).
   b. Specify a copy group name in the label of each volume that makes up a copy pair. (You can use the Device Manager server to specify volume labels.)

2. Recover the copy pair configuration definition file. This depends on whether there has been a storage configuration change as a result of a failure recovery:
If there has been no storage configuration change as a result of a failure recovery, copy the backup you made of the pair configuration definition file to the pair management server. If the pair management server is in a redundant configuration, add the necessary nodes using the Pair Configuration Wizard to recover the configuration definition file.

If there has been a storage configuration change, you must either modify the copy pair configuration definition file that was backed up, or manually create a configuration definition file for the copy pair and use Replication Manager to update the storage system information for the copy group. If the secondary volume is a paired LUN, you cannot use the Pair Configuration Wizard to recreate a copy pair configuration definition file. (This is because no paired LUN is displayed as an available secondary volume in the Pair Association window of the Pair Configuration Wizard.)

**Alert settings and volume switching**

If an operation results in the primary volume and secondary volume of the target copy pair being switched, the copy pair is treated as a different copy pair than before the operation. For this reason, you might need to set up **My Copy Group** settings and alert settings, and create Change Copy Pair Status tasks for the switched copy pair and copy group.

![Fig 10-5 Alert settings and volume reversal](image)

Alerts set for copy group CG1 are not valid for the copy group CG1 with reversed primary and secondary volumes. If you reverse the primary and secondary volumes for copy group CG1, the alerts set for copy group CG1 become valid once again.

**Note:** When primary and secondary volumes are reversed, the copy group name is the same both before and after the reversal. However, the object ID for the copy group changes and duplicate copy groups with the same name are displayed in the list of copy groups.
### Basic operations and corresponding CCI commands

The following table lists the basic operations available on the **3. Select Pair Operation** page of the Change Pair Status Wizard, along with the corresponding CCI commands.

<table>
<thead>
<tr>
<th>Change Pair Status Wizard</th>
<th>CCI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
<td><strong>Option</strong></td>
</tr>
<tr>
<td>create</td>
<td>Copy Pace</td>
</tr>
<tr>
<td>Fence Level</td>
<td></td>
</tr>
<tr>
<td>Pool ID</td>
<td></td>
</tr>
<tr>
<td>Pool ID(P)</td>
<td></td>
</tr>
<tr>
<td>Pool ID(S)</td>
<td></td>
</tr>
<tr>
<td>JNLG ID(P)</td>
<td></td>
</tr>
<tr>
<td>JNLG ID(S)</td>
<td></td>
</tr>
<tr>
<td>No Copy</td>
<td></td>
</tr>
<tr>
<td>Split</td>
<td></td>
</tr>
<tr>
<td>Quick Split</td>
<td></td>
</tr>
<tr>
<td>Read disable (secondary)</td>
<td></td>
</tr>
<tr>
<td>Assign CTG for At-Time Split</td>
<td>To specify CTGID at the same time:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Assign CTG</td>
<td>To specify CTGID at the same time:</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>CTGID</td>
<td></td>
</tr>
<tr>
<td>3DC</td>
<td></td>
</tr>
<tr>
<td>Quorum Disk ID</td>
<td></td>
</tr>
<tr>
<td>split</td>
<td>Copy pace</td>
</tr>
<tr>
<td>Secondary Mode</td>
<td></td>
</tr>
<tr>
<td>Force Suspend</td>
<td></td>
</tr>
<tr>
<td>Quick Split</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Swap Suspend</td>
<td></td>
</tr>
<tr>
<td>resync</td>
<td>Copy pace</td>
</tr>
</tbody>
</table>
## Conditions for copy pair operations (basic versus advanced)

Available copy pair operations depend on the storage system type and volume status.

### Basic operations

The following operations and storage system configurations are not supported for basic operations:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Option</th>
<th>Command</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Resync</td>
<td>-fq quick</td>
<td>pairresync -c size</td>
<td></td>
</tr>
<tr>
<td>restore</td>
<td>Copy pace</td>
<td>pairresync -restore</td>
<td></td>
</tr>
<tr>
<td>Quick Restore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>delete</td>
<td>Force Delete</td>
<td>pairsplit -R</td>
<td>-RS and -R</td>
</tr>
<tr>
<td>Reverse Direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>take snapshot</td>
<td>Copy pace</td>
<td>pairresync -c size</td>
<td>-C size</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pairsplit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quick Mode</td>
<td>pairresync -fq normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pairsplit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Quick Mode option is not specified:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-fq normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run pairresync -fq normal followed by pairsplit -fq normal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Quick Mode option is specified:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-fq quick</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run pairresync -fq quick followed by pairsplit -fq quick.</td>
<td></td>
</tr>
</tbody>
</table>
• A create or delete operation for a copy group defined in a device group.
• The storage system type is Universal Storage Platform V/VM or VSP and the copy pair is a HAM copy pair.

**Note:** For mainframe systems, basic operations require Business Continuity Manager (not Mainframe Agent).

### Advanced operations

For open systems, the following storage system configurations support advanced operations:

- The storage system is Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM, the target is not a copy group defined in a device group, and the copy type is either TrueCopy Synchronous, Universal Replicator, or global-active device.
- The storage system is Universal Storage Platform V/VM and the copy type is either Universal Replicator or TrueCopy.
- The storage system is HUS100 series, Hitachi AMS2000, or Hitachi AMS/WMS and the copy type is TrueCopy Sync.

For mainframe systems, change pair status operations might not be possible depending on volume status.

- Before performing a split operation, confirm that I/O to the primary volume is not in progress. If I/O is in progress, the data on the secondary volume might be incomplete.
- During a planned stop (when the primary and secondary volumes are being switched), a delete operation cannot be executed.

### Related topics

- [Advanced pair operations and recovery scenarios on page 10-132](#)

### Advanced operations and corresponding CCI commands

The following table lists the advanced operations available on the **3. Select Pair Operation** page of the Change Pair Status Wizard, along with the corresponding CCI commands.

<table>
<thead>
<tr>
<th>Change Pair Status Wizard</th>
<th>Description</th>
<th>CCI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
<td><strong>Option</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>takeover</td>
<td>None</td>
<td>Performs S-VOL takeover.</td>
</tr>
<tr>
<td></td>
<td>Timeout for data transfer</td>
<td>Specifies a timeout value for an S-VOL takeover.</td>
</tr>
<tr>
<td>force-split</td>
<td>None</td>
<td>Performs P-VOL takeover.</td>
</tr>
</tbody>
</table>
### Change Pair Status Wizard

<table>
<thead>
<tr>
<th>Operation</th>
<th>Option</th>
<th>Description</th>
<th>CCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>swap</td>
<td>None</td>
<td>Redirects copying, retaining the current copy pair state.</td>
<td>Execute the following commands.</td>
</tr>
<tr>
<td></td>
<td>Copy Pace</td>
<td></td>
<td><strong>For TrueCopy Sync and Universal Replicator</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. pairsplit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. pairresync - swaps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>For GAD</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. pairsplit - RS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. pairresync - swaps</td>
</tr>
</tbody>
</table>
Note: Replication Manager only supports monitoring and managing copy pair configuration definitions that use virtual command devices. You cannot set up such a configuration from within Replication Manager.

This module includes the following topics:

- About virtual command devices on page 10-146
- Prerequisites for virtual command device configurations on page 10-148
- Setting up an SVP or CTL1/CTL2 as a virtual command device on page 10-150
- Using a Virtual Command Device server on page 10-150
- If a virtual command device fails to call the Device Manager Agent on page 10-151
- CCI response time and virtual command devices on page 10-151

About virtual command devices

Command devices are used to send CCI commands between the pair management server and a storage system. Command devices use the FC link (known as an in-band connection).

Virtual command devices allow you to perform the same operations using the LAN (known as an out-of-band connection). This configuration uses either the Service Processor (SVP) or CTL1/CTL2 of the storage system, or a dedicated CCI server (known as a Virtual Command Device server).

The following figure shows an example of a configuration in which SVPs or CTL1/CTL2 are used as virtual command devices. Because this configuration eliminates the need for connecting a command device to the pair management server, you can install Device Manager Agent and CCI on the management server, allowing it to double as a pair management server.
Figure 10-6 Configuration using SVP or CTL1/CTL2 as virtual command device

Note: If the SVP or CTL1/CTL2 is used as the virtual command device, there is no need to set up a Virtual Command Device server or command device. However, command processing using the SVP or CTL1/CTL2 takes significantly longer, so we recommend using a Virtual Command Device server for large-scale configurations.

For enterprise-class storage systems or HUS VM, the SVP is used as a command device. For VSP Gx00 models or VSP Fx00 models, the CTL1/CTL2 is used as a command device.

The following figure shows a Virtual Command Device server configuration. The server connected to the actual command device is set as the virtual
command device on each pair management server or application host. The Virtual Command Device server can be the same machine as the CCI server.

Prerequisites for virtual command device configurations

The following requirements apply to virtual command device configurations.

**Note:** To monitor pool usage or journal usage for Universal Storage Platform V/VM, Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM storage systems, the pair management server and Virtual Command Device server must be discovered by Replication Manager (or, in the case of Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM, the system must be configured for managing copy groups defined by device group).
Table 10-10 System prerequisites

<table>
<thead>
<tr>
<th>Target</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management server</td>
<td>The Device Manager server has discovered storage systems with primary and secondary volumes, and the server has been registered to Replication Manager as an information source.</td>
</tr>
<tr>
<td>Pair Management server</td>
<td>Device Manager agent 7.1.0 or later and CCI 01-25-xx/xx or later must be installed. The configuration definition file is in a format that is supported by Device Manager agent, and the CCI instance must have started normally.</td>
</tr>
<tr>
<td>Storage system</td>
<td>The serial numbers of the storage systems managed by the Device Manager server must be unique.</td>
</tr>
</tbody>
</table>
| Virtual Command Device server   | CCI 01-25-xx/xx or later must be installed (Device Manager agent is not necessary), and the relay (CCI) instance must have been started. In addition:  
  • The user account for executing the Device Manager agent service (or Application Agent service) and the LocalSystem account must be set up to permit login in by the command device authentication account.  
  • If the CCI instance is used to access multiple storage systems, the account must be set up so that the same command device authentication account and password can be used to log into each of the command devices. |

**Note:** Some configurations using virtual command devices are not supported; see the *Hitachi Command Suite Replication Manager Configuration Guide* for more information.

Table 10-11 Network prerequisites

<table>
<thead>
<tr>
<th>Network application scope</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication between the primary and secondary CCI instances</td>
<td>The UDP communication ports used by the CCI instances must be specified in a configuration definition file.</td>
</tr>
<tr>
<td>Communication between the CCI instances and the SVPs or CTL1/CTL2</td>
<td>The CCI instances on the pair management servers can communicate with the SVPs or CTL1/CTL2 using UDP. The ports used by the CCI instances on the pair management servers are determined by adding 34000 + <em>instance-number</em> + 1. The port number used by the SVPs or CTL1/CTL2 is 31001.</td>
</tr>
<tr>
<td>Communication between the CCI instances and the CCI relay instance on the virtual command device</td>
<td>The CCI instances on the pair management servers can communicate with the relay (CCI) instance installed on the virtual command device server using UDP. The ports used by the CCI instances on the pair management servers is the value determined by adding 34000 + <em>instance-number</em> + 1. The port used by the (CCI) relay instance on the virtual command device server is specified in a configuration definition file.</td>
</tr>
</tbody>
</table>
Setting up an SVP or CTL1/CTL2 as a virtual command device

Note: For complete details on configuring and using virtual command devices, consult the Command Control Interface User and Reference Guide.

To set up an SVP or CTL1/CTL2 as a virtual command device:

1. Change the account used for execution of the Device Manager agent service to an account with Administrator permission. (The default is the LocalSystem account.)
2. Specify the IP address of the SVP or CTL1/CTL2 in the HORCM_CMD section of the HORCM configuration file.
3. Add copy groups to the HORCM configuration file.
4. Execute the raidcom -login command on the server managing the HORCM configuration file.
5. Perform a storage refresh from Device Manager.
6. If you using a remote Device Manager, follow the procedure for Refreshing configuration information manually for each information source on page 11-17. The new copy groups are displayed in the Copy Groups table of the Hosts view.

After you complete these steps, you can perform pair operations using the new resources.

Note: For CCI user authentication, Replication Manager uses the user ID and password for the SVP or CTL1/CTL2 registered when the storage system was added to Device Manager. If you change the user ID or password of the SVP or CTL1/CTL2, you must do the following:

1. Use Device Manager to change the user ID and password of the SVP or CTL1/CTL2. (For more information, see the Device Manager documentation).
2. Refresh the configuration from Replication Manager.

Using a Virtual Command Device server

Note: For complete details about configuring and using virtual command devices, consult the Command Control Interface User and Reference Guide.

To use a Virtual Command Device server:

1. Change the account used for execution of the Device Manager agent service to an account with Administrator permission. (The default is the LocalSystem account.)
2. Create and start a Virtual Command Device server (dedicated CCI server).
3. Specify the IP address of the Virtual Command Device server in the HORCM_CMD section of the HORCM configuration file.
4. Add copy groups to the HORCM configuration file.
5. If the Virtual Command Device server is connected to a command device that has authentication mode enabled, log into the account used for execution of the Device Manager agent service and execute the `raidcom-login`.

**Note:** For Linux systems, log in as the root user.

6. Perform a storage refresh from Device Manager.

7. If you using a remote Device Manager, follow the procedure for Refreshing configuration information manually for each information source on page 11-17. The new copy groups are displayed in the Copy Groups table of the Hosts view.

Once these steps are complete, you can perform pair operations using the new resources.

**If a virtual command device fails to call the Device Manager Agent**

The following message might appear in a configuration that uses a virtual command device to manage copy pairs:

```
Failed to call the Device Manager agent (Agent error code: RPM-03216) [RPM-01629]
```

This message appears if there is an authorization problem:

- The user is not authenticated in the storage system when an SVP or CTL1/CTL2 is used as a virtual command device.
- The user is not authenticated in the storage system when the Virtual Command Device server is used as a virtual command device and the user authentication setting of the command device is enabled.

In either case, first make certain you are using a supported version of CCI. In addition:

- When an SVP or CTL1/CTL2 is used as a virtual command device, authenticate the user in the storage system.
- When a virtual command device server is used, disable the user authentication setting of the command device or authenticate the user in the storage system.

For details about how to authenticate a user in the storage system, see Performing user authentication for replica operations on page 10-152.

**CCI response time and virtual command devices**

When managing copy pairs in a configuration that uses copy groups defined by device group or a virtual command device, the response time for CCI commands is much slower than for a physical command device. This time lag can cause the Device Manager to terminate with an error. For best results, set the following properties file values as described here.
Device Manager agent properties:

- Set the value of the `server.agent.rm.moduleTimeOut` property of the `server.properties` file to 1800 or higher.
- Set the value of the `agent.rm.TimeOut` property of the `agent.properties` file to 1800 or higher.

After changing these properties, restart the Device Manager agent service.

Replication Manager properties:

- Set the value of the `hdvmagtif.MaxPollingCount` property of the `agentif.properties` file to 100.
- Set the value of the `hdvmagtif.PollingInterval` property of the `agentif.properties` file to 60 or higher.

After changing these properties, restart the services of the Hitachi Command Suite Common Component.

Performing user authentication for replica operations

When performing replica operations using command devices and CCI authentication is enabled, you must execute the OS commands described in this procedure:

1. Start the CCI instance that will be used by Application Agent:
   
   ```
   CCI-instance-location\etc\horcmstart CCI-instance-number
   ```

2. Perform user authentication with the current login user account (the user account for executing the Application Agent service):
   
   ```
   CCI-instance-location\etc\raidcfg.exe -I CCI-instance-number -login command-device-authentication-account password
   ```

3. Perform user authentication with the LocalSystem account as follows.

   a. Create a task that runs on the LocalSystem account:
      
      ```
      schtasks /Create /TN task-name /TR "CCI-instance-location\etc\raidcfg.exe -I CCI-instance-number -login command-device-authentication-account password" /SC ONCE /ST 00:00 /RU SYSTEM
      ```

   b. Run the task immediately:
      
      ```
      schtasks /Create /TN task-name
      ```

   c. Query the results of the task:
      
      ```
      schtasks /Query /V /FO LIST
      ```

   d. Confirm the output is as follows:
      
      **TaskName:** `task-name` specified in step 3a  
      **Status:** Ready  
      **Last Run Time:** time that step 3b was performed  
      **Last Result:** 0  
      If the **Last Result** is not 0, check the CCI log information to determine if the CCI command failed. If the CCI command failed,
eliminate the cause of the error as described in the CCI documentation.

e. Delete the task:
   `schtasks /Delete /TN task-name /F`

4. Confirm that user authentication was successful. Make sure the CCI authentication files were created using the same account names (with which authentication was performed) as the user names contained in the file names that execute the commands.

   *Example authentication file of LocalSystem account:*
   C:\HORCM\usr\var\host01_SYSTEM_53038

   *Example authentication file of user account for executing Application Agent service:*
   C:\HORCM\usr\var\host01_Administrator_53038

5. To perform discovery of the new applications, click **Refresh Hosts** in the Applications view.

---

**Monitoring and management of copy groups defined by device group**

Copy groups defined by device group enable you to manage the LDEVs in a storage system as a single entity, allowing operations to be performed in batch mode.

---

**Note:** As of release 7.1.0, Replication Manager supports the following operations with copy groups defined by device group:

- Monitoring
- Basic Operations of the Change Pair Status Wizard (split, resync, and restore)

For details about creating and modifying copy groups defined by device group, consult the *Command Control Interface User and Reference Guide*.

---

This module includes the following topics:
- [About copy groups defined by device group](#)
- [Prerequisites for copy group configurations defined by device group](#)

---

**About copy groups defined by device group**

Copy group information can be defined in a storage system for Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, and HUS VM storage systems. Operations on such copy groups are performed through the Service Processor (SVP) or CTL1/CTL2 only and cannot be changed from Replication Manager.

Replication Manager detects copy groups defined by device group and displays them along with copy groups defined in HORCM files in the **Copy Groups** tab of the *host-name* subwindow.
Note: For copy groups defined by device group, an empty box is displayed in Replication Manager for server and pair configuration file information as follows.

Server and Config File (Primary and Secondary) in the following windows:

- Copy Groups - copy-type-name dialog box
- host-name subwindow (open systems)
- copy-group-name subwindow (open systems) (checking in the hosts view)

Pair Management Server and Prefix / Config File in the Edit My Copy Groups dialog box.

Copy group information is acquired using SVPs or CTL1/CTL2 using the instance of Device Manager agent and CCI on the management server. See Setting up an SVP or CTL1/CTL2 as a virtual command device on page 10-150 for more information.

Note: Although copy groups defined by device group can be managed through virtual command devices, use of a Virtual Command Device server is not supported.

Prerequisites for copy group configurations defined by device group

The following requirements apply to copy groups defined by device group.

Note: If you plan to use Replication Manager to manage a mix of storage systems that includes Hewlett Packard Enterprise, the CCI (RAID Manager) version on the management server must be supported by both platforms.

<table>
<thead>
<tr>
<th>Target</th>
<th>Prerequisites</th>
</tr>
</thead>
</table>
| Management server    | - The management server has been discovered as a pair management server in Replication Manager on the pair management server. (If performing discovery of copy groups defined by device group at a remote site, you also need to refresh the Device Manager configuration on the remote site.)
  
  **Note:** The pair management software can be installed on a separate pair management server or on the management server.
  
  - The Device Manager server must have already discovered the storage systems and their primary/secondary volumes, and the server must be registered to the Replication Manager as an information source.
  
  - For VSP G1000, VSP G1500, or VSP F1500, Device Manager agent 8.0.0 or later and CCI 01-33-xx/xx or later must be installed on the same server as the Replication Manager server.

  For VSP, Device Manager agent 7.1.0 or later and CCI 01-25-xx/xx or later must be installed on the same server as the Replication Manager server.

  For VSP Gx00 models, Replication Manager must be 8.1.2 or later, Device Manager server the storage system is registered must be 8.1.2 or later, Device Manager agent must be 8.1.2 |
<table>
<thead>
<tr>
<th>Target</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>or later, and CCI 01-33-xx/xx or later must be installed on the same server as the Replication Manager server</td>
<td>For VSP Fx00 models, Replication Manager must be 8.2.1 or later, Device Manager server the storage system is registered must be 8.2.1 or later, Device Manager agent must be 8.2.1 or later, and CCI 01-33-xx/xx or later must be installed on the same server as the Replication Manager server.</td>
</tr>
<tr>
<td>For HUS VM, Device Manager agent v7.2.1 or later and CCI 01-28-03/xx or later must be installed on the same server as the Replication Manager server.</td>
<td>• The communication path between Device Manager server and Replication Manager must be HTTPS.</td>
</tr>
<tr>
<td>• When a Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM storage system is registered on the Device Manager server, the user name and password must satisfy the following conditions:</td>
<td>1) They each cannot exceed 63 characters in length.</td>
</tr>
<tr>
<td>2) Only characters supported by the CCI commands can be used. For details, consult the Command Control Interface User and Reference Guide.</td>
<td>• The names of the device group, the copy group defined by the device group, and the copy pair defined by the copy group must satisfy the following conditions:</td>
</tr>
<tr>
<td>1) They each cannot exceed 63 characters in length.</td>
<td>2) They each cannot contain a one-byte space.</td>
</tr>
<tr>
<td>2) They each cannot contain a one-byte space.</td>
<td>Storage system</td>
</tr>
<tr>
<td>• The serial numbers of the storage systems managed by the Device Manager server must be unique.</td>
<td>• The primary and secondary storage systems must match VSP, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM.</td>
</tr>
<tr>
<td>• For Virtual Storage Platform, the microcode version must be 70-02-00-XX/XX or later.</td>
<td>• For VSP G1000, VSP G1500, or VSP F1500, the microcode version must be 80-01-XX/XX or later.</td>
</tr>
<tr>
<td>• For VSP Gx00 models or VSP Fx00 models, the microcode version must be 01-33-XX/XX or later.</td>
<td>• For HUS VM, the microcode version must be 73-01-XX/XX or later.</td>
</tr>
</tbody>
</table>

Precautions for replica operations (Application Agent)

The following considerations concern the use of groups defined by device group and Application Agent:

- HORCM definitions on page 10-156
- User authentication on page 10-156
**HORCM definitions**

HORCM_DEV, HORCM_LDEV, or HORCM_LDEVG must be specified in the CCI configuration definition file used by Application Agent. If the instructions above are not followed, the primary volume might be disconnected from the database server (file server) when the server is rebooted or when the scanning for disks is performed. The problem occurs when creating replicas, concealing secondary volumes, and unmounting replicas (whether executed from Replication Manager or the CCI interface).

To recover from this condition, go to the database server (file server) and repeat the following steps for all of the pair volumes that are targets of Application Agent processing:

1. Confirm whether INQUIRY of the primary volume is not allowed, as in this example command and output:
   ```
   raidvchkdsp -g Grp01 -d vol01 -v gflag
   Group PairVol Device_File Seq# LDEV# GI-C-R-W-S PI-C-R-W-S R-Time
   Grp01 vol01 Harddisk1 2332 3 D E E E E E E E E E -
   ```
   Proceed to step 2 only if the value of the GI attribute is D (INQUIRY is not allowed).

2. Release the INQUIRY of the primary volume as in this example:
   ```
   raidvchkset -g Grp01 -d vol01 -idb
   ```

3. Confirm that the INQUIRY of the primary volume is allowed, as in this example:
   ```
   raidvchkdsp -g -g Grp01 -d vol01 -v gflag
   Group PairVol Device_File Seq# LDEV# GI-C-R-W-S PI-C-R-W-S R-Time
   Grp01 vol01 Harddisk1 2332 3 E E E E E E E E E E -
   ```
   Confirm that the value of the GI attribute is E (INQUIRY is allowed).

**User authentication**

For a configuration in which user authentication of the command device is enabled and operations using Application Agent and CCI coexist, the user who executes each operation must meet one of the following requirements:

- Among multiple user accounts that have the same user name (example: Administrator) but different log-on destinations (such as the domain user and local user), use only one user account.
- Use different user names (example: Domain\Administrator1 and Local \Administrator2) for each operation.

If the instructions above are not followed, unexpected log-off from the storage system might occur because, even though the user authentication for the command device has finished, another user might overwrite the authentication information.

You must use the same case-sensitive user name when logging on to the OS for all of the following operations:

- When the user authentication of the command device is performed.
- When the operation of Application Agent is performed.
- When the execution account for the Application Agent service is set.

The user name is case-insensitive when the user logs on to Windows, but the user authentication functionality of CCI is case-sensitive. Therefore, Application Agent might fail with the following error message in spite of finishing the user authentication:

```
KAVX0006-E An error that stopped processing occurred.
Cause = DRM-10339: The user has not been authorized by CCI.
```

If an operation is performed without the requisite authentication and you log off while Application Agent Application is running, an unexpected error or system freeze might occur. If Application Agent is frozen, perform the following procedures for recovery:

1. Start the Windows Task Manager.
2. Select the process of Application Agent (the process with the name starting with “drm”) in the Image Name column of the `Processes` tab.
3. Click **End Process**.
4. Open the trace log file of Application Agent and confirm the CCI process name output to the last record of the log. The path of the file is:
   
   `Installation-destination-of-Application Agent\DRM\log\drm_pp_traceX.log`

5. Select the process of CCI in the Image Name column of the `Processes` tab.
6. Click **End Process**.

**Unsupported copy group configurations defined by device group**

The following configurations are not supported:

- The number of volumes differs between copy groups defined by device group.
- The device name of a copy-pair target volume differs from that of a copy-pair source volume.

**Using global storage virtualization features with Replication Manager**

Replication Manager supports the management of copy pairs and data migration using the global storage virtualization features of VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, and VSP Fx00 models storage systems:

- Virtual IDs
- Virtual storage machines
- Global-active device copy type (VSP G1000, VSP G1500, VSP F1500, and VSP Gx00 models only)
This module describes special considerations that apply to using global storage virtualization features:

- **Copy pair management using global-active device on page 10-158**
- **Pair management using virtual IDs on page 10-158**
- **Remote copy limitations using virtual IDs on page 10-159**
- **Re-establishing Replication Manager settings after migrating to a virtual storage machine on page 10-159**

### Copy pair management using global-active device

Global-active device (GAD) is a remote copy type comprising two physical storage systems. GAD supports an active-active configuration, synchronizing the storage systems to ensure continuous business operation in the event of a path or storage system failure. A Quorum Disk is connected to the primary and secondary storage systems to determine which storage system can be used to continue processing of I/O requests.

Hitachi Command Suite includes an integrated global-active device setup window that launches configuration functions of Device Manager and Replication Manager. The ongoing management of global-active device copy pairs is performed using Device Manager and Replication Manager.

**Note:** For complete information on configuration requirements and management procedures for global-active device configurations, see:

- Global-Active Device User Guide
- Hitachi Command Suite User Guide

### Global-active device pairs and ALUA volumes

If you are going to configure a global-active device pair that consists of ALUA attribute volumes, set ALUA attribute to the volume using the Device Manager GUI, and then configure the global-active device pair using Replication Manager GUI.

**GAD pair status summary: I/O mode**

Replication Manager displays an *I/O mode* for each GAD copy pair to summarize the current state of operation. For example, if the I/O modes of both primary and secondary storage systems are displayed as Block, you need to delete the GAD copy pair forcibly using Storage Navigator or CCI. For details about the relationship between I/O mode and detailed pair status, see the Global-Active Device User Guide.

### Pair management using virtual IDs

You can manage copy pairs using a virtual ID on a virtual storage machine. When you migrate a storage system using nondisruptive migration, information of the migration source is transferred to the destination. Virtual IDs or physical IDs must be set for each copy group. If an existing copy...
group has a virtual ID, it will be associated with the added pair. The following virtual ID data is available from within Replication Manager:

- Virtual storage machine name (including type of storage system, serial number)
- Virtual LDEV information

For details about specifying the definition format, see Creating copy groups on page 10-28.

Remote copy limitations using virtual IDs

Use a physical ID to define a copy pair if you perform a remote copy between a VSP G1000, VSP G1500, VSP F1500, or VSP Gx00 models storage system and a storage system that does not support virtual storage machine. If you use a virtual ID, the following task types are not available.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-VOL is a VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, or VSP Fx00 models</td>
<td>takeover-recovery(recreate)</td>
</tr>
<tr>
<td>S-VOL is a VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, or VSP Fx00 models</td>
<td>create modify file+create (If you add a pair to an existing copy group)</td>
</tr>
</tbody>
</table>

Caution: We recommend that you do not delete a copy pair whose P-VOL and S-VOL relationship was reversed by a swap operation. If you delete such a copy pair and re-create it, data stored in the volume will be lost.

Re-establishing Replication Manager settings after migrating to a virtual storage machine

After migrating data to a virtual storage machine, you must first refresh the storage system information using Replication Manager. Next, you must apply the Replication Manager settings from your source storage system to the target resources on the virtual storage machine.

The following table lists the Replication Manager settings to be re-created.

<table>
<thead>
<tr>
<th>Settings</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource group settings</td>
<td>Re-establish any resource group settings from the migration source on the target virtual storage machine.</td>
</tr>
<tr>
<td>Monitoring (alert) settings</td>
<td>Re-create the alert settings that were configured on the source DKC:</td>
</tr>
<tr>
<td></td>
<td>• Alert settings of each copy pair</td>
</tr>
<tr>
<td></td>
<td>• Alert settings for copy groups defined by a device group</td>
</tr>
<tr>
<td></td>
<td>• Alert settings for journal groups and pools</td>
</tr>
<tr>
<td></td>
<td>• Alert settings for license usage</td>
</tr>
<tr>
<td>Settings</td>
<td>Operation</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Storage system settings</td>
<td>Re-establish any settings of a pair management server for a snapshot group.</td>
</tr>
<tr>
<td>Pair management</td>
<td>Create a workflow (when you want to create a task again using a completed or temporarily-saved workflow).</td>
</tr>
<tr>
<td>Task management</td>
<td>Review tasks that were previously defined:</td>
</tr>
<tr>
<td></td>
<td>• Delete any obsolete scheduled tasks</td>
</tr>
<tr>
<td></td>
<td>• Re-create tasks on the destination DKC</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Re-create tasks whose task type is split, resync, restore, syncwait, or take snapshot, out of scheduled tasks and tasks executed from Replication Manager CLI.</td>
</tr>
<tr>
<td>My copy group management</td>
<td>Re-create settings of any copy groups defined in a device group.</td>
</tr>
</tbody>
</table>
Refreshing management information

This chapter describes ways to refresh configuration and copy pair status information.

- About refreshing management information
- Refreshing copy pair status
- Refreshing configuration information
About refreshing management information

To maintain operability, Replication Manager has its own database for storing information about managed resources. However, to view the latest information from the GUI, storage system information acquired using Device Manager, Business Continuity Manager, or Mainframe Agent must be applied to the Replication Manager database.

Note: For the local instance of Device Manager, the Replication Manager and Device Manager databases are synchronized as needed. For more information, see About refreshing configuration information on page 11-12.

The following explains the types of management information that can be refreshed.

**Configuration information**

Configuration information includes the following aspects of the storage system:

- Volumes
- Copy pairs and copy groups
- Command devices
- DMLUs
- Journal volumes
- Pool volumes
- Remote paths
- Licenses for each copy type (including license usage)

**Copy pair status information**

The copy pair status information includes the following types of information:

- Copy pair statuses and summarized copy pair statuses
- Copy pair states
- Copy progress
- Performance information (C/T delta values and buffer usage on a copy group basis)

Tip: When refreshing copy pair statuses, the sidefile usage on a copy group and journal volume usage basis are included as target buffer usages of the refresh operation.

If you change the replication configuration, make sure that you refresh the configuration information before you refresh the copy pairs.

Related topics

- Explorer menu items for refreshing management information on page 11-3
Functions for refreshing management information

The following table shows the functions for refreshing management information, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refreshing configuration information manually</td>
<td>Y¹</td>
</tr>
<tr>
<td>Refreshing configuration information automatically</td>
<td>Y²</td>
</tr>
<tr>
<td>(refresh settings)</td>
<td>N</td>
</tr>
<tr>
<td>Refreshing copy pair status information manually</td>
<td>Y¹</td>
</tr>
<tr>
<td>Refreshing copy pair status information automatically</td>
<td>Y²</td>
</tr>
<tr>
<td>(refresh settings)</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be used with this permission.
N: Cannot be used with this permission.

1. This function can be used only for the resources in resource groups associated with the user.
2. To specify refresh settings for information sources, a user must be able to access all necessary resources (all resources belonging to an information source must be included in the resource groups associated with the user.)

Explorer menu items for refreshing management information

The following table shows the Explorer menu items that are related to refreshing management information, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Resources</td>
<td>Hosts</td>
</tr>
<tr>
<td></td>
<td>Storage Systems</td>
</tr>
<tr>
<td></td>
<td>Pair Configurations</td>
</tr>
<tr>
<td>My Groups</td>
<td>My Copy Groups</td>
</tr>
<tr>
<td>Settings</td>
<td>Refresh Setting</td>
</tr>
</tbody>
</table>
Refreshing copy pair status

This module describes methods for refreshing copy pair status:

- About refreshing copy pair status on page 11-4
- Disabling the Device Manager refresh function on page 11-7
- Refreshing copy pair statuses manually for each host on page 11-8
- Refreshing copy pair statuses manually for each copy group or snapshot group on page 11-9
- Refreshing copy pair statuses manually for My Copy Groups on page 11-9
- Refreshing copy pair statuses manually for each volume on page 11-8
- Refreshing copy pair status automatically for each pair management server on page 11-11

About refreshing copy pair status

In open systems, copy pair statuses are acquired using Device Manager agents. If Device Manager servers installed at multiple sites are used as information sources, the copy pair statuses are acquired using their Device Manager agents.

**Tip:** If copy pairs have been defined using storage system operation management software such as Storage Navigator, there is no configuration definition file (because there are copy pairs that are not managed by pair management servers). In this case, you should execute the Device Manager refresh function from Replication Manager as described in Acquiring the latest configuration information (configuration refresh) on page 22-7.

Performance-related information, copy progress, and the copy pair state for the secondary volume cannot be acquired. For details on the Device Manager refresh function, see the Hitachi Command Suite Help or Hitachi Command Suite CLI Reference Guide. To view the flow of data in open systems, see Refreshing copy pair statuses data flow (open systems) on page 11-5.

In mainframe systems, the copy pair statuses are acquired from the instances of Business Continuity Manager or Mainframe Agent registered as information sources. To view the flow of data in mainframe systems, see
Refreshing copy pair statuses data flow (mainframe systems) on page 11-6.

Copy pair statuses can be refreshed manually (from a subwindow) or automatically (at an interval preset in the refresh settings). Normally, refreshing takes anywhere from a few to tens of minutes total. However, if the Device Manager refresh function is used (because there are copy pairs not managed by pair management servers in open systems), refreshing can require anywhere from a few to tens of minutes for each storage system. If all copy pairs are managed by pair management servers, disable the Device Manager refresh function. For details, see Disabling the Device Manager refresh function on page 11-7.

Note: If the copy group is defined by device group, the value of C/T delta is refreshed when the copy pair status is refreshed.

When you determine the interval for refreshing copy pair statuses on open systems, use the number of monitored copy pairs on each pair management server. For mainframe systems, use the number of monitored copy pairs on each information source as a guideline. The following table provides guidelines for determining the interval for refreshing copy pair statuses.

### Guideline for determining the interval for refreshing copy pair statuses

<table>
<thead>
<tr>
<th>Number of copy pairs on pair management server or information source</th>
<th>Guideline interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1,000</td>
<td>3 minutes</td>
</tr>
<tr>
<td>1,001 to 2,000</td>
<td>5 minutes</td>
</tr>
<tr>
<td>2,001 to 3,000</td>
<td>10 minutes</td>
</tr>
<tr>
<td>3,001 to 5,000</td>
<td>15 minutes</td>
</tr>
</tbody>
</table>

Related topics

- Refreshing the copy pair status automatically for each information source on page 11-10
- Refreshing copy pair status automatically for each pair management server on page 11-11
- Refreshing copy pair statuses manually for each copy group or snapshot group on page 11-9
- Refreshing copy pair statuses manually for each host on page 11-8
- Refreshing copy pair statuses manually for My Copy Groups on page 11-9

### Refreshing copy pair statuses data flow (open systems)

The following figure shows the flow of data when copy pair statuses are refreshed in open systems.
Refreshing copy pair statuses data flow (mainframe systems)

The following figure shows the flow of data when copy pairs are refreshed in mainframe systems.
Disabling the Device Manager refresh function

In open systems where all copy pairs are managed by pair management servers, you should prevent the Device Manager refresh function from executing during a manual refresh. If this function is used to refresh copy pair statuses, processing time increases.

Tip: If copy pairs have been defined using storage management software such as Storage Navigator, no configuration definition file exists. Such copy pairs are not managed by pair management servers.
You can also disable the Device Manager refresh function during automatic refreshing. For details, see Refreshing the copy pair status automatically for each information source on page 11-10.

To disable the Device Manager refresh function:

1. From the Explorer menu, choose Settings and then Refresh Setting. The Refresh Setting subwindow appears.
2. Click the Monitoring Setting link. The Monitoring Setting subwindow appears.
3. Click the icon of the information source for which you want to disable the Device Manager refresh function. The Edit Interval of Refresh Pair Status - information-source-name dialog box appears.
4. Select the Do not execute a Device Manager refresh operation during a manual refresh operation check box, and then apply the new settings. The settings specified in the Monitoring Setting subwindow are updated. Thereafter, a manual refresh acquires information from the Device Manager agent on each pair management server (not from the database of the instance of Device Manager on the management server).

Refreshing copy pair statuses manually for each host

To refresh copy pair statuses manually on a host basis:

1. From the Explorer menu, choose Resources and then Hosts. The Hosts subwindow appears.
2. Display a host view subwindow, and click Refresh Host or Refresh Hosts. Copy pair statuses displayed in the hosts view subwindow are refreshed. For details on the hosts view, see Viewing a list of hosts on page 14-5.

Related topics
- About refreshing copy pair status on page 11-4

Refreshing copy pair statuses manually for each volume

To refresh copy pair statuses manually on a volume basis:

1. Display the information about the volume whose copy pair status you want to refresh. For details, see Viewing information about volumes belonging to a host on page 14-12 or Viewing information about volumes belonging to a storage system on page 14-12.
2. Click Refresh LUN, Refresh DEVN, Refresh LDEV, or Refresh Copy Pairs to start a refresh operation.
The copy pair status displayed in the *volume-name* subwindow is refreshed.

In the Storage Systems view, you can also refresh copy pair statuses by selecting a volume from the list of volumes (LUNs) and then clicking *Refresh LUNs*.

For details on the Storage Systems view, see [Viewing a list of storage systems on page 14-5](#).

**Tip:** In mainframe systems, copy pair statuses might not be refreshed depending on the status of Business Continuity Manager or Mainframe Agent. If the information in the *Last Refresh* column is not up-to-date, check the status of Business Continuity Manager or Mainframe Agent.

### Refreshing copy pair statuses manually for each copy group or snapshot group

To refresh copy pair statuses manually on the basis of copy group or snapshot group:

1. Display the information about the desired copy group or snapshot group. For details, see [Viewing information about copy groups or snapshot groups belonging to a host on page 14-9](#) or [Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8](#).

2. Click **Refresh Copy Group** or **Refresh Copy Groups**, or **Refresh Snapshot Group** or **Refresh Snapshot Groups** to start a refresh operation.

The copy pair statuses are refreshed in the *copy-group-name* or *snapshot-group-name* subwindow.

**Tip:** In mainframe systems, copy pair statuses might not be refreshed, depending on the status of Business Continuity Manager or Mainframe Agent. If the information in the *Last Refresh* column is not updated, check the status of Business Continuity Manager or Mainframe Agent.

### Refreshing copy pair statuses manually for My Copy Groups

To refresh copy pair statuses manually for the copy groups in My Copy Groups:

1. From the **Explorer** menu, choose **My Groups** and then **My Copy Groups**.
The **My Copy Groups** subwindow appears.

2. Click **Refresh My Copy Groups** to start a refresh operation. Copy pair statuses displayed in the **My Copy Groups** subwindow are refreshed.

---

**Tip:** In mainframe systems, the copy pair statuses might not be refreshed depending on the status of Business Continuity Manager or Mainframe Agent. If this occurs, check the status of Business Continuity Manager or Mainframe Agent.

---

**Related topics**

- About refreshing copy pair status on page 11-4
- Refreshing copy pair statuses manually for each copy group or snapshot group on page 11-9

---

**Refreshing the copy pair status automatically for each information source**

In open systems, the refresh interval (the interval for collecting information) can be set either for each pair management server or for each Device Manager server that is an information source. In mainframe systems, the refresh interval can be set for each instance of Business Continuity Manager or Mainframe Agent that is an information source. You can also disable periodic refreshing.

**To refresh the copy pair status automatically for each information source:**

1. From the **Explorer** menu, choose **Settings** and then **Refresh Setting**. The Refresh Setting subwindow appears.
2. Click the **Monitoring Setting** link. The Monitoring Setting subwindow appears.
3. Click the icon of the information source from which you want the copy pair status to be acquired automatically. The Edit Interval of Refresh Pair Status - information-source-name dialog box or the Edit Interval of Refresh Pair Status - pair-management-server-name dialog box appears.
4. Enter the refresh interval. In open systems in which the interval has been set for each pair management server, if you specify **Refresh Interval Settings for Agent**, the settings of all pair management servers belonging to the information source are overwritten. If you want to set a different refresh interval for a specific pair management server, set the refresh interval for that server later.

If you do not want to use the Device Manager refresh function because all copy pairs of an open system are managed by pair management servers, select the **Disable periodical refresh** check box in **Refresh Interval Settings for Device Manager**.
5. Confirm and apply the settings.
   The settings specified in the Monitoring Setting subwindow are applied. From this point, the copy pair status is automatically refreshed based on the specified settings.

**Tip:** In mainframe systems, the copy pair status might not be refreshed, depending on the status of Business Continuity Manager or Mainframe Agent. If the information in the **Last Refresh** column is not updated at the specified time, check the status of Business Continuity Manager or Mainframe Agent.

**Related topics**

- About refreshing copy pair status on page 11-4
- Refreshing copy pair status automatically for each pair management server on page 11-11
- Calculating the copy pair status refresh interval on page 9-14

**Refreshing copy pair status automatically for each pair management server**

In open systems, you can set the refresh interval either for each pair management server or for each Device Manager server that is an information source. You can also disable periodic refreshing.

**To refresh copy pair statuses automatically on a pair management server basis:**

1. From the **Explorer** menu, choose **Settings** and then **Refresh Setting**. The Refresh Setting subwindow appears.
2. Click the **Monitoring Setting** link. The Monitoring Setting subwindow appears.
3. Click the link that has the name of the Device Manager server that is an information source to which the pair management server belongs. The **Device-Manager-server-name** subwindow appears.
4. Click the icon of the pair management server from which you want the copy pair statuses to be acquired automatically. The Edit Interval of Refresh Pair Status - **pair-management-server-name** dialog box appears.
5. Modify the interval settings, and then apply them. The settings specified in the **Device-Manager-server-name** subwindow are applied. From this point, the copy pair statuses are automatically refreshed based on the specified settings.

**Related topics**

- About refreshing copy pair status on page 11-4
- Refreshing the copy pair status automatically for each information source on page 11-10
- Calculating the copy pair status refresh interval on page 9-14

**Refreshing management information**
Refreshing configuration information

You should refresh configuration information to apply the latest configuration information to Replication Manager.

This module describes methods for refreshing configuration information:

- **About refreshing configuration information on page 11-12**
- **Refreshing configuration information automatically (using the refresh settings) on page 11-16**
- **Refreshing configuration information manually for each information source on page 11-17**
- **Refreshing configuration information manually for each storage system on page 11-18**

**Note:** We recommend refreshing the configuration information from Replication Manager when a configuration definition file satisfies the following conditions:

- The configuration definition file was not created using Replication Manager.
- Copy pairs associated the configuration definition file have not yet been created.
- A volume defined by the configuration definition file is related to a cascade or multi-target configuration that includes another copy pair.

If you refresh the configuration information before creating the copy pair, the primary and secondary volumes might not be displayed in the proper order in the Pair Configurations view.

**About refreshing configuration information**

In mainframe systems, configuration information is acquired from the instances of Business Continuity Manager or Mainframe Agent registered as information sources. To view the flow of data when configuration information is refreshed in mainframe systems, see Data flow when configuration information is refreshed in mainframe systems on page 11-15.

In open systems, configuration information is acquired from the databases of Device Manager servers registered as information sources and from Device Manager agents. If Device Manager servers installed at multiple sites are used as information sources, configuration information is acquired using the Device Manager agents for each of those sites. To view the flow of data when configuration information is refreshed in open systems, see Data flow when configuration information is refreshed in open systems on page 11-15.

Device Manager and Replication Manager maintain separate databases for configuration information. The act of synchronizing these two databases is known as a configuration refresh.

For a local instance of Device Manager, this synchronization is always performed as needed (so there is no need for manual or scheduled refresh operations). The following events trigger synchronization of the Replication Manager and Device Manager databases:
Storage system updates that change the configuration
- Adding or deleting storage systems
- Adding or deleting hosts
- Adding or deleting copy pairs using the CLI

For storage controlled by a remote instance of Device Manager, a manual refresh can be performed at any time as described in Refreshing configuration information manually for each information source on page 11-17, or it can be refreshed automatically.

### Refresh operations for remote instances of Device Manager

The automatic refresh of configuration information for remote instances of Device Manager is controlled by two types of settings:

- Automatic updating in conjunction with storage systems refresh operations
- Periodic updating based on a specified refresh interval

Replication Manager allows you to use either one or both of the above settings to automatically refresh configuration information associated with remote instances of Device Manager. In the initial settings of Replication Manager, the automatic update setting is enabled and the periodic update setting is disabled.

**Tip:** The configuration might be updated often if both settings are enabled. Therefore we recommend that if you want to enable the periodic update setting, you disable the automatic update setting.

### Automatic refreshing

When automatic refreshing of configuration information is enabled, Replication Manager regularly checks whether remote Device Manager servers registered as information sources have refreshed their storage systems configurations, then synchronizes the Device Manager and Replication Manager databases.

You can enable or disable this automatic refresh by setting the `base.repository.synchronize.polling` property in the `base.properties` file on the management server. When this property is set to `true`, these two parameters go into effect:

- `base.repository.synchronize.interval`: the monitoring interval at which regular checks for storage refresh are performed.
- `base.repository.synchrocheck.interval`: the interval at which a message is displayed if configuration information is not synchronized.

For details on these properties, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

**Tip:** Replication Manager does not regularly check whether instances of Business Continuity Manager or Mainframe Agent registered as information...
sources have refreshed their storage systems configurations. When a storage system managed exclusively by Business Continuity Manager is refreshed, the information is provided by Business Continuity Manager or Mainframe Agent.

**Periodic refreshing**

When the periodic refreshing of configuration information is enabled, the latest configuration is acquired from the information source regardless of a storage refresh operation in Device Manager. For this option, you should specify a configuration refresh interval for acquiring the latest configuration information as described in Refreshing configuration information automatically (using the refresh settings) on page 11-16.

**Refresh status messages**

The Hosts, Storage Systems, and Pair Configurations views display messages relating to the status of synchronization between the Device Manager and Replication Manager databases.

<table>
<thead>
<tr>
<th>Table 11-1 Database synchronization status messages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Message</strong></td>
</tr>
<tr>
<td>The configuration information of the storage system might not be the latest version. Before setting the storage system, perform a Configuration Refresh.</td>
</tr>
<tr>
<td>Before setting the storage system, you need to perform a Configuration Refresh.</td>
</tr>
<tr>
<td>The configuration information is now being acquired. Wait a few seconds or minutes until the acquisition of the latest configuration information is completed.</td>
</tr>
<tr>
<td>An error occurred during the acquisition of the configuration information.</td>
</tr>
</tbody>
</table>

**Related topics**

- Refreshing configuration information manually for each information source on page 11-17
- Refreshing configuration information automatically (using the refresh settings) on page 11-16
Data flow when configuration information is refreshed in open systems

The following figure shows the flow of data when configuration information is refreshed in open systems.

Data flow when configuration information is refreshed in mainframe systems

The following figure shows the flow of data when configuration information is refreshed in mainframe systems.
Refreshing configuration information automatically (using the refresh settings)

To minimize effects on operation, determine the refresh interval and start time carefully so that configuration information is refreshed while machine use is not heavy. You can also disable periodic refreshing if the configuration does not change.

Note: Only remote instances of Device Manager are displayed. The local instance of Device Manager is refreshed automatically.
Tip: In open systems, when Device Manager is set to refresh information periodically, specify the refresh settings so that Replication Manager refreshes information after the Device Manager server database is refreshed.

To refresh configuration information automatically:

1. From the Explorer menu, choose Settings and then Refresh Setting. The Refresh Setting subwindow appears.
2. Click the Configuration Setting link. The Configuration Setting subwindow appears.
3. Click the icon of the information source where you want to acquire configuration information automatically.
   The Edit Interval of Refresh Configuration - information-source-name dialog box appears.
4. Set and apply a refresh interval and refresh start time.
   The settings in the Configuration Setting subwindow are applied. From this point, configuration information is automatically refreshed based on the applied refresh settings.

Refreshing configuration information manually for each information source

To refresh configuration information manually for each information source:

1. From the Explorer menu, choose Settings and then Refresh Setting. The Refresh Setting subwindow appears.
2. Click the Configuration Setting link. The Configuration Setting subwindow appears.
3. Select the check boxes of the information sources where you want to acquire the latest configuration information, and then click Refresh Configuration.
   The Refresh Configuration - information-source-name dialog box appears.
4. Check the message and then perform the refresh.
   When processing finishes, a dialog box appears indicating that configuration information is acquired.
5. In the Configuration Setting subwindow, confirm that the Last Refresh time is updated.

Related topics

- About refreshing configuration information on page 11-12
- Refreshing configuration information manually for each storage system on page 11-18
Refreshing configuration information manually for each storage system

To refresh configuration information manually on a storage system basis:

1. From the Explorer menu, choose Resources and then Storage Systems.
The Storage Systems subwindow appears.
2. Select a storage system and click Refresh Storage System.
The configuration information displayed in the Storage Systems view subwindow is refreshed. For details, see Viewing a list of storage systems on page 14-5.

Click the following buttons in the lists of volumes (LUNs), pools, journals, or copy licenses to refresh a specific portion of the configuration information:

- Refresh Pool Info (the pool status and pool volume usage are refreshed)
- Refresh JNLG Info (journal group statuses and journal volume usage are refreshed)
- Refresh License Info

Note: In an open system, pool information and journal group information will sometimes fail to be refreshed after a pair management server is restarted (Error code: RPM-01618).
If this problem occurs, first refresh the statuses of the copy pairs in copy groups that were created using volumes in the target storage system, then refresh the pool or journal group information.

Related topics

- About refreshing configuration information on page 11-12
- Refreshing the copy pair status automatically for each information source on page 11-10
- Refreshing configuration information automatically (using the refresh settings) on page 11-16
System monitoring

Replication Manager provides multiple ways to monitor the operating status of the replication environment. You can monitor frequently viewed copy groups, check pair statuses, pair configurations, and the performance of remote copies.

This chapter describes the different types of system monitoring functions supported by Replication Manager.

- About system monitoring
- Monitoring configuration information
- Monitoring pair status
- Monitoring performance of remote copies
- Monitoring license usage
- Monitoring application replicas
About system monitoring

Replication Manager allows you to perform the following types of system monitoring functions.

Monitoring configuration information

You can monitor copy pair configurations in multiple ways using Replication Manager. You can use a tree view to check the configuration definition file for CCI that is created by Replication Manager or other products, or to check the copy group definition file for Business Continuity Manager or Mainframe Agent. You can limit the range of copy pairs being monitored to those of a host or storage system, and also check the configuration of related copy pairs. You can also check copy pair configurations from a copy group perspective.

Monitoring pair statuses

You can configure pair status monitoring for hosts, storage systems, copy groups, or copy pairs to detect an unexpected pair status. When a pair status for which you require notification is detected, Replication Manager can be configured to alert you with an email message or an SNMP trap. Replication Manager also detects pair statuses based on the periodic monitoring of pair statuses.

Monitoring the performance of remote copies

You can configure threshold monitoring for asynchronous remote copy metrics to detect where preset thresholds have been exceeded. You can display the transfer delay state between the primary and secondary volumes for each copy group. This feature is used to monitor asynchronous remote copying using Hitachi TrueCopy Asynchronous software, Hitachi TrueCopy Extended Distance software, and Hitachi Universal Replicator software. The transfer delay state of remote copies displays these types of information:

- Usage of side file/journal
- Write delay time (C/T delta)
- Usage rate of pool capacity

Monitoring the status of application replicas

You can monitor the progress of replica creation using the summary displayed in the Applications and Servers subwindows. You can receive notification through email or SNMP traps on replica monitoring parameters.

Monitoring resource utilization

You can monitor the usage ratio of buffers (pools and journal groups) and receive alerts by email or SNMP traps based on the predefined thresholds. If you are an administrator, you can add volumes to the buffers using Replication Manager.
Monitoring copy license usage

You can monitor the used capacity and copy license usage percentage for each copy product in complex replication environments. You can configure alerts to send notifications when copy license usage reaches a particular threshold or the licensed capacity has been reached.

Monitoring configuration information

This module describes methods for checking configuration information:

- About copy pair configuration checks on page 12-3
- Checking copy pair configurations on page 12-4
- Viewing copy pair configuration definition information on page 12-6

About copy pair configuration checks

The following table describes the methods for checking copy pair configurations provided by Replication Manager.

### Copy pair configuration check methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking the copy pair configuration</td>
<td>You can use a tree view to check the configuration definition file for CCI that is created by Replication Manager or other products, or to check the copy group definition file for Business Continuity Manager or Mainframe Agent.</td>
</tr>
<tr>
<td>configuration by limiting the copy pairs to those for a specific volume</td>
<td>You can find a copy pair by limiting the range of copy pairs to those of a host or storage system, and also checking the configuration of the related copy pairs.</td>
</tr>
<tr>
<td>Checking the copy group configuration by limiting the copy pairs to a specific copy pair</td>
<td>You can find a copy group by limiting the range of copy pairs to those of a host or to those in the pair configuration definition, and also checking the configuration of the related copy pairs.</td>
</tr>
</tbody>
</table>

**Tip:** If necessary, refresh the configuration information before checking copy pair configurations as described in Refreshing configuration information manually for each information source on page 11-17.

Related topics

- Checking copy pair configuration (perspective of specific volume) on page 12-5
- Checking copy pair configuration (perspective of specific copy group) on page 12-6
Checking copy pair configurations

Replication Manager provides multiple ways to check copy pair configurations.

For details on how to check copy pair configuration, see:

- Checking copy pair configuration definitions on page 12-4
- Checking copy pair configuration (perspective of specific volume) on page 12-5
- Checking copy pair configuration (perspective of specific copy group) on page 12-6

Copy pair configuration check workflow

The following figure shows the flow of tasks for checking copy pair configurations.

Checking copy pair configuration definitions

To check a copy pair configuration definition:

1. Select a pair management server.
   From the Explorer menu, either choose Resources and then Pair Configurations or choose Shared Views and then Sites. Select the pair management server that contains the copy pair whose configuration you want to check.

2. Expand the object tree nodes. Expand the tree nodes for the pair management server in the navigation area.
3. Check the copy pair configuration.

Check the copy groups defined in the configuration definition file or the copy group definition file (prefix). When you select a copy group, you can view a list of copy pairs belonging to the copy group.

**Related topics**

- About copy pair configuration checks on page 12-3
- Checking copy pair configuration (perspective of specific copy group) on page 12-6

**Checking copy pair configuration (perspective of specific volume)**

To check a copy pair configuration from the perspective of a specific volume:

1. Select a host or storage system.

   From the **Explorer** menu, select **Resources** and then **Hosts**, select **Resources** and then **Storage Systems**, or select **Shared Views** and then **Sites**. Select the host that contains the copy pair whose configuration you want to check. If you select a storage system instead of a host, also select the platform (mainframe or open systems).

   If necessary, click **Refresh Hosts** or **Refresh Storage System**.
2. Select a volume.
   In the displayed list, select the volume (LUN or DEVN) where you want to check the copy pair configuration to display information. For a storage system that connects to mainframe systems, before selecting the volume, select the applicable LDKC and CU for the model.

3. Check the copy pair configuration.
   In the list of copy pairs related to the selected volume, check the copy pair configuration.

Related topics
- Checking copy pair configuration (perspective of specific volume) on page 12-5

Checking copy pair configuration (perspective of specific copy group)

To check a copy pair configuration from the perspective of a specific copy group:

1. Select a host or pair management server.
   From the Explorer menu, select Resources and then Hosts, select Resources and then Pair Configurations, or select Shared Views and then Sites. Select the host or pair management server that contains the copy pair whose configuration you want to check.

2. Select a configuration definition file or a copy group definition file.
   From the displayed list, select the configuration definition file or the copy group definition file (prefix) that contains the copy pair whose configuration you want to check. A list of copy groups is displayed. For an open system host, click the Copy Groups tab.

3. Select a copy group.
   From the list, select the copy group that includes the copy pair whose configuration you want to check.

4. Check the copy pair configuration.
   In the list of copy pairs belonging to the selected copy group, check the copy pair configuration. When you click the Copy Group Relationship tab, you can view a list of cascaded copy groups that include the selected copy group.

Related topics
- Checking copy pair configuration (perspective of specific volume) on page 12-5

Viewing copy pair configuration definition information

You can display the configuration definition information of a pair management server (a host in mainframe systems). You can view a list of copy groups that are specified in the configuration definition file or copy group definition file (prefix). You can also check the summarized copy pair status of each copy group.
Related topics

- Viewing prefix information (mainframe systems) on page 12-7

**Viewing information about a configuration definition file (open systems)**

**To view information about a configuration definition file:**

1. From the **Explorer** menu, choose **Resources** and then **Pair Configurations**.
   The Pair Configurations subwindow appears.
2. Expand the object tree, and then select a pair management server under **Pair Configurations**.
   The `pair-management-server-name` subwindow appears.
3. Select a configuration definition file.
   The information about the configuration definition is displayed.

Related topics

- Viewing a list of copy pair configurations on page 14-4
- About configuration definition file formats on page 10-11

**Viewing prefix information (mainframe systems)**

**To view prefix information:**

1. From the **Explorer** menu, choose **Resources** and then **Pair Configurations**.
   The Pair Configurations subwindow appears.
2. Expand the object tree, and then select a pair management server under **Pair Configurations**.
   The `pair-management-server-name` subwindow appears.
3. Expand the object tree, and then select a prefix under the `pair-management-server-name` node.
   The information about the selected prefix is displayed.

Related topics

- Viewing a list of copy pair configurations on page 14-4

**Monitoring pair status**

You can configure pair status monitoring for hosts, storage systems, copy groups, or copy pairs to detect unexpected pair status. When a pair status for which notification is required is detected, Replication Manager can be configured to alert you by email or an SNMP trap.

Replication Manager also detects pair statuses based on periodic monitoring. The maximum number of times and frequency at which pair operation tasks monitor the pair status is based on the values of the following parameters in the `base.properties` file:
• For open systems, the `base.taskscheck.interval` and `base.taskscheck.maxcount` parameters are used.
• For mainframe systems, the `base.taskscheck.mf.interval` and `base.taskscheck.maxcount` parameters are used.

For details on the `base.properties` file parameters, see the *Hitachi Replication Manager Configuration Guide*.

This module describes methods for monitoring pair status:

• Monitoring pair statuses using alerts on page 12-8
• Monitoring pair statuses using My Copy Groups on page 12-8
• Monitoring pair status using refresh settings on page 12-11

### Monitoring pair statuses using alerts

You can monitor pair statuses using alerts. Alerts can be sent when a specific copy pair enters a preset status. Alert conditions can be specified for an individual copy pair or for a copy group. For example, you can specify an alert is sent when a given error status is detected. In this case, an alert is sent when any of the copy pairs belonging to the copy group enters the error status.

**Tip:** Because you can receive alerts by way of email or SNMP traps, you can also monitor the replication environment without being logged on to Replication Manager.

**Related topics**

• Exporting alert history on page 25-3
• Setting the copy pair status monitoring conditions for each copy pair on page 9-8
• Setting the copy pair status monitoring conditions for each copy group on page 9-6

### Monitoring pair statuses using My Copy Groups

To monitor specific copy groups, you can register them as **My Copy Groups**. This feature allows you to check the pair status of copy groups in one window or to check the details of a specific copy group by clicking the group's link.

**Related topics**

• Checking My Copy Groups on page 13-2

### Displaying My Copy Groups

**To display My Copy Groups:**

1. Register the desired copy groups.
   
   From the **Explorer** menu, select **My Groups**, select **My Copy Groups**, and set the copy groups you want to display as **My Copy Groups**.
2. Refresh the list.
   Click **Refresh My Copy Groups** to refresh the copy pair statuses for the copy groups registered as **My Copy Groups**.

3. Use **My Copy Groups** to check the configuration and status of copy groups.

For examples of how copy groups are displayed, see **Examples of My Copy Groups on page 7-9**.

**Related topics**
- **About My Copy Groups on page 7-8**

**Displaying My Copy Groups workflow**

The following figure shows the flow of tasks for displaying **My Copy Groups**.

![Displaying My Copy Groups workflow](image)

**Icons representing the relationship between a volume and a copy group or snapshot group**

Replication Manager uses icons to represent volumes, copy groups, and snapshot groups, along with arrow icons to indicate the relationship between a volume and a copy group or snapshot group.

**Icons representing the relationship between a volume and copy group or snapshot group**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Indicates a primary volume. When a group of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td>Icon</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="Icon" alt="primary-volume" /></td>
<td>Indicates a primary volume that has been reserved. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="secondary-volume" /></td>
<td>Indicates a secondary volume. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="reserved-secondary-volume" /></td>
<td>Indicates a secondary volume that has been reserved. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="primary-copy-group" /></td>
<td>Indicates a primary copy group or snapshot group. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="reserved-primary-copy-group" /></td>
<td>Indicates a primary copy group or snapshot group that has been reserved. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="secondary-copy-group" /></td>
<td>Indicates a secondary copy group or snapshot group. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="reserved-secondary-copy-group" /></td>
<td>Indicates a secondary copy group or snapshot group that has been reserved. When an organization of related volumes is displayed, the currently selected volume is highlighted.</td>
</tr>
<tr>
<td><img src="Icon" alt="suspended-error-status" /></td>
<td>Indicates the presence of a suspended status or an error status.</td>
</tr>
<tr>
<td><img src="Icon" alt="copy-processing" /></td>
<td>Indicates that copy processing is underway in the direction indicated by the arrow.</td>
</tr>
<tr>
<td><img src="Icon" alt="cascade-copy" /></td>
<td>There is another copy pair connected in the cascade format to the copy pair’s primary volume.</td>
</tr>
<tr>
<td><img src="Icon" alt="cascade-copy-secondary" /></td>
<td>There is another copy pair connected in the cascade format to the copy pair’s secondary volume.</td>
</tr>
</tbody>
</table>

The following shows a pair configuration and an example of its display in the actual window:
Monitoring pair status using refresh settings

You can acquire or confirm the latest pair status for the monitored resource by clicking Refresh in the Application area.

This module describes methods for monitoring pair status using refresh settings:

- Checking the copy pair status on page 12-12
- About copy pair status checks on page 12-12
- Copy pair status check workflow on page 12-12
- Checking status of copy pairs associated with volumes belonging to a host on page 12-13
- Checking status of copy pairs for a volume in a storage system on page 12-14
- Checking copy pair statuses for a copy group on page 12-14
Checking the copy pair status

Replication Manager provides multiple ways to check copy pair statuses:

- Checking status of copy pairs associated with volumes belonging to a host on page 12-13.
- Checking status of copy pairs for a volume in a storage system on page 12-14.

Related topics

- Copy pair status check workflow on page 12-12

About copy pair status checks

Replication Manager provides multiple ways to check copy pair status. The following table describes the methods for checking copy pair status provided by Replication Manager.

<table>
<thead>
<tr>
<th>Method for checking copy pair statuses</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>For volumes of a host</td>
<td>You can use this method to view the statuses of the copy pairs that affect a specific host.</td>
</tr>
<tr>
<td>For volumes in a storage system</td>
<td>You can use this method to view the statuses of the copy pairs that are contained in a specific storage system.</td>
</tr>
<tr>
<td>Checking a copy group</td>
<td>You can use this method to view the statuses of the copy pairs that affect a specific copy group.</td>
</tr>
</tbody>
</table>

Tip: In open systems, copy pair statuses are normally acquired from the Device Manager agent on the pair management server. However, if copy pairs have been created using storage system operation management software (such as Storage Navigator or Storage Navigator Modular), the configuration definition information (the configuration definition file for CCI on the pair management server) does not exist. In this case, copy pair statuses are acquired from the Device Manager server. Pair status acquisition from the Device Manager server takes more time than acquisition from the Device Manager agent. For this reason, if you want to frequently check the pair status of specific copy pairs, you should prepare an environment in which the configuration of the copy pairs has been defined using Replication Manager.

Related topics

- About copy pair status on page 10-100

Copy pair status check workflow

The following figure shows the flow of tasks for checking copy pair statuses.
Checking status of copy pairs associated with volumes belonging to a host

To check the copy pair status for a volume of a host:

1. Select a host.
   From the Explorer menu, either choose Resources and then Hosts or choose Shared Views and then Sites. Select the host that contains the copy pair whose status you want to check.

2. Select a volume.
   In the displayed list, select the volume (LUN or DEVN) included in the copy pair whose status you want to check. Selecting the volume displays information about that volume.

3. Check the copy pair status.
   In the list of copy pairs related to the selected volume, check the copy pair status, copy pair state, and copy progress.

Related topics
- About copy pair status checks on page 12-12
- Copy pair status check workflow on page 12-12
- Checking status of copy pairs for a volume in a storage system on page 12-14
- Checking copy pair statuses for a copy group on page 12-14
Checking status of copy pairs for a volume in a storage system

To check the copy pair statuses for a storage system volume:

1. Select a storage system.
   From the Explorer menu, either choose Resources and then Storage Systems or choose Shared Views and then Sites. Select the storage system that contains the copy pair whose status you want to check, then select the platform (mainframe or open) to display information about that storage system.

2. Select a volume.
   In the displayed list, select the volume (LUN or DEVN) included in the copy pair whose status you want to check. Selecting the volume displays information about that volume. For mainframe systems, before selecting the volume, select the applicable LDKC and then the CU for the model.

3. Check the copy pair statuses.
   In the list of copy pairs related to the selected volume, check the copy pair status, copy pair state, and copy progress for each pair.

Related topics
• About copy pair status checks on page 12-12
• Checking status of copy pairs associated with volumes belonging to a host on page 12-13

Checking copy pair statuses for a copy group

If you have registered the target copy groups as your My Copy Groups, instead of using the following procedure, you can check the copy pair statuses directly by choosing My Groups and then My Copy Groups from the Explorer menu.

To check the copy pair statuses for a copy group, perform the following:

1. Select a host or pair management server.
   From the Explorer menu, choose Resources and then Hosts, choose Resources and then Pair Configurations, or choose Shared Views and then Sites. Select the host or pair management server that contains the copy pair whose status you want to check.

2. Select a configuration definition file or a copy group definition file.
   From the displayed list, select the configuration definition file or copy group definition file (prefix) that contains the copy pair whose status you want to check. A list of copy groups is displayed. For an open system host, click the Copy Groups tab.
   In the list of copy groups contained in the selected configuration definition file or copy group definition file (prefix), you can check for the most serious status (summary status) among the pairs that exist within each copy group.

3. Select a copy group.
From the displayed list, select the copy group that includes the copy pair whose status you want to check.
If necessary, click **Refresh Copy Group** to refresh the information.

4. Check the copy pair statuses.
   Use the copy group summary to check the copy pair that has the most critical pair status of the copy pairs in the selected copy group. You can also use the list of copy pairs to check the copy pair status, copy pair state, and copy progress for each copy pair.

**Related topics**
- About copy pair status checks on page 12-12
- Copy pair status check workflow on page 12-12
- Checking status of copy pairs associated with volumes belonging to a host on page 12-13
- Checking status of copy pairs for a volume in a storage system on page 12-14

**Monitoring performance of remote copies**

Replication Manager can monitor the usage ratio of buffers to avoid overflow and maintain data consistency. You can get notification through SNMP traps or email based on the predefined threshold. If you are an administrator you can add volumes to the buffers using Replication Manager.

Replication Manager can also be used to monitor asynchronous remote copying performed using Hitachi TrueCopy Asynchronous software, Hitachi TrueCopy Extended Distance software, or Hitachi Universal Replicator software. Write delay time or consistency time deltas (C/T delta) can be monitored to acquire transfer delay status from volume replication facilities. You can display the transfer delay state between the primary and secondary volumes for each copy group.

This module describes methods for monitoring performance of remote copies:
- About performance monitoring on page 12-15
- Checking the performance of remote copies on page 12-16
- Monitoring transfer delay state of remote copies on page 12-17
- Monitoring resource utilization (pools and journal groups) on page 12-19

**About performance monitoring**

Performance monitoring is available when the system uses asynchronous remote copy functionality, such as TrueCopy Async, TrueCopy Extended Distance, or Universal Replicator, or copy functionality based on snapshot images, such as Copy-on-Write Snapshot/Thin Image.

The following table summarizes the types of information available to find out if the target copy group is maintaining the predefined performance level.
Buffer usage

You can check the usage of the following buffers:

- When using TrueCopy Async: sidefiles, which are stored in cache memory areas of the storage system to which the primary and secondary volumes belong
- When using Universal Replicator: journal volumes that correspond to the primary and secondary volumes
- When using Copy-on-Write Snapshot/Thin Image or TrueCopy Extended Distance in open systems: pool volumes for storing the differential data used to create snapshot images (virtual volumes)

Write delay time (C/T delta)

You can check the time required to write data of the primary volume to the secondary volume based on the write delay time.

To view the workflow for checking the performance of remote copies, see Checking performance workflow (remote copies) on page 12-17.

If necessary, you can export the performance history to a CSV or HTML file. (Note that you can export only data whose retention period has not expired.)

Tip: You can use the alert function to monitor buffer usage. When the performance value exceeds the defined threshold, an alert is reported by e-mail or SNMP trap. See Enabling or disabling alert settings on page 17-3 for more information.

Remote copy performance monitoring (Device Manager)

You can check the copy performance of Universal Replicator copy groups using the Replication tab of Device Manager:

- Buffer usage
- Current status and trend of write delay time (C/T delta)
- List of C/T delta alerts

When a drop in performance occurs, you can analyze the cause by checking detailed information provided by the Replication tab.

To use the Replication tab, the following Replication Manager settings are required:

- Edit Tuning Manager and Device Manager property settings as described in the Hitachi Command Suite Administrator Guide.

For details about the Replication tab and a complete list of prerequisites, see the Hitachi Command Suite User Guide.

Checking the performance of remote copies

Tip: You can check the performance of remote copies when system operation uses asynchronous remote copy functionality. See About performance monitoring on page 12-15 for more information.

For details on how to check performance of remote copies, see the following:
• Checking buffer usage (pools and journal groups) on page 12-20.
• Checking buffer usage (sidefiles and journal volumes) on page 12-20.
• Checking write delay time (C/T Delta) for each copy group on page 12-18.

Checking performance workflow (remote copies)

The following figure shows the flow of tasks for checking the performance of remote copies.

Monitoring transfer delay state of remote copies

This module describes how progress of volume replication functions are monitored:

• About copy progress on page 12-17
• Viewing copy progress on page 12-18
• Checking write delay time (C/T Delta) for each copy group on page 12-18

About copy progress

*Copy progress* is a value that indicates the progress of the volume replication functions being executed by the storage system. The copy progress (copy pair matching rate) or differential-bitmap matching rate is displayed.
according to the copy type or copy pair status. The following table lists the values displayed to indicate the copy progress.

### Copy progress display

<table>
<thead>
<tr>
<th>Copy type</th>
<th>Copy pair status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>error</td>
</tr>
<tr>
<td>ShadowImage</td>
<td>CP</td>
</tr>
<tr>
<td>• ShadowImage</td>
<td></td>
</tr>
<tr>
<td>• Copy-on-Write Snapshot/Thin Image</td>
<td></td>
</tr>
<tr>
<td>• TrueCopy Sync</td>
<td>BM</td>
</tr>
<tr>
<td>• TrueCopy Async</td>
<td>BM</td>
</tr>
<tr>
<td>• TrueCopy Extended Distance</td>
<td></td>
</tr>
<tr>
<td>• Universal Replicator</td>
<td></td>
</tr>
</tbody>
</table>

Legend:

CP: Copy progress (copy pair matching rate)
BM: Differential-bitmap matching rate
--: Not displayed

### Related topics

- [About copy pair status on page 10-100](#)
- [Viewing copy progress on page 12-18](#)

### Viewing copy progress

To confirm copy progress, select a copy group on the Pair Configurations view or click the link on the My Copy Groups page.

To acquire the latest copy progress, click Refresh Copy Group in the Pair Configurations view.

### Related topics

- [About copy progress on page 12-17](#)

### Checking write delay time (C/T Delta) for each copy group

**Tip:** If you have registered the target copy group as one of your My Copy Groups, you do not need to use the following procedure. Instead, see Refreshing copy pair statuses manually for My Copy Groups on page 11-9.

To check the write delay time (C/T delta) for each copy group:

1. Select a host or pair management server.
   From the Explorer menu, select Resources and then Hosts, select Resources and then Pair Configurations, or select Shared Views and
then Sites. Select the host or pair management server that contains the copy group whose C/T delta you want to check. If you have selected a host, click Refresh Hosts to refresh the information when necessary.

2. Select a configuration definition file or prefix.
   From the displayed list, select the configuration definition file or prefix that includes the copy group whose C/T delta you want to check. For an open-system host, click the Copy Groups tab.

3. Select a copy group.
   From the list, select the copy group whose C/T delta you want to check.

Tip: If the copy group is defined by device group, click Refresh Copy Group to refresh the information.

4. Check the C/T delta.
   Use the copy group summary to check the C/T delta. For open systems, the difference between the data write times for the primary and secondary volumes is displayed. For mainframe systems, the difference between the secondary-volume consistency time and the current time is displayed for each consistency group.

5. Export the C/T delta history.
   If necessary, export the C/T delta history to a CSV or HTML file by clicking Export History.

Note: You can also export C/T delta history using a command line. See Using the GetCTDelta command on page 27-2 for details.

Note: The C/T delta value is an estimate based on the outflow of data to the secondary volume. The value may be off by a few minutes depending on the configuration. The C/T delta calculation occurs approximately once every 5 minutes, but also varies depending on the configuration.

Related topics
- Viewing the data retention period on page 9-16

Monitoring resource utilization (pools and journal groups)

Replication Manager monitors the usage ratio of buffers and makes a notification with alert functionality, in order to avoid the overflow of the buffers and maintain data consistency. You can get notification through SNMP email, based on the predefined threshold. If you are an administrator you can add volumes to the buffers using Replication Manager.

This module describes how to monitor resource utilization:
- Pool usage threshold values on page 12-20
- Checking buffer usage (pools and journal groups) on page 12-20
- Checking buffer usage (sidefiles and journal volumes) on page 12-20
Pool usage threshold values

The values for the pool usage threshold must be in the range shown in the following table.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Hitachi AMS, WMS, SMS</th>
<th>USP_V, VSP, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, HUS VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create pool</td>
<td>50 to 80% in every 1</td>
<td>20 to 95% in every 5</td>
</tr>
<tr>
<td>Edit pool</td>
<td>50 to 80% in every 1 and more than Usage Rate</td>
<td>20 to 95% in every 5 and more than Usage Rate</td>
</tr>
</tbody>
</table>

Checking buffer usage (pools and journal groups)

To check the usage of the buffers (pool volumes or journal volumes) for each pool or journal group:

1. Select a storage system.
   From the Explorer menu, either select Resources and then Storage Systems or select Shared Views and then Sites. Select the storage system that contains the copy pair whose buffer usage you want to check, and the appropriate platform (mainframe or open systems).
   If necessary, click Refresh Storage System to refresh the information about the selected storage system.

2. Check the usage of the buffers (pool volumes or journal volumes).
   You can check the buffer usage in the pool list or journal group list displayed by clicking the appropriate tab.

3. Export the usage history of the buffers (pool volumes or journal volumes).
   If necessary, export the usage history of pools or journal groups to a CSV or HTML file by clicking Export History.

Checking buffer usage (sidefiles and journal volumes)

Tip: If you have registered the target copy group as one of your My Copy Groups, you do not need to use the following procedure. Instead, see Refreshing copy pair statuses manually for My Copy Groups on page 11-9.

To check the usage of buffers (sidefiles and journal volumes) for each copy group:

1. Select a host or pair management server.
   From the Explorer menu, select Resources and then Hosts, select Resources and then Pair Configurations, or select Shared Views and then Sites. Select the host or pair management server that contains the copy pair whose buffer usage you want to check. If you have selected a host, click Refresh Hosts to refresh the information when necessary.

2. Select a configuration definition file or prefix.
From the displayed list, select the configuration definition file or prefix that includes the copy group whose buffer usage you want to check. For an open-system host, click the Copy Groups tab.

3. Select a copy group.
   From the list, select the copy group whose buffer usage you want to check. If necessary, click Refresh Copy Group to refresh the information.

4. Check the usage of buffers (sidefiles and journal volumes).
   Use the copy group summary to check the usage of the sidefiles or journal volumes.

5. Check the detailed usage information for buffers (sidefiles and journal volumes).
   In the copy group summary, if you click the sidefile usage link or journal volume usage link, you can view the following types of information:

   - **Sidefile usage (TrueCopy Async):** In the primary volume column, the sidefile usage is displayed on a consistency group basis. In the secondary volume column, the sidefile usage is displayed on a consistency group basis (in open systems) or on a storage system basis (in mainframe systems).
   - **Journal volume usage (Universal Replicator):** The journal volume usage is displayed on a consistency group basis (in open systems) or on a journal group basis (in mainframe systems). In mainframe systems, the usage information is split and displayed in the metadata area and journal data area.

6. Export the usage history of the buffers (sidefiles and journal volumes).
   If necessary, export the usage history to a CSV or HTML file by clicking Export History.

**Related topics**
- [Checking buffer usage (pools and journal groups) on page 12-20](#)

**Monitoring license usage**

Replication Manager assists in monitoring the license capacity, making it easy to track license usage, especially in large and complex replication environments. Replication Manager functions can be used within the licensed capacity of each copy product. Additional licenses are required when the target volumes for pair configuration exceed the licensed capacity. You can view and monitor the used capacity and copy license usage percentage for each copy product to prevent license expiry. You can configure alerts to get notifications when copy license usage reaches a particular threshold or exceeds the licensed capacity.

This module describes methods for monitoring license usage:
- [Checking copy license usage on page 12-22](#)
Checking copy license usage

To check copy license usage:

1. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed.
3. Click the Open link or Mainframe link.
   The Open subwindow or Mainframe subwindow appears.
4. Click the Copy Licenses tab.
   The license usage information for different copy types is displayed in the Copy License Usage field.

Monitoring application replicas

This module describes methods for monitoring application replicas:

- About data protection status on page 12-22
- Data protection status example on page 12-23
- About aggregation rules for protection status on page 12-23
- Excluding objects from data protection status monitoring on page 12-24

About data protection status

The protection status display allows quick identification of the cases shown in the table.

<table>
<thead>
<tr>
<th>Status</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>✨</td>
<td>The latest replica is current (the last scheduled replica was successful).</td>
</tr>
<tr>
<td>Warning</td>
<td>🚨</td>
<td>The latest replica is older than expected (the last scheduled replica was unsuccessful).</td>
</tr>
<tr>
<td>Critical</td>
<td>⚠️</td>
<td>No replica is available due to task failures.</td>
</tr>
<tr>
<td>Unknown</td>
<td>⚫</td>
<td>No replica is available as the task has not yet been created/executed.</td>
</tr>
<tr>
<td>Excluded</td>
<td>⚪</td>
<td>The object has been excluded from monitoring. Only displayed at the lowest level (information stores). When an object is excluded, the status of the object is not aggregated to the upper layer.</td>
</tr>
</tbody>
</table>

Related topics

12-22 System monitoring
Hitachi Replication Manager User Guide
Data protection status example

The following example illustrates how to interpret the status display.

<table>
<thead>
<tr>
<th></th>
<th>Status (07:00 AM)</th>
<th>Create Tasks (08:00 AM)</th>
<th>Status (09:00 AM)</th>
<th>1st Backup (10:00 AM)</th>
<th>Status (11:00 AM)</th>
<th>2nd Backup (12:00 PM)</th>
<th>Status (13:00 PM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object-1 (Task-A)</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Success</td>
<td>Yes</td>
<td>Success</td>
<td>Yes</td>
</tr>
<tr>
<td>Object-2 (Task-B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object-3 (Task-C)</td>
<td></td>
<td></td>
<td></td>
<td>Failed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object-4 (Task-D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object-5 (Task-E)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Related topics

- Checking the status of application replicas on page 23-61
- About data protection status on page 12-22

About aggregation rules for protection status

The Applications view consists of three levels: application (Microsoft Exchange or SQL Server), the servers running the application, and the storage groups (Exchange 2007), information stores (Exchange 2010/2013/2016), or database instance (SQL) allocated to each server. To simplify monitoring, a series of status labels are applied to each level in the structure. In order of priority, the labels are:

- Critical
- Unknown
- Warning
- Normal

The data protection status and latest replica are aggregated from the bottom up based on these rules:

- If one or more instance of Critical exists on a level, the upper level is also labeled Critical
- If no instance of Critical exists, but one or more instances of Warning exist, the upper level is labeled Warning
If no instance of **Critical** or **Warning** exists, the upper level is labeled **Normal**.

This ensures that the current status of each level reflects that of the one below. In the example below, the top (application) level is tagged with an aggregate status of **Critical**.

![Diagram showing aggregation example (Exchange 2007)](image)

**Figure 12-1 Aggregation example (Exchange 2007)**

**Related topics**
- [Checking the status of application replicas on page 23-61](#)
- [About data protection status on page 12-22](#)
- [Data protection status example on page 12-23](#)

**Excluding objects from data protection status monitoring**

During a maintenance operation, the protection status for a specific object could be intentionally set to **Critical**. In this case, aggregating the status would disturb status monitoring. To avoid this situation, administrators can exclude objects from monitoring by excluding the individual information sources.
Like the aggregation of status, exclusion works from the bottom up: the status of an object is displayed as *Excluded* if all its sub-objects are excluded from monitoring.

**To exclude an object from monitoring:**

1. From the **Explorer** menu, select **Resources**, and then **Applications**.
   The Applications subwindow appears.
2. Click on the link for the server.
   The server subwindow appears.
3. In the **Storage Groups** tab (Exchange 2007), click the desired storage group link. In the **Information Stores** tab (Exchange 2010/2013/2016), click the desired information store link.
   The Monitoring setting window is opened.
4. To exclude an information store from monitoring, clear the check box.
5. Click **OK** when your settings are complete.

The status of the object changes to *Excluded* and is not aggregated to the upper layer. The latest replica is also ignored.

**Related topics**

- [About data protection status on page 12-22](#)
- [About aggregation rules for protection status on page 12-23](#)
Managing My Copy Groups

This chapter describes tasks for managing My Copy Groups.

- My Copy Groups management functions
- Explorer menu items for My Copy Groups management
- Checking My Copy Groups
- Editing My Copy Groups
**My Copy Groups management functions**

The following table shows the **My Copy Groups** management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Viewing my copy groups</td>
<td>Y</td>
</tr>
<tr>
<td>Editing my copy groups</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.

**Tip:** Each function can be used only for the resources (specifically, the copy groups that contain the volume pairs belonging to the resources) in resource groups associated with the user.

**Explorer menu items for My Copy Groups management**

The following table shows the **Explorer** menu items that are related to **My Copy Groups** management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>My Groups</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be executed with this permission.

**Checking My Copy Groups**

You can view **My Copy Groups** to check information such as the registered copy groups and the number of copy groups for each copy type. Each copy group functions as a link to the window that displays the detailed information of the copy group. However, the link is enabled only when you have access permissions for the pair management server (host) on which the copy group is defined. The access permissions you have depends on which resource groups are associated with you.

To view **My Copy Groups**, from the **Explorer** menu, choose **My Groups** and then **My Copy Groups**. The **My Copy Groups** subwindow appears.
To refresh the information displayed in the **My Copy Groups** subwindow, click **Refresh My Copy Groups**.

**Related topics**
- Displaying My Copy Groups workflow on page 12-9
- About My Copy Groups on page 7-8

## Editing My Copy Groups

**To edit My Copy Groups:**

1. From the **Explorer** menu, choose **My Groups** and then **My Copy Groups**.
   The **My Copy Groups** subwindow appears.
2. Click **Edit My Copy Groups**.
   The Edit My Copy Groups dialog box appears.
3. Edit **My Copy Groups**.
   If you do not want to use **My Copy Groups**, select the **Disable My Copy Groups** check box. If you want to use **My Copy Groups**, in the list, select the copy groups you want to display in **My Copy Groups**.
4. Click **OK** to update **My Copy Groups**.
   The information displayed in the **My Copy Groups** subwindow is refreshed.

**Related topics**
- About My Copy Groups on page 7-8
Managing resources

This chapter describes different methods for managing resources.

- Resource management functions
- Explorer menu items for resource management
- Viewing a list of copy pair configurations
- Viewing a list of copy pairs associated with a task
- Viewing a list of hosts
- Viewing a list of storage systems
- Viewing a summary of storage systems
- Viewing DEVN information (mainframe systems)
- Viewing individual host information
- Viewing individual storage system information
- Viewing information about copy groups belonging to a copy pair configuration definition
- Icons representing a copy topology
- Viewing copy group information in the Pair Configurations view (mainframe systems)
- Viewing copy group information in the Pair Configurations view (open systems)
- Viewing information about copy groups or snapshot groups belonging to a host
- Viewing copy group information in the Hosts view (mainframe systems)
- Viewing copy group information in the Hosts view (open systems)
- Viewing information about pair management servers
- Viewing information about prefixes belonging to a host (mainframe systems)
- Viewing information about volumes belonging to a host
- Viewing information about volumes belonging to a storage system
- Viewing information about CUs belonging to a storage system (mainframe systems)
- Viewing LDEV information (mainframe systems)
- Viewing LUN information in the Storage Systems view (open systems)
- Viewing LUN information in the Hosts view (open systems)
- Viewing storage system information (mainframe systems)
- Viewing storage system information (open systems)
- Viewing information about LDKCs belonging to a storage system (mainframe systems)
# Resource management functions

The following table describes the resource management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin Modify View</td>
</tr>
<tr>
<td>Viewing a list of information sources</td>
<td>Y  N  N</td>
</tr>
<tr>
<td>Adding information sources</td>
<td>Y  N  N</td>
</tr>
<tr>
<td>Editing information sources</td>
<td>Y  N  N</td>
</tr>
<tr>
<td>Removing information sources</td>
<td>Y  N  N</td>
</tr>
<tr>
<td>Viewing a list of hosts</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing individual host information</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about volumes belonging to a host</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about prefixes belonging to a host (mainframe systems)</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about copy groups belonging to a host</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing a list of storage systems</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing a list of applications/servers</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing a summary of storage systems</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing individual storage system information</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about LDKCs belonging to a storage system (mainframe systems)</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about CUs belonging to a storage system (mainframe systems)</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about volumes belonging to a storage system</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing a list of copy pair configurations</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about pair management servers</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing copy pair configuration definition information</td>
<td>Y  Y  Y</td>
</tr>
<tr>
<td>Viewing information about copy groups belonging to a copy pair configuration definition</td>
<td>Y  Y  Y</td>
</tr>
</tbody>
</table>

**Legend:**

- **Y:** Can be used with this permission.
- **N:** Cannot be used with this permission.

**Tip:** Each function can be used only for the resources in resource groups associated with the user.
Explorer menu items for resource management

The following table describes the Explorer menu items that are related to resource management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Submenu</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td></td>
</tr>
<tr>
<td>Information Source</td>
<td>Y</td>
</tr>
<tr>
<td>Resources</td>
<td></td>
</tr>
<tr>
<td>Hosts</td>
<td>Y</td>
</tr>
<tr>
<td>Storage Systems</td>
<td></td>
</tr>
<tr>
<td>Pair Configurations</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be executed with this permission.
N: Cannot be executed with this permission.

**Viewing a list of copy pair configurations**

You can display a list of pair management servers (or hosts in mainframe systems) that manage copy pair configuration definitions.

**To view a list of copy pair configuration definitions:**

1. From the Explorer menu, choose Resources and then Pair Configurations.
   A list of managed pair management servers is displayed in the Pair Configurations subwindow.

**Related topics**

- Viewing copy pair configuration definition information on page 12-6
- Structure of the Pair Configurations view on page 3-11

**Viewing a list of copy pairs associated with a task**

You can view the list of copy pairs associated with a task to confirm copy status before or during task execution or to investigate the pair configuration or status of a selected copy group.

**To view the list of copy pairs associated with a task:**

1. In the Explorer menu, choose Tasks and then Tasks.
   A list of tasks is displayed in the Tasks subwindow.
2. Select a task and the copy group or snapshot group name:
The list of copy pairs associated with the copy group are displayed in the \textit{copy-group-name} subwindow.

The list of copy pairs associated with the snapshot group are displayed in the \textit{snapshot-group-name} subwindow.

\begin{itemize}
\item The copy group or snapshot group link can be selected once the copy groups or snapshot groups are created in the Resource view.
\end{itemize}

\textbf{Related topics}

- \textit{Confirming copy status during task execution on page 10-132}

\section*{Viewing a list of hosts}

You can list information about all hosts for which you have access permissions.

To view a list of hosts, from the \textbf{Explorer} menu, choose \textbf{Resources} and then \textbf{Hosts}. The managed hosts are listed in the Hosts subwindow.

\textbf{Related topics}

- \textit{Viewing individual host information on page 14-6}
- \textit{Structure of the Hosts view on page 3-7}

\section*{Viewing a list of storage systems}

To view a list of connected storage systems, from the \textbf{Explorer} menu, choose \textbf{Resources} and then \textbf{Storage Systems}. The managed storage systems are listed in the Storage Systems subwindow.

\textbf{Related topics}

- \textit{Structure of the Storage Systems view on page 3-9}
- \textit{Viewing individual storage system information on page 14-7}
- \textit{Viewing information about volumes belonging to a storage system on page 14-12}

\section*{Viewing a summary of storage systems}

You can display the following summary information for each storage system:

- Storage system summary
  Information such as the storage system type and serial number is displayed.

- List of platforms
  Information such as the license registration status of each copy type and the information sources is displayed for each platform (mainframe or open systems).
To view a summary of storage systems:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed in the storage-system-name subwindow.

Related topics
- Viewing individual storage system information on page 14-7
- Viewing information about volumes belonging to a storage system on page 14-12

Viewing DEVN information (mainframe systems)

To view DEVN information (mainframe systems):

1. From the Explorer menu, choose Resources and then Hosts.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a host under Hosts.
   The host-name subwindow appears.
3. On the DEVNs page, select a volume.
   The information about the selected volume is displayed.

Related topics
- Viewing information about volumes belonging to a host on page 14-12

Viewing individual host information

You can display the following information about individual hosts:

For open system hosts:
- List of volumes (LUNs) belonging to the host
  The volumes that constitute copy pairs (other than volumes in simplex status) are displayed in the Paired list, and the volumes that do not constitute copy pairs (including volumes in simplex status) are displayed in the Unpaired list.
- List of copy groups belonging to the host

For mainframe hosts:
- List of volumes (DEVNs) belonging to the host
  The volumes that constitute copy pairs (other than volumes in simplex status) are displayed in the Paired list, and the volumes that do not
constitute copy pairs (including volumes in simplex status) are displayed in the **Unpaired** list.

- List of copy group definition files (prefixes) belonging to the host

**To view host information:**

1. From the **Explorer** menu, select **Resources** and then **Hosts**. The Hosts subwindow appears.
2. Expand the object tree, and then select a host under **Hosts**. The information about the selected host is displayed.

**Related topics**

- [Viewing a list of hosts on page 14-5](#)
- [Structure of the Hosts view on page 3-7](#)

**Viewing individual storage system information**

You can display the following information about each storage system for each platform (mainframe or open systems).

For open systems:

- Storage system summary (capacity)
- List of volumes (LUNs)
- List of command devices
- List of pools
- List of journal groups (enterprise-class storage systems, VSP Gx00 models, VSP Fx00 models, or HUS VM)
- List of remote paths
- List of DMLUs (midrange storage systems)
- List of licenses for each copy type
- List of snapshot groups

For mainframe systems:

- Storage system summary (capacity)
- List of LDKCs (for storage systems that support LDKCs)
- List of CUs (for storage systems that do not support LDKCs)
- List of journal groups
- List of licenses for each copy type

**Related topics**

- [Viewing storage system information (open systems) on page 14-15](#)
- [Viewing storage system information (mainframe systems) on page 14-15](#)
Viewing information about copy groups belonging to a copy pair configuration definition

You can display the following copy group information belonging to a configuration definition:

- Copy group summary
- List of copy pairs belonging to a copy group
- Copy group relationships

Related topics

- Viewing copy group information in the Hosts view (open systems) on page 14-10
- Viewing copy group information in the Pair Configurations view (mainframe systems) on page 14-9

Icons representing a copy topology

Replication Manager uses icons to represent a copy topology. The following table lists and describes these icons.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Copy Group or Snapshot Group" /></td>
<td>Indicates a copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image" alt="Newly Created Copy Group or Snapshot Group" /></td>
<td>Indicates a newly created copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image" alt="Edited Copy Group or Snapshot Group" /></td>
<td>Indicates an edited copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image" alt="Deleted Copy Group or Snapshot Group" /></td>
<td>Indicates a deleted copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image" alt="Both Directions" /></td>
<td>Indicates that copying is being performed in both directions (from the primary volume to the secondary volume, and vice versa).</td>
</tr>
<tr>
<td><img src="image" alt="Directional Copying" /></td>
<td>Indicates that copying is being performed in the direction indicated by the arrow.</td>
</tr>
</tbody>
</table>
Viewing copy group information in the Pair Configurations view (mainframe systems)

To view copy group information (mainframe systems):

1. From the Explorer menu, choose Resources and then Pair Configurations.
   The Pair Configurations subwindow appears.
2. Expand the object tree, and then select a pair management server under Pair Configurations.
   The pair-management-server-name subwindow appears.
3. Select a prefix.
   The prefix-name subwindow appears.
4. Select a copy group.
   The information about the selected copy group is displayed.

Related topics

• Viewing copy group information in the Hosts view (mainframe systems) on page 14-10

Viewing copy group information in the Pair Configurations view (open systems)

To view copy group information (open systems):

1. From the Explorer menu, choose Resources and then Pair Configurations.
   The Pair Configurations subwindow appears.
2. Expand the object tree, and then select a pair management server under Pair Configurations.
   The pair-management-server-name subwindow appears.
3. Select a configuration definition file.
   The configuration-definition-file-name subwindow appears.
4. Select a copy group.
   The information about the selected copy group is displayed.

Related topics

• Viewing copy group information in the Hosts view (open systems) on page 14-10

Viewing information about copy groups or snapshot groups belonging to a host

You can display the following information for copy groups or snapshot groups belonging to a host:
• Summary of copy groups and snapshot groups
• List of copy pairs belonging to a copy group or snapshot group
• Copy group and snapshot group relationships

Related topics
• Viewing copy group information in the Hosts view (open systems) on page 14-10
• Viewing copy group information in the Hosts view (mainframe systems) on page 14-10
• Viewing or modifying snapshot groups on page 10-51

Viewing copy group information in the Hosts view (mainframe systems)

To view copy group information (mainframe systems):
1. From the Explorer menu, choose Resources and then Hosts. The Hosts subwindow appears.
2. Expand the object tree, and then select a host under Hosts. The host-name subwindow appears.
3. On the Prefixes page, select a prefix. The prefix-name subwindow appears.
4. Select a copy group. The information about the selected copy group is displayed.

Related topics
• Viewing copy group information in the Pair Configurations view (mainframe systems) on page 14-9

Viewing copy group information in the Hosts view (open systems)

To view copy group information (open systems):
1. From the Explorer menu, choose Resources and then Hosts. The Hosts subwindow appears.
2. Expand the object tree, and then select a host under Hosts. The host-name subwindow appears.
3. On the Copy Groups page, select a copy group. The information about the selected copy group is displayed.

Related topics
Viewing information about pair management servers

You can display the following information about pair management servers (hosts in mainframe systems):

- **Pair management server summary**
  Information such as the IP address and sysplex name is displayed.

- **List of configuration definitions**
  A list of configuration definition files or copy group definition files (prefixes) is displayed.

**To view information about a pair management server:**

1. From the **Explorer** menu, choose **Resources** and then **Pair Configurations**.
   The Pair Configurations subwindow appears.
2. Expand the object tree, and then select a pair management server under **Pair Configurations**.
   The information about the selected pair management server is displayed.

**Related topics**

- Viewing a list of copy pair configurations on page 14-4

Viewing information about prefixes belonging to a host (mainframe systems)

You can list the prefix information of mainframe hosts. The copy group information defined in the copy group definition files (prefixes), such as the copy type and summarized copy pair status, can then be checked.

**To view prefix information:**

1. From the **Explorer** menu, choose **Resources** and then **Hosts**.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a host under **Hosts**.
   The **host-name** subwindow appears.
3. On the **Prefixes** page, select a prefix.
   The information for the selected prefix is displayed in the **prefix-name** subwindow.

**Related topics**

- Viewing a list of hosts on page 14-5
- Structure of the Hosts view on page 3-7
Viewing information about volumes belonging to a host

You can display the following information about the volumes belonging to a host:

- Volume summary (LUNs or DEVNs)
  Summary information includes the mount point and capacity of each volume.
- Copy pair relationships
  Information about the copy pairs that include the selected volume, such as the copy pair status and copy pair state, is listed.

Related topics
- Viewing LUN information in the Hosts view (open systems) on page 14-15
- Viewing DEVN information (mainframe systems) on page 14-6

Viewing information about volumes belonging to a storage system

You can display the following information about the volumes belonging to a storage system for each platform (mainframe or open systems):

- Volume (LUN or DEVN) summary
  The LUN information (such as the mount point and capacity) or DEVN information (such as the serial number and emulation type).
- Copy pair relationships
  Information about the copy pairs that include the selected volume, such as the copy pair status and copy pair state.

Related topics
- Viewing LUN information in the Storage Systems view (open systems) on page 14-14

Viewing information about CUs belonging to a storage system (mainframe systems)

You can display the following information about the CUs used in mainframe storage systems:

- CU summary
  The capacity of each CU is displayed.
- List of volumes (LDEVs) belonging to a CU
  Information such as the serial number and capacity is listed for each volume.
To view CU information:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Mainframe link.
   The Mainframe subwindow appears.
4. On the LDKCs page, select an LDKC.
   The LDKC-name subwindow appears.
5. Select a CU.
   The information about the selected CU is displayed.

Tip: Volumes that are currently locked by a task are marked with the ⌐ icon. When you put the cursor over a locked entry in the LDEV column, the following information is displayed indicating the name of the task:

LU (Reserved by workflow: workflow-name)

Related topics

- Reviewing paired LDEV list on page 5-12

Viewing LDEV information (mainframe systems)

To view LDEV information:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Mainframe link.
   The Mainframe subwindow appears.
4. On the LDKCs page, select an LDKC.
   The LDKC-name subwindow appears.
5. Select a CU.
   The CU-name subwindow appears.
6. Select an LDEV.
   The information about the selected LDEV is displayed in the LDEV-name subwindow.
LDEV display format

The LDEV display format varies from one storage system type to another. The following table shows these formats.

<table>
<thead>
<tr>
<th>Storage system</th>
<th>LDEV display formats</th>
</tr>
</thead>
</table>
| Enterprise-class storage systems VSP Gx00 models, VSP Fx00 models, and HUS VM | The LDEV number is displayed in hexadecimal, as explained below. If the LDEV number is a single-digit number, a leading zero is added (0A for example) so that it will be displayed as a 2-digit number.  
**Open system:** xx:xx (CU-number: LDEV number)  
**Mainframe system:** xx:xx (CU-number: CCA (Command Control Address))  
Example: 0:0A, 1:A4, 54:32 |
| Midrange storage system | The LDEV number is displayed in decimal, as explained below: If the LDEV number is smaller than 10, a leading zero is added (04 for example) so that it will be displayed as a 2-digit number.  
**Open system:** xx (LDEV number)  
**Mainframe system:** Not applicable  
Example: 04, 66, 105 |

Viewing LUN information in the Storage Systems view (open systems)

To view LUN information:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the LUNs page, select a LUN.
   The information about the selected LUN is displayed.

Related topics

- Viewing information about volumes belonging to a storage system on page 14-12
Viewing LUN information in the Hosts view (open systems)

To view LUN information (open systems):
1. From the Explorer menu, choose Resources and then Hosts.
   The Hosts subwindow appears.
2. Expand the object tree, and then select a host under Hosts.
   The host-name subwindow appears.
3. Click the LUNs tab and then the Paired tab, and then select a volume.
   The information about the selected volume is displayed.

Related topics
- Viewing information about volumes belonging to a host on page 14-12

Viewing storage system information (mainframe systems)

To view storage system information (mainframe systems):
1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Mainframe link.
   Mainframe system information is displayed in the Mainframe subwindow.

Related topics
- Viewing individual storage system information on page 14-7
- Viewing information about CUs belonging to a storage system (mainframe systems) on page 14-12

Viewing storage system information (open systems)

To view storage system information (open systems):
1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   Information about open systems is displayed in the Open subwindow.
Tip: Take note of the following:

- Volumes that are currently locked by a task are marked with the 🗝️ icon. When you put the cursor over a locked entry in the Port/Host Group/LUN column, the following information is displayed indicating the name of the task:
  LU (Reserved by workflow: workflow-name)

- Clicking Filter on the LUNs tab displays the Filter - Paired LUN List dialog box or the Filter - Unpaired LUN List dialog box. If you specify conditions in this dialog box, such as capacity and LDEV label, you can filter the displayed information by volume (LUN).

Related topics

- Viewing information about volumes belonging to a storage system on page 14-12
- Viewing a list of storage systems on page 14-5

Viewing information about LDKCs belonging to a storage system (mainframe systems)

You can display the following information about the LDKCs used in mainframe storage systems that support them:

- LDKC summary
  The capacity of each LDKC is displayed.

- List of CUs belonging to an LDKC
  The capacity of each CU is listed.

To view LDKC information:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Mainframe link.
   The Mainframe subwindow appears.
4. On the LDKCs page, select an LDKC.
   The information is displayed in the LDKC-name subwindow.

Related topics

- Reviewing paired LDEV list on page 5-12
Managing storage systems

This chapter describes tasks for managing storage systems.

- Managing V-VOLs
- Managing command devices
- Managing remote paths
- Managing DMLUs
- Managing pool volumes
- Managing journal groups
Managing V-VOLs

This module describes tasks for managing V-VOLs:

- Conditions for deleting V-VOLs on page 15-2
- Deleting V-VOLs on page 15-2
- Deleting multiple V-VOLs on page 15-2

Conditions for deleting V-VOLs

The following restrictions apply when deleting a V-VOL:

- The V-VOL must not be part of a pair configuration.
- The V-VOL must not have a path defined to any host.

Deleting V-VOLs

The following is required before deleting V-VOLs:

- The copy pairs of the V-VOLs must be deleted
- The LUNs of the V-VOLs must be deleted with Device Manager.

To delete V-VOLs:

1. On the V-VOLs tab, select the check boxes for the V-VOLs to be deleted.
2. Click Delete V-VOLs.
   The Delete V-VOLs window is displayed.
3. Review the list of selected V-VOLs to be deleted and confirm the operation.
4. Click Confirm.

Deleting multiple V-VOLs

When there are multiple V-VOLs in a parity group on a Universal Storage Platform V/VM storage system, CVS is required to delete some of the V-VOLs in the group. If CVS has been removed from the storage system while multiple V-VOLs were created in a parity group, the delete operation will delete all of the V-VOLs located in the same parity group.

Tip: Any unselected V-VOLs in the same parity group as the V-VOLs selected for deletion are also listed in the Delete V-VOLs window.

Note: For a Virtual Storage Platform, VSP G1000, VSP G1500, or VSP F1500 storage system (regardless of CVS installation) only one V-VOL can be created in a single Parity Group. Therefore, if you delete a V-VOL, the Parity Group containing the V-VOL is also deleted.

Related topics

- Conditions for deleting V-VOLs on page 15-2
Managing command devices

This module describes tasks for managing command devices:

- Editing command devices on page 15-3
- Deleting command devices on page 15-3

Editing command devices

You can edit command device information (security settings).

To edit the information about command devices:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the Cmd Devs page, click the icon of the command device you want to edit.
   The Edit Command Device - LDEV-number dialog box appears.
5. Edit and update the information about the command device.
   The command device information displayed in the Open subwindow is refreshed.

Related topics

- About command devices on page 8-11
- Storage system types and volume requirements (command devices) on page 8-11

Deleting command devices

To delete command devices:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
The Open subwindow appears.

4. On the **Cmd Devs** page, select the check boxes of the command devices you want to delete, and then click **Delete Cmd Devices**.
   The Delete Command Devices dialog box appears.

5. Confirm your selections, and then delete them.
   The information in the display is updated.

**Related topics**
- About command devices on page 8-11

### Managing remote paths

This module describes tasks for managing remote paths:

- Editing a remote path on page 15-4
- About deleting remote paths on page 15-4

### Editing a remote path

For enterprise-class storage systems, you can edit the labels of remote paths and you can add and delete the ports of remote paths. For midrange storage systems, you can edit the labels and bandwidths of remote paths.

**To edit a remote path:**

1. From the **Explorer** menu, select **Resources**, and then **Storage Systems**.
   The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The *storage-system-name* subwindow appears.

3. Click the **Open** link.
   The Open subwindow appears.

4. Under the **Remote Paths** tab, click the icon of the remote path that you want to edit.
   The Edit Remote Path dialog box appears.

5. Edit and update the information for the remote path.
   The remote path you edited is updated in the Open subwindow.

**Related topics**
- About remote paths on page 8-14

### About deleting remote paths

Remote paths can be deleted by performing the following operations:
Deleting an associated copy pair

To delete an associated copy pair:

1. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. From the Remote Paths tab, select the check box of the remote path (only one) that you want to delete, and click Delete Related Pairs.
   The Delete Related Pairs dialog box appears.
5. Confirm your selection, and then delete it.
   The completed operation is registered as a task.
6. Check the Status column under Tasks to make sure the process ended normally. You can access Tasks from the Explorer menu by selecting Tasks, and then Tasks again.

Related topics

- About remote paths on page 8-14
- About deleting remote paths on page 15-4
- Deleting a remote path on page 15-6
- Conditions for deleting associated copy pairs on page 15-6
Conditions for deleting associated copy pairs

If any of the following conditions applies, you cannot delete the copy pair from the Delete Related Pairs dialog box. To delete such a copy pair, perform the operation associated with your configuration.

- The copy pair of open volumes is reserved:
  A copy pair that is reserved for performing other copy pair operations cannot be deleted. You must first delete the applicable tasks and workflows. For details, see Deleting tasks on page 10-61 and Deleting workflows on page 10-67.

- The copy pair of mainframe volumes exist:
  The copy pair specified by Business Continuity Manager or Mainframe Agent cannot be deleted using Replication Manager. Delete the copy pair with the software that was used to set up the copy pair.
  After deleting the copy pair, update the configuration information of each target storage system. For details, see Refreshing configuration information manually for each storage system on page 11-18.

- The copy pair is not managed under Replication Manager:
  There are no configuration definition files for copy pairs set up with storage system operation management software (such as Storage Navigator or Storage Navigator Modular), so they cannot be deleted from Replication Manager. To delete such copy pairs, you must use the software that was used to set them up.
  After deleting the copy pair, update the configuration information of each target storage system. For details, see Refreshing configuration information manually for each storage system on page 11-18.

Deleting a remote path

To delete a remote path:

1. From the Explorer menu, select Resources, and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. Under the Remote Paths tab, select the check box of the remote path that you want to delete, and click Delete Paths.
   The Delete Remote Paths dialog box appears.
5. Confirm your selection, and then delete it.
   The information in the display is updated.

Related topics

- About remote paths on page 8-14
Managing DMLUs

This module describes tasks for managing DMLUs:

- Deleting a DMLU on page 15-7
- Conditions for deleting DMLUs on page 15-7

Deleting a DMLU

To delete a DMLU:

1. From the **Explorer** menu, select **Resources**, and then **Storage Systems**.

   **Note:** For the HS100 series, a DMLU cannot be deleted if an SI or TCS pair is defined in the storage system. For other storage systems, a DMLU cannot be deleted under the following conditions:
   - A pair exists.
   - A remote path is not defined.
   - A pool is defined.

   The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under **Storage Systems**.
   
   The **storage-system-name** subwindow appears.

3. Click the **Open** link.
   
   The Open subwindow appears.

4. Under the **DMLUs** tab, select the check box for the DMLU you want to delete, and then click **Delete DMLUs**.
   
   The Delete DMLUs dialog box appears.

5. Confirm your selection, and then delete it.
   
   The information in the display is updated.

Related topics

- Conditions for deleting DMLUs on page 15-7

Conditions for deleting DMLUs

To delete all DMLUs from a storage system, it must not include any of the following:

- copy pairs
• remote paths
• pools

If you want to delete either of the DMLUs when two DMLUs have been specified, the above conditions are not required.

Note: For the HUS100 series:
• To delete all DMLUs from a storage system, it must not include copy pairs of SI or TCS copy type.
• Pool configuration is not supported.

Managing pool volumes

This module describes tasks for managing pool volumes:

• Editing pools on page 15-8
• Deleting pools on page 15-9

Editing pools

You can edit pool information (pool volumes and pool options) about existing pools. For details about the conditions that must be satisfied, see Storage system types and volume requirements (pools) on page 8-21. For details about pool usage threshold values that can be specified as an option for changing to warning status, see Pool usage threshold values on page 12-20.

Caution: Once you have set volumes in a pool, you can no longer remove those volumes from the pool. If you want to remove a volume from a pool, you must delete the pool and then set it up again.

To edit a pool:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the Open link.
   The Open subwindow appears.
4. On the Pools page, click the icon of the pool you want to edit.
   The Edit Pool Setting - pool-ID dialog box appears.
5. Edit and update the information about the pool.
   The pool information displayed in the Open subwindow is refreshed.

Related topics

• About pool volumes on page 8-21
Deleting pools

To delete pools:

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The `storage-system-name` subwindow appears.
3. Click the **Open** link.
   The Open subwindow appears.
4. On the **Pools** page, select the check boxes of the pools you want to delete, and then click **Delete Pools**.
   The Delete Pools dialog box appears.
5. Confirm your selections, and then delete them.
   The information in the display is updated.

Related topics

- [About pool volumes on page 8-21](#)
- [Pool usage threshold values on page 12-20](#)

Managing journal groups

This module describes tasks for managing journal groups:

- [Editing journal groups on page 15-9](#)
- [Deleting journal groups on page 15-10](#)
- [Expanding journal group capacity on page 15-10](#)
- [Editing a warning banner on page 21-6](#)

Editing journal groups

You can edit journal group information (journal volumes and journal group options). For details about the conditions that must be satisfied in order to set a volume as a journal volume, see **Storage system types and volume requirements (journal) on page 8-26**.

To edit the information about a journal group:

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The `storage-system-name` subwindow appears.
3. Click the **Open** link.
The Open subwindow appears.

4. On the JNLGs page, click the [ ] icon of the journal group you want to edit.
   The Edit Journal Group Setting - journal-group-ID dialog box appears.

5. Edit and update the information about the journal group.
   The journal group information displayed in the Open subwindow is refreshed.

**Related topics**

- About journal groups on page 8-25
- Storage system types and volume requirements (journal) on page 8-26
- Expanding journal group capacity on page 15-10

### Deleting journal groups

**To delete journal groups:**

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.

3. Click the Open link.
   The Open subwindow appears.

4. On the JNLGs page, select the check boxes of the journal groups you want to delete and click Delete JNLGs.
   The Delete Journal Groups dialog box appears.

5. Confirm your selections, and then delete them.
   The information in the display is updated.

**Related topics**

- About journal groups on page 8-25
- Editing journal groups on page 15-9

### Expanding journal group capacity

**To expand capacity of a journal group:**

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.

2. Expand the object tree, and then select a storage system under Storage Systems.
   The storage-system-name subwindow appears.
3. Click the **Open** link.
   The Open subwindow appears.

4. On the **JNLGs** page, click the icon of the journal group you want to edit.
   The Edit Journal Group Setting - *journal-group-ID* dialog box appears.

5. To add volumes to the journal group, perform the following operations on the **Journal Volume Setting** tab:
   a. Select filtering parameters for CU, Capacity and Parity Group and click Refresh.
   b. On the **Free Volumes** pane, select the candidate volumes you want to register as journal volumes and click **Add**.

6. To delete volumes from the journal group, perform the following operation on the **Journal Volume Setting** tab:
   a. On the **Journal Volumes** pane, select the journal volumes you want to unregister and click **Delete**.

7. To edit journal group options, on the **Journal Option Setting** tab, specify the journal option settings.

8. Click **OK** to finish editing journal group settings.
   The Edit Journal Group - *journal-group-ID* dialog box appears.

9. Check the updated journal group settings by reviewing the summary information.

10. Click **Confirm** to change settings of the journal group.

11. After journal group settings are updated, click **Close**.
    The journal group information displayed in the Open subwindow is refreshed.

**Related topics**
- [About journal groups on page 8-25](#)
- [Storage system types and volume requirements (journal) on page 8-26](#)
- [Editing journal groups on page 15-9](#)

**Changing the maximum number of initial copy activities**

The **Maximum Initial Copy Activities** limits the number of volumes that can be copied at one time during initial copy and resynchronization operations.

---

**Note:** A new setting only applies to pairs created after the setting was changed, not to existing pairs.

**To change the maximum value:**

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The Storage Systems subwindow appears.

3. Click **Edit System Option**.
   The Edit System Option dialog box appears.

4. Specify the **Maximum Initial Copy Activities**.
   Click **OK**, followed by **Confirm**, and then **Close**.
This chapter describes tasks for managing sites.

- **About site administration**
- **Viewing a list of sites**
- **Viewing individual site information**
- **Editing sites**
- **Removing hosts from a site**
- **Removing storage systems from a site**
- ** Removing pair management servers from a site**
- **Removing applications from a site**
- **Deleting sites**
About site administration

In a complex replication environment, storage systems can be located at many sites. In such cases, you can create logical sites whenever necessary by grouping resources. Grouping resources based on the actual sites simplifies resource management because you can then use a graphical user interface for management.

Related topics

- Explorer menu items for site administration on page 16-3
- Site management functions on page 16-3

Site setup example

The following figure illustrates an example of setting up sites.
Site management functions

The following table describes the site management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Viewing a list of sites</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing individual site information</td>
<td>Y</td>
</tr>
<tr>
<td>Adding sites</td>
<td>Y</td>
</tr>
<tr>
<td>Editing sites</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting sites</td>
<td>Y</td>
</tr>
<tr>
<td>Adding hosts to a site</td>
<td>Y</td>
</tr>
<tr>
<td>Removing hosts from a site</td>
<td>Y</td>
</tr>
<tr>
<td>Adding storage systems to a site</td>
<td>Y</td>
</tr>
<tr>
<td>Removing storage systems from a site</td>
<td>Y</td>
</tr>
<tr>
<td>Adding pair management servers to a site</td>
<td>Y</td>
</tr>
<tr>
<td>Removing pair management servers from a site</td>
<td>Y</td>
</tr>
<tr>
<td>Adding applications to a site</td>
<td>Y</td>
</tr>
<tr>
<td>Removing applications from a site</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be used with this permission.
N: Cannot be used with this permission.

Tip: Each function can be used only for the resources in resource groups associated with the user.

Explorer menu items for site administration

The following table describes the Explorer menu items that are related to site management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Shared Views</td>
<td></td>
</tr>
<tr>
<td>Sites</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.
Viewing a list of sites

To view a list of registered sites, from the Explorer menu, choose Shared Views and then Sites. A list of registered sites is displayed in the Sites subwindow.

Viewing individual site information

You can display information about individual sites. You can view the resources specified for the selected site from the perspective of Hosts, Storage Systems, Pair Configurations, or Applications.

Tip: If you want to check copy pair statuses or configuration when many resources are managed across multiple sites, locating a resource is easier if you choose Shared Views and then Sites instead of choosing Resources from the Explorer menu.

To view the information about a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The information about the selected site is displayed.

Related topics

• Viewing a list of sites on page 16-4

Editing sites

To edit the information about a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. Click Edit Site. The Edit Site - site-name dialog box appears.
4. Edit and update the site information. The site information displayed in the Sites subwindow is refreshed.

Related topics

• Adding hosts to a site on page 7-5
• Adding storage systems to a site on page 7-6
• Adding pair management servers to a site on page 7-7
Removing hosts from a site

To remove hosts from a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. Click the Hosts link. The Hosts subwindow appears.
4. In the list of hosts, select the check boxes of the hosts you want to remove, and then click Remove Hosts. The Remove Hosts dialog box appears.
5. Confirm the hosts to be removed, and then remove them. The hosts are removed from the Hosts subwindow.

Removing storage systems from a site

To remove storage systems from a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. Click the Storage Systems link. The Storage Systems subwindow appears.
4. In the list of storage systems, select the check boxes of the storage systems you want to remove, and then click Remove Storage Systems. The Remove Storage Systems dialog box appears.
5. Confirm the storage systems to be removed, and then remove them. The list is updated accordingly.

Related topics

- Removing pair management servers from a site on page 16-5
- Removing hosts from a site on page 16-5

Removing pair management servers from a site

To remove pair management servers (hosts) from a site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. Click the **Pair Configurations** link.
The Pair Configurations subwindow appears.

4. In the list of pair management servers, select the check boxes of the pair management servers you want to remove, and then click **Remove Hosts**.
The Remove Hosts dialog box appears.

5. Confirm the pair management servers to be removed, and then remove them.
The pair management servers are removed from the Pair Configurations subwindow.

**Related topics**
- [Removing hosts from a site on page 16-5](#)
- [Removing storage systems from a site on page 16-5](#)

**Removing applications from a site**

**To remove hosts/applications from a site:**

1. From the **Explorer** menu, choose **Shared Views** and then **Sites**.
The Sites subwindow appears.

2. Expand the object tree, and then select a site under **Sites**.
The site-name subwindow appears.

3. Click the **Applications** link.
The Applications subwindow appears.

4. In the list of hosts, select the check boxes of the hosts/applications you want to remove, and then click **Remove Hosts**.
The Remove Hosts dialog box appears.

5. Confirm the hosts to be removed, and then remove them.
The hosts are removed from the Hosts subwindow.

**Related topics**
- [Removing pair management servers from a site on page 16-5](#)
- [Removing storage systems from a site on page 16-5](#)

**Deleting sites**

You can delete either a single displayed site or multiple sites you select from a list.

The following topics are included in this module:

- [Deleting individual sites on page 16-7](#)
- [Deleting multiple sites on page 16-7](#)
Deleting individual sites

To delete a single site:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. Expand the object tree, and then select a site under Sites. The site-name subwindow appears.
3. Click Delete Site. The Delete Site - site name dialog box appears.
4. Confirm the site to be deleted, and then delete it. The site list is updated accordingly.

Related topics

Deleting multiple sites

To delete multiple sites:

1. From the Explorer menu, choose Shared Views and then Sites. The Sites subwindow appears.
2. In the list of sites, select the check boxes of the sites you want to delete and click Delete Sites. The Delete Sites dialog box appears.
3. Confirm your selections, and then delete them. The information in the display is updated.

Related topics

- Deleting individual sites on page 16-7
- Removing pair management servers from a site on page 16-5
- Removing storage systems from a site on page 16-5
- Removing hosts from a site on page 16-5
Managing alerts

This chapter describes tasks for alert management.

- About alert management
- Enabling or disabling alert settings
- Viewing alerts and settings
- Testing alert settings
- Editing alert settings
- Marking alerts as completed
- Deleting alert settings
- Disabling or enabling alert automarking
About alert management

Replication Manager can send an alert when a monitored target, such as a copy pair or buffer, satisfies a preset condition. The conditions that can be set include: thresholds for copy pair statuses, performance information, and copy license usage. You can specify a maximum of 1,000 conditions.

Alert notification is useful for enabling a quick response to a hardware failure or for determining the cause of a degradation in transfer performance. Alert notifications are also useful for preventing errors due to buffer overflow and insufficient copy licenses. Because you can receive alerts by email or SNMP traps, you can also monitor the replication environment while you are logged out of Replication Manager.

Related topics

• About alert settings on page 9-2
• Explorer menu items for alert management on page 17-3

Alert management functions

The following table shows the alert management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Viewing a list of alerts and alert settings</td>
<td>Y</td>
</tr>
<tr>
<td>Marking alerts as completed*</td>
<td>Y</td>
</tr>
<tr>
<td>Adding alert settings</td>
<td>Y</td>
</tr>
<tr>
<td>Changing alert settings</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting alert settings</td>
<td>Y</td>
</tr>
<tr>
<td>Testing alert settings</td>
<td>Y</td>
</tr>
<tr>
<td>Enabling or disabling alert settings</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.
N: Cannot be used with this permission.
*: Only present when the alert automarking feature has been disabled.

Tip: Each function can be used only for the resources in resource groups associated with the user.

Related topics

• About alert settings on page 9-2
Explorer menu items for alert management

The following table shows the Explorer menu items that are related to alert management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Alerts</td>
<td>Alerts</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.

Enabling or disabling alert settings

You can enable or disable alert settings used for monitoring. If you do not want to use alert settings temporarily, you can disable them without deleting them.

To enable or disable alert settings:
1. From the Explorer menu, choose Alerts and then Alerts. The Alerts subwindow appears.
2. On the Alert Setting List page, select the check boxes of the desired alerts and then click Enable Alerts or Disable Alerts. The Enable Alerts - alert-name dialog box or the Disable Alerts - alert-name dialog box appears.
3. Confirm the settings that will be enabled or disabled, and then enable or disable them. The information in the Enabled/Disabled column of the alert settings displayed in the Alerts subwindow is refreshed.

Related topics
• About alert settings on page 9-2
• Viewing alerts and settings on page 17-3

Viewing alerts and settings

You can view the following:
• List of alerts
  Includes the resource from which each alert was issued and information about the detected event (copy pair status, performance information, or copy license usage). The maximum number of alerts is 1,000.
• List of alert settings
Includes the notification conditions such as the alert action (email or SNMP trap) and item being monitored (copy pair status, performance information, or copy license usage threshold). The maximum number of alert settings is 1,000.

- List of copy group alert settings
  Lists all copy groups and any alerts applied. You can also see which copy groups are not currently monitored and create alerts as needed.

To view the list of alerts and alert settings, from the Explorer menu, choose Alerts and then Alerts. The alerts that have been output and their settings are listed in the Alerts subwindow. (use the Copy Groups tab to display a list alerts by copy groups).

To check the settings of a received alert, click the icon.

**Detected Pair List**

**Detected Pairs** is displayed only when an alert is generated for a copy group and the alert automarking feature is enabled (**Marking Type**: Auto is displayed in the Alert List tab of the Alerts subwindow). The format is as follows:

pair-name[Primary-LDEV(Primary-Storage-System)-Secondary-LDEV(Secondary-Storage-System)]

For example:

Copy Pair1[01:01(USP_V@10.208.10.1)-02:01(USP_V@10.208.20.1)]

For mainframe pairs, the pair-name is omitted.

To limit the volume of information when an enormous number of pairs is involved, the display is limited to ten pairs along with the following message:

More than 10 pairs were detected.

**Related topics**

- About alert settings on page 9-2

**Testing alert settings**

**To test alert settings to check whether alerts function correctly:**

1. From the Explorer menu, choose Alerts and then Alerts. The Alerts subwindow appears.
2. Click the Alert Setting List tab. The alerts that have been set are displayed on the Alert Setting List page.
3. Select the check boxes of the alerts you want to test, and then click Test Alert. The Test Alert - alert-name dialog box appears.
4. Check the message, and then perform the test. 
   If the test fails, check the error message, and then revise the alert settings.

Related topics
• About alert settings on page 9-2 
• Viewing alerts and settings on page 17-3

Editing alert settings

To edit alert settings:
1. From the Explorer menu, choose Alerts and then Alerts. 
The Alerts subwindow appears.
2. On the Alert Setting List page, click the icon of the alert whose settings you want to edit. 
The Edit Alert Setting - alert-name dialog box appears (where alert-name is the name of the alert whose icon you clicked).
3. Edit and update the alert notification conditions and monitoring targets. 
The alert settings displayed in the Alerts subwindow are refreshed.

Related topics
• About alert settings on page 9-2 
• Viewing alerts and settings on page 17-3

Marking alerts as completed

Note: By default, alerts are automatically marked as Completed when a change in status occurs in the object being monitored. If this feature (known as alert automarking) has been disabled, the operator must manually mark each alert as completed as described in this topic. See Disabling or enabling alert automarking on page 17-6 for more information.

After you have responded to an alert, you need to mark the alert as completed. Replication Manager does not start monitoring the target while an alert is still in the Not Complete status. To restart monitoring, you must mark the alert as completed.

Tip: Once you have marked an alert as Completed, you cannot restore the Not Completed status.

To mark alerts as completed:
1. From the Explorer menu, choose Alerts and then Alerts. 
The Alerts subwindow appears.
2. On the Alert List page, select the check boxes of the alerts you want to set as completed, and then click Mark as Completed. The Mark as Completed dialog box appears.

3. Confirm the alerts that will be set as completed, and then set them as already read. The number of alerts displayed in the Completed/Not Completed column and Dashboard menu in the Alerts subwindow is updated.

Related topics
• About alert settings on page 9-2

Deleting alert settings

To delete alerts:
1. From the Explorer menu, choose Alerts and then Alerts. The Alerts subwindow appears.
2. On the Alert Setting List page, select the check boxes of the alerts you want to delete, and then click Delete Alerts. The Delete Alert Settings - alert-name dialog box appears.
3. Confirm your selections, and then delete them. The information in the display is updated.

Related topics
• About alert settings on page 9-2
• Viewing alerts and settings on page 17-3

Disabling or enabling alert automarking

When an alert is issued, it is marked as Not Completed until the object being monitored exits the specified alert condition. By default, alerts are automatically marked as completed according to the criteria described in About alert settings on page 9-2.

If you do not want alerts to be managed automatically and prefer to handle each alert manually, you must disable the alert automarking feature. This is done by changing the value of the base.alert.automarking parameter in the base.properties file to false. (When automarking is disabled, the Alert List window reads Manual instead of Auto.)

During manual operation, after you have responded to an alert, you need to mark the alert as Completed in the Alert List window. The software does not resume monitoring the target while an alert is still Not Completed. To restart monitoring, you must mark the alert as completed.

Tip: To return to automatic operation, reset the base.alert.automarking parameter to the default setting of true.
Related topics

- About alert settings on page 9-2
Managing licenses

This chapter describes tasks for license management.

- About licenses
- Viewing license information
- Editing a license
About licenses

Licenses must be registered for the storage systems managed by Replication Manager. The following table describes the types of license keys.

### Types of license keys

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td>A license key required to use a product permanently. Permanent license keys are provided for each storage system that is to be managed by Replication Manager.</td>
</tr>
<tr>
<td>Temporary</td>
<td>A license key that allows a user to use a product temporarily for a purpose such as product evaluation. Temporary license keys are provided for individual systems.</td>
</tr>
<tr>
<td>Emergency</td>
<td>A license key that allows a user to use a product temporarily only in an emergency. Emergency license keys are provided for individual systems. If an emergency license key is added when a permanent license key has already been registered, the emergency license key takes precedence.</td>
</tr>
</tbody>
</table>

**Related topics**

- [Editing a license on page 18-3](#)
- [Viewing license information on page 18-3](#)

### Functions for license management

The following table shows the functions for license management, user permissions, and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Permissions</strong></td>
</tr>
<tr>
<td></td>
<td>Admin (user management)</td>
</tr>
<tr>
<td>Viewing license information</td>
<td>Y</td>
</tr>
<tr>
<td>Editing a license</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.

### Explorer menu items for license management

The following table shows the Explorer menu items that are related to license management, user permissions, and whether the items can be executed with the indicated permissions.
<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Settings</td>
<td>License Info</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.

**Viewing license information**

You can view the following information about registered licenses:

- Replication Manager version information
- License key type
- Information about DKCs that have registered licenses, and licensed capacity (displayed for permanent license keys)
- License expiration date and the number of days remaining until that date (displayed for temporary or emergency license keys)

To view license information, from the **Explorer** menu, choose **Settings** and then **License Info**. Information about registered licenses is displayed in the License Info subwindow.

You can also view license information by choosing **Help** and then **About** in the global tasks bar area.

**Related topics**

- [About licenses on page 18-2](#)
- [Checking copy license usage on page 12-22](#)

**Editing a license**

You can update the information about the licenses that have been registered.

For a temporary or emergency license key, register a new one before the current one expires.

**To edit a license:**

1. From the **Explorer** menu, choose **Settings** and then **License Info**. The License Info subwindow appears.
2. Click **Edit License**. The Edit License dialog box appears.
3. Edit and update the license information.
The license information displayed in the License Info subwindow is refreshed.

Related topics

- About licenses on page 18-2
- Viewing license information on page 18-3
Managing users and permissions

Replication Manager provides role-based user access control to secure protection processes and recovery operations and mitigate the risk of unauthorized operations. To achieve stringent access control and efficiency, multiple users can be allocated access to functions on the basis of their role in the organization. User permissions can be assigned for different categories such as Storage Administrator, Database/Server Administrator and Super User (HRpM Administrator).

This chapter describes tasks for managing users and permissions, user profiles and user authentication.

- User management functions
- Explorer menu items for user management
- Managing users
- Managing user permissions
- Managing user profiles
- Managing user accounts and user authentication
### User management functions

The following table describes the user management functions, user permissions, and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
<th>Admin, modify, or view (Replication Manager management) permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing a list of users</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Viewing individual user information</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Viewing a summary of user permissions</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Viewing a list of user permissions</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Adding users</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Editing user profiles</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Deleting users</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Changing user passwords</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Changing user permissions</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Locking user accounts</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Unlocking user accounts</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Changing the method for user authentication</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

**Legend:**

Y: Can be used with this permission.

N: Cannot be used with this permission.

---

### Explorer menu items for user management

The following table describes the Explorer menu items that are related to managing users, user permissions, and whether the menu command can be executed with the indicated permissions.
Managing users

This module describes tasks for managing users:

- Viewing a list of users on page 19-3
- Viewing individual user information on page 19-3
- Changing user passwords (managing users and permissions) on page 19-4
- Changing user roles on page 19-5
- Editing user profiles (managing users and permissions) on page 19-5
- Deleting users on page 19-6

Viewing a list of users

You can display a list of users of all Hitachi Command Suite products installed on a management server. The displayed information includes user IDs and user names.

To view a list of users:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Users.
   The registered users are listed in the Users subwindow.

Related topics

- Viewing a list of user permissions on page 19-7
- Viewing user profiles on page 19-9

Viewing individual user information

You can display the following information for individual users:
To view the information for an individual user:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select a user ID under Users.
   Information about the user with the selected user ID is displayed in the user-ID subwindow.

Related topics

- Viewing a list of users on page 19-3

Changing user passwords (managing users and permissions)

A user with the Admin (user management) permission can change the passwords of registered users (except for users who are externally authenticated). You cannot change the passwords of users for whom external authentication is enabled because an external authentication server manages such passwords. User passwords must satisfy preset conditions that include the passwords having valid lengths and combinations of character types. To specify these conditions, from the Explorer menu, choose Administration and then Security. For details on specifying these conditions, see About security settings on page 21-2.

If the password of a user is changed while that user is logged in, that user can continue to perform permitted operations until logout.

Caution: If Hitachi Command Suite products and Storage Navigator Modular 2 are installed on the same computer, Common Component centrally manages the user accounts for both. Therefore, if you change the password for a user ID in a Hitachi Command Suite product or Storage Navigator Modular 2, the password for the other is also changed.

To change a user password:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select a user ID under Users.
   The user-ID subwindow appears.
3. Click Change Password.
   The Change Password - user-ID dialog box appears.
4. Change the password, and then update the information.
   The password is changed.
Tip: If you change the password for the built-in account (user ID: System) when Replication Manager is being used in a cluster configuration, specify the same settings for all nodes in the cluster.

Related topics
- Viewing a list of user permissions on page 19-7
- Viewing a summary of user permissions on page 19-8

Changing user roles

To change the roles assigned to users:

1. From the Explorer menu, choose Administration and then User Roles. The User Roles subwindow appears.

Tip: As with other menus under Administration, only users with Admin permission can access this window.

The “User Roles” table lists all users with access to Replication Manager.
- When no user role is assigned, the “Role” field is empty and the user is equivalent to the “Storage Administrator” role (with no restrictions).
- The check boxes used to assign roles are disabled for users with only View permission (because they have no access).
- In the same way, check boxes for users with Admin permission are disabled (because they already have full access).

2. Select one or more users and click Change User Role. The Change User Roles dialog appears.

3. Select the User Role and click OK.

Once a user role is assigned, Replication Manager controls operations by enabling/disabling the buttons for launching wizards. For example, the Pair Configuration Wizard cannot be launched when the user has a role other than Storage Administrator.

Related topics
- About user roles on page 6-3
- About permissions and user roles on page 6-5

Editing user profiles (managing users and permissions)

You can edit user profile information, such as full names and email addresses.

Note: You cannot edit the profile of a user who logs in by linking to an external authorization server, because the account has not been registered in the Hitachi Command Suite products. To edit the profile of such a user, use Windows Active Directory.
To edit a user profile:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.

2. Expand the object tree, and then select a user ID under Users.
   The user-ID subwindow appears.

3. Click Edit Profile.
   The Edit Profile - user-ID dialog box appears.

4. Edit and update user information.
   The user information displayed in the user-ID subwindow is refreshed.
   If the new user information is not applied immediately to the list of users in the Users subwindow, you can click Refresh Tree to refresh this information in the navigation area.

Related topics
- About user profiles on page 19-8
- Viewing user profiles on page 19-9

Deleting users

You can delete either a single displayed user or multiple users you select from a list.

The following topics are included in this module:
- Deleting individual users on page 19-6
- Deleting multiple users on page 19-7

Deleting individual users

Tip: Do not delete the user account that is used for communication between Device Manager agents and the Device Manager server (default: HaUser).

To delete a single user:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.

2. Expand the object tree, and then select a user ID under Users.
   The user-ID subwindow appears.

3. Click Delete User.
   The Delete User - user-ID dialog box appears.

4. Confirm your selection and delete the user.
   The information in the display is updated.

Related topics
- Deleting multiple users on page 19-7
Deleting multiple users

Tip: Do not delete the user account that is used for communication between Device Manager agents and the Device Manager server (default: HaUser).

To delete multiple users:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Users.
   The Users subwindow appears.
3. In the list of users, select the check boxes of the users that you want to delete, and then click Delete Users.
   The Delete Users dialog box appears.
4. Confirm your selections, and then delete them.
   The information in the display is updated.

Related topics

- Deleting individual users on page 19-6
- Viewing a list of users on page 19-3

Managing user permissions

This module describes tasks for managing user permissions.

- Viewing a list of user permissions on page 19-7
- Viewing a summary of user permissions on page 19-8

Viewing a list of user permissions

You can display a list of users who have the Admin (user management) permission or a list of the users of an installed Hitachi Command Suite product. The list includes the permissions for each user.

To view a list of user permissions:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select either User Management or a product name under Permissions.
   Users and their permissions are displayed in the User Management subwindow or in the application-name subwindow.

Related topics

- About users, permissions, and roles on page 6-2
- Viewing a summary of user permissions on page 19-8
Viewing a summary of user permissions

You can display summarized information about all Hitachi Command Suite products that have been installed. The displayed information includes the number of registered products and the number of users.

To view a summary of user permissions:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Permissions.
   A summary of permissions is displayed in the Permissions subwindow.

Related topics

- About users, permissions, and roles on page 6-2
- Changing user permissions on page 6-7
- Viewing a list of user permissions on page 19-7

Managing user profiles

This module describes tasks for managing user profiles:

- About user profiles on page 19-8
- Viewing user profiles on page 19-9
- Editing user profiles (managing user profiles) on page 19-9
- Changing user passwords (managing users and permissions) on page 19-4

About user profiles

User profiles include user information such as user IDs, login passwords, full names, and email addresses. All users can set up and manage personal profiles regardless of their permissions.

When a user logs in for the first time, that user must use the initial password specified by a user with the Admin (user management) permission. If login with the initial password is successful, the user can change the password.

User profile management functions

The following table describes the user profile management functions, user permissions, and whether the functions can be used with the indicated permissions.
### Explorer menu items for user profile management

The following table describes the **Explorer** menu items that are related to user profile management, user permissions, and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Settings</td>
<td>User Profile</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

**Y**: Can be executed with this permission.

### Viewing user profiles

You can display the following information about the logged in user:

- User information, such as the user ID and full name
- Product specific permissions specified for the user

To view a user profile, from the **Explorer** menu, choose **Settings** and then **User Profile**. The information about the user who is currently logged in is displayed.

### Editing user profiles (managing user profiles)

You can edit user profile information, such as the full name and email address. A logged in user can change only his or her own information. A user with the Admin (user management) permission can add or delete user IDs and change permissions by choosing **Administration** from the **Explorer** menu.
To edit a user profile:

1. From the Explorer menu, choose Settings and then User Profile. The User Profile subwindow appears.
2. Click Edit Profile. The Edit Profile - user-ID dialog box appears.
3. Edit and update user information. The user information displayed in the User Profile subwindow is refreshed. If the new user information is not applied immediately to the list of users in the Users subwindow, you can click Refresh Tree to refresh this information in the navigation area.

Related topics

- Viewing user profiles on page 19-9

Changing user passwords (managing users and permissions)

A user with the Admin (user management) permission can change the passwords of registered users (except for users who are externally authenticated). You cannot change the passwords of users for whom external authentication is enabled because an external authentication server manages such passwords. User passwords must satisfy preset conditions that include the passwords having valid lengths and combinations of character types. To specify these conditions, from the Explorer menu, choose Administration and then Security. For details on specifying these conditions, see About security settings on page 21-2.

If the password of a user is changed while that user is logged in, that user can continue to perform permitted operations until logout.

Caution: If Hitachi Command Suite products and Storage Navigator Modular 2 are installed on the same computer, Common Component centrally manages the user accounts for both. Therefore, if you change the password for a user ID in a Hitachi Command Suite product or Storage Navigator Modular 2, the password for the other is also changed.

To change a user password:

1. From the Explorer menu, choose Administration and then Users and Permissions. The Users and Permissions subwindow appears.
2. Expand the object tree, and then select a user ID under Users. The user-ID subwindow appears.
3. Click Change Password. The Change Password - user-ID dialog box appears.
4. Change the password, and then update the information. The password is changed.
Tip: If you change the password for the built-in account (user ID: System) when Replication Manager is being used in a cluster configuration, specify the same settings for all nodes in the cluster.

Related topics

- Viewing a list of user permissions on page 19-7
- Viewing a summary of user permissions on page 19-8

Managing user accounts and user authentication

This module describes tasks for managing users:

- About account locking on page 19-11
- Locking user accounts on page 19-12
- Unlocking user accounts on page 19-13
- About user authentication on page 19-14
- Linking to an external authentication server on page 19-14
- Changing the user authentication method on page 19-15
- Using an external authorization server (authorization groups) on page 19-16

About account locking

To prevent unauthorized individuals from logging in, you can set the system to automatically lock user accounts when invalid passwords are entered a specified number of times in succession.

The following limitations apply when setting automatic account locking:

- Accounts for which external authentication is enabled function according to the settings on the external authentication server. Settings for automatic account locking of these accounts are not controlled from Replication Manager. These accounts must be manually locked.

- By default, the built-in account (user ID: System) cannot be locked automatically. To enable automatic locking of the built-in account, you must edit the user.conf file on the management server. For details about the user.conf file, see the Hitachi Command Suite System Administrator Guide.

- If other Hitachi Command Suite products are being used in addition to Replication Manager, successive unsuccessful attempts to log in to any of the Hitachi Command Suite products are counted in determining when to automatically lock a user account. The number of unsuccessful login attempts associated with a specific user account is reset when login to that account is successful or when the account is locked.
If you change the setting for the number of allowed login failures, the new setting does not apply retroactively to users who have already exceeded the new value or to user accounts that are already locked.

If an attempt is made to log in to Replication Manager using an invalid password for a user account that is already logged into Replication Manager.

If you want to lock the accounts for external authentication, lock the accounts manually. For details on how to do this, see Locking user accounts on page 19-12.

A user whose account has already been locked automatically cannot log in until the account is unlocked. When a user whose account is locked attempts to log in, the user is only notified of an ordinary authentication error, not that his or her account is locked. You can check the Status column of the list of users to determine whether a user account is locked. For details on how to unlock user accounts, see Unlocking user accounts on page 19-13.

Related topics
• Viewing settings for automatic account locking on page 21-4
• Changing settings for automatic account locking on page 21-4

Locking user accounts

You can temporarily prevent specific users from logging in by manually locking their accounts.

Note: Users who have the User Management permission can manually lock and unlock user accounts registered in the Hitachi Command Suite products.

The following restrictions apply to account locking:

• The accounts of users who are currently logged in can be locked; however, a user cannot lock his or her own account while logged in.
• By default, the built-in account (user ID: System) cannot be locked. To enable locking of this built-in account, edit the user.conf file on the management server. For details about the user.conf file, see the Hitachi Command Suite System Administrator Guide.
• In Hitachi Command Suite products, you cannot change the lock status of a user that logs in by linking to an external authorization server because such an account has not been registered in the Hitachi Command Suite products.
• If the account of a logged in user is locked, an error occurs in the graphical user interface, preventing the user from continuing operation.
• If a user with Admin (user management) permissions (including the System (user ID) built-in account) attempts to manually lock all other user accounts with Admin (user management) permissions, the last such unlocked account will not lock.
You can also specify automatic account locking, which locks the accounts of users who repeatedly fail to log in. For information on setting automatic account locking, see Changing settings for automatic account locking on page 21-4.

To lock user accounts:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Users.
   The Users subwindow appears.
3. Select the check boxes of the users whose accounts you want to lock, and then click Lock Users.
   The Lock Users dialog box appears.
4. Confirm your selections, and then lock the accounts.
   The information in the display is updated.

Related topics

- About account locking on page 19-11

Unlocking user accounts

Users whose accounts have been locked manually on a temporary basis or locked automatically cannot log in until their accounts are unlocked by a user with the Admin (user management) permission.

The Status column of the list of users indicates whether a user account is locked. If all user accounts are locked and no users can log in, execute the hcmds64unlockaccount command on the management server to unlock accounts. For details about the hcmds64unlockaccount command, see the Hitachi Command Suite System Administrator Guide.

To unlock user accounts:

1. From the Explorer menu, choose Administration and then Users and Permissions.
   The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Users.
   The Users subwindow appears.
3. Select the check boxes of the users whose accounts you want to unlock and click Unlock Users.
   The Unlock Users dialog box appears.
4. Confirm the users whose accounts you want to unlock, and then unlock the accounts.
   The lock statuses of the users displayed in the Users subwindow are refreshed.
Note: If you select a user account that is locked because no password has been set, the user account cannot be unlocked. If you set a password, the user account will be unlocked.

Related topics

- About account locking on page 19-11
- Locking user accounts on page 19-12

About user authentication

You can use an external authentication server (LDAP directory server, RADIUS server, or Kerberos server for user authentication) to authenticate user accounts for Hitachi Command Suite products and centrally manage the accounts with other application programs.

For each user, you can specify whether the account is authenticated as an account exclusive to Hitachi Command Suite products or authenticated using an external authentication server.

Note: If you also want to link to an external authorization server, you can manage the user accounts that can use Hitachi Command Suite products per authorization group. For details on the necessary settings, see Using an external authorization server (authorization groups) on page 19-16.

To enable external authentication for users, you need to prepare to link to the external authentication server by setting up the server and registering user accounts. Perform the procedures described in Linking to an external authentication server on page 19-14, and then perform the procedures described in Changing the user authentication method on page 19-15.

To disable external authentication, perform the procedures described in Changing the user authentication method on page 19-15 to change the authentication method to the one used in Hitachi Command Suite products.

Tip: Do not enable external authentication of the built-in account (user-ID: System) and the user account that is used for communication between Device Manager agents and the Device Manager server (default: HaUser).

Related topics

- Changing the user authentication method on page 19-15

Linking to an external authentication server

To link to an external authentication server:

1. On the Device Manager management server, specify settings for linking to an external authentication server.

For details about requirements for an external authentication server and how to specify settings for linking to the server, see the Hitachi Command Suite System Administrator Guide.
2. Register the user IDs and passwords used by Hitachi Command Suite products in the external authentication server. The user IDs must use valid characters. For details about valid character strings, click Help in the Add User dialog box. For passwords, you do not have to follow the Replication Manager restrictions.

3. Register Hitachi Command Suite product users using the user IDs registered in step 2. For details about how to register users, see Adding users on page 6-6. This step is not necessary if you have done this already.

**Tip:** In the GUI, specify the same user IDs registered in the external authentication server as those common to the Hitachi Command Suite products. In the following cases, include the domain or realm name when specifying a user ID:

- A user that is authenticated by the LDAP server specified as a external authentication server in the environment where there are multi domains.
- A user that is authenticated by another RADIUS server connected using a RADIUS server that is specified as the connection destination in step 1.
- A user that is registered in a Kerberos server and belongs to a realm other than the realm specified as the default in step 1.

For example, if the user name that is registered in a RADIUS or Kerberos server is user1, the realm is example.com, and the separator is @, specify user1@example.com as the user ID. If multiple user IDs have the same user name and different realms, each user ID is authenticated as a separate user ID.

**Tip:** Setting passwords is optional. Users authenticated externally are done so using the passwords registered in the external authentication server. Note that you can set passwords in advance because, if passwords have not been set, the user account will be locked when you change the authentication method from external authentication to user authentication common to Hitachi Command Suite products.

4. Specify permissions for the users registered in step 3. For details about how to specify user permissions, see Changing user permissions on page 6-7. This step is not necessary if you have done this already.

**Changing the user authentication method**

**To change the method for user authentication:**

1. From the Explorer menu, choose Administration and then Users and Permissions. The Users and Permissions subwindow appears.
2. Expand the object tree, and then select Users.
The Users subwindow appears.

3. In the list of users, select the check boxes of the users for whom you want to enable or disable linkage to the external authentication server, and then click **Change Auth**.
   The Change Authentication Method dialog box appears.

4. Specify the authentication method, and then update the information.
   The **Authentication** column for each user displayed in the Users subwindow is refreshed.

**Related topics**
- [About user authentication on page 19-14](#)
- [Viewing a list of users on page 19-3](#)

**Using an external authorization server (authorization groups)**

If you use an external authorization server, you can set permissions for Hitachi Command Suite products per Windows Active Directory group (authorization group). You do not need to register individual user accounts in Hitachi Command Suite products. Note, however, that if you register a user account in Hitachi Command Suite products, the permissions assigned to the user account, rather than those of the authorization group to which that user belongs, are applied (even if linkage with an external authorization server is enabled).

User IDs to be authenticated per authorization group must consist of a character string that can be used in Hitachi Command Suite products.

The following tasks are covered in this module:
- [Linking to an external authorization server on page 19-16](#)
- [Registering an authorization group on page 19-16](#)
- [Setting permissions for an authorization group on page 19-17](#)
- [Deleting an authorization group on page 19-18](#)

**Linking to an external authorization server**

**To link to an external authorization server:**

1. On the Replication Manager management server, specify settings for linking to an external authorization server.
   For details about requirements for an external authorization server and how to specify settings for linking to the server, see the **Hitachi Command Suite System Administrator Guide**.

2. In the Add Groups - *domain-name* dialog box, register the authorization group that will use the Hitachi Command Suite products.

**Registering an authorization group**

To manage user accounts per authorization group, register authorization groups in the Hitachi Command Suite products. You cannot register only
authorization groups that are already registered in the authorization server. You must first register authorization groups in the Hitachi Command Suite products, then register them in the authorization server.

By default, All Resources is assigned to the authorization group as the resource group.

To register an authorization group:

1. In the Explorer menu, choose Administration and then Users and Permissions.
2. In the navigation area, expand the Groups object tree and select domain-name.
   The domain-name subwindow appears.
3. Click Add Groups.
   The Add Groups - domain-name dialog box appears.
4. In the Distinguished Name text field, enter the distinguished name of the authorization group.
   A maximum of 20 distinguished names can be registered at a time.
   RFC 4514 prescribes that distinguished names must be from 1 to 250 characters. The names are not case sensitive.
   RDN at the beginning of a distinguished name indicates an authorization group name.
5. Click Check DN to make sure that the distinguished name is registered on the external authorization server.

   Note: Verifying registration using the Check DN button is optional. If a distinguished name is not registered on an external authorization server, a message appears. However, the authorization group can be registered.

6. Click OK.
   The dialog box closes and the authorization group is registered in the Hitachi Command Suite products.

Setting permissions for an authorization group

Assign permissions to the authorization group registered in the Hitachi Command Suite products. If a user belongs to multiple authorization groups, all the permissions assigned to the groups are applied to the user.

To set permissions for a registered authorization group:

1. In the Explorer menu, choose Administration and then Users and Permissions.
2. In the navigation area, expand the Groups object tree, select domain-name, then group-name.
   The group-name subwindow appears.
3. Click Change Permission.
   The Change Permission - group-name dialog box appears.
4. Select the permissions to be specified for the authorization group for each application and click OK to save the settings.
Note: The following restrictions apply.

Permissions: When the Modify permission is granted to an externally authenticated group, detailed permissions (permission per operation provided by the User Role function) for users who belong to the group are set to the default value ("Storage Administrator") and cannot be changed.

Resource Group: Users belonging to the externally authenticated group are assigned to the resource group All Resources, and this setting cannot be changed.

Deleting an authorization group

To delete an authorization group:

1. In the Explorer menu, choose Administration and then Users and Permissions.
2. In the navigation area, expand the Groups object tree and select domain-name.
   The domain-name subwindow appears.
3. In the Group List, select the check box of each authorization group you want to remove and click Delete Groups.
   The Delete Groups - domain-name subwindow appears.

Caution: If you want to view information about an authorization group before you delete it, select domain-name in the Groups object tree and then group-name to open the group-name subwindow. By clicking Delete Groups in this window, you can delete the displayed authorization group.

4. To remove the authorization group, click OK.
Managing resource groups

This chapter describes the tasks for Resource Group management.

- About resource group management
- Editing resource groups
- Viewing a list of resource groups
- Viewing individual resource group information
- Removing hosts from a resource group
- Removing storage systems from a resource group
- Removing users from a resource group
- Removing applications from a resource group
- Deleting resource groups
About resource group management

Resource groups can be managed only by users with the Admin (Replication Manager management) permission. Users other than the System built-in account can only use the resources in the associated resource groups, the configuration definition of those resources, and alerts.

Before creating new resource groups, you need to determine how you will group resources by considering sites, departments, and associated users. You cannot create a resource group named All Resources, which is the default resource group in which all resources are automatically registered.

Related topics

• Explorer menu items for resource group management on page 20-3
• About resource groups on page 6-8

Resource group management functions

The following table describes the resource group management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Viewing a list of resource groups</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing individual resource group information</td>
<td>Y</td>
</tr>
<tr>
<td>Creating resource groups</td>
<td>Y</td>
</tr>
<tr>
<td>Editing resource groups</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting resource groups</td>
<td>Y</td>
</tr>
<tr>
<td>Adding hosts to a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Removing hosts from a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Adding storage systems to a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Removing storage systems from a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Adding users to a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Removing users from a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Adding applications to a resource group</td>
<td>Y</td>
</tr>
<tr>
<td>Removing applications from a resource group</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.

N: Cannot be used with this permission.
Explorer menu items for resource group management

The following table describes the Explorer menu items that are related to resource group management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Administration</td>
<td>Resource Groups</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be executed with this permission.

N: Cannot be executed with this permission.

Editing resource groups

You can edit resource groups. However, you cannot edit the default resource group All Resources, which is the group in which all resources are automatically registered.

To edit a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. Click Edit Properties.
   The Edit Properties - resource-group-name dialog box appears.
4. Edit and update the group information.
   The group information displayed in the Resource Groups subwindow is refreshed.

Related topics

- About resource groups on page 6-8

Viewing a list of resource groups

To view a list of registered resource groups, from the Explorer menu, choose Administration and then Resource Groups. Registered resource groups are listed in the Resource Groups subwindow.

Related topics

- About resource groups on page 6-8
Viewing individual resource group information

You can display the following information about resource groups:

- Resource group summary
  The resource group name, the number of resources belonging to the resource group, and the number of users belonging to the resource group are displayed.
- List of hosts belonging to the resource group
- List of storage systems belonging to the resource group
- List of applications belonging to the resource group
- List of users belonging to the resource group

To view resource group information:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select either a resource group under Resource Groups or the All Resources group.
   The information about the selected resource group is displayed.

Related topics

- About resource groups on page 6-8
- Viewing a list of resource groups on page 20-3

Removing hosts from a resource group

You can remove hosts registered as resources from their resource groups. However, you cannot remove hosts from the All Resources group, which is the resource group in which all hosts are automatically registered.

To remove hosts from a resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. On the Hosts page, select the check boxes of the hosts you want to remove, and then click Remove Hosts.
   The Remove Hosts - resource-group-name dialog box appears.
4. Confirm the hosts to be removed, and then remove them.
   The selected hosts are removed from the Hosts page.
Removing storage systems from a resource group

You can remove storage systems registered as resources from their resource groups.

**Note:** You cannot remove storage systems from the All Resources group, which is the resource group in which all storage systems are automatically registered.

**To remove storage systems from a resource group:**

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. On the Storage Systems page, select the check boxes of the hosts you want to remove, and then click Remove Storage Systems.
   The Remove Storage Systems - resource-group-name dialog box appears.
4. Confirm the storage systems to be removed, and then remove them.
   The selected storage systems are removed from the Storage Systems page.

Removing users from a resource group

**Tip:** Be aware of the following:

- Because the user System (the built-in account) is automatically registered in the All Resources group, you cannot remove this user.
- If the association between a logged in user and a resource group is changed, the change is applied the next time the user logs in.

**To remove users from a resource group:**

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select either a resource group under Resource Groups or the All Resources group.
   The resource-group-name subwindow or the All Resources subwindow appears.
3. On the **Users** page, select the check boxes of the users you want to remove, and then click **Remove Users**. The Remove Users - *resource-group-name* dialog box appears.

4. Confirm the users to be removed, and then remove them. The users are removed from the **Users** page.

**Related topics**

- [About resource groups on page 6-8](#)
- [Adding users to a resource group on page 6-13](#)

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### Removing applications from a resource group

You can remove hosts/applications registered as resources from their resource groups.

**Note:** You cannot remove applications from the *All Resources* group, which is the resource group in which all applications are automatically registered.

**To remove applications (hosts) from a resource group:**

1. From the **Explorer** menu, choose **Administration** and then **Resource Groups**. The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under **Resource Groups**. The *resource-group-name* subwindow appears.
3. On the **Applications** page, select the check boxes of the hosts/applications you want to remove, and then click **Remove Hosts**. The Remove Hosts - *resource-group-name* (Applications) dialog box appears.
4. Confirm the hosts to be removed, and then remove them. The selected hosts are removed from the **Applications** page.

**Related topics**

- [Adding hosts to a resource group on page 6-12](#)

---

### Deleting resource groups

You can delete registered resource groups. You can delete either a single displayed resource group or multiple resource groups you select from a list.

**Note:** You cannot delete the default resource group *All Resources*, which is the group in which all resources are automatically registered.

The following topics are included in this module:

- [Deleting individual resource groups on page 20-7](#)
Deleting individual resource groups

To delete a single resource group:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. Expand the object tree, and then select a resource group under Resource Groups.
   The resource-group-name subwindow appears.
3. Click Delete Group.
   The Delete Group - resource-group-name dialog box appears.
4. Confirm the resource group to be deleted, and then delete the resource group.
   The list is updated accordingly.

Related topics

• About resource groups on page 6-8
• Viewing a list of resource groups on page 20-3

Deleting multiple resource groups

To delete multiple resource groups:

1. From the Explorer menu, choose Administration and then Resource Groups.
   The Resource Groups subwindow appears.
2. In the list of resource groups, select the check boxes of the resource groups you want to delete, and then click Delete Groups.
   The Delete Resource Groups dialog box appears.
3. Confirm your selections, and then delete them.
   The information in the display is updated.

Related topics

• About resource groups on page 6-8
• Deleting individual resource groups on page 20-7
Managing security

This chapter describes tasks for managing security.

- About security settings
- Viewing conditions for passwords
- Changing conditions for passwords
- Viewing settings for automatic account locking
- Changing settings for automatic account locking
- About warning banners
- Viewing a preview of the warning banner
- Editing a warning banner
- Deleting a warning banner
About security settings

Replication Manager provides security functions that allow you to perform the following:

- Set password conditions to prevent users from using easy-to-guess passwords.
- Enable automatic locking of user accounts for which successive login attempts have failed.
- Display a user-specified message (a warning banner) in the user login window at login time as a security measure.

You can specify security options using either the management server configuration file or commands. If Replication Manager is in a cluster environment, specify the security options for each management server. For more information, see the *Hitachi Command Suite System Administrator Guide*.

Functions for setting security

The following table shows the functions for setting security, user permissions, and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin (user management)</td>
</tr>
<tr>
<td>Viewing conditions for passwords</td>
<td>Y</td>
</tr>
<tr>
<td>Changing conditions for passwords</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing settings for automatic account locking</td>
<td>Y</td>
</tr>
<tr>
<td>Changing settings for automatic account locking</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing a preview of the warning banner</td>
<td>Y</td>
</tr>
<tr>
<td>Editing a warning banner</td>
<td>Y</td>
</tr>
<tr>
<td>Deleting a warning banner</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.

N: Cannot be used with this permission.
**Explorer menu items for setting security**

The following table shows the Explorer menu items that are related to setting security, user permissions, and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Administration</td>
<td>Security</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be executed with this permission.

N: Cannot be executed with this permission.

**Viewing conditions for passwords**

You can view the following password conditions that have been set:

- Minimum number of characters in a password
- The numbers of different types of characters that must be used in a password (upper-case letters, lower-case letters, numeric characters, and symbols)
- Whether a password that is the same as the user ID can be used

**To view password conditions:**

1. From the Explorer menu, choose Administration and then Security. The Security subwindow appears.
2. Expand the object tree, and then select Password under Security. The password conditions that have been set are displayed in the Password subwindow.

**Related topics**

- About security settings on page 21-2

**Changing conditions for passwords**

You can set password conditions, such as the minimum number of characters and combination of character types, to prevent users from specifying easy-to-guess passwords. If Replication Manager is in a cluster environment, you must set password conditions for each management server. For details on how to do so, see the Hitachi Command Suite System Administrator Guide.
**Note:** When using an external authentication server to authenticate users, the settings on the external authentication server are used as the combination of character types that can be used for passwords.

apply when new users are added or when passwords are changed. Because newly set conditions do not apply to existing user passwords, existing users can continue to log in to Replication Manager using their existing passwords, even if those passwords do not conform to the newly established conditions.

**To change password conditions:**

1. From the **Explorer** menu, choose **Administration** and then **Security**. The Security subwindow appears.
2. Expand the object tree, and then select **Password** under **Security**. The Password subwindow appears.
3. Click **Edit Settings**. The Password dialog box appears.
4. Change the desired conditions and then apply them. The information in the display is updated.

**Related topics**

- Viewing conditions for passwords on page 21-3
- About security settings on page 21-2

**Viewing settings for automatic account locking**

You can view whether the function for automatically locking accounts is enabled. When it is enabled, the number of successive login failures is displayed as the threshold for locking accounts.

**To view the settings for the automatic account locking function:**

1. From the **Explorer** menu, choose **Administration** and then **Security**. The Security subwindow appears.
2. Expand the object tree, and then select **Account Lock** under **Security**. The settings for the function are displayed in the Account Lock subwindow.

**Changing settings for automatic account locking**

You can automatically lock user accounts to prevent unauthorized access. To enable automatic account locking you must specify the number of unsuccessful login attempts after which an account should be locked. The built-in account (user ID: System) can never be locked even when this function is used.

**Tip:** If Replication Manager is in a cluster environment, the function must be set for each management server. For details on how to set the automatic
account locking function on a management server, see the *Hitachi Command Suite System Administrator Guide*.

For a user account that logs in by linking to an external authorization server, the settings on the external authentication server are used for automatic locking control.

If you change the setting for the number of allowed login failures, the new setting does not apply retroactively to users who have already exceeded the new value or to user accounts that are already locked. For example, if you change the number of login failures from 5 to 2, a user account whose number of successive login failures is 3 remains valid. However, the account will be locked if the user’s next login attempt fails.

**To change the settings for the automatic account locking function:**

1. From the **Explorer** menu, choose **Administration** and then **Security**. The Security subwindow appears.
2. Expand the object tree, and then select **Account Lock** under **Security**. The Account Lock subwindow appears.
3. Click **Edit Settings**. The Account Lock dialog box appears.
4. Change the settings for the automatic account locking function, and then apply the changes. The settings for the automatic account locking function displayed in the Account Lock subwindow are refreshed.

**Related topics**

- [About account locking on page 19-11](#)
- [Viewing settings for automatic account locking on page 21-4](#)

**About warning banners**

As a security measure during login, you can display a message in the user login window. You can edit the message in HTML format.

You can also specify HTML tags by following the guides provided in the Edit Message dialog box. However, in the following cases, use commands on the management server to set up the warning banner:

- You want to specify a message for a different locale.
- You want to use HTML tags that are not supported by the GUI.
- Replication Manager is operating in a cluster environment.

For details on how to set up a warning banner on a management server, see the *Hitachi Command Suite System Administrator Guide*.

**Related topics**

- [About security settings on page 21-2](#)
- [Editing a warning banner on page 21-6](#)
Viewing a preview of the warning banner

To preview the current warning banner:

1. From the Explorer menu, choose Administration and then Security. The Security subwindow appears.
2. Expand the object tree, and then select Warning Banner under Security. The warning banner that is currently set up is displayed in the Warning Banner subwindow.

Related topics
- About warning banners on page 21-5

Editing a warning banner

To edit a warning banner:

1. From the Explorer menu, choose Administration and then Security. The Security subwindow appears.
2. Expand the object tree, and then select Warning Banner under Security. The Warning Banner subwindow appears.
3. Click Edit Message. The Edit Message dialog box appears.
4. Edit and update the message that will be set up as a warning banner. Click Preview to display a preview in HTML. Confirm that the message is displayed correctly, and then apply the changes.

Related topics
- About security settings on page 21-2
- Editing a warning banner on page 21-6

Deleting a warning banner

To delete a warning banner that has been set up:

1. From the Explorer menu, choose Administration and then Security. The Security subwindow appears.
2. Expand the object tree, and then select Warning Banner under Security. The Warning Banner subwindow appears.
3. Click Edit Message. The Edit Message dialog box appears.
4. Click Delete to clear the message, and then apply the change.
The message is deleted from the Warning Banner subwindow.

Related topics

- About warning banners on page 21-5
Managing information sources

This chapter describes tasks for managing information sources.

- Viewing a list of information sources
- Editing information sources
- Removing information sources
- Acquiring the latest configuration information (configuration refresh)
Viewing a list of information sources

You can display a list of the Device Manager servers, instances of Business Continuity Manager, instances of Mainframe Agent, or instances of Application Agent that are used as Replication Manager information sources.

To view a list of information sources:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and then select Device Manager, BC Manager / Mainframe Agent, or Application Agent.
   A list of the applicable information sources are displayed in the subwindow.

Related topics
- About information sources on page 4-2

Editing information sources

You can change the information about registered information sources. If you change the settings of a registered Device Manager server, instance of Business Continuity Manager, instance of Mainframe Agent, or instance of Application Agent, you must also change the information source settings in Replication Manager.

For details on how to edit information sources, see the following:
- Editing a Device Manager server on page 22-2
- Editing an instance of Business Continuity Manager or Mainframe Agent on page 22-3
- Editing an instance of Application Agent on page 22-3

Related topics
- About information sources on page 4-2
- Registering information sources on page 4-2

Editing a Device Manager server

To edit a Device Manager server:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and then select Device Manager.
   The Device Manager subwindow appears.
3. Click the icon of the Device Manager server whose information you want to change. 
   The Edit Device Manager - Device-Manager-server-name dialog box appears.
4. Edit and update the desired information. 
   The display is refreshed to reflect your changes. If the IP address (or host name), protocol, or port number in Replication Manager is changed, the corresponding configuration information belonging to the Device Manager server is also changed.

Related topics
- About information sources on page 4-2

Editing an instance of Application Agent

**To edit an instance of Application Agent:**

1. From the Explorer menu, choose Administration and then Information Source. 
   The Information Source subwindow appears. 
2. Expand the object tree, and then select Application Agent. 
   The Application Agent subwindow appears. 
3. Click the icon of the instance of Application Agent whose information you want to change. 
   The Edit Application Agent -Application-Agent-name dialog box appears. 
4. Edit and update the Application Agent information.

---

**Note:** When the configuration of an instance of Application Agent is changed from stand-alone host to clustered host (or vice versa), remove the agent and add it again.

The information in the display is refreshed. If the IP address (or host name) or port number in Replication Manager is changed, the corresponding configuration information belonging to the instance of Application Agent is also changed.

**Tip:** If you use IPv6 to connect to Application Agent, specify the IP address (or host name) and port number for IBM HTTP Server.

---

Editing an instance of Business Continuity Manager or Mainframe Agent

**To edit an instance of Business Continuity Manager or Mainframe Agent:**

1. From the Explorer menu, choose Administration and then Information Source. 
   The Information Source subwindow appears.
2. Expand the object tree, and then select **BC Manager / Mainframe Agent**.
   The BC Manager / Mainframe Agent subwindow appears.

3. Click the icon of the instance of Business Continuity Manager or Mainframe Agent whose information you want to change.
   The Edit BC Manager / Mainframe Agent - Business-Continuity-Manager-or-Mainframe-Agent-name dialog box appears.

4. Edit and update the desired information.
   The display is refreshed to reflect your changes. If the IP address (or host name) or port number in Replication Manager is changed, the corresponding configuration information belonging to the instance of Business Continuity Manager or Mainframe Agent is also changed.

   **Tip:** If you use IPv6 to connect to Business Continuity Manager or Mainframe Agent, specify the IP address (or host name) and port number for IBM HTTP Server.

**Related topics**
- About information sources on page 4-2

**Removing information sources**

You can remove Device Manager servers, instances of Business Continuity Manager or Mainframe Agent, or instances of Application Agent registered as information sources if they no longer require management by Replication Manager. When you remove information sources, the resources belonging to them are automatically deleted from the Hosts view, Storage Systems view, Pair Configurations view, Applications, Resource Groups, and the site.

To view the flow of tasks for removing information sources, see Removing information sources workflow on page 22-5.

For details on how to remove information sources, see the following:
- Removing Device Manager servers on page 22-5
- Removing instances of Business Continuity Manager or Mainframe Agent on page 22-6
- Removing instances of Application Agent on page 22-6

   **Tip:** User-configured My Copy Groups and alert settings are not cleared automatically when you delete the information sources. For details on how to manually clear the relevant settings, see Editing My Copy Groups on page 13-3. For details on how to manually clear the alert settings, see Deleting alert settings on page 17-6.

**Related topics**
- About information sources on page 4-2
Removing information sources workflow

The following figure shows the flow of tasks for removing information sources.

Removing Device Manager servers

To remove Device Manager servers:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and then select Device Manager.
   The Device Manager subwindow appears.
3. Select the check boxes of the Device Manager servers you want to delete, and then click Remove HDvMs.
   The Remove Device Managers dialog box appears.
4. Confirm your selections, and then delete them.
   The information in the display is updated.
Removing instances of Business Continuity Manager or Mainframe Agent

To remove instances of Business Continuity Manager or Mainframe Agent:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and then select BC Manager / Mainframe Agent.
   The BC Manager / Mainframe Agent subwindow appears.
3. Select the check boxes of the instances of Business Continuity Manager or Mainframe Agent you want to delete, and then click Remove BCMs / MFAs.
   The Remove BC Managers / Mainframe Agents dialog box appears.
4. Confirm your selections, and then delete them.
   The information in the display is updated.

Removing instances of Application Agent

To remove instances of Application Agent:

1. From the Explorer menu, choose Administration and then Information Source.
   The Information Source subwindow appears.
2. Expand the object tree, and then select Application Agent.
   The Application Agent subwindow appears.
3. Select the check boxes of the instances of Application Agent you want to delete, and then click Remove Agent.
   The Remove Application Agent dialog box appears.
4. If you wish to cancel any pending tasks for the deleted agent, use the Delete the task scheduling registered on the production server check box.
5. Check the instances to be deleted, and click Confirm.
   The information in the display is updated.

Related topics

- About information sources on page 4-2
- Adding an instance of Application Agent on page 4-6
- Refreshing Application Agent on page 4-14
Acquiring the latest configuration information (configuration refresh)

Whether you need to refresh the configuration and synchronize the configuration information of Replication Manager and Device Manager depends on the source of the acquired information for managing the storage system:

- When the source of the acquired information for managing the storage system is a remote Device Manager, Business Continuity Manager, or an instance of Mainframe Agent, the Replication Manager and the source of the acquired information is not automatically synchronized, so you need to perform configuration refresh.

- When the source of the acquired information for managing the storage system is a local Device Manager, Replication Manager and Device Manager configuration information is automatically synchronized, so you need not perform configuration refresh.

To perform a configuration refresh, see Refreshing configuration information manually for each information source on page 11-17.

Note: The following considerations apply when you have used a program other than Replication Manager to change the configuration:

- If you have used storage system operation management software (such as Storage Navigator or Storage Navigator Modular) to change the configuration, always perform a refresh operation on the storage system in Device Manager.

- If you use the Device Manager CLI on the same machine as Replication Manager to change the configuration definition file, you must perform a Refresh Storage System operation as described in Refreshing configuration information manually for each storage system on page 11-18.

Related topics

- About setting up storage systems on page 8-2
- About refreshing configuration information on page 11-12

Updating registered information workflow

The following diagram shows the Flow of tasks for acquiring the latest storage system information.
Example of updating information registered in Replication Manager

The following figure shows how to update information managed by Replication Manager, to acquire the latest storage system information.
Managing information sources

Configuration of storage systems, hosts, and volumes (in which objects are added and deleted)

Legend:
- Added objects
- Deleted objects
Managing application replicas

This chapter describes how to manage application replicas using Replication Manager.

- About application replicas
- Managing generations (replica rotation)
- About storage groups and information stores
- Check replica configuration workflow
- Precautions for replica operations
- Replica data types and configuration requirements
- Software that should not be used during replica operations
- About creating application replicas
- About the Create Replica Wizard
- Launching the Create Replica Wizard
- Creating an application replica
- Restoring application replicas
- Using Agent backup scripts (tape backups)
- Performing tape backups and restores
■ Replica operations in an SQL Server replication configuration

■ Mounting and unmounting application replicas

■ Checking the status of application replicas

■ Confirming application resources
About application replicas

An application replica is a snapshot of an application server that is saved to a series of secondary volumes on an immediate or scheduled basis. As with copy pair management, the creation and management of application replicas is organized around tasks and storage assets. Replication Manager is used to create, manage, and (manually) restore replicas.

The following table lists the copy types that can be used for management of application replicas.

<table>
<thead>
<tr>
<th>Copy type</th>
<th>Exchange server</th>
<th>SQL server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local copy</td>
<td>ShadowImage</td>
<td>Y</td>
</tr>
<tr>
<td>Thin Image (not applicable for snapshot groups)</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Copy-on-Write Snapshot</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Remote copy</td>
<td>TrueCopy Sync</td>
<td>Y</td>
</tr>
<tr>
<td>TrueCopy Async</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Universal Replicator</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>global-active device</td>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
Y: Usable
N: Not usable

Related topics
- Creating an application replica on page 23-29
- Adding an instance of Application Agent on page 4-6

Managing generations (replica rotation)

Application Agent can manage multiple secondary volumes for a single primary volume. In these cases, the secondary volumes are referred to as generations (or generational backups).

Normally, Replication Manager automatically determines which secondary volumes to use for the backup destinations. In this way, the volumes where replicas are stored are automatically rotated in the same way that backup tapes are created and later re-used. This (default) behavior is determined by the Target Generation option located on the 2. Setup Options page of the Create Replica Wizard.

When selecting a secondary volume for a backup, you can either manually select the volume you want or use the default. To have Replication Manager choose a secondary volume for you, you need to use the volume copy
function. When manually selecting a volume, choose the generation name unique to the desired volume. Replication Manager creates generation names using the following format:

`local_MU#` or `remote_MU#`

Each element used to create a unique generation name is described below:

<table>
<thead>
<tr>
<th>local</th>
<th>Specify this when the secondary volume will be stored on the same storage system as the primary volume.</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote</td>
<td>Specify this when the secondary volume will be stored on a different storage system than the primary volume.</td>
</tr>
<tr>
<td>MU#</td>
<td>The MU number defined in the CCI configuration definition file (horcmn.conf).</td>
</tr>
</tbody>
</table>

When you back up data to a TrueCopy secondary volume (on a remote site), the assigned generation name is `remote_0`.

As shown in Figure 23-1 Backing up multiple generations on page 23-4, because there is a limit of three generations, the fourth generation must write over one of the preexisting volumes. In this case, the oldest volume (generation 1) is overwritten. Generations 5 and 6 follow the same pattern of overwriting the oldest, existing generation.

![Figure 23-1 Backing up multiple generations](image)

The order in which secondary volumes are used for backups does not change regardless of which generation you might decide to restore at some point in time. Figure 23-2 Backup and restore operations on page 23-5 depicts how generations are used.

**Tip:** The number of generations that Replication Manager can manage depends on the volume replication function and hardware used, but the same procedures are used for backup and restoration operations. To determine the number of generations supported according to storage system and copy type, see Copy pair configuration conditions on page 10-13.
Figure 23-2 Backup and restore operations

Managing application replicas
Hitachi Replication Manager User Guide
About storage groups and information stores

Storage groups are objects managed by Microsoft Exchange 2007 to store databases. Multiple databases can be managed together because databases within the same group use a common transaction log. For Exchange 2007, storage groups are the actual objects being copied and managed by Replication Manager using the services of Application Agent.

Information stores comprise the constituents of a storage group: mailbox stores and public folder stores (*.edb files).

For Exchange 2007, individual information stores can be restored from a replica, but only storage groups can be specified when creating a replica.

Exchange 2010/2013/2016 does not use storage groups, therefore individual information stores are managed by Replication Manager. The following table lists which objects are eligible for Exchange replica operations.

**Table 23-1 MS Exchange Replica objects**

<table>
<thead>
<tr>
<th>Application</th>
<th>Operation</th>
<th>Resource (target) types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange 2007</td>
<td>Backup</td>
<td>All storage groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The specified storage group</td>
</tr>
<tr>
<td></td>
<td>Restore</td>
<td>The specified storage group or information store</td>
</tr>
<tr>
<td>Exchange 2010/2013/2016</td>
<td>Backup</td>
<td>All information stores</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The specified information store</td>
</tr>
<tr>
<td></td>
<td>Restore</td>
<td>The specified information store</td>
</tr>
</tbody>
</table>

Related topics

- [Replica data types and configuration requirements on page 23-20](#)
- [Restoring the latest application replica (simple restore) on page 23-36](#)
- [Restoring in units of information stores (Exchange 2007) on page 23-34](#)

Check replica configuration workflow

The following figure shows the flow for checking the configuration of an application replica.
Precautions for replica operations

The following are points to be aware of (and precautions to observe) when performing replica operations. There are also certain tools and applications that should not be used during replica operations. For a list of these programs, see Software that should not be used during replica operations on page 23-26.

Mount points

If different logical volumes are mounted in multiple mount points with a hierarchical relationship (such as M:\ and M:\MNT) do not specify a mount point that includes a lower level directory mountpoint (for example, M:\ in the above instance) as the target of replication. If this is done, the replica creation fails and the error message (KA VX0006-E, DRM-10062) is output. To specify multiple mount points (that include directory mount points) as replication targets, make sure they are not in a hierarchical relationship.

Disabling of automatic mounting

Before using Application Agent, make sure that Automatic mounting of new volume is disabled on the database server or backup server. Perform the following procedure to check the current status and, if automatic mounting is enabled, disable it:

1. Execute the diskpart command in the command prompt.
2. Enter automount to display the current status.
3. If automatic mounting of new volumes is enabled, enter automount disable to disable the setting.
4. Enter exit to end the diskpart command execution.
If you use the replica created prior to changing the pair configuration, you must restore the system to the configuration associated with that replica. If you do not, a system mismatch might occur. Use the `drmsqlcat` or `drmexgcat` commands to confirm the configuration at the time of replica creation. See the *Hitachi Command Suite Replication Manager Application Agent CLI Reference Guide*.

**Concealed volumes and Hitachi Dynamic Link Manager**

If you conceal a secondary volume using Replication Manager, a message (KAPL08019-E, KAPL08022-E, or KAPL08026-E) indicating a path failure occurred due to deletion of the path from the concealed secondary volume might be output to the Windows event log. These messages can be ignored and does not affect your operation.

For more information about Application Agent events that can be ignored and their cause, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

**Using Shadow Copy function of Windows**

Do not create replicas for a volume for which the Shadow Copy function of Windows shared folder is enabled, or volumes that are specified for data storage using the Shadow Copy function. Data consistency cannot be guaranteed under these circumstances.

**Backup servers and Windows Server 2008 or later**

If you are performing a VSS backup and the backup server is Windows Server 2008 or later, specify Offline for the secondary volume. After replica creation, the secondary volume disk status becomes Offline, but if replica creation fails, the status might remain Online. If this happens, perform the following procedure to change disk statuses of the secondary volumes on the backup server to Offline:

1. Use the CCI command `inqraid $Phys -CLI` to check the disk numbers of all secondary volumes that are the backup destinations. The disk numbers are shown in the `DEVICE_FILE` column.

2. Start the `diskpart` command and then enter `list disk` to display the current disk statuses.
   A list of disks that are currently connected to the server are displayed. The disk numbers are shown in the `Disk ###` column. Check the `Status` column and confirm the disk numbers corresponding to the disk numbers on the secondary volumes are Online.

3. For each secondary volume whose disk status is Online, perform the following procedure:
   a. Enter: `select disk disk-number`.  
      The following message is displayed: Disk `disk-number` is now the selected disk.
   b. Enter: `offline disk`. 

The following message is displayed: DiskPart successfully offlined the selected disk.

4. Enter list disk to display the current disk statuses. Make sure that the disk statuses of the secondary volumes are Offline in the Status column.

5. Enter exit to terminate the diskpart command.

**Database and backup server time synchronization**

The database server time and backup server time should be set to the present time, or the task status related to replica management operation is not updated correctly. If the time zone of the database server and backup server is changed, from the Explorer menu, choose Administration and then Information Source. Choose the relevant server, and then click Refresh Agent to update the information.

**Deleting copy groups used for replica operations**

When an attempt is made to delete a copy group that is in a HORCM instance used by Application Agent, the Pair Configuration Wizard task may fail with the error message KAVN02521-E (RPM-00527). If this occurs, first delete the HORCM instances from the Setup Application Agent dialog box on the database server and the backup server.

**Exchange Server offline address book data**

Application Agent cannot treat Exchange Server offline address book data as a backup or restore target. As a result, do not put data files, transaction log files, or checkpoint files that are backup targets in the volume that is storing the offline address book data. If the backup target files are stored in the same volume that is storing the offline address book data, you must backup and restore the offline address book data separately.

**Changing a backup server**

When changing a backup server using the database server Application Agent settings, first delete any existing replica tasks, change the backup server, and then recreate the replica tasks. If any replica tasks remain from before the backup server is changed, those tasks might be executed for the old backup server.

**Simultaneous operations**

Host-refresh operations, replica-mounting operations, and replica-unmounting operations all take longer than usual if they are performed while a replica-creation or replica-restoration task is being executed. To avoid this, use the Task List to ensure no replicas are being created or restored for any hosts where you plan to perform such operations.
**Task scheduling**

When a schedule is set from the Create Replica Wizard or the Task List, the window may not display a response when **Monthly** is selected for the schedule type and one of the following dates is selected:

- 31, when the system date is April 1, June 1, September, 1 or November 1
- 30 or 31, when the system date is February 1 on a leap year
- 29, 30, or 31, when the system date is February 1 on a non-leap year

To recover from this condition, follow this procedure:

1. On the database server, start the Windows Task Scheduler.
2. In the **Processes** tab, select the process whose name in the **Image Name** column is `drmjobsch.exe`.
3. Click **End Process**.

If the recovery procedure above is not performed, the next time an attempt is made to create or edit a replica task, the RPM-24103 message might be output and the operation may fail.

**SQL Server database instances and physical volumes**

Because SQL Server replicas operate on individual physical volumes, the object configuration of SQL Server databases must meet the following requirement:

- Data files to be stored on a particular disk drive must belong to the same instance. Data files from different instances must not be stored on the same disk drive.

**Mount status of secondary volumes**

Unmount all secondary volumes before performing a backup or restore to a database server. Failing to do so may cause unpredictable results. For example, CCI might not operate normally, a mount or unmount operation might fail, or a data inconsistency might occur. Also, note that applications might be executed in the background by a service.

**CCI configuration definition files**

For replica management, the configuration definition (HORCM) files of a linked CCI instance must be located in the Windows directory (`%windir%`).

**Multi-target or cascade configurations**

If a volume is used to configure more than one copy pair (for multi-target or cascade configurations), the configurations for the volume need to be defined using the same instance number.
Cluster configurations (SQL Server)
The following considerations apply to cluster configurations:

- If a database server is in a cluster configuration, specify a shared disk for the following:
  - VDI metafile directory
  - UNDO file directory
- Add the shared disk indicated above to the cluster group defining the instance.
- To create both Exchange and SQL Server cluster configurations on the same physical node, the host IDs, application types, and virtual hosts must be specified correctly. Even if SQL Server information is incorrectly specified for Exchange, or Exchange information is incorrectly specified for SQL Server, an error might not be displayed. If the configuration is incorrect and the system continues to be used, abnormal operations may result.

Recovery model (SQL Server)
Replication Manager only supports the database recovery models "Full" or "Bulk-logged."

Copy groups and applications
A copy group should only contain copy pairs associated with a single application. If a copy group contains copy pairs associated with multiple applications, backup and restoration operations may have unpredictable results.

Copy groups and backup catalogs
The backup information in the backup catalog is managed based on using the copy group as a key. Depending on the backup method, you might not be able to perform a restore, even though the backup data exists on the secondary volume. The following is an example of two objects (databases, storage groups, or information stores) stored in separate volumes:

- Database A (copy group: vg01, obj01)
- Database B (copy group: vg01, obj01)

Use the following backup method to back up the databases:

1. Back up database A and database B concurrently. The replica 2010/8/31 07:14:00 is created.
2. Back up database A only. The replica 2010/9/06 08:15:00 is created.

The following figure shows the correspondence of the backup catalog and copy group.
Figure 23-3 Correspondence of backup catalog and copy group

When you back up database A only (as described in step 2), the replica 2010/9/06 08:15:00 is created, and the old backup information (replica 2010/8/31 07:14:00) about the copy group vg01, obj01 on database A is deleted from the backup catalog. In other words, because the backup information about database B (included in replica 2010/8/31 07:14:00) is also deleted from the backup catalog, database B cannot be restored even though the backup data exists in the secondary volume. When you restore database B, restore the backup data obtained using step 1 (backing up database A and database B concurrently) from tape to the secondary volume, and then restore the backup data from the secondary volume to the primary volume.

Remote operations

When a backup or restore operation is performed between different sites, Device Manager needs to be active on the server that is running Replication Manager at the local site. However, Device Manager does not need to be active on the management server at the remote site. (This differs from operations such as copy pair definition, where Device Manager must be active on the remote site.)

Refreshing hosts after changes to system configuration

When any of the following occurs you should execute a Refresh Hosts for the relevant database server:
• The configuration definition file for CCI is changed (excluding changes made with Replication Manager).

**Note:** After using a CCI command to change the configuration of a copy pair, you should also execute a **Refresh Storage System** for the relevant storage system. For more information, see **Refreshing configuration information manually for each storage system on page 11-18**.

• The mount point (drive letter for Windows) is changed.
• The disk configuration is changed by adding and removing a hard disk.
• The configuration of a database is modified.
• An SQL Server instance is constructed or deleted.
• An SQL Server database is added or deleted.
• The name of an SQL Server database is changed.
• The configuration file for an SQL Server database is added or deleted.
• The configuration file for an SQL Server database is moved.
• The name of a configuration file of an SQL Server database is changed.

**Tip:** When rebooting a system that references a secondary volume (replica), be aware that the volume might be mounted automatically. If this happens, use the disk management utility provided by the OS to manually unmount the automatically mounted secondary volume to be used for replica creation and restore processing.

**Daylight savings time**

Daylight savings time involves adjusting the system time of the database server for certain time periods. Replica operations scheduled for these time periods are handled in the following manner:

• When daylight savings time starts, a replica scheduled for the skipped time period (for example, from 2:00 to 2:59) is not executed.
• When daylight savings time ends, a backup job scheduled for overlapping time periods (for example, from 1:00 to 2:00) is executed twice.

For best results, do not schedule a replica creation when the server system time will be adjusted for daylight savings time.

**GPT disks and VSS Backups**

If you execute a VSS backup for a GPT disk, the number of registry keys related to the GPT disk is increased. If you repeatedly execute VSS recoveries, the VSS backup might fail. For this reason, we do not recommend using Application Agent with a GPT disk configuration. If you must execute a VSS backup for a GPT disk, you should clean up the registry of the backup server according to the Microsoft support article KB934234.
Creating replicas (backups)

The following precautions apply to creating replicas:

- Do not use LUN#0 as a secondary volume for the backup destination, or other disks may not be recognized.
- To back up an SQL Server instance, the instance must be online. If an attempt is made to back up an instance when it is not running, the attempt will fail.
- If an instance contains multiple databases, the way volumes can be replicated or restored differs as follows, depending on the configuration of the primary volumes containing the databases:
  - When the databases are stored in the same volume, they can be replicated or restored at the same time.
  - When the databases are stored on different volumes, only some of the databases within the instance can be replicated or restored.
- Do not mount another volume in a directory on the volume to be backed up. If another volume is mounted, mounting and restoration of the secondary volume may fail.
- When data is backed up, a folder named `DRMVSSMETADATA_backup-ID` is created in the root directory of the secondary volume. Do not delete this folder because it contains metadata necessary for restoration. This folder is automatically deleted after data has been restored.
- On Exchange 2007, you cannot back up individual information stores. In addition, the information stores of the storage group to be backed up must be mounted in advance.
- On Exchange 2010/2013/2016 (which does not use storage groups), all information to be backed up must be mounted in advance.
- You cannot back up storage groups extending across multiple database servers.
- The recovery storage groups for Exchange Server 2007 cannot be backed up. The files and folders that make up the restoration storage group must be placed on a different file system from the storage groups to be backed up.
- Among the cluster resource groups, the Exchange System Attendant resource and the Exchange information store resource must be online during backup. If they are not online, the backup operation will result in an error.
- The operations shown below change information pertaining to the Exchange 2007 Server on the Active Directory, so if you perform any of these operations you will no longer be able to restore backup data obtained before these operations:
  - Modification of the paths of the information store, log, and system files.
  - Addition or deletion of storage groups.
  - Modification of the storage group name.
  - Addition of an information store to a storage group.
• Deletion of an information store from a storage group.
If you have performed any of the above operations, you will need to back up the Active Directory and the Exchange database again. To perform a backup of the Active Directory database, follow the instructions in the Microsoft documentation.

• The following event log messages might be output to a backup server:
  Event type: Error
  Event source: PlugPlayManager
  Event ID: 12
  Event type: Warning
  Event source: ftdisk
  Event ID: 57
  Event type: Warning
  Event source: disk
  Event ID: 51
  Event type: Warning
  Event source: ntfs
  Event ID: 50

  These messages are displayed because the secondary volume is temporarily hidden during the backup. They have no impact on the operation and can be ignored.

• When an Exchange replica is created, the following event logs, which do not affect backup processing, may be output to the backup server:
  Source: VDS Dynamic Provider
  Event ID: 10
  Level: Error
  Description: The provider failed while storing notifications from the driver. The Virtual Disk Service should be restarted.
  hr=80042505
  Event Type: Warning
  Event Source: VSS
  Event ID: 12290
  Description: Volume Shadow Copy Service warning:
  GetVolumeInformationW(\?\Volume{XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXXXXX}\,NULL,0,NULL,NULL,[0x00000000], , 260) == 0x00000057. hr = 0x00000000.
  Event Type: Warning
  Event Source: VSS
  Event ID: 12290
  Description: Volume Shadow Copy Service warning:
  GetVolumeInformationW(\?\Volume{XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXXXXX}\,NULL,0,NULL,NULL,[0x00000000], , 260) == 0x00000001. hr = 0x00000000.
  Event Type: Error
  Event Source: Service Control Manager
  Event ID: 7034
  Description: The Virtual Disk Service terminated unexpectedly. It has done this XX time(s).
  Event type : error
  Event source : VDS Basic Provider
  Event ID : 1
  Description : Unexpected error. Error code : l001010013
  Event type : error
  Event source : Virtual Disk Service
  Event ID : 1
  Description : Unexpected error. Error code : l02000018
Event type : error
Event source : Virtual Disk Service
Event ID : 1
Description : Unexpected error. Error code : 48F@02000018
Event type : error
Event source : Disk
Event ID : 15
Description : The Device XXXXXXXXXXXX is not the status that can be accessed.

- The following event log may be output to the database server, the file server, or the backup server, and can safely be ignored:
  Event type : Warning
  Event source : VSS
  Event ID : 12333
  Description : Warning of Volume Shadow Copy : The storageID that is not supported in VSS was reported from the provider.

- After a volume is hidden and the OS disk configuration is recognized again, the error message Device has been removed is output to the Windows event log. We recommend that you periodically delete the error messages in the event log.

Restoring replicas (restores)

The following precautions apply to restoring replicas:

- To restore and recover SQL Server system databases, stop the target SQL Server service. This will make the databases being restored temporarily inaccessible. Do not connect to SQL Server when a restore is in progress.

- To restore a renamed SQL Server database, be sure to detach the database before doing the restoration. If you attempt to restore the database without detaching it, the restore will not execute properly and the restored database might not be available. If this occurs, detach the database and restore it again.

- Make sure that all databases to be restored are ready. For information on the status of a database, see About SQL database and service status on page 23-43. A database with the Unconfirmed status is automatically removed and restored. If any of the databases to be restored are not ready, the process might fail. If this occurs, remove any databases that are not ready and re-start the restoration.

- Quit all business programs and make sure that any applications that access the database are not running. (The term applications implies any application that is at a higher level than SQL Server.) Also, make sure that SQL Server components such as Reporting Services, which is also an application at a higher level than SQL Server itself, are not running. If an application that connects to the database is running, a roll-forward operation might fail after applying the metafiles. If this occurs, the restoration will not be performed correctly. For example, if an application is running that retries when an ODBC session is not established, the application will issue an ODBC session establishment request during a roll forward (that occurs after metafiles have been applied), resulting in a failed roll-forward operation.
• To avoid possible errors during a restore, do not connect to any database restored from a different computer, such as an application server.

• Make sure that no files or directories in the primary volume are being used by other applications:
  ◦ If the Command Prompt was used to migrate a drive to the primary volume, close the Command Prompt window. If a drive is migrated to a volume other than the primary volume, an error will occur when the drive is unmounted.
  ◦ If the primary volume drive is being opened from Explorer, move the mount point to a drive other than the primary volume or exit Explorer.
  ◦ If the primary volume drive is being opened from an external computer, exit the application opening the drive.
  ◦ The primary volume might have been opened by a memory-resident monitoring program. If this is the case, stop the monitoring program.

• If Management Studio has been used to view the database to be restored, use Enterprise Manager to detach from the database or exit Management Studio before the restoration.

• Match the configuration (drive name and path) of the restoration target SQL Server database with that used to create a replica to help ensure a successful restoration. If they do not match, the restoration will fail.

• When a database is restored, the owner of the database is changed to the user who performed the restoration. To change the owner of the database back to the original owner, use Management Studio to attach the database again or use the system stored procedure `sp_changedbowner`.

• If you execute either of the following operations using the ESEUTIL utility, the database signature is changed and you will no longer be able to execute a roll-forward restore for replicas created prior to executing the command:
  ◦ Repairing an information store using `ESEUTIL /p`
  ◦ Defragmentation using `ESEUTIL /d`

  If you have executed these operations, use the Create Replica Wizard to recreate the replicas of the Exchange database.

• When using Copy-on-Write Snapshot/Thin Image, you cannot back up to tape using Replication Manager. Use another backup product to back up (to tape) an Exchange database that is on the primary volume.

• When using Copy-on-Write Snapshot/Thin Image, check the free capacity of the data pool during the restore. You should periodically check the data pool and increase the capacity as necessary.

• In a cluster environment, when restoring data in a physical node different from that used during backup, an Exchange virtual server that uses the same shared disk as that used during backup must be running. Replication Manager cannot restore data for an Exchange virtual server, such as one at a remote site, that uses a disk different from the one used during backup.
• While restoring a replica, do not open the physical disk resource property of the cluster administrator screen. If a property is opened, the restore may fail.

• When restoring cluster resources, be sure and offline all cluster resources that are dependent on these resources (Exchange resources for Exchange Server and service resources of the SQL Server instance).

## Mixing TC and SI pair volumes

If you want to mix the pair volumes for ShadowImage and TrueCopy, the following system configurations are supported.

![Figure 23-4 When the primary volume for SI and the primary volume for TC are the same LDEV](image_url)

**Figure 23-4** When the primary volume for SI and the primary volume for TC are the same LDEV
When using the configuration shown in Figure 23-4 When the primary volume for SI and the primary volume for TC are the same LDEV on page 23-18 to restore the paired volume for ShadowImage, set the status of the paired volume for TrueCopy to SMPL or PSUS (SSUS). If you attempt to restore the pair volume for ShadowImage with the status of a pair volume for TrueCopy PAIR, an error message indicating that the status of the copy group is invalid is displayed and the restore operation fails.

**Defining consistency groups and CCI**

It is important to consider how backup and restore operations are performed when defining consistency groups, especially if you plan on performing partial database restorations.

**For SQL Server databases**

*When restoring individual databases:*

Define one consistency group to one database so that each database is in a separate consistency group.

*When restoring multiple databases:*

If you want databases to be restored together, place them in the same consistency group.

**Note:** Define one consistency group as one group (dev_group) of CCI configuration definition files so that there are never too many or too few copy groups.

**For Exchange databases**

*When restoring individual information stores:*

Define consistency groups to make each information store of data files (*.edb) in the same consistency group. In addition, define consistency groups to make the transaction log files and checkpoint files (*.log, *.chk) of each storage group in the same consistency group.

*When restoring multiple information stores:*

It is possible to define consistency groups so that the data files (*.edb) of information stores that are always restored together are in one consistency group. In addition, define consistency groups to make the transaction log files and checkpoint files (*.log, *.chk) of each storage group in the same consistency group.

*When restoring storage groups (individual or multiple):*

Define consistency groups to make files of each file type of each storage group in a separate consistency group. However, if rolling forward is not performed when restore and recovery operations are performed, it is possible to define consistency groups to ensure the files of each storage group are in the same consistency group.
Replica data types and configuration requirements

This topic describes the types of data associated with replicas and specific configuration requirements for Exchange and SQL Server databases to ensure the data is accessible.

Exchange data and requirements

The following are the types of Exchange data subject to backup using Replication Manager.

<table>
<thead>
<tr>
<th>Database subject to backup</th>
<th>Files subject to backup</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange Server 2007 storage group</td>
<td>Data files (Exchange Server information store)</td>
<td>*.edb</td>
</tr>
<tr>
<td></td>
<td>Transaction log files</td>
<td>*.log</td>
</tr>
<tr>
<td></td>
<td>Checkpoint files</td>
<td>*.chk</td>
</tr>
<tr>
<td>Exchange Server 2010/2013/2016 information stores</td>
<td>Data files (Exchange Server information stores)</td>
<td>*.edb</td>
</tr>
<tr>
<td></td>
<td>Transaction log files</td>
<td>*.log</td>
</tr>
<tr>
<td></td>
<td>Checkpoint files</td>
<td>*.chk</td>
</tr>
</tbody>
</table>

Databases are backed up and restored in units of volumes, so the configuration of objects of an Exchange database has the following conditions:

- The files to be backed up must all be placed on a RAID volume defined as a pair.
- For Exchange 2007 servers, deploy the storage group taking into consideration that backups are conducted in units of volumes. If you deploy multiple storage groups in the same volume, you need to back up or restore these storage groups as one group. When backing up or restoring a storage group separately, deploy the storage group on a separate volume.
- When you place an Exchange database that is subject to backup on a volume, note the following:
  - You cannot put the transaction log file (*.log) on a volume where data files are stored.
  - Data files (*.edb) and checkpoint files (*.chk) cannot be allocated to the same volume.
- Do not use the following characters when setting a name for a storage group: = ; \ / “ ,
- Do not register the instances of multiple Exchange resources into a cluster group.
• If a mounted storage group or information store is renamed in Exchange Server 2007, all of the information stores under the corresponding storage group must be unmounted and then remounted.

• If an information store is renamed in Exchange Server 2010/2013/2016, the information store must be unmounted and then remounted.

• Exchange Server 2010/2013/2016 recovery information stores are not backed up. Recovery information store files and folders must be located on a different file system from the information stores.

• To back up a storage group in Exchange Server 2007, the information stores in the storage group must be mounted.

• To back up information stores in Exchange Server 2010/2013/2016, the information stores must be mounted.

• Backup and restore operations cannot be performed in an environment in which the Automatic Reseed feature of Exchange Server 2013/2016 is enabled.

• If you back up a passive mailbox database and then perform a point-in-time restoration from that backup, the restored data might be older than the data you intended to back up. To prevent this from occurring, do the following:
  a. Stop the database copy.
  b. Reseed the database.
  c. Back up the database copy.

**Exchange Server backup requirements**

The Exchange Information Store service and the Microsoft Exchange Replication service (Exchange Server 2013/2016) must be running to perform a VSS backup. In addition, all information stores to be backed up must be mounted.

During backup, write processing to the Exchange Server databases is stopped for approximately 10 seconds. This means that operations involving database write processing (such as email transmissions) are temporarily stopped.

**Exchange Server restore requirements**

For Exchange Server 2013/2016, before you restore the database, you need to stop the Microsoft Exchange Search Host Controller service on the database server. The following symptoms might occur when the Microsoft Exchange Search Host Controller service terminates:

• You cannot search for items using Outlook (online mode) or the Outlook Web App.

• The `ContentIndexState` is `Failed` when you execute the `GetMailboxDatabaseCopyStatus` command.

**Note:** You can still search for items using Outlook (cache mode).
After you resume the Microsoft Exchange Search Host Controller service, the index operation is also resumed. However, it may take longer than usual for the status to change from Failed to Healthy and to enable email search.

**SQL Server data and requirements**

The following are the types of SQL Server data subject to backup using Replication Manager. Backed-up databases differ depending on the option specified in the Create Replica Wizard.

---

### Table 23-3 Types of data subject to backup (SQL Server)

<table>
<thead>
<tr>
<th>Database subject to backup</th>
<th>Files subject to backup</th>
<th>Backup file name</th>
<th>Storage destination for backup files</th>
</tr>
</thead>
<tbody>
<tr>
<td>master</td>
<td>Data file</td>
<td>Same as the backup source file name</td>
<td>Secondary volume</td>
</tr>
<tr>
<td>model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>msdb</td>
<td>Transaction log file</td>
<td>Same as the backup source file name</td>
<td>Secondary volume</td>
</tr>
<tr>
<td>User database</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution database</td>
<td>Metafile</td>
<td>Varies depending on the VDI metafile storage directory specified.*</td>
<td></td>
</tr>
</tbody>
</table>

Legend:

*: When a VDI metafile storage directory is registered in the **SQL Options** tab of the Setup Application Agent dialog box, the metafile is stored in the registered directory. The file name is **backup-ID_database-ID.dmp**. When **default** is selected for the VDI metafile storage directory, the metafile is stored in the directory that contains the file whose management number (**file_id**) for SQL Server in the database file is a minimum value. The file name is **META_xxx.dmp**.

Databases are backed up and restored in units of volumes, so the object configuration of an SQL Server database requires the following:

- Configure each instance so that its data files are on one volume. In addition, do not place data files of multiple instances on a single volume.
- The following should **not** be placed in the same directory as the database configuration files (***.mdf**, ***.ndf**, and ***.ldf**):
  - Metafile directory (only when specified)
  - Transaction log backup files
  - Roll-forward recovery processing can only be performed if the above directory and file are placed on separate volumes. (In the event of a restoration, this prevents the metadata and transaction log files from reverting to a previous state.) If this requirement is not satisfied, the backup terminates with an error.
- When entering the SQL server instance, enter **DEFAULT** for the standard instance that was registered when SQL Server was installed.
- You can use the following characters when naming a database:
  - ASCII characters
Multi-byte characters (one character must be expressed using 1- or 2-byte characters)

However, do not use the following characters: `\ / : , ; * ? < > | "`

- Do not use names in the following form for database data files:
  
  META_database-ID.dmp

  Where database-ID is a 10-digit number.

- In a cluster environment, specify a user on each node for the owner of a database subject to backup. Local users with the same user name and password on different nodes are not considered to be the same user. Therefore, use a domain user account that is common to all nodes. If a failover is performed to a node where the database-owner user does not exist, the backup fails because the database owner is unknown.

- If the system databases (master, model, and msdb) are to be backed up, specify, as the output destination for SQL Server error log files, a volume different than the one that contains the system databases. If the system database to be backed up is specified as the destination, when the system database is restored from the secondary volume, the SQL Server error log files are also restored. As a result, the contents of the error log files return to the state they were before the backup, and consequently the error log information generated after the backup will be lost.

- Store tempdb on a different volume from the one used to store a user database to be backed up. If the same volume is used, tempdb remains online and is overwritten with data restored from the secondary volume when restoring from the user database only. This causes SQL Server to go into an invalid state. To recover SQL Server from this state, it must be restarted to recreate tempdb. After restarting SQL Server, move tempdb to a volume separate from the user database and attempt the restore again.

- A backed-up database cannot be restored if the SQL Server versions do not match. For example, a database backed up from a database server running SQL Server 2012 cannot be restored to a database server running SQL Server 2014.

- If the Copy-on-Write Snapshot function is used on a Hitachi AMS/WMS, Hitachi AMS2000, HUS100 series, or Hitachi SMS series storage system, and SQL Server metadata is stored on a primary volume, Replication Manager cannot be configured to make backups.

- In a cluster environment, install an SQL Server instance as a failover cluster.

- Databases that use the snapshot function cannot be backed up and restored by Replication Manager. If configured to back up a database snapshot, the backup will fail. When backing up an entire instance, first remove any database snapshots.

- The service broker becomes disabled when databases are restored using Replication Manager. To enable the service broker, execute the following SQL statement after restoration:

  `ALTER DATABASE [database-name] SET ENABLE_BROKER`
• When using Replication Manager to manage replicas of databases using a
database mirroring function, run the operation on a principal server.
• To restore a database using a database that uses the mirroring function,
disable the mirroring function for the database.
• To restore system databases (master, model, and msdb) together with a
database that uses the database mirroring function, disable the mirroring
function for the database using it, restore the system databases, and then
restore the database that uses the mirroring function.

Unsupported functions
For information on SQL Server functions that are not supported, refer to the
Hitachi Command Suite Replication Manager Application Agent CLI User
Guide.

Allocating files that comprise a database
Do not place database files to be backed up in the same volume as files that
will not be backed up.

Allocating metafiles
A metafile is a file SQL Server outputs during backup processing. Metafiles
store information about database composition and are therefore used in
restoration processing. For this reason, when backup data is backed up to
tape, the metafile must also be backed up to the tape.

If you have specified a VDI metafile storage directory, when backup data of
the secondary volume is backed up to tape, the metafile must also be backed
up to the tape (this is not necessary if the metafile is stored in the same
directory as the database file).

When you back up to tape, use FTP or a similar method to transfer the
metafile created in the metafile storage directory in the database server to
the backup server. Transfer the file in the directory using the same name as
in the metafile storage directory in the backup server and allocate the same
drive characters.

Metafile allocation on the database server and the backup server is shown in
the following figure.
For best results, store metafiles in a volume belonging to an SQL Server resource group so that, even if an SQL Server cluster resource fails over, the metafiles are failed over with the resource group.

The following figure shows a sample location for metafiles in an active/standby (or active/passive) cluster configuration.
Using a cluster configuration

Do not register the service resources of multiple SQL Server instances into a single cluster group.

Software that should not be used during replica operations

There are several tools and applications that can interfere with replica operations and should not be run while performing backups and restores. Applications that use the primary or secondary volumes can prevent CCI from operating properly, interfere with mount/unmount operations, and cause data inconsistencies. Such applications include:

- Disk management tools
- CHKDSK command
- Disk de-fragmentation tools
- Performance logging
- Anti-virus programs
- Programs that track directories and files in the drive (Index service, DLC service, and so on.)
Applications that carry out disk operations (backup products other than Application Agent, and so on)
Veritas Enterprise Administrator

These applications might be executed from services in the background. Adjust the startup times so that processing of these applications does not conflict with replica operations.

**Note:** Do not run CCI commands while Replication Manager is executing replica operations.

**Windows Indexing Service (SearchIndexer.exe)**

Observe the following precautions with the indexing service:

- Confirm that the master binder of the index service is not operating. File access by the index service can conflict with file operations of Replication Manager, which can cause an error in the index service master binding or in replica creation or restore processing.
- Do not specify volumes that store the index service catalog. This is because when the restore occurs the catalog of index service is also restored, possibly causing problems with the index services.

**Provisioning Manager**

For a database or backup server, do not perform any operation from Replication Manager that uses the Windows OS during the host setup and refresh operations of Provisioning Manager until 10 minutes after the completion of these operations. If such an operation is carried out, there are cases where replication operations may terminate with an error. When this occurs, operation of Provisioning Manager is terminated. Wait at least ten minutes before executing replica operations.

**About creating application replicas**

Replication Manager supports creation of application replicas (snapshots) of SQL Server and Microsoft Exchange Server databases.

**Related topics**

- [Creating an application replica on page 23-29](#)

**Create application replica workflow**

The following figure shows the flow for creating an application replica.
About the Create Replica Wizard

Replication Manager includes a Create Replica Wizard for creating snapshots of application servers.

The Create Replica Wizard provides the following functions:

- Choose to create a new task or edit an existing one, and select target objects.
- Set options including the rotation of target volumes, execution options, and mount options (for tape backups).
- Schedule the execution of the task.

Related topics

- Creating an application replica on page 23-29
- Create application replica workflow on page 23-27

Launching the Create Replica Wizard

To launch the Create Replica Wizard:

1. From the Explorer menu, select Resources, and then Applications. The Applications subwindow appears.
2. Expand the object tree, and then select a server under **Applications**. The summary information for the selected server is displayed.

3. Select one or more application resources (storage groups for Exchange 2007, information stores for Exchange 2010/2013/2016, or database instances for SQL Server) and click **Create Replica**. The Create Replica Wizard is launched.

### Creating an application replica

**To create an application replica:**

1. From the **Explorer** menu, select **Resources**, and then **Applications**. The Applications subwindow appears.
2. Expand the object tree and select a server. The summary information for the selected server is displayed.
3. Select one or more application resources: storage groups (Exchange 2007), information stores (Exchange 2010/2013/2016), or database instances (SQL Server) and click **Create Replica**. The Create Replica Wizard is launched.
4. On the 1. Select Target page, specify the task type and the target parameters:
   a. To create a new task, select **Create new task** and choose **Local** or **Remote** for the location.
   b. To edit an existing task, select **Edit existing task** and choose a task number.
5. Click **Refresh**. The object(s) selected are listed along with the subordinate components.

| Tip: | Although displayed, Exchange 2007 information stores cannot be selected because storage groups are the lowest level of granularity supported. Exchange 2010/2013/2016 does not use storage groups and individual information stores can be selected. |

6. You can select objects in the **Replica Source** display. Select **Dynamically add/remove target resources according to resource changes** if you want to account for resources that are added/removed before the task is executed. (Otherwise new resources are not included in the replica and deleted resources cause an error because they no longer exist.)
7. Click **Next**. The 2. Setup Options page is displayed. You can make changes or simply use the default settings.
   - For details on specifying the S-VOLs used for the replica (**Target Generation**), see Managing generations (replica rotation) on page 23-3.
   - **Basic Options** determine whether to abort the backup if there is a mismatch between the actual volume configuration and the one stored by Application Agent (repository). You can elect to ignore any
mismatch and allow the backup to complete (and update the repository).

**Note:** For Exchange servers, **Basic Options** include the option to **Truncate Exchange transaction log files** when the replica is created. If you select this option, the existing replicas can no longer be used to perform roll-forward restores.

- **Advanced Options** control mount options, the processing of replica (backup) catalogs, and the execution of jobs and scripts (used mostly for tape operations). For more information, see *Performing tape backups and restores on page 23-52.*

When your selections are complete, click **Next**.

8. The **3. Set Schedule** page is displayed.
   a. To create the replica immediately (without a recurring schedule) select **Execute Immediately**.
   b. For scheduled replica creation (single or recurring), select **Execute on Schedule**, choose a **Schedule Type**, and select the applicable calendar options.

**Note:** Do not create a schedule that will cause a copy pair to re-synchronize. If the creation of a replica does not finish before a copy pair starts to be re-synchronized, an error might occur during the creation of the replica. To re-synchronize a copy pair after a replica has been created, use a user script to re-synchronize the copy pair.

9. To save the schedule, click **OK**.
   The **4. Confirm** page is displayed. Review the replica settings.

**Note:** A Task ID is only displayed for an existing task.

10. When you are finished, select the **Yes, I have confirmed the above information and wish to create replica** check box and click **Confirm**.

11. If you chose to create the replica immediately the operation is executed with the specified parameters, otherwise the task is registered for scheduling on the production server.

12. You can use the Task Lists window to view the results of the backup.

13. If you have created the replica on a remote site, you should next use the Change Pair Status Wizard to resync the copy groups.

**Related topics**

- [Restoring the latest application replica (simple restore) on page 23-36](#)

**Restoring application replicas**

This module describes methods of restoring application replicas:

- [Roll-forward versus point-in-time restores on page 23-31](#)
Roll-forward versus point-in-time restores

An application replica can be restored in one of two modes:

- Roll-forward
- Point-in-time

When backup data on an Exchange Server or SQL Server database server is restored, the database returns to the state at the point-in-time when the backup occurred. If the transaction logs from the time when the backup was executed up until the restore are stored on the primary volume, the uncommitted transactions can be applied using the roll-forward option. By applying the transaction logs after backup, the database is restored to a state immediately before the error occurred. With a point-in-time restore, the transaction log data is not used and the database returns to the state of the last complete backup.

**Note:** Roll-forward operations for SQL Server cannot be performed by Replication Manager. After restoring a database, the actual roll-forward operation must be accomplished using the `drmsqlrecovertool` command or SQL Management Studio. For information on `drmsqlrecovertool`, see the *Hitachi Command Suite Replication Manager Application Agent CLI User Guide*.

Roll forward scenario (Exchange)

The roll-forward scenario for Exchange databases is described in the following figure.

**Note:** Exchange 2010/2013/2016 does not use storage groups, so replica operations are performed on information stores. See About storage groups and information stores on page 23-6 for more information.
After the database is backed up from the primary volume to the secondary volume at point A, the database is updated at point B. If an error occurs in a data file on the primary volume at point C and then the database is restored from the secondary volume to the primary volume, the database returns to the state it was in at point A. In this case, if the transaction logs from when the backup was executed up until the time of the restore are stored on the primary volume, the database can be recovered to the state immediately before the error occurred (point C) using the roll-forward option.
Example of a roll-forward restore (Exchange 2007)

This example describes restoring only the data in the mailbox store (information store) out of the backup data obtained from the secondary volume to the primary volume, and rolling forward transaction logs. (When a restore is executed in units of information stores, you must roll forward transaction logs at the time of restoration.)

The prerequisites for this example are the same as for the previous scenario, plus the following:

- Only the data files (*.edb) in the information store are stored on the same drive.
- The transaction log file on the primary volume is not destroyed (roll-forward is executable).
- Storage group SG1 has been backed up from the primary volume to the secondary volume.

Related topics

- Restoring the latest application replica (simple restore) on page 23-36
- Restoring an application replica from the Replica History on page 23-38
Restoring in units of information stores (Exchange 2007)

The ability to restore information stores depends on the way the storage volumes are configured. In some cases it is possible to restore an entire storage group, but not the individual information stores within the group. This topic explains which configurations support each type of operation.

**Note:** This topic does not apply to Exchange 2010/2013/2016, which does not use storage groups. See [About storage groups and information stores on page 23-6](#) for more information.

You can restore backup data in units of information stores (in units of *.edb data files), making it possible to quickly restore only the necessary data files (rather than the entire replica). To support the restore of information stores, you must partition the LDEV accordingly, taking into account the unit of restoration when allocating data files.

The following database configurations allow the restoration of information stores:

- Configurations in which only the information store data files (*.edb) to be restored individually are stored on separate LDEVs
- Configurations in which only information store data files (*.edb) to be restored individually are stored on the same LDEV
- Configurations in which multiple information store data files within the same storage group are stored on the same LDEV

You can restore all information stores stored on the same LDEV provided that you specify all the information stores. In this case, if you do not specify all information stores located on the same LDEV, the restore operation will fail.

**Note:** When data files (*.edb), transaction log files (*.log), and check point files (*.chk) in different storage groups are located on the same LDEV, information stores below a storage group that shares the LDEV *cannot* be restored individually.

The following figure shows a database configuration that allows restoration in units of information stores.
In the above example, information stores from IS11 to IS14 belong to the storage group SG1. In this case, you can restore backup data in the following units:

- Restore only IS11 individually
- Restore IS13 and IS14 at the same time (you cannot restore just one)
- Restore only IS12 individually

**Note:** The following restrictions apply:

- When restoring backup data in units of information stores, you must apply (roll forward) the transaction log at the time of restoration.
- To restore backup data in units of information stores, you need at least three LDEVs for one storage group. If you are using TrueCopy as the volume duplication function, up to two LDEVs can be backed up for a single storage group. This means that you cannot restore backup data in units of information stores.
**Restore application replica workflow**

The following figure illustrates the workflow for restoring an application replica.

---

**Figure 23-11 Restore replica workflow**

**About the Restore Replica Wizard**

Replication Manager includes a Restore Replica Wizard for restoring replicas (snapshots) of application servers from secondary volumes.

**Related topics**

- [Creating an application replica on page 23-29](#)

**Restoring the latest application replica (simple restore)**

- **Tip:** This operation is available when all the target resources can be restored from a single replica. If target resources are managed by multiple tasks/replicas, see [Restoring an application replica from the Replica History on page 23-38](#).
To perform a simple restore of the most recent replica:

1. If you are restoring a replica located at a remote site to the local site, run the Change Pair Status Wizard and split the copy group.

2. From the **Explorer** menu, choose **Resources** and then **Applications**. The Applications subwindow appears.

3. Expand the object tree, and then select a database server. The Server summary window appears.

4. Select a storage group (Exchange 2007), information store (Exchange 2010/2013/2016), or database (SQL Server) and click **Restore Replica**. The Restore Replica Wizard is launched.

5. On the 1. Select Target page, select the **Restore Target** from the tree structure. The resources that can be selected depend on your configuration. For details on Exchange servers, see *Restoring in units of information stores (Exchange 2007)* on page 23-34.

**Note:** For hosts running Exchange Server 2007, do not select a Recovery Storage Group as a restore target; this feature is not supported.

6. Click **Next**.

   The 2. Setup Options page is displayed.

7. For SQL Server only, select the **Target Server** (database or backup) and the **Target Instance**: **Original SQL instance** or **Alternative SQL instance** (that you select from the drop-down list).

8. Choose the **Restore Mode**.

   - **Point-in-time Restore**: Restores the replica and the transaction logs (without committing the outstanding transactions).
   - **Roll-forward Restore**: Restores the replica and then commits any outstanding database transactions stored in the transaction logs.

**Note:** A roll-forward operation cannot be performed for SQL Servers from within Replication Manager. Instead, the actual roll-forward operation must be performed using the **drmsqlrecovertool** command or SQL Management Studio after completing the restore operation. (For information on **drmsqlrecovertool**, see the *Hitachi Command Suite Replication Manager Application Agent CLI User Guide.*) In addition, you can choose to **Restore data with loading status** (inaccessible) or **Restore data with standby status** (read-only).

   For Exchange 2007 servers, if you are restoring information stores (instead of an entire storage group), you must choose the **Roll-forward Restore** option.

   For details, see **Roll-forward versus point-in-time restores** on page 23-31.

9. For Exchange 2010/2013/2016 servers, an additional set of options is available under **Restore Option** that configure support for Database Availability Groups. (See **About Database Availability Groups (DAGs)** on page 23-42 for more information.)

10. Click **Next**.
The 3. Confirm page is displayed.

11. Confirm that your settings are correct and click **Confirm**.

12. If you have restored a replica located at a remote site to the local site, you should next use the Change Pair Status Wizard to resync the copy groups.

**Related topics**

- Restoring in units of information stores (Exchange 2007) on page 23-34

### Restoring an application replica from the Replica History

**Tip:** You should follow this procedure when the target resources are managed by multiple tasks/replicas. When all the target resources can be restored from a single replica, see Restoring the latest application replica (simple restore) on page 23-36.

To restore a replica from the Replica History:

1. If you are restoring a replica located at a remote site to the local site, you should first run the Change Pair Status Wizard and split the copy group.
2. From the **Explorer** menu, choose **Resources** and then **Applications**. The Applications subwindow appears.
3. Expand the object tree, and then select a database server. The Server summary window appears.
4. Open the **Replica History** tab to view a list of replicas.
5. Select a replica and click **Restore Replica**. The Restore Replica Wizard is launched.
6. Follow the procedure in Restoring the latest application replica (simple restore) on page 23-36 starting at step 5.

**Related topics**

- Restoring the latest application replica (simple restore) on page 23-36
- Creating an application replica on page 23-29

### Restoring an SQL Server replica to a remote site

This topic explains how to restore an SQL Server application replica to a remote site and recover the restored database to a local site.

To restore an SQL Server replica to a remote site:

1. Select a copy group, start the Change Pair Status Wizard, then delete a copy pair (or pairs).
2. Restore the database from tape as described in Performing tape backups and restores on page 23-52, but do not run the Restore Replica Wizard at this point.
3. Use the Disk Management function to mount a volume connected the backup server.
Note: If the secondary volumes are concealed, follow the procedure in *Revealing secondary volumes prior to a remote restore operation on page 23-39.*

4. Start the SQL Server instance on the backup server.
5. In the Applications view, open the Hosts list and select the server. In the Replica History tab, select the replica to be restored and start the Restore Replica Wizard.
6. On the 1. Select Target page, select the target to be restored.
7. On the 2. Setup Options page, set the target server as the backup server.
8. Complete the Restore Replica Wizard and use the Tasks List window to check the results of the restore operation.
9. If necessary, follow the procedure *Recovering a database from a remote site to local on page 23-39.*

Related topics
- Restoring an application replica from the Replica History on page 23-38

**Recovering a database from a remote site to local**

To recover the database from the remote site:
1. Stop SQL Server on the database server.
2. Use the disk management function to unmount the primary volume connected to the database server.
3. Stop SQL Server on the backup server.
4. Select the replica associated with the volume in step 2 from the Replica History and click Unmount Replica.
5. Select the copy group, start the Change Pair Status Wizard, and select create.
6. Select the copy group, start the Change Pair Status Wizard, and select swap.
7. In the Replica History tab of the SQL Server subwindow, select the replica created before the failure occurred and click Delete Replicas.
8. Use the disk management function to mount the primary volume connected to the database server.

**Revealing secondary volumes prior to a remote restore operation**

Prior to a restore operation to a remote site, if the secondary volumes are concealed, you must first reveal them as described here.

1. Start the Windows Command Prompt on the backup server.
2. Change directory to the following folder:
   
   Application-Agent-installation-destination\DRM\bin\
3. Execute the following command:
   drmappcat

4. Obtain the appropriate backup ID from the displayed list by comparing the END-TIME for the backup ID and the creation time displayed in the Replica History tab. Here is an example of the command output:

<table>
<thead>
<tr>
<th>BACKUP-ID</th>
<th>BACKUP-MODE</th>
<th>BACKUP-OBJECT</th>
<th>START-TIME</th>
<th>END-TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000000038</td>
<td>VSS</td>
<td>MSEXCHANGE</td>
<td>2010/03/08 12:00:00</td>
<td>2010/03/08 12:15:02</td>
</tr>
<tr>
<td>0000000039</td>
<td>VSS</td>
<td>MSEXCHANGE</td>
<td>2010/03/08 12:00:00</td>
<td>2010/03/08 12:15:02</td>
</tr>
<tr>
<td>0000000040</td>
<td>VSS</td>
<td>MSEXCHANGE</td>
<td>2010/04/12 22:00:00</td>
<td>2010/04/14 10:11:00</td>
</tr>
<tr>
<td>0000000069</td>
<td>ONLINE</td>
<td>MSSQL</td>
<td>2010/04/14 10:00:00</td>
<td>2010/04/15 09:32:10</td>
</tr>
<tr>
<td>0000000070</td>
<td>ONLINE</td>
<td>MSSQL</td>
<td>2010/04/14 10:00:00</td>
<td>2010/04/15 09:32:10</td>
</tr>
<tr>
<td>0000000072</td>
<td>ONLINE</td>
<td>MSSQL</td>
<td>2010/04/15 09:05:00</td>
<td>2010/04/15 09:32:10</td>
</tr>
</tbody>
</table>

   **Note:** If some replicas have identical creation times, run the command again with the following additional arguments:
   drmappcat -hostname database-server-name
   Where database-server-name is the name of a particular database server. This command filters out the replicas for other hosts.

5. Execute the following command to reveal the volumes:
   drmdevctl backup-ID -attach
   Where backup-ID is the value obtained in the previous step.

### Using Database Availability Groups (DAGs)

Replication Manager supports Exchange Database Availability Groups (DAGs). In a DAG configuration, data mirroring occurs between the DAG active node and passive nodes. (The target server can be an active or passive node.)

**Note:** The DAG feature is exclusive to Exchange Server 2010/2013/2016. For more information, see About Database Availability Groups (DAGs) on page 23-42.

![Figure 23-12 Sample DAG configuration](image)
The following operations apply to DAG configurations:

- As an initial operation, you should perform a backup (a full copy that represents a baseline). After completing the backup, Exchange Server automatically transfers the updates of transaction log files and applies them to the passive nodes.

- The Setup Options page of the Restore Replica Wizard includes the restore option **Send the Exchange database data copy to the other hosts within the same Database Availability Group**. When this option is specified, Replication Manager will resynchronize the DAG passive data with active data.

- When the Exchange data is restored to an active or passive node, the Exchange Server stops data mirroring. (The backdating of the latest transaction log files prevents Exchange Server from identifying the updates.)

- To resume data mirroring, performing a full copy is required.

- When creating a replica of an active mailbox database copy, there are no unique requirements for DAG configurations. However, when a replica of a passive mailbox database copy is created:

  - The active mailbox database copy related to the passive mailbox database copy that is the target of replica creation must be mounted.
  - Microsoft Exchange Replication Service must be running on the Exchange Server 2010/2013/2016 for which the replica creation is performed.
  - The Exchange Server 2010/2013/2016 replication status of the passive mailbox database copy that is the replica creation target must be Healthy.

- You cannot simultaneously create the replica of the active and passive mailbox database copies. Wait until execution of the replica creation is finished for the first mailbox database copy before you begin create the replica of the other mailbox database copies.

- When you restore a replica, the target mailbox database copy must be an active mailbox database copy.

- A replica can be restored only to the Exchange Server 2010/2013/2016 server where the replica was created. Replicas acquired from another Exchange Server 2010/2013/2016 server cannot be restored.

- After the restore completes, you must execute the seed function to change the status of the Exchange Server 2010/2013/2016 replication function to normal.

- If you perform a restore without using the seed function, the Exchange Server 2010/2013/2016 replication function to be restored will be stopped, but the seeding will not be performed. After the restore completes, you must perform seed processing and restart the Exchange Server 2010/2013/2016 replication manually.

- If you create a replica of either the active mailbox database copy or a passive mailbox database copy using the option for deleting transaction logs, you cannot perform a roll-forward restore using the replica that was made before the transaction logs are deleted, regardless of the active
mailbox database copy or the passive mailbox database copy. Therefore, we recommend that you use the option to delete transaction logs for only one mailbox database copy (either the active or passive).

- When performing a restore, Microsoft Exchange Replication Service must be running on the Exchange Server 2010/2013/2016 server that is assigned the role of the Primary Active Manager.

- Even if performing the seed after point time restore, the length of copy queue might not be 0. If you switch over the mailbox database copy in this status, use the Exchange Management Shell. The following is an example using the `Move-ActiveMailboxDatabase` cmdlet:

```powershell
Move-ActiveMailboxDatabase databasename -ActivateOnServer destination-servername -SkipLagChecks:$True MountDialOverride:Besteffort
```

Related topics
- [Restoring the latest application replica (simple restore) on page 23-36](#)

### About Database Availability Groups (DAGs)

Database Availability Groups are a high-availability feature implemented in Exchange 2010/2013/2016. DAGs provide automatic database-level recovery from a database, server, or network failure. DAGs use continuous replication and a subset of Windows failover clustering technologies to provide continuous mailbox availability. Mailbox servers in a DAG monitor each other for failures. When a Mailbox server is added to a DAG, it works with the other servers in the group to provide automatic, database-level recovery from database failures.

Note: There is a limit of 16 mailbox servers per DAG.

When a DAG is created, it is initially empty and a directory object is created in Active Directory that represents the DAG. The directory object is used to store relevant DAG information, such as server membership. When the first server is added to a DAG, a failover cluster is automatically created for the group and the infrastructure that monitors the servers for network or server failures is initiated. The failover cluster heartbeat mechanism and cluster database are then used to track and manage information about the DAG, such as database mount status, replication status, and last mounted location.

Replication Manager supports data backups and restores on a DAG configuration.

Related topics
- [Using Database Availability Groups (DAGs) on page 23-40](#)
About SQL database and service status

When Replication Manager is used to restore data from a secondary volume to a primary volume, the status of the database becomes either loading or standby:

- Loading status (loading)
  The database can neither be viewed nor updated.
- Standby status (read-only)
  The database can be viewed, but not updated.

Transaction logs can be applied to databases in the loading status and standby status using Management Studio.

You can set database instances to be restored in standby using **Restore Task Options** in the **SQL Options** tab of the Setup Application Agent window (including setting the UNDO log file location). The Restore Replica Wizard includes an option to restore with loading status.

**Note:** You cannot perform a backup on databases in loading or standby status. Use Management Studio to change the status of the database so that it can be viewed and updated.

The following tables summarize database and service status and the operations that can be performed.

**Table 23-4 SQL Server database status and user actions supported**

<table>
<thead>
<tr>
<th>User action</th>
<th>SQL Server database status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Online</td>
</tr>
<tr>
<td>Create replicas</td>
<td>•</td>
</tr>
<tr>
<td>Update task information</td>
<td>•</td>
</tr>
<tr>
<td>Update host information</td>
<td>•</td>
</tr>
<tr>
<td>Configure Application Agent Settings</td>
<td>0</td>
</tr>
<tr>
<td>Point-in-time restore</td>
<td>0</td>
</tr>
<tr>
<td>Roll-forward restore</td>
<td>•</td>
</tr>
</tbody>
</table>

Managing application replicas

Hitachi Replication Manager User Guide

23-43
### SQL Server database status

<table>
<thead>
<tr>
<th>User action</th>
<th>Online</th>
<th>Offline</th>
<th>Loading</th>
<th>Read-only</th>
<th>Unconfirmed</th>
<th>Offline and Unconfirmed</th>
<th>Loading and Unconfirmed</th>
<th>Read-only and Offline</th>
<th>Read-only and Unconfirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(standby)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roll-forward restore (loading)</td>
<td>•</td>
<td>•</td>
<td>1</td>
<td>•</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>•</td>
<td>2</td>
</tr>
</tbody>
</table>

**Legend:**
- •: Action permitted and database changes are allowed.
- o: Action permitted and no database changes allowed.
- x: Action not permitted.

**Notes:**
1. Action permitted if the restore includes the system databases (master, model, and msdb). If only user databases are being restored, first remove any databases that are not ready to be restored.
2. A database in the "Unconfirmed" status is automatically removed and restored.
3. After the action, databases are put into the "Online" status.
4. After the action, databases are put into the "Read-only" status.
5. After the action, databases are put into the "Loading" status.

---

### Table 23-5 SQL Server service status and user actions supported

<table>
<thead>
<tr>
<th>User action</th>
<th>Service status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Started</td>
</tr>
<tr>
<td>Create replicas</td>
<td>•</td>
</tr>
<tr>
<td>Update task information</td>
<td>•</td>
</tr>
<tr>
<td>Update host information</td>
<td>•</td>
</tr>
<tr>
<td>Configure Application Agent Settings</td>
<td>•</td>
</tr>
<tr>
<td>Restore both user and system databases</td>
<td>•</td>
</tr>
<tr>
<td>Restore user databases only</td>
<td>•</td>
</tr>
</tbody>
</table>

**Legend:**
Using Agent backup scripts (tape backups)

This topic outlines how to use scripts to perform tape backups from Replication Manager.

Because Replication Manager performs tape backups using a separate backup management product, you must configure a script to execute the necessary commands. Using an agent user script in conjunction with a batch command file, you can back up a database to tape from the primary volume using the secondary volume in a single operation.

This topic includes the following information:

- Coding rules for scripts on page 23-46
- Script entries on page 23-47
- Agent script example on page 23-50
- Environment variables on page 23-50
- Unmounting after an automatic mount on page 23-51
- Batch command file example on page 23-51
- Preparing the user script and batch command file on page 23-52

Related topics
Coding rules for scripts

To specify a command in a user script, you must follow the scripting rules. The script should consist of two sections:

**PRE_PROC:** Pre-processing specified by the user (before the backup command is issued).

**POST_PROC:** Post-processing specified by the user (after the backup command is issued).

### Table 23-7 Coding rules

<table>
<thead>
<tr>
<th>Applicable Items</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall user script</td>
<td>• The character code set must be ASCII.</td>
</tr>
<tr>
<td></td>
<td>• Codes lower than 0x20 cannot be used, except for CR (0x0d), LF (0x0a), and TAB (0x09).</td>
</tr>
<tr>
<td></td>
<td>• The linefeed code must be LF (0x0a) or CR+LF (0x0d and 0x0a).</td>
</tr>
<tr>
<td></td>
<td>• The length of a single line must not exceed 8 KB.</td>
</tr>
<tr>
<td></td>
<td>• Do not execute a command that will display more than 2000 bytes of text. If you need to reference a large amount of text output by a command, redirect the command output to a file, and then view the file.</td>
</tr>
<tr>
<td>Item and section names</td>
<td>• Each line must contain only one item.</td>
</tr>
<tr>
<td></td>
<td>• Item and section names are not case-sensitive.</td>
</tr>
<tr>
<td></td>
<td>• Item and section names must consist of only one-byte characters. Multi-byte characters cannot be used.</td>
</tr>
<tr>
<td></td>
<td>• Item names must be separated by a one-byte equal sign (=). One-byte space and tab characters can be inserted before and after equal signs.</td>
</tr>
<tr>
<td>Item values</td>
<td>• The value of an item must be specified after the one-byte equal sign (=) that follows the item name. Do not enter a linefeed code between an item's name and value.</td>
</tr>
<tr>
<td></td>
<td>• The item value begins after the one-byte equal sign (=) that follows the item name and ends at the linefeed code.</td>
</tr>
<tr>
<td></td>
<td>• If an item name is specified alone (without a value), an error results.</td>
</tr>
<tr>
<td>Comments</td>
<td>• A line that begins with a one-byte hash mark (#) is regarded as a comment line.</td>
</tr>
<tr>
<td></td>
<td>• If a one-byte hash mark (#) is entered anywhere on a line other than at the beginning of the line, the part of the line following the hash mark will not be regarded as a comment</td>
</tr>
<tr>
<td></td>
<td>• If a hash mark (#) on a line is preceded by no characters other than tab and space characters, the line will be regarded as a comment line.</td>
</tr>
</tbody>
</table>
### Applicable items

| Blank lines | • You can enter blank lines.  
• A line that consists only of tab and one-byte space characters is regarded as a blank line. |

### Script entries

The following table describes the available script entries and how they can be used.

**Note:** If command line execution from a user script times out, the task might remain in the *Executing* status. If this happens, perform the following procedure before re-creating the task:
1. Restart the Application Agent service.
2. Update the task information.
3. Revise the CMDLINE and TIMEOUT settings in the user script.

#### Table 23-8 Script entries

<table>
<thead>
<tr>
<th>Entry name</th>
<th>Meaning and specifiable values</th>
<th>Multiple specification</th>
<th>Omit</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCAL_BACKUP</td>
<td>Specify YES.</td>
<td>Not allowed</td>
<td>Not allowed</td>
</tr>
<tr>
<td>[PRE_PROC]</td>
<td>User processing section: Indicates the beginning of the &quot;user pre-processing.&quot; In this section, define commands to be executed before the backup operation.</td>
<td>Not allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>[POST_PROC]</td>
<td>User processing section: Indicates the beginning of the &quot;user post-processing.&quot; In this section, define commands to be executed after the backup operation.</td>
<td>Not allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>[CMD]</td>
<td>Indicates the beginning of a command definition section.</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
</tbody>
</table>

*This item must be specified within a user processing section.*

*If two or more command definitions are included in your code, they will be executed individually in the order in which they are coded.*

*When a value other than NOWAIT is specified in TIMEOUT, the next command does not start executing until the executing command finishes or times out (in other words, only one command executes at a time).*

*When TIMEOUT=NOWAIT is specified, the subsequent command executes without waiting for the preceding command to finish.*

*The item specified in the command definition section is valid only on the command definition section for the target command. The other command definition sections are not affected.*
<table>
<thead>
<tr>
<th>Entry name</th>
<th>Meaning and specifiable values</th>
<th>Multiple specification</th>
<th>Omit</th>
</tr>
</thead>
</table>
| **CMDLINE** | Specifies a command line to be executed.  
- If you want to specify an option, separate the command name and the option with a one-byte space character.  
- One command definition section must contain only one command line.  
- A maximum of 2048 characters can be specified on a command line.  
- A path or file name containing one or more spaces must be enclosed in double quotation marks (").  
- Command and file names must be specified using absolute path names. However, nested double quotation marks (") cannot be specified.  
- Do not include any environment variable in a command name or command path name (for example, a specification like %SystemRoot%
otepad.exe is not allowed).  
- If you want to use a shell command such as dir, execute it as a child process of cmd.exe. An example is C:\WINNT\System32\cmd.exe /c dir.  
- To redirect processing, you must specify C:\WINNT\System32\cmd.exe /c.  
- If you specify .exe, .com, .cmd, or .bat as the file extension, the command line is executed as is. If you specify an extension other than the above, the command line is executed using the application associated with the extension (file type). Do not specify an executable file that will display a window or message and will make the system wait for a response. | Not allowed | Not allowed |
| **ENV** | Specifies the environment variables to be applied for execution of the specified command.  
- Only one environment variable is allowed per line.  
- The name and value of an environment variable must be separated by a one-byte equal sign (=).  
- One environment variable definition can consist of up to 2048 characters.  
- If you omit the value for the environment variable, the environment variable is deleted. For example, the environment variable ABC is deleted when you specify ENV=ABC=.  
- The ENV setting is valid only for the target command. Note that the subsequent command does not inherit the setting contents.  
- Even if you specify an environment variable that contains a percent sign (%), the contents are not extracted. For example, if you specify ENV=ABC=%PATH%, the character string %PATH% is specified in the environment variable ABC. | Allowed | Allowed |
<table>
<thead>
<tr>
<th>Entry name</th>
<th>Meaning and specifiable values</th>
<th>Multiple specification</th>
<th>Omit</th>
</tr>
</thead>
</table>
| END_CODE     | Specifies the action to be performed in response to the return value of the executed command. Specifiable values are as follows:  
  **TERMINATE_NZ** (default)  
  Terminates script processing if a non-zero return value returns.  
  **IGNORE**  
  Continue processing whatever may be returned for a return value.  
  **Error threshold value**  
  Specify an integer in the range from 0 to 255. If a return value higher than the specified value is returned, script processing terminates.  
  - Specify the value using one-byte characters.  
  - If the executing command times out, processing terminates if **TERMINATE_NZ** or an error threshold value is specified, and processing continues if **IGNORE** is specified.                                                                                               | Not allowed           | Allowed |
| TIMEOUT      | Specifies the command timeout value. Specifiable values are as follows:  
  **Timeout value** (in seconds)  
  - The range of specifiable values is from 0 to 86400.  
  - Use one-byte numeric characters only.  
  - No timeout will occur if 0 is specified here.  
  **NOWAIT**  
  Once a command starts successfully, there is no wait for the command to finish. With this specification, the command return value becomes 0. The default is 600 (10 minutes).                                                                                     | Not allowed           | Allowed |
| LOCATION     | Specifies the execution server of the specified command. Specifiable values are as follows:  
  **LOCAL** (default)  
  Executes the specified command on the local server.  
  **REMOTE**  
  Executes the specified command on the backup server. This value can be specified if you check **Mount the replica volumes** in the Create Replica Wizard.                                                                                         | Not allowed           | Allowed |
| PARENT_STAT  | Specifies whether the script can be executed based on the execution status of the parent command (command that calls the script). Specifiable values are as follows:  
  **NORMAL** (default)  
  Executes the command specified in **CMDLINE** only if the execution status of the parent command is **NORMAL**.  
  **ERROR**  
  Executes the command specified in **CMDLINE** only if the execution status of the parent command is **ERROR**. The | Not allowed           | Allowed |
<table>
<thead>
<tr>
<th>Entry name</th>
<th>Meaning and specifiable values</th>
<th>Multiple specification</th>
<th>Omit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANY</td>
<td>Execution result of the parent command becomes <strong>ERROR</strong> regardless of the script result. Always executes the command specified in <strong>CMDLINE</strong>. If the execution status of the parent command is <strong>ERROR</strong>, the execution result of the parent command becomes <strong>ERROR</strong> regardless of the script result. In the <strong>[PRE_PROC]</strong> section, specify <strong>ANY</strong> or <strong>NORMAL</strong>. If you specify <strong>ERROR</strong>, the commands in the <strong>[PRE_PROC]</strong> section will not be executed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Environment variables**

The table below shows the Application Agent script environment variables that must be referenced by commands in the user post-processing section. These script environment variables can be referenced from the local server and the backup server.

**DRMENV_L_BACKUPID**
- Backup ID of the local server. This environment variable is valid in the following cases:
  - The command is being executed in the local server.
  - The execution status of the parent command is normal.

**DRMENV_R_BACKUPID**
- Backup ID of the backup server. This environment variable is valid in the following cases:
  - The command is being executed in the backup server.
  - The execution status of the parent command is normal.
  - The **Mount the replica volumes** option in the Create Replica Wizard is checked.

**DRMENV_CMD_STAT**
- Command execution status:
  - **NORMAL**: Normal
  - **ERROR**: Error

**Agent script example**

The table below shows the user script that is created for the example.
Table 23-9 User backup script example

<table>
<thead>
<tr>
<th>Script text</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCAL_BACKUP=YES</td>
<td>YES is required.</td>
</tr>
<tr>
<td>#Pre-processing section</td>
<td></td>
</tr>
<tr>
<td>LOCAL_BACKUP=YES</td>
<td></td>
</tr>
<tr>
<td>#Pre-processing section</td>
<td></td>
</tr>
<tr>
<td>#None</td>
<td></td>
</tr>
<tr>
<td>#Post-processing section</td>
<td></td>
</tr>
<tr>
<td>[POST_PROC]</td>
<td>Start of the user post-processing section.</td>
</tr>
<tr>
<td>#Tape backup of the secondary volume</td>
<td></td>
</tr>
<tr>
<td>[CMD]</td>
<td></td>
</tr>
<tr>
<td>CMDLINE=C:\tmp\tapebackup.bat</td>
<td></td>
</tr>
<tr>
<td>TIMEOUT=NOWAIT</td>
<td>Execute the next command without waiting for the command to terminate.</td>
</tr>
<tr>
<td>END_CODE=TERMINATE_NZ</td>
<td>Treat a command return value that is a value other than 0 as an error.</td>
</tr>
<tr>
<td>LOCATION=REMOTE</td>
<td>Execute on the remote server.</td>
</tr>
<tr>
<td>PARENT_STAT=NORMAL</td>
<td>Execute only when the backup command is normal.</td>
</tr>
</tbody>
</table>

Unmounting after an automatic mount

If you specify the **Automatically mount during the operation option** while using the Create Replica Wizard, to automatically unmount the replica after the backup has been completed, you must execute the `drmumount` command. The **Batch command file example on page 23-51** demonstrates how to do this.

**Tip:** To use the `drmumount` command, be sure and include this entry in the user post-processing section:

LOCATION=REMOTE

**Batch command file example**

The following is an example batch file that backs up the secondary volume to tape using `tapebackup.bat`:

```plaintext
rem Use NTBACKUP to execute the job Job1, and perform a copy backup of G:\ and H:\ to tape Tape1
rem For the backup source specification, use the backup selection file (C:\tmp\exg.bks)
```
rem Set the backup comment passed to the DRMENV_COMMENT environment variable as the backup job explanation
"C:\Windows\system32\ntbackup.exe" backup "@C:\tmp\exg.bks" /j "Job 1" /a /t "Tape 1" /D "%DRMENV_COMMENT%" /m copy
IF NOT "%errorlevel%"=="0" GOTO ERROR
rem After the tape backup, specify the backup ID imported to the backup server, and unmount the secondary volume
"Application-Agent-installation-folder\DRM\bin\drmumount.exe" %DRMENV_R_BACKUPID%
IF NOT "%errorlevel%"=="0" GOTO ERROR
exit 0
:ERROR
exit 1

Tip: Lines beginning with rem are comments.

Preparing the user script and batch command file

To prepare the script for execution from the Create Replica Wizard:

1. Save the user script file in any folder on the database server. You must supply this location in the Create Replica Wizard.
2. Save the batch command file in the directory C:\tmp on the backup server.

Performing tape backups and restores

This topic covers tape backups and restores and explains their relationship to disk-based replicas:

Note: Tape backups are not made from the primary volumes on the database server, but from the secondary volumes on the backup server. A tape is essentially a dump of an application replica.

- By default, Replication Manager does not perform tape backups. A separate backup management product must be configured on the backup server to command the tape drive and operated manually. For details, see Saving a replica to tape on page 23-53 or Restoring a replica from tape on page 23-54.
- To automate tape backups, the Create Replica Wizard supports the use of a backup script that executes the tape commands. This allows Replication Manager mount and unmount the necessary secondary volumes and execute the script. For details, see Automating tape backups with scripts on page 23-54.
Saving a replica to tape

Saving a replica to tape has the following prerequisites:

- **SQL Server only**: The database server must be set up with the default VDI Meta File Location in the SQL Options tab of the Setup Application Agent dialog box.
- The backup server must be set as the tape backup destination by setting Replica Catalog Location in the Server Options tab of the Setup Application Agent dialog box.

**To save a replica to tape:**

1. Select the instance/database (SQL Server), storage group (Exchange 2007), or information store (Exchange 2010/2013/2016) to be backed up in the Applications view, and start the Create Replica Wizard.
2. In the 1. Select Target page, select the target to be backed up.
3. In the 2. Setup Options page, select the following options:
   - **Transfer the replica catalog**...  
   - **Export a replica catalog file**...
5. Finish the Create Replica Wizard. You can use the Tasks list window to view the backup results.

6. Once the replica is completed, go to the Applications view, open the Hosts list and select the server. In the Replica History tab, click Mount Replica.

7. Use the data backup management tool to back up the following to the tape:
   - Database (mounted volume)
   - Catalog files (exported files under the folder specified in Replica Catalog Location)

8. Once the tape operation is complete, select the replica as you did in step 6 and click Unmount Replica.

**Restoring a replica from tape**

**To restore a database replica from tape:**

1. Use the data backup management tool to restore the Catalog files from the tape.

2. In the Replica History tab for the server click Import Replica Info and make the following selections:
   - For Source Backup Server, select the backup server from which data is to be restored.
   - Select Acquires the changes to secondary volumes as a result of tape restorations.

3. When information in the replica restored from the tape appears in the Replica History tab, select the replica and click Mount Replica.

4. Use the data backup management tool to restore the database from the tape.

5. Select the replica from step 3 and click Unmount Replica.

6. Restore the replica to the primary volume as described in Restoring the latest application replica (simple restore) on page 23-36.

**Automating tape backups with scripts**

To perform a tape backup using scripts, consult the rules and examples documented in Using Agent backup scripts (tape backups) on page 23-45 to prepare a user script and batch command file.

Once the script and batch file are in place, you must specify settings using the Create Replica Wizard. In the Advanced Options on the 2. Setup Options page:

- Choose to **Automatically mount during the operation** (and supply a Mount Point), or bypass this step and **Manually mount later**.
- Select **Execute pre/post jobs with Agent User Script** and supply the path to a Script File located on the production server.
Tip: If you set the **Automatically mount during the operation** option in the Create Replica Wizard, you should unmount the volume manually when the restore is complete.

**Command line tools**

Several command line tools to support tape operations are installed as part of Application Agent. The tools are located in the following folder:

```
Application-Agent-installation-directory\DRM\bin\<br>
```

A subset of the available commands are outlined in the topics that follow. For detailed information on these and other commands (including the available options), see the *Hitachi Command Suite Replication Manager Application Agent CLI Reference Guide*.

**drumount command**

The `drmumount` command unmounts a secondary volume. If the target volume has already been unmounted, the command displays a warning that the target volume has been unmounted, and then continues processing.

Before executing this command, all the application programs using the secondary volume to be unmounted must be stopped.

The format of the command is as follows:

```
drumount %DRMENV_R_BACKUPID%
```

Where `%DRMENV_R_BACKUPID%` is an environment variable that automatically determines the ID of the target volume.

Return values are 0 for normal termination; any other value indicates an error.

**drmdbexport command**

The `drmdbexport` command exports the backup information from the backup catalog to a file. You can use the `drmdbimport` command to import data into a backup catalog on another server from a file that contains the exported backup information. The `drmdbexport` command must be executed from in the post-processing section of a user script.

The format of the command is as follows:

```
drbdbexport %DRMENV_R_BACKUPID% -f export-destination-file-name
```

The arguments are as follows:

- `%DRMENV_R_BACKUPID%`<br>  
  An environment variable that automatically determines the backup ID used to select the backup catalog.

- `-f export-destination-file-name`
Use an absolute path name to specify the file to which you want to export the backup information. Use a maximum of 511 bytes for a file name. If the specified export destination file already exists, the existing file is overwritten. When specifying on the command line a file name or directory name containing space characters for the \(-f\) option, you must enclose the path name in double quotation marks (".").

Return values are 0 for normal termination; any other value indicates an error.

**drmdbimport command**

The **drmdbimport** command imports, into a backup catalog, backup-information from a file that was exported by the **drmdbexport** command. Application Agent programs manage backup information based on copy groups, which are used as a key.

**Tip:** The **drmdbimport** command must be executed manually; it cannot be used in a script.

If the backup information of the same copy group exists in the backup catalog when you attempt to import the backup information, the old backup information is overwritten.

The format of the command is as follows:

```
 drmdbimport -f import-source-file-name
```

The arguments are as follows:

- **-f import-source-file-name**
  
  Use an absolute path name to specify the file whose backup information is to be imported into the backup catalog. Use a maximum of 511 bytes for a file name. When specifying on the command line a file name or directory name containing space characters for the \(-f\) option, you must enclose the path name in double quotation marks (".").

Return values are 0 for normal termination; any other value indicates an error.

**drmexgcat command**

The **drmexgcat** command displays a listing of the backup information for a storage group (Exchange 2007) or information store (Exchange 2010/2013/2016).

**drmappcat command**

The **drmappcat** command displays backup information saved in the backup catalog on the server on which the command was executed.
**drmdevctl command**

The `drmdevctl` command enables or disables concealment of secondary volumes.

**Related topics**

- [Using Agent backup scripts (tape backups) on page 23-45](#)
- [Restoring an application replica from the Replica History on page 23-38](#)
- [Creating an application replica on page 23-29](#)

**Replica operations in an SQL Server replication configuration**

This topic explains the system configuration, requirements, and procedures for performing replica operations and recovery in a configuration that uses the SQL Server replication function.

When the SQL Server replication function is used, the following requirements must be satisfied:

- You must use the transaction replication type.
- The name of the distribution database must be `distribution`, and only one distribution database can be created.
- The subscription database must be restored separately from the system database (master, model, msdb), so the subscription database must be configured in a different volume than the system database.
- The **Sync with backup** option must be set for both the publication database and the distribution database. For details about how to set and view this option, see *SQL Server Books Online*.

**SQL Server system configuration**

The example is based on the system configuration shown in the figure below.
Requirements for the publication and distribution databases

The publication database and the distribution database used in the processing of a single replication must be allocated to satisfy the following requirements:

- Because backups of these two databases must be made at the same time, they must be allocated to the same SQL Server instance.
- Because these two databases must be restored separately from the system databases (master, model, and msdb), they must be allocated to a different volume from the system databases.
Backing up the databases

The publication database needs to be backed up at the same time as the distribution database. From the Select Target window of the Create Replica Wizard, select both the publication and distribution databases.

Back up the publication database transaction log

Use Management Studio to back up the transaction log.

Restoring the databases

To restore a database, the following conditions must be satisfied:

- When the publication database is restored, the distribution database must be restored at the same time.
- When the publication database is restored, this database must be online or have been deleted.
- When the system database is restored, the publication database must be online.
The following preparations are required to restore the databases. However, if only the subscription database is to be restored, perform only step 2 (subscription synchronous stop).

1. Stop the log reader agent.
2. Stop the subscription agent.

When preparations are complete, use the Restore Replica Wizard to restore the databases.

**Restarting operations**

Before resuming operation, you must perform startup operations on the server associated with the subscription format:

- For push subscription: use the publisher/distributor server.
- For pull subscription: use the subscriber server.

On the appropriate server, do the following:

1. Start the log reader agent.
2. Start the subscription agent.
3. Re-initialize the subscription, or remove and then recreate the subscription.

**Mounting and unmounting application replicas**

Replicas can be mounted or unmounted on the backup server as desired. Mounting is used to make a replica volume (S-VOL of pair) visible from the host (backup server). If the replica is mounted on a host, users can refer to the contents of the volume from the host.

Tip: Take note of the following:

- When a volume/replica is mounted using Replication Manager, you must also unmount it the same way (as opposed to using some other application).
- Mounting does not restore a replica, nor is it necessary to use this menu operation before performing a restore.
- To perform a mount or unmount as described here, the **Mount the replica volumes** setup option must be selected when using the Create Replica Wizard.

**To mount or unmount a replica:**

1. From the **Explorer** menu, choose **Resources** and then **Applications**. The Applications subwindow appears.
2. Select **Exchange** or **SQL** to display the associated list of database servers.
3. Click the check box of the desired server and click **Refresh Hosts** to update the server information. Follow the prompts until the refresh is complete.

4. Click the host name to open the Server summary window.

5. Open the Replica History tab.

6. Select a replica from the list.

7. Click **Mount Replica** or **Unmount Replica**. The confirmation dialog box appears.

8. Confirm that you wish to perform the operation and click **Confirm**.

You can view the detailed mount point information by clicking on the link in the Secondary Host column of the Replica History list.

**Related topics**

- Performing tape backups and restores on page 23-52
- Using Agent backup scripts (tape backups) on page 23-45

## Checking the status of application replicas

The status of application replicas is summarized in the Applications and Server subwindows. A set of icons represent how recent the replicas are, whether they have been created successfully, and so on. These icons are discussed in [About data protection status on page 12-22](#).  

**To check the data protection status of application replicas:**

1. From the **Explorer** menu, choose **Resources** and then **Applications**. The Applications subwindow appears.
2. Expand the object tree, and then select a database server. The Server summary window appears.
3. Open the **Replica History** tab to view a list of replicas.

To view an example of how to interpret the status information, see [Data protection status example on page 12-23](#).  

**Related topics**

- Restoring an application replica from the Replica History on page 23-38
- Roll-forward versus point-in-time restores on page 23-31
- About application replicas on page 23-3

## Check status of a replica workflow

The following figure shows the flow for checking the status of an application replica.
Confirming application resources

To display/confirm the resources associated with an application:

1. From the Explorer menu, choose Resources and then Applications. The Applications subwindow appears.
2. Expand the object tree, and then select a database server. The Server summary window appears.
3. For Exchange 2007, the Storage Groups tab allows you to view the storage groups associated with the server. For Exchange 2010/2013/2016, the Information Store tab allows you to view the information stores associated with the server. Clicking an object opens the Monitoring Setting window, which lists the information stores and Task ID links.

Related topics

- Creating an application replica on page 23-29
- Restoring the latest application replica (simple restore) on page 23-36
- Managing generations (replica rotation) on page 23-3
Handling errors

This chapter describes error handling mechanisms supported by Replication Manager.

- About handling errors
- Monitoring events using event logs
- Troubleshooting the replication environment
- About MIB definition files
About handling errors

To monitor for errors occurring in a complex replication environment, you must acquire information that identifies the locations of errors. With Replication Manager, you can set alert conditions for monitoring entities such as copy pairs, copy groups, journal groups and copy licenses. The following parameters can be used to determine alert conditions:

- Copy pair status
- Performance information thresholds
- Copy license usage threshold

By configuring alert settings, alerts can be issued when the alert conditions are met. Such alerts can then be used for determining the cause of a problem and the corrective action that should be taken.

Because you can use email or SNMP traps to send alerts, you can manage error information using the application of your choice without having to log into Replication Manager.

Related topics
- Troubleshooting the replication environment on page 24-4
- About alert settings on page 9-2

Monitoring events using event logs

This module describes the use of event logs for error handling:

- About event logs on page 24-2
- Viewing a list of event log data on page 24-3

About event logs

Replication Manager allows you to monitor operating information (event logs), including user operations and the results of automatic refresh operations. You can check the event log data for errors in the management information, alert settings, or copy pair settings. By analyzing the information, you can determine the cause of the event and the time that the event occurred. Replication Manager also outputs data such as the number of management-target pairs to separate event logs after discovery of the replication environment configuration. You can also view the contents of specific event logs and export an event log to a file in CSV or HTML format.

Related topics
- Explorer menu (event logging) on page 24-3
- Event log management functions on page 24-3
- Viewing a list of event log data on page 24-3
Event log management functions

The following table shows the event log management functions, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Admin</th>
<th>Modify</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing a list of event log files</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be used with this permission.
N: Cannot be used with this permission.

Explorer menu (event logging)

The following table shows the Explorer menu items that are related to event log management, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Administration</td>
<td>Event Logs</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.
N: Cannot be executed with this permission.

Viewing a list of event log data

You can view a list of event log data. The maximum number of event log files is 1,000.

To view a list of event log files, from the Explorer menu, choose Administration and then Event Logs. The event log files are listed in the Event Logs subwindow.

To view the contents of an event log, click that log's icon.

Related topics

- About event logs on page 24-2

Icons for messages

The icons displayed with messages show the severity of those messages. The following table lists and describes the icons for messages.
## Troubleshooting the replication environment

For a diagram, see [Troubleshooting the replication environment workflow on page 24-5](#).

### To troubleshoot the replication environment:

1. **Use the alert list to check the error information.**
   
   When an error is detected, use the alert list to check the error information. You can learn of the occurrence of an error by updating the number of alerts from the **Dashboard** menu or by receiving an alert by email or SNMP trapping. To display the alert list, from the **Explorer** menu, choose **Alerts** and then **Alerts**.

2. **Determine where the error occurred.**
   
   In the alert list, check the resource name displayed under **Resource** and the information about the link target.

3. **Determine the cause of the error and take corrective action.**
   
   You can determine the cause of the error by checking the information collected by Replication Manager and using Tuning Manager or storage system operation management software. You can correct the error using Device Manager or storage system operation management software.
   
   If the error is related to pool or journal performance in an open system, you can use Replication Manager to take corrective action by, for example, changing the relevant pool or journal volume or adding a new volume.

4. **If the alert is related to the copy pair status, change the pair status.**
   
   In open systems, you can use Replication Manager to change copy pair statuses. If necessary, place the copy pair in its previous status after the error is corrected. If necessary, restore the data by copying the data from the secondary volume back to the primary volume (reverse copy), and change the status of the copy pair on which the error status was indicated back to normal.

### Related topics

- [About alert settings on page 9-2](#)
- [About handling errors on page 24-2](#)
Troubleshooting the replication environment workflow

The following figure shows the flow of troubleshooting.

Start

Check the error information in the alert list

Determine where the error occurred

Determine the cause of the error and take corrective action

Was a copy pair status alert issued?

No

Yes

Change the copy pair status

End

Note: By default, alerts are automatically marked as completed when the pair leaves the monitored status. If the automarking feature has been disabled, the alert must be handled manually. See Marking alerts as completed on page 17-5 for more information.

About MIB definition files

You can check received SNMP traps using the MIB definition files provided by Replication Manager. The MIB definition files are created in the following location when Replication Manager is installed:

In Windows:

`Replication-Manager-installation-folder\util\mibs`

In Linux:

`Replication-Manager-installation-directory/util/mibs`

Replication Manager provides the following MIB definition files:
RPM-NOTIFICATION-MIB.txt - Defines the MIB for the SNMP traps sent during the monitoring of copy pair statuses.

RPM-NOTIFICATION-MIB2.txt - Defines the MIB for the SNMP traps sent during the monitoring of performance information and copy license usage.

Related topics

- [About alert management on page 17-2](#)
- [About alert settings on page 9-2](#)
Exporting management information

This chapter describes tasks for exporting management information.

- About exporting management information
- Exporting alert history
- Exporting event log data
- Exporting the history of C/T delta
- Exporting the history of journal volume usage for each copy group
- Exporting the history of journal volume usage for each journal group
- Exporting the history of pool volume usage
- Exporting the history of sidefile usage
About exporting management information

You can export Replication Manager management information to a file in CSV or HTML format. Using the exported file, you can determine the cause of an error, establish corrective measures, and analyze performance information. If necessary, you can edit the file or open it with another application program. You can export a maximum of 20,000 data items at a time.

The following types of management information can be exported:

- The histories of performance information items

The following performance information items can be exported:

- Write delay time (C/T delta) on a copy group basis
- Sidefile usage on a copy group basis
- Journal volume usage on a copy group basis
- Journal volume usage on a journal group basis (in open systems)
- Pool volume usage on a pool basis (in open systems)
- The history of received alerts
- Event logs

When you export management information, you can specify a time period to limit the amount of information that will be exported. However, you can export only information whose data retention period has not expired. The retention period can be managed by a user with the Admin (Replication Manager management) permission.

Related topics

- Explorer menu (exporting management information) on page 25-3
- Management information export functions on page 25-2

Management information export functions

The following table shows the functions for exporting management information, user permissions (Replication Manager management), and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Exporting the history of performance information</td>
<td>Y</td>
</tr>
<tr>
<td>Exporting the alert history</td>
<td>Y</td>
</tr>
<tr>
<td>Exporting event log files</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be used with this permission.

N: Cannot be used with this permission.
Tip: Each function can be used only for the resources in resource groups associated with the user.

Explorer menu (exporting management information)

The following table shows the Explorer menu items that are related to exporting management information, user permissions (Replication Manager management), and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submenu</td>
<td>Menu command</td>
</tr>
<tr>
<td>Resources</td>
<td>Hosts</td>
</tr>
<tr>
<td></td>
<td>Storage Systems</td>
</tr>
<tr>
<td></td>
<td>Pair Configurations</td>
</tr>
<tr>
<td>Alerts</td>
<td>Alerts</td>
</tr>
<tr>
<td>Administration</td>
<td>Event Logs</td>
</tr>
</tbody>
</table>

Legend:

Y: Can be executed with this permission.

N: Cannot be executed with this permission.

Exporting alert history

To export a history of received alerts:

1. From the Explorer menu, choose Alerts and then Alerts. The Alerts subwindow appears.
2. On the Alert List page, click Export Alerts. The Export Alerts dialog box appears.
3. Specify a time period for the information to be exported and the export format, and then export the information. The alert history is exported to a file.

Related topics

- About exporting management information on page 25-2

Exporting event log data

To export event log data:

1. From the Explorer menu, choose Administration and then Event Logs. The Event Logs subwindow appears.
2. Click **Export**.
   The Export Event Logs dialog box appears.
3. Specify a time period for the information to be exported and the export format, and then export the information.
   The event log data is exported to a file.

**Related topics**

- [About exporting management information on page 25-2](#)

### Exporting the history of C/T delta

**To export the C/T delta history:**

1. Display the information about the copy group whose C/T delta history you want to export.
   For details on how to display this information, see the following:
   - [Viewing individual host information on page 14-6](#)
   - [Viewing information about copy groups or snapshot groups belonging to a host on page 14-9](#)
   - [Viewing copy pair configuration definition information on page 12-6](#)
   - [Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8](#)
2. Click **Export History**.
   The Export History - `copy-group-name` dialog box appears (where `copy-group-name` is the name of the copy group whose information you displayed).
3. From the **Target Metrics** drop-down list, select **C/T Delta per Copy Group**.
4. Specify a time period for the information to be exported and the export format, and then export the information. The C/T delta history is exported to a file.

**Related topics**

- [About exporting management information on page 25-2](#)
- [Using the GetCTDelta command on page 27-2](#)

### Exporting the history of journal volume usage for each copy group

**To export the history of journal volume usage on a copy group basis:**

1. Display the information about the copy group whose journal volume usage history you want to export.
   For details on how to display this information, see the following:
Viewing individual host information on page 14-6

Viewing information about copy groups or snapshot groups belonging to a host on page 14-9

Viewing copy pair configuration definition information on page 12-6

Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8

2. Click **Export History**.
   The Export History - *copy-group-name* dialog box appears (where *copy-group-name* is the name of the copy group whose information you displayed).

3. From the **Target Metrics** drop-down list, select **Journal Usage per Copy Group**.

4. Specify a time period for the information to be exported and the export format, and then export the information.
   The journal volume usage history is exported to a file.

Related topics
- About exporting management information on page 25-2

### Exporting the history of journal volume usage for each journal group

To export the history of journal volume usage on a journal group basis:

1. From the **Explorer** menu, choose **Resources** and then **Storage Systems**.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under **Storage Systems**.
   The summary information for the selected storage system is displayed.
3. Click the **Open** link.
   The Open subwindow appears.
4. On the **JNLGs** page, select the check boxes of the journal groups whose journal volume usage history you want to export, and then click **Export History**.
   The Export History - *journal-group-name* dialog box appears.
5. From the **Target Metrics** drop-down list, select **Journal Usage per Journal Group**.
6. Specify a time period for the information to be exported and the export format, and then export the information.
   The journal volume usage history is exported to a file.

Related topics
- About exporting management information on page 25-2
Exporting the history of pool volume usage

To export the history of pool volume usage:

1. From the Explorer menu, choose Resources and then Storage Systems.
   The Storage Systems subwindow appears.
2. Expand the object tree, and then select a storage system under Storage Systems.
   The summary information for the selected storage system is displayed.
3. Click the Open link.
   The Open subwindow appears.
4. On the Pools page, select the check boxes of the pools whose pool volume usage history you want to export, and then click Export History.
   The Export History - pool-ID dialog box appears.
5. From the Target Metrics drop-down list, select Pool Usage per Pool.
6. Specify a time period for the information to be exported and the export format, and then export the information.
   The pool volume usage history is exported to a file.

Related topics

• About exporting management information on page 25-2

Exporting the history of sidefile usage

To export the history of sidefile usage:

1. Display the information about the copy group whose sidefile usage history you want to export.
   For details on how to display this information, see the following:
   o Viewing individual host information on page 14-6
   o Viewing information about copy groups or snapshot groups belonging to a host on page 14-9
   o Viewing copy pair configuration definition information on page 12-6
   o Viewing information about copy groups belonging to a copy pair configuration definition on page 14-8
2. Click Export History.
   The Export History - copy-group-name dialog box appears (where copy-group-name is the name of the copy group whose information you displayed).
3. From the Target Metrics drop-down list, select Sidefile Usage per Copy Group.
4. Specify a time period for the information to be exported and the export format, and then export the information.
   The sidefile usage history is exported to a file.
Related topics

- About exporting management information on page 25-2
This chapter describes the system maintenance functions supported by Replication Manager.

- About system maintenance
- About operation modes
- Viewing the operation mode
- Changing the operation mode
**About system maintenance**

In Replication Manager, system maintenance can be performed by changing the operation mode from normal to maintenance mode and managing the retention periods of data according to system configuration and operating status. Changing to maintenance mode disables monitoring operations during maintenance operations such as replacement of the storage system microprogram.

**Related topics**

- About data retention periods on page 9-15
- About operation modes on page 26-3

**Functions for Replication Manager maintenance**

The following table shows the functions for Replication Manager maintenance, user permissions, and whether the functions can be used with the indicated permissions.

<table>
<thead>
<tr>
<th>Function</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Viewing the operation mode</td>
<td>Y</td>
</tr>
<tr>
<td>Changing the operation mode</td>
<td>Y</td>
</tr>
<tr>
<td>Viewing the data retention period</td>
<td>Y</td>
</tr>
<tr>
<td>Editing the data retention period</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be used with this permission.
N: Cannot be used with this permission.

**Explorer menu items for Replication Manager maintenance**

The following table shows the Explorer menu items that are related to Replication Manager maintenance, user permissions, and whether the items can be executed with the indicated permissions.

<table>
<thead>
<tr>
<th>Explorer menu</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Admin</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Y</td>
</tr>
<tr>
<td>Data Retention</td>
<td>Y</td>
</tr>
</tbody>
</table>

Legend:
Y: Can be executed with this permission.
N: Cannot be executed with this permission.
About operation modes

During storage system maintenance it may be necessary to disable Replication Manager monitoring functions. This can be done by entering maintenance mode.

**Normal mode**

The default mode. In this mode, you can perform all operations, including refreshing management information (automatically or manually) and manipulating copy pairs.

**Maintenance mode**

In this mode, automatic refreshing of management information is disabled. You cannot perform manual refreshing or manipulate copy pairs, and the action buttons for executing these operations are disabled.

Viewing the operation mode

You can view the Replication Manager operation mode, which is either normal mode or maintenance mode.

To view the operation mode, from the Explorer menu, choose **Administration** and then **Maintenance**. The current Replication Manager operation mode is displayed in the Maintenance subwindow.

You can also check the current operation mode from the Dashboard menu.

**Related topics**

- [About operation modes on page 26-3](#)

Changing the operation mode

Changing the operation mode suppresses operations on storage systems during maintenance operations (such as replacement of the storage system microprogram).

**To change the operation mode (which is either normal or maintenance mode):**

1. From the Explorer menu, choose **Administration** and then **Maintenance**.
   
   The Maintenance subwindow appears.

2. Click **Change Mode**.
   
   Either the Change Mode to Maintenance dialog box or the Change Mode to Normal dialog box appears.

3. Read the message, and then change the operation mode.
   
   The operation mode displayed in the Maintenance subwindow is updated.
Related topics

- Viewing the operation mode on page 26-3
- About operation modes on page 26-3
Replication Manager CLI tools

This chapter describes the CLI functions supported by Replication Manager.

- About the installation base path
- Using the GetCTDelta command
- Using the task commands
About the installation base path

If the Hitachi Command Suite Common Component is not installed under the installation directory of Hitachi Command Suite products, you must set the `HRPM_CLI_BASE_PATH` environment variable to the actual installation path. Typical cases where this environment variable setting is necessary are:

- A Hitachi Command Suite product is installed in an environment where Common Component has already been installed by another product.
- A Hitachi Command Suite product is upgraded to 7.4 or later in an environment where the Common Component has already been installed by another Hitachi Command Suite product earlier than 7.0.

If the `HRPM_CLI_BASE_PATH` environment variable has not been set correctly, the Replication Manager CLI will generate a KAVN00189-E error. If you see this error after executing a command, check the value of `HRPM_CLI_BASE_PATH`.

Using the GetCTDelta command

In addition to the Replication Manager GUI, you can also export C/T Delta (write delay) history data from the command line. Using the `GetCTDelta` command, you can output the histories of all (or select) copy groups to a CSV-format file or the console. The command line is an alternative to generate the information quickly without the overhead associated with the GUI.

`GetCTDelta` output is in CSV format. Histories are output from the time of execution up until the date specified by the command. The CLI output is the same as that exported from the GUI.

This topic includes the following:

- Requirements on page 27-2
- Location on page 27-3
- Syntax on page 27-3
- Examples on page 27-5

Related topics

- About exporting management information on page 25-2

Requirements

Note the following requirements:

- For Windows Server 2008 or later, you must have administrator permissions to execute the `GetCTDelta` command.
- The `GetCTDelta` command requires that the Hitachi Command Suite Common Component services are running.
• If the Hitachi Command Suite Common Component is not installed under the installation directory of Hitachi Command Suite products, you must set the HRPM_CLI_BASE_PATH environment variable. See About the installation base path on page 27-2 for more information.

• GetCTDelta must be run on the management server.

Note: Do not attempt to invoke multiple instances of GetCTDelta.

Location

The GetCTDelta command is in the following location.

In Windows:

Replication-Manager-installation-folder\RpMCLI

In Linux:

Replication-Manager-installation-directory/RpMCLI

Syntax

GetCTDelta [{-o | --output} output_file] [{ -h | --help}] [parameters]

When executed without an output specification (-o or --output), the output is sent to the command line display.

Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| -o output_file     | • The execution results are output to the specified file instead of the console.  
| or --output output_file | • The file path can be either relative or absolute.  
|                    | • Do not use a shortcut or symbolic link in the file path.  
|                    | • If an existing file is specified, it is overwritten.  |
| -h or --help       | Displays the command usage. If you include other options or parameters when using the help option, they are ignored. |

Parameters

Optional parameters can be used to specify the information to be exported. Multiple parameters must be separated by spaces and be of the form parameter=value.
Output for the specified copy group:

\[\text{groupName}=\text{copy-group-name} \ [\text{hour}=\text{number-of-hours} \ | \ \text{day}=\text{number-of-days}]\]

Output for the specified copy group (open system or mainframe system managed by CCI):

\[\text{hostName}=\text{pair-management-server-name} \ \text{instanceNumber}=\text{instance-number} \ \text{groupName}=\text{copy-group-name} \ [{\{\text{hour}=\text{number-of-hours} \ | \ \text{day}=\text{number-of-days}}}]\]

Output for the specified copy group (mainframe system managed by Business Continuity Manager):

\[\text{hostName}=\text{host-name} \ \text{prefix}=\text{prefix} \ \text{groupName}=\text{copy-group-name} \ [{\{\text{hour}=\text{number-of-hours} \ | \ \text{day}=\text{number-of-days}}}]\]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostName</td>
<td>Pair management server or host name.</td>
</tr>
<tr>
<td>instanceNumber</td>
<td>Instance number (cannot be specified with prefix).</td>
</tr>
<tr>
<td>prefix</td>
<td>Prefix (cannot be specified with instanceNumber).</td>
</tr>
<tr>
<td>groupName</td>
<td>Copy group name.</td>
</tr>
<tr>
<td>hour</td>
<td>Hours to be displayed (cannot be specified with day).</td>
</tr>
<tr>
<td>day</td>
<td>Days to be displayed (cannot be specified with hour).</td>
</tr>
</tbody>
</table>

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal termination</td>
</tr>
<tr>
<td>1</td>
<td>An error occurred</td>
</tr>
</tbody>
</table>

**Output**

The information output by GetCTDelta is as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date / Time</td>
<td>Date and time</td>
</tr>
<tr>
<td>Pair Management Server / Host</td>
<td>When the copy group is managed by CCI, the pair management server name is displayed. When the copy group is managed by Business Continuity Manager, the host name is displayed. When the copy group is defined by device group, &quot;n/a&quot; is displayed.</td>
</tr>
<tr>
<td>Configuration File / Prefix</td>
<td>When the copy group is managed by CCI, the configuration file name is displayed.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Copy Group</td>
<td>Copy group name</td>
</tr>
<tr>
<td>CTG</td>
<td>When the copy group is managed by CCI, an empty string is displayed. When the copy group is managed by Business Continuity Manager, the CTGID is displayed.</td>
</tr>
<tr>
<td>C/T Delta</td>
<td>The C/T Delta value is displayed.</td>
</tr>
</tbody>
</table>

**Examples**

Sample commands and outputs are included here.

**Without options**

GetCTDelta

Date / Time, Pair Management Server / Host, Configuration File / Prefix, Copy Group, CTG, C/T Delta

<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Pair Management Server / Host</th>
<th>Configuration File / Prefix</th>
<th>Copy Group</th>
<th>CTG</th>
<th>C/T Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Jul 03 11:02:12 JST 2012</td>
<td>hcdg05</td>
<td>horcm1302.conf</td>
<td>UR001</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tue Jul 03 11:04:08 JST 2012</td>
<td>hcdg05</td>
<td>horcm1302.conf</td>
<td>UR001</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tue Apr 17 22:43:33 JST 2012</td>
<td>XX01</td>
<td>HRPM.TEST.C1</td>
<td>UR2</td>
<td>22-22</td>
<td>0</td>
</tr>
<tr>
<td>Tue Apr 17 22:48:33 JST 2012</td>
<td>XX01</td>
<td>HRPM.TEST.C1</td>
<td>UR2</td>
<td>21-21</td>
<td>0</td>
</tr>
</tbody>
</table>

**With parameters (open systems)**

GetCTDelta hostname=hcfg05 instanceNumber=1302 groupName=UR001 hour=10

Date / Time, Pair Management Server / Host, Configuration File / Prefix, Copy Group, CTG, C/T Delta

<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Pair Management Server / Host</th>
<th>Configuration File / Prefix</th>
<th>Copy Group</th>
<th>CTG</th>
<th>C/T Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Jul 03 11:02:12 JST 2012</td>
<td>hcdg05</td>
<td>horcm1302.conf</td>
<td>UR001</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tue Jul 03 11:04:08 JST 2012</td>
<td>hcdg05</td>
<td>horcm1302.conf</td>
<td>UR001</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**With parameters (mainframe systems)**

GetCTDelta hostname=XX01 prefix=HRPM.TEST.C1 groupName=UR2 day=20

Date / Time, Pair Management Server / Host, Configuration File / Prefix, Copy Group, CTG, C/T Delta

<table>
<thead>
<tr>
<th>Date / Time</th>
<th>Pair Management Server / Host</th>
<th>Configuration File / Prefix</th>
<th>Copy Group</th>
<th>CTG</th>
<th>C/T Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Apr 17 22:43:33 JST 2012</td>
<td>XX01</td>
<td>HRPM.TEST.C1</td>
<td>UR2</td>
<td>22-22</td>
<td>0</td>
</tr>
<tr>
<td>Tue Apr 17 22:48:33 JST 2012</td>
<td>XX01</td>
<td>HRPM.TEST.C1</td>
<td>UR2</td>
<td>21-21</td>
<td>0</td>
</tr>
</tbody>
</table>

**File output**

GetCTDelta -o "C:\work\test.csv" hour=24
Using the task commands

In addition to using the Replication Manager GUI, you can also execute tasks and obtain task status information from the command line using the `ExecuteTask` and `GetTasks` commands.

Each command can also generate output in CSV format.

You can use the Task List in the Replication Manager GUI to confirm the result of CLI execution tasks as well as GUI execution tasks. Clicking the Task ID will launch the Task History dialog that displays the execution history and results.

This topic contains the includes the following:

- **Requirements on page 27-6**
- **Property settings on page 27-6**
- **Location on page 27-7**
- **Common options on page 27-7**
- **Getting information about tasks (GetTasks) on page 27-7**
- **Executing a task (ExecuteTask) on page 27-9**
- **Managing tasks with scripts on page 27-10**

Requirements

Note the following requirements:

- For Windows Server 2008 or later, you must have administrator permissions to execute the task commands.
- The task commands require that the Hitachi Command Suite Common Component services are running.
- If the Hitachi Command Suite Common Component is not installed under the installation directory of Hitachi Command Suite products, you must set the `HRPM_CLI_BASE_PATH` environment variable. See About the installation base path on page 27-2 for more information.
- Task commands must be run on the management server.
- The task CLI only supports tasks whose targets are open system copy pairs or copy groups. Mainframe system copy pairs and copy groups managed by Business Continuity Manager or CCI are not supported.

Property settings

Before starting task management operations using Replication Manager CLI, certain properties in the `base.properties` file must be set:

- **base.rmi.port**
  Specify an RMI registry port number used by Replication Manager for receiving processing requests (default value: 25200).
- **base.taskschedule.threadmax**
Specify a maximum number of tasks that can be executed concurrently in Replication Manager (default value: 10). If you execute multiple tasks concurrently, change the value of this property to the value that is suitable for your operation. When you execute an additional task, if the number of executing tasks including the additional task reaches the value specified for this property, the additional task is not carried out immediately. When any one of the executing tasks finishes, the additional task is carried out.

For details about the base.properties file, see the *Hitachi Command Suite Replication Manager Configuration Guide*.

**Location**

The task commands are in the following location.

**In Windows:**

Replication-Manager-installation-folder\RpMCLI

**In Linux:**

Replication-Manager-installation-directory/RpMCLI

**Common options**

The following options are common to all task CLI commands:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| -o output_file or --output output_file | The execution results are output to the specified file instead of the console.  
  • The file path can be either relative or absolute.  
  • Do not use a shortcut or symbolic link in the file path.  
  • If an existing file is specified, it is overwritten. |
| -h or --help                  | Displays the command usage. If you include other options or parameters when using the help option, they are ignored.                      |

**Getting information about tasks (GetTasks)**

The GetTasks command obtains information about tasks that have been created for execution by the CLI. The parameters enable you to specify a taskID for which you want information, retry interval, and number of times to confirm a task status change. If you specify a taskID, the return value enables you to confirm the task status. If you do not specify any parameters, all CLI tasks are displayed.
Syntax

To specify the task ID:

GetTasks [taskID=task-id]

To specify retry interval and number of times to retry:

GetTasks [taskID=task-id retryInterval=retry-interval retryCount=number-of-retries]

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>taskID</td>
<td>The task ID number of a task created using the CLI.</td>
</tr>
<tr>
<td></td>
<td>• Each alphabetical character must be uppercase.</td>
</tr>
<tr>
<td></td>
<td>• You cannot specify multiple taskIDs.</td>
</tr>
<tr>
<td></td>
<td>• If you do not specify the taskID, all CLI-based tasks are displayed.</td>
</tr>
<tr>
<td>retryInterval</td>
<td>Specifies the retry interval: 1-3600 seconds.</td>
</tr>
<tr>
<td></td>
<td>Use of this parameter requires that you specify the taskID and retryCount.</td>
</tr>
<tr>
<td>retryCount</td>
<td>Specifies the retry count: 0-3600.</td>
</tr>
<tr>
<td></td>
<td>A value of 0 means the GetTasks command is retried until the task status</td>
</tr>
<tr>
<td></td>
<td>changes. Use of this parameter requires that you specify the taskID and</td>
</tr>
<tr>
<td></td>
<td>retryInterval.</td>
</tr>
</tbody>
</table>

Return values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal termination</td>
</tr>
<tr>
<td>1</td>
<td>An error occurred</td>
</tr>
<tr>
<td>100</td>
<td>The task is pending execution</td>
</tr>
<tr>
<td>101</td>
<td>The task is in execution</td>
</tr>
<tr>
<td>102</td>
<td>The task was canceled</td>
</tr>
<tr>
<td>103</td>
<td>The task failed to execute</td>
</tr>
<tr>
<td>104</td>
<td>The execution was successful</td>
</tr>
<tr>
<td>105</td>
<td>The execution task timed out</td>
</tr>
</tbody>
</table>

Output

The information output by the GetTasks command is as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task ID</td>
<td>Task ID in the form TASKxxx</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MF/Open</td>
<td>Mainframe or open system</td>
</tr>
<tr>
<td>Host (Primary)</td>
<td>Target host name. When the copy group is managed by CCI, the primary pair</td>
</tr>
<tr>
<td></td>
<td>management server name is displayed. When the copy group is a snapshot group</td>
</tr>
<tr>
<td></td>
<td>or defined by a device group, a hyphen (-) is displayed.</td>
</tr>
<tr>
<td>Host (Secondary)</td>
<td>Target host name. When the copy group is managed by CCI, the secondary pair</td>
</tr>
<tr>
<td></td>
<td>management server name is displayed. When the copy group is a snapshot group</td>
</tr>
<tr>
<td></td>
<td>or defined by a device group, a hyphen (-) is displayed.</td>
</tr>
<tr>
<td>Target</td>
<td>Target copy group name</td>
</tr>
<tr>
<td>Copy type</td>
<td>Target copy type</td>
</tr>
<tr>
<td>Task type</td>
<td>Task type</td>
</tr>
<tr>
<td>Status</td>
<td>Task status</td>
</tr>
<tr>
<td>Creation Time</td>
<td>When the task was created</td>
</tr>
<tr>
<td>Execution Start Time</td>
<td>When the task was started</td>
</tr>
<tr>
<td>Execution End Time</td>
<td>When the task ended</td>
</tr>
<tr>
<td>Message</td>
<td>When the status is &quot;Failure&quot; or &quot;Warning,&quot; a message is displayed. For other</td>
</tr>
<tr>
<td></td>
<td>status values, a hyphen (-) is displayed.</td>
</tr>
<tr>
<td>Detail Message</td>
<td>When the status is &quot;Failure&quot; or &quot;Warning,&quot; a detailed message is displayed.</td>
</tr>
<tr>
<td></td>
<td>For other status values, a hyphen (-) is displayed.</td>
</tr>
</tbody>
</table>

### Executing a task (ExecuteTask)

The **ExecuteTask** command executes a task that was created for execution by the Replication Manager CLI. When you run the **ExecuteTask** command, you must specify parameters for user authentication.

**Syntax**

```
ExecuteTask { -u | --user } user-id {-p | --password } password
  taskID=task-id
```

**Parameters**

Each of the following parameters is required.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-u user-id</td>
<td>Specify a user id that is used to log in to the management server. The</td>
</tr>
<tr>
<td></td>
<td>specified user must have the Admin or Modify authority of Replication</td>
</tr>
<tr>
<td>or</td>
<td>Manager, and must belong to the All Resources group.</td>
</tr>
<tr>
<td>--user user-id</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-p password</td>
<td>Specifies the password associated with the user ID.</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>-- password password</td>
<td>Specifies the ID of a CLI task. You can only specify a single taskID.</td>
</tr>
</tbody>
</table>

**Return values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal termination</td>
</tr>
<tr>
<td>1</td>
<td>An error occurred</td>
</tr>
</tbody>
</table>

**Managing tasks with scripts**

A task created using the Replication Manager GUI can be registered as a task to be executed using the CLI. By creating a user script to execute the task in conjunction with performing a quiesce operation, you can perform data backup linking with the application. By placing such a script on the management server, copy pair operations on each host can be managed collectively and the execution results confirmed from Replication Manager GUI.

**Example task CLI procedure**

This an example of how to perform an application (DBMS) backup using the following configuration:

- A primary and remote site are defined as a UR pair.
- The P-VOL and S-VOL are defined as an SI pair in the remote site.

1. Register a task to be executed using the CLI by running the Change Pair Status Wizard.
   The following tasks need to be registered:
   - A task that performs a resync operation of an SI pair
   - A task that performs a split operation of an SI pair
   - A task that performs a syncwait operation for the P-VOL of a UR copy group
   Select the CLI option in the Set Schedule screen for each task. For more information, see [Changing the copy pair status for each copy pair on page 10-127](#).

2. Create a script file to perform data backup linking with an application:
   a. Execute a task that performs a resync operation for an SI pair using the Replication Manager CLI.
b. Quiesce the application.

c. Execute a task that performs a syncwait operation for a UR pair using the Replication Manager CLI.

d. Execute a task that performs a split operation for an SI pair.

e. Release the application from the quiesced state.

3. Execute the task CLI script on the management server. (See Sample Windows script on page 27-11 for a partial example that demonstrates steps 2a, c, and d.)

   Use task scheduling software (such as the Windows Task Scheduler) to execute the script.

4. Confirm the result of the task execution using the Replication Manager GUI.

   In the Task subwindow, click the taskID of the task executed by Replication Manager CLI to open the Task History dialog.

   Use the Replication Manager GUI if you want to edit, cancel, or delete a task.

Sample Windows script

The following script includes an example of executing a single task and confirming the execution. (A complete script requires the execution of multiple tasks and quiesce operations.) You must replace user-id, password, task-ID with the appropriate values.

```batch
rem change current folder
cd "%Program Files%\HiCommand\ReplicationManager\RpMCLI"
rem executing pair operation task
call ExecuteTask.bat -u user-id -p password taskID=task-ID
set cmdRetVal=%errorlevel%
if not "%cmdRetVal%"=="0" (rem an error occur
   echo Error!!
   exit /b 1)
rem Confirming the result of pair operation task
call GetTasks.bat taskID=task-ID retryInterval=5 retryCount=12
set cmdRetVal=%errorlevel%
if not "%cmdRetVal%"=="104" (rem an error occur
   echo Error!!
   exit /b 1)
rem Normal termination
exit /b 0
```

Adjusting the interval for confirming status

If you need to consider the time to quiesce the application and minimize the execution time of the task, you should adjust the retry interval time for confirming the task status (as defined in properties files). The following table lists the recommended adjustments according to the copy pair operation and processing time of the CCI command.
Note: In consideration of the load concerning the management server, we recommend using the default properties file values unless your copy pair operation matches the conditions set forth in the table.

<table>
<thead>
<tr>
<th>CCI command and duration</th>
<th>Method of adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>split:</strong> When the processing time of the <code>pairsplit</code> command is approximately 100-120 seconds.</td>
<td>Set the <code>hdvmagtif.PollingInterval</code> property of the <code>agentif.properties</code> file to 5-15 (seconds). (The default is 30.)</td>
</tr>
<tr>
<td><strong>syncwait:</strong> When you intend to set the timeout to approximately 100-120 seconds.</td>
<td></td>
</tr>
<tr>
<td><strong>resync:</strong> When the time from executing the <code>pairresync</code> command to when the pair status is changed to PAIR is less than 150 seconds.</td>
<td>Set the <code>base.taskscheck.interval</code> property of the <code>base.properties</code> file to 30-60 (seconds). (The default is 120.)</td>
</tr>
<tr>
<td><strong>restore:</strong></td>
<td></td>
</tr>
<tr>
<td>If the copy type is local: When the time from executing the <code>pairresync -restore</code> command to when the pair status is changed to PAIR is less than 180 seconds.</td>
<td></td>
</tr>
<tr>
<td>If the copy type is remote: When the time executing the <code>pairresync -swapp</code> command to when the pair status is changed to PAIR is less than 180 seconds.</td>
<td></td>
</tr>
</tbody>
</table>

You must restart Replication Manager after changing property values. For details about editing the property file and restarting Replication Manager, see the *Hitachi Command Suite Replication Manager Configuration Guide*. 
This appendix provides a listing of icons and their descriptions.

- Icons for executing operations
- Icons for executing screen operations
- Icons representing copy pair statuses
- Icons representing the management target
Icons for executing operations

Clicking an icon for executing an operation displays a dialog box or wizard. The following table lists and describes the icons for executing operations:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Starts a wizard for changing the pair status. The icon is called Change Pair Status." /></td>
<td>Starts a wizard for changing the pair status. The icon is called <em>Change Pair Status</em>.</td>
</tr>
<tr>
<td><img src="image" alt="Displays a dialog box for editing the settings. This icon is disabled when the settings cannot be edited. The icon is called Edit." /></td>
<td>Displays a dialog box for editing the settings. This icon is disabled when the settings cannot be edited. The icon is called <em>Edit</em>.</td>
</tr>
<tr>
<td><img src="image" alt="Displays a dialog box for checking alert settings and detailed event log information. The icon is called Detail." /></td>
<td>Displays a dialog box for checking alert settings and detailed event log information. The icon is called <em>Detail</em>.</td>
</tr>
</tbody>
</table>

Icons for executing screen operations

You can change the display range of areas by clicking an icon for executing a screen operation. The following table lists the icons for executing screen operations:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="From the Pair Configuration Wizard 2. Pair Association, you can use this icon to increase the display range of Pair List." /></td>
<td>From the Pair Configuration Wizard <em>2. Pair Association</em>, you can use this icon to increase the display range of <em>Pair List</em>.</td>
</tr>
<tr>
<td><img src="image" alt="From the Pair Configuration Wizard 2. Pair Association, you can use this icon to increase the display range of all areas in Detail of pair-group-name and the displayed buttons." /></td>
<td>From the Pair Configuration Wizard <em>2. Pair Association</em>, you can use this icon to increase the display range of all areas in <em>Detail of pair-group-name</em> and the displayed buttons.</td>
</tr>
<tr>
<td><img src="image" alt="From the Pair Configuration Wizard 2. Pair Association, you can use this icon to increase the display range of Volume Selection." /></td>
<td>From the Pair Configuration Wizard <em>2. Pair Association</em>, you can use this icon to increase the display range of <em>Volume Selection</em>.</td>
</tr>
</tbody>
</table>

Icons representing copy pair statuses

Replication Manager uses the following icons to indicate copy pair statuses.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Copy pair status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="error" /></td>
<td>error</td>
<td>An error has occurred in the copy pair.</td>
</tr>
<tr>
<td><img src="image" alt="suspend" /></td>
<td>suspend</td>
<td>The copy pair is in the split status.</td>
</tr>
<tr>
<td><img src="image" alt="copying" /></td>
<td>copying</td>
<td>The copy pair is under forward or backward copy processing.</td>
</tr>
<tr>
<td><img src="image" alt="sync" /></td>
<td>sync</td>
<td>The copy pair is synchronized.</td>
</tr>
<tr>
<td><img src="image" alt="simplex" /></td>
<td>simplex</td>
<td>There is copy pair definition information, but there is no actual copy pair configuration.</td>
</tr>
<tr>
<td><img src="image" alt="unknown" /></td>
<td>unknown</td>
<td>Replication Manager cannot determine the pair status due to any of the following reasons:</td>
</tr>
</tbody>
</table>
Icons representing the management target

The icons representing the management target are displayed in the navigation area and the application area. The following table lists and describes the icons that represent the management target:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Icon" /></td>
<td>Indicates a root node in the Hosts view.</td>
</tr>
<tr>
<td><img src="image2" alt="Icon" /></td>
<td>Indicates a host in a mainframe system.</td>
</tr>
<tr>
<td><img src="image3" alt="Icon" /></td>
<td>Indicates a host in an open system.</td>
</tr>
<tr>
<td><img src="image4" alt="Icon" /></td>
<td>Indicates a root node in the Storage Systems view.</td>
</tr>
<tr>
<td><img src="image5" alt="Icon" /></td>
<td>Indicates a storage system in a mainframe system.</td>
</tr>
<tr>
<td><img src="image6" alt="Icon" /></td>
<td>Indicates a storage system in an open system.</td>
</tr>
<tr>
<td><img src="image7" alt="Icon" /></td>
<td>Indicates a port.</td>
</tr>
<tr>
<td><img src="image8" alt="Icon" /></td>
<td>Indicates a Host Group.</td>
</tr>
<tr>
<td><img src="image9" alt="Icon" /></td>
<td>Indicates a CU.</td>
</tr>
<tr>
<td><img src="image10" alt="Icon" /></td>
<td>Indicates a prefix.</td>
</tr>
<tr>
<td><img src="image11" alt="Icon" /></td>
<td>Indicates a copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image12" alt="Icon" /></td>
<td>Indicates a reserved copy group or snapshot group.</td>
</tr>
<tr>
<td><img src="image13" alt="Icon" /></td>
<td>Indicates a root node in the Pair Configurations view.</td>
</tr>
<tr>
<td><img src="image14" alt="Icon" /></td>
<td>Indicates a configuration definition file for Command Control Interface (CCI).</td>
</tr>
<tr>
<td><img src="image15" alt="Icon" /></td>
<td>Indicates a copy group container.</td>
</tr>
<tr>
<td><img src="image16" alt="Icon" /></td>
<td>Indicates a copy pair.</td>
</tr>
<tr>
<td><img src="image17" alt="Icon" /></td>
<td>Indicates a newly created copy pair.</td>
</tr>
<tr>
<td><img src="image18" alt="Icon" /></td>
<td>Indicates an edited copy pair.</td>
</tr>
<tr>
<td>Icon</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="image1" alt="Icon" /></td>
<td>Indicates a deleted copy pair.</td>
</tr>
<tr>
<td><img src="image2" alt="Icon" /></td>
<td>Indicates a reserved copy pair.</td>
</tr>
<tr>
<td><img src="image3" alt="Icon" /></td>
<td>Indicates a hundred LUs.</td>
</tr>
<tr>
<td><img src="image4" alt="Icon" /></td>
<td>Indicates an LU.</td>
</tr>
<tr>
<td><img src="image5" alt="Icon" /></td>
<td>Indicates a reserved LU.</td>
</tr>
<tr>
<td><img src="image6" alt="Icon" /></td>
<td>Indicates an LDEV.</td>
</tr>
<tr>
<td><img src="image7" alt="Icon" /></td>
<td>Indicates a reserved LDEV.</td>
</tr>
<tr>
<td><img src="image8" alt="Icon" /></td>
<td>Indicates a root node in the site.</td>
</tr>
<tr>
<td><img src="image9" alt="Icon" /></td>
<td>Indicates a workflow.</td>
</tr>
<tr>
<td><img src="image10" alt="Icon" /></td>
<td>Indicates an Exchange root node of an application group.</td>
</tr>
<tr>
<td><img src="image11" alt="Icon" /></td>
<td>Indicates a parent node of an Exchange Server</td>
</tr>
<tr>
<td><img src="image12" alt="Icon" /></td>
<td>Indicates an Exchange Server (physical server).</td>
</tr>
<tr>
<td><img src="image13" alt="Icon" /></td>
<td>Indicates an Exchange Server (virtual server).</td>
</tr>
<tr>
<td><img src="image14" alt="Icon" /></td>
<td>Indicates an Exchange 2007 storage group.</td>
</tr>
<tr>
<td><img src="image15" alt="Icon" /></td>
<td>Indicates an information store (Mailbox, Public Folder) of Exchange.</td>
</tr>
<tr>
<td><img src="image16" alt="Icon" /></td>
<td>Indicates a created Replica (the data that was backed up at a specified time).</td>
</tr>
</tbody>
</table>
Exceptions

This appendix provides information about complex system configuration scenarios.

- Cautionary notes for the GUI display
- When multiple Replication Manager servers manage the same information source
- When Replication Manager handles multiple prefixes (mainframe systems)
Cautionary notes for the GUI display

Certain cautionary notes exist for the GUI. Before starting operations, review the following related information:

- When the copy pair configuration does not match definition information on page B-2
- When the copy pair configuration is complex on page B-5
- When the displayed information depends on the system configuration on page B-7

When the copy pair configuration does not match definition information

In Replication Manager, the copy pair configuration displayed in the Hosts view or Storage Systems view sometimes differs from the definition information displayed in the pair configurations view. The following explains the difference for open systems and mainframe systems.

For open systems

In the Hosts view or Storage Systems view, volumes to which paths have been specified are displayed in either the Paired or Unpaired list. The volumes constituting copy pairs are displayed in the Paired list and the other volumes are displayed in the Unpaired list. However, the volumes constituting copy pairs in simplex status are displayed in the Unpaired list, because they have been defined, but not yet created.

In the pair configurations view, configuration definition information, including the information about the copy pairs in simplex status, is displayed based on what is defined in the configuration definition file. However, for Replication Manager to be able to manage existing copy pairs, the following conditions must be satisfied:

- A CCI configuration definition file must be present.
  If a copy pair is created using storage system operation management software (such as Storage Navigator) and there is no configuration definition file, configuration definition information is not displayed in the pair configurations view.

- The CCI configuration definition file must be stored in the following default directory:
  Windows: system-folder (the folder represented by the %windir% environment variable)
  Systems other than Windows: /etc-directory

- When more than one copy pair is set to a single volume (when a multi-target or cascade configuration is being used), each combination of a copy group name and copy pair name defined in the configuration definition file must be unique.
- The copy group name and copy pair name defined in the configuration definition file on a primary volume must match the copy group name and copy pair name defined in the configuration definition file on the secondary volume.

- When the pair management server is managing multiple copy pairs, every port number, copy group name, and copy pair name combination defined in the configuration definition file must be unique in the pair management server.

- The settings specified in the configuration definition file must be within the ranges supported by the Device Manager agent.

Depending on the version of Device Manager agent you are using, there are a number of limitations that apply to the specification format and settings in the CCI configuration definition file. The range of specification formats (in the configuration definition file) that are supported by CCI are the same as the range supported by Device Manager. For details about the specification settings supported in configuration definition files, see the Hitachi Command Suite Administrator Guide.

To view an example configuration in which copy groups containing copy pairs in simplex status and a configuration definition file exist, see Configuration in which copy groups containing copy pairs in simplex status and a configuration definition file exist (open systems) on page B-3.

**For mainframe systems**

In the Hosts view or Storage Systems view, only the paired volumes (the volumes constituting copy pairs) belonging to the host or storage system are displayed. However the volumes constituting copy pairs in simplex status are not displayed, because they are nominal copy pairs and do not exist.

In the pair configurations view, configuration definition information, including the information about the copy pairs in simplex status, is displayed based on the copy group definition file (prefix). However, if a copy pair is created using storage system operation management software (such as Storage Navigator) and there is no copy group definition file, the configuration definition information is not displayed in the pair configurations view.

To view an example configuration in which two copy group definition files are used for the same copy group (for mainframe systems), see Example configuration in which two copy group definition files are used for the same copy group (for mainframe systems) on page B-4.

**Configuration in which copy groups containing copy pairs in simplex status and a configuration definition file exist (open systems)**

In this example, copy groups containing copy pairs in simplex status and a configuration definition file exist. In the example, in the Hosts or Storage Systems view, volumes 5:11 and 4:88, which belong to copy group CG.TCA01, are displayed in the Paired list, and volumes 6:11 and 5:88, which belong to copy group CG.TCA02, are displayed in the Unpaired list. In
the pair configurations view, information about both copy groups \texttt{CG.TCA01} and \texttt{CG.TCA02} is displayed.

**Example configuration in which two copy group definition files are used for the same copy group (for mainframe systems)**

In this example, the definition files applied during the day and at night (for backup operation) are used for the same copy group. In the example, in the Hosts view or Storage Systems view, two copy group names (\texttt{CG.TCA01} and \texttt{CG.TCA02}) are displayed because two definition files are valid for the same copy group. In the pair configurations view, a copy group is displayed for each definition file (\texttt{CG.TCA01} as Prefix-A, and \texttt{CG.TCA02} as Prefix-B).
When the copy pair configuration is complex

For a complex configuration, such as one in which a copy group has two primary volumes, copy group configuration information cannot be displayed when copy groups are displayed in list format, as they are in the pair configurations view.

The following are specific examples:

- When two configuration definition files defining an opposite relationship of primary and secondary volumes are used for one copy group
  To view an illustration, see Example of complex cascade configuration 1 on page B-5.

- In a cascade configuration consisting of a primary volume, primary-secondary volume, and secondary volume, the primary volume and secondary volume are paired in the same copy group (the two pair relationships are defined in the same copy group).
  To view an illustration, see Example of complex cascade configuration 2 on page B-6.

Example of complex cascade configuration 1

The following figure shows an example of this configuration. Configuration definition file A defines copy group A as the primary volume and copy group B
as the secondary volume. On the other hand, configuration definition file B defines copy group B as the primary volume and copy group A as the secondary volume.

**Example when two configuration files define an opposite relationship of primary and secondary volumes for the same copy group**

![Diagram showing opposite relationship]

**Legend:**
- - - - - - - - : Data flow from primary volume to secondary volume

**Example of complex cascade configuration 2**

**Example of when two pairs in a cascade configuration are defined in the same copy group**

![Diagram showing complex cascade configuration]

**Legend:**
- - - - - - - - : Data flow from primary volume to secondary volume
When the displayed information depends on the system configuration

In Replication Manager, displayed information might be limited by the system configuration. The following describes such limitations separately for open systems and mainframe systems.

For open systems

In open systems, if a Device Manager agent is not installed on a host, the IP address and mount point of the host cannot be obtained and therefore are not displayed.

Tip: It is assumed that each Device Manager server has been registered as an information source of Replication Manager and that the pair management servers and hosts have been registered in the Device Manager server at each site.

For mainframe systems

In mainframe systems, if the storage systems connected to a host have been registered in a Device Manager server, and that server has been registered as an information source of Replication Manager, you can view detailed information about the storage systems.

However, if the connected storage systems have not been registered in a Device Manager server, or if such a server has not been registered as an information source of Replication Manager, displayed information is limited as follows.

<table>
<thead>
<tr>
<th>Information for which display is limited</th>
<th>Displayed information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage system name/type</td>
<td>This information is displayed as the family name of the storage system (USP_V, VSP, VSP G1000, VSP G1500, and VSP F1500).</td>
</tr>
<tr>
<td>Journal volume usage rate</td>
<td>The JNLGs Tab is not displayed</td>
</tr>
<tr>
<td>Copy license information</td>
<td>No Object</td>
</tr>
</tbody>
</table>

In addition, if Mainframe Agent has been registered as an information source in a mainframe system, you can only monitor copy pairs created using PPRC. Information displayed about the PPRC copy pairs is limited as follows.

<table>
<thead>
<tr>
<th>Information whose display is limited</th>
<th>Displayed information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the storage system to which the secondary volume belongs</td>
<td>n/a</td>
</tr>
<tr>
<td>Sidefile usage rate on the secondary volume side (for TrueCopy Async)</td>
<td>n/a</td>
</tr>
<tr>
<td>Information about the secondary volume (DEVN) (hosts view)</td>
<td>This information is not displayed in the list of DEVNs.</td>
</tr>
</tbody>
</table>
Example configuration in which data is remotely copied between multiple sites (for open systems)

<table>
<thead>
<tr>
<th>Information whose display is limited</th>
<th>Displayed information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about the secondary volume (LDEV) (Storage Systems view)</td>
<td>n/a</td>
</tr>
<tr>
<td>Information about the storage system to which the secondary volume belongs (Storage Systems view)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Legend:
- : Copy pair
- : Registration in Replication Manager or Device Manager
When multiple Replication Manager servers manage the same information source

In configurations where multiple Replication Manager servers manage the same information source (HDvM / BCM), the servers cannot simultaneously monitor and manage pairs. If different servers issue simultaneous processing requests to an HDvM Agent or BCM Agent associated with an information source, there is a possibility for errors during HDvM Agent or BCM Agent processing.

In such configurations where Replication Manager is to be set up on both the local (operating) site and remote (standby) site in order to prepare for disaster recovery, we recommend that the status of Replication Manager server on the standby site be set to maintenance mode. If the status is not set to maintenance mode, an error might occur on either the operating site or the standby site, when Replication Manager instances on the both of these sites attempt to perform operations simultaneously on the information source.

When Replication Manager handles multiple prefixes (mainframe systems)

Replication Manager allows you to confirm, define and operate copy pairs for multiple prefixes concurrently. On the Hosts or Storage Systems view you can confirm DEVNs and LDEVs without specifying or identifying the prefix. During pair configuration, Replication Manager prohibits selection of P-VOLs / S-VOLs from multiple prefixes on a mainframe host.

To avoid conflicts when managing multiple prefixes, Replication Manager does not allow volumes that were already scanned and stored to the disk configuration definition file to be added as the volume range. When a volume scanned by multiple prefixes is discovered, Replication Manager displays the prefixes in the Hosts view, allowing you to identify duplication of prefixes.
Display formats

This appendix provides information on supported display formats.

- Display formats used when no pertinent information is available
- Display format of multi-valued information items for a management target
- Display format of copy type
- About volume attributes
Display formats used when no pertinent information is available

If no pertinent information is available, several items are displayed in the GUI depending on the context:

No object

Indicates that Replication Manager cannot acquire the information because the information source does not exist.

In this case, the connection with the information source must be re-established.

n/a

Indicates that Replication Manager cannot acquire or has not acquired the pertinent information due to either of the following reasons:

- Replication Manager cannot acquire the information because of a restriction on the current system configuration of Replication Manager (for example, the Device Manager agent is not available). It is unknown whether the information source contains pertinent information.

**Tip:** If Replication Manager fails to acquire the mount point information (a type of information that should be acquired using the Device Manager agent), for example, because the Device Manager agent does not exist, this item is blank when displayed in the GUI.

In this case, the system configuration of Replication Manager must be changed so that the pertinent information can be acquired.

- Replication Manager has not acquired the pertinent information about items added during the upgrade of Replication Manager.
  In this case, update the copy pair configuration information.

(Rectangle icon)

Indicates that Replication Manager cannot acquire pertinent information because the information is not contained in the information source.

Before this information can be displayed, the information source system configuration must be edited so that the information source can display the information.

unsupported

Indicates that this version of Replication Manager does not support the acquisition or display of the information.

- (hyphen)

Indicates that no value is specified for the configuration information managed by Replication Manager.
Before this information can be displayed, a value must be specified for the information in Replication Manager. (This does not apply to hyphens contained in license information.)

Blank

Indicates that Replication Manager acquired blank information from the information source.

(Unknown icon) or Unknown

(For the summary copy pair status, the Unknown icon is displayed. For the copy pair state, Unknown is displayed.)

Indicates that Replication Manager cannot determine the pair status due to any of the following reasons (unknown):

• The settings are set not to acquire copy pair statuses.
• The configuration does not allow copy pair statuses to be acquired.
• The configuration information has already been acquired, but the copy pair information has not.

To display this information, you need to perform the corresponding operation as follows:

• If the settings are set not to acquire copy pair statuses, change the setting so that the desired information can be acquired.
• If the configuration does not allow copy pair statuses to be acquired, change the configuration.
• If the copy pair information has not yet been acquired, refresh the copy pair status.

Display format of multi-valued information items for a management target

For a specific management target, a single information item might have multiple values. In this case, each value is separated by a comma (,) or a line feed.

For example, when several mount points have been specified using Volume Manager, multiple values are displayed for the mount point information in the dialog box that displays detailed information. Similarly, when a single LU is shared among multiple hosts, multiple values are displayed for host information. In such cases, the information is displayed on a separate line for each host, and the mount points for each host are comma-separated and displayed on one line.
Example of displayed information items (LUN, Copy type, mount point, and host)

<table>
<thead>
<tr>
<th>LUN</th>
<th>Copy type</th>
<th>Mount point</th>
<th>Host</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUN1</td>
<td>TCS</td>
<td>/mnt,/mnt2</td>
<td>Host_A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>/mnt,/mnt2</td>
<td>Host_B</td>
</tr>
<tr>
<td>LUN2</td>
<td>TCS</td>
<td>/mnt,/mnt2</td>
<td>Host_A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>/mnt,/mnt2</td>
<td>Host_B</td>
</tr>
</tbody>
</table>

Display format of copy type

The copy type is displayed using an abbreviation. The following table shows the copy types and the display formats supported by Replication Manager.

<table>
<thead>
<tr>
<th>Display format in GUI</th>
<th>Copy type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI</td>
<td>ShadowImage</td>
</tr>
<tr>
<td>TCA</td>
<td>TrueCopy Async</td>
</tr>
<tr>
<td>TCA / TCE</td>
<td>TrueCopy Async or TrueCopy Extended Distance</td>
</tr>
<tr>
<td>TCS</td>
<td>TrueCopy Sync</td>
</tr>
<tr>
<td>COW / TI</td>
<td>Copy-on-Write Snapshot/Thin Image</td>
</tr>
<tr>
<td>TI (Snapshot Group)</td>
<td>Thin Image (for snapshot group pair)</td>
</tr>
<tr>
<td>UR</td>
<td>Universal Replicator</td>
</tr>
<tr>
<td>UR (3DC Delta Resync)</td>
<td>Universal Replicator (when 3DC delta resync is supported)</td>
</tr>
<tr>
<td>GAD</td>
<td>global-active device</td>
</tr>
</tbody>
</table>

About volume attributes

Volume attributes are obtained from Device Manager and displayed in Replication Manager dialogs used to view or select volumes.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUARD</td>
<td>Volume in guard mode</td>
</tr>
<tr>
<td>CVS</td>
<td>Customized Volume Size volume</td>
</tr>
<tr>
<td>LUSE</td>
<td>Logical Unit Size Expansion volume</td>
</tr>
<tr>
<td>DP-VOL</td>
<td>Dynamic Provisioning volume</td>
</tr>
<tr>
<td>DP-Pool-VOL</td>
<td>Dynamic Provisioning pool volume</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>POOL</td>
<td>Pool volume</td>
</tr>
<tr>
<td>Compression</td>
<td>Volume with compression function (dedup and compression) enabled</td>
</tr>
<tr>
<td>Deduplication</td>
<td>Volume with deduplication function (dedup and compression) enabled</td>
</tr>
<tr>
<td>V-VOL</td>
<td>Virtual volume</td>
</tr>
<tr>
<td>JNL-VOL</td>
<td>Journal volume (open systems)</td>
</tr>
<tr>
<td>MF-JNL</td>
<td>Journal volume (mainframe systems)</td>
</tr>
<tr>
<td>EXTERNAL</td>
<td>External volume</td>
</tr>
<tr>
<td>DMLU</td>
<td>Differential Management LUN volume</td>
</tr>
<tr>
<td>Encrypted</td>
<td>Encrypted volume</td>
</tr>
<tr>
<td>Encrypted (partial)</td>
<td>LUSE volume including LDEVs that are encrypted and non-encrypted.</td>
</tr>
<tr>
<td>Quorum Disk</td>
<td>Volume for a Quorum Disk in High Availability Manager</td>
</tr>
<tr>
<td>UVM-VOL</td>
<td>Internal volume to which an external volume is mapped.</td>
</tr>
<tr>
<td>ALU</td>
<td>ALU attribute volume</td>
</tr>
<tr>
<td>SLU</td>
<td>SLU attribute volume</td>
</tr>
<tr>
<td>PoolOnly</td>
<td>PoolOnly attribute volume</td>
</tr>
<tr>
<td>Data Direct Mapping</td>
<td>Data Direct Mapping attribute volume</td>
</tr>
<tr>
<td>NAS Platform (System LU)</td>
<td>System volume of VSP Gx00 models or VSP Fx00 models equipped with an NAS module</td>
</tr>
<tr>
<td>NAS Platform (User LU)</td>
<td>User volume of VSP Gx00 models or VSP Fx00 models equipped with an NAS module</td>
</tr>
</tbody>
</table>
This glossary defines the special terms used in this document. Click the desired letter below to display the glossary entries that start with that letter.

#

3DC Multi-target configuration
A configuration in which, in addition to the local site, a connection is established between a nearby remote site and a distant remote site and TrueCopy Sync and Universal Replicator are used to copy storage system volumes among the three sites (called a data center). Such a configuration provides support for disaster recovery through the use of data at the distant remote site. If the delta resync function is used between the nearby and distant remote sites, journal-copying of only the minimum data required is performed following a failure, which minimizes the recovery time.

B

backup (replica) catalog
The backup catalog stores the replica history and the information pertaining to generational backups. When a backup is performed, a new record that contains information about the backup is created in the backup catalog. When restoring data from a backup, Replication Manager references the information in the backup catalog. Information stored in the backup catalog includes the following:
Backup start date and time
Backup source information
Backup destination information
batch collection command for maintenance information
Software that collects necessary information, such as log files and properties files that are related to a problem that cannot be resolved at the user level, for forwarding to customer support.

BCM (Business Continuity Manager)
Software used to control a storage system from a host in a mainframe system. By using Business Continuity Manager to issue commands from the host to the storage system, you can acquire copy pair configuration and status information. Replication Manager manages copy pair configuration and status in conjunction with Business Continuity Manager.

cascade structure
A structure of consecutive copy pairs. In a cascade structure, the secondary volume of one copy pair is the primary volume of another copy pair. This volume is called a secondary/primary volume (SP-VOL).

CCI
Command Control Interface. Software used to control volume replication functionality (such as TrueCopy or ShadowImage) by means of commands issued from a host to a storage system. A command device must be set up in the storage system to enable the storage system to receive commands from CCI. In an open system, Replication Manager uses the CCI configuration definition files to modify copy pair configurations and to acquire configuration information. Copy pair modification processing, such as splitting and re-synchronizing copy pairs, is executed on the storage system by CCI.

CLI
Command Line Interface

CLPR
Cache Logical Partition

cluster configuration
In a Replication Manager operating environment, the term cluster configuration refers to a configuration that consists of an executing node and a standby node, each of which includes a duplicate management server.

cluster software
Software installed on management server nodes to boost overall availability by duplicating management servers as a cluster system. Available software depends on the OS that runs on the management server.
configuration definition file
The text file which defines connected hosts and the volumes and groups known to the CCI instance. Physical volumes (special files) used independently by the hosts are combined when paired logical volume names and group names are given to them. The configuration definition file establishes the correspondence between the physical volumes used by the hosts, the paired logical volumes and the names of the remote hosts connected to the volumes. Also referred to as a CCI configuration definition file or HORCM configuration definition file.

consistency group
A group used as a unit in TrueCopy, Universal Replicator, Thin Image, or global-active device that maintains integrity of the update order for volumes.

copy group
A group of copy pairs. You can perform operations, such as modifying pair statuses, on all the copy pairs in the group.

copy group configuration definition
A list of copy pairs. In a mainframe environment, it refers to a file containing a list of copy pairs managed by Business Continuity Manager. The data in the file is created or added to when a copy pair is defined. The file name matches the copy group. In an open system environment, it is also referred to as copy pair configuration definition.

copy group container (container)
A collection of copy groups (consistency groups) available only in a mainframe environment.

copy group list
A list of copy group configuration definitions.

Copy-on-Write Snapshot
Software used to duplicate volumes in a single storage system. Copy-on-Write Snapshot duplicates differential data in a data pool. The secondary volume is a virtual volume that consists of the primary volume and the differential data. By duplicating only the differential data, Copy-on-Write Snapshot can copy data in a very short time as well as reduce the capacity required of the volume used for duplication. For more information, see the Copy-on-Write Snapshot manuals.

Copy-on-Write Snapshot Pool
Object within a storage storage system that provides storage regions to zero or more V-VOLs (made up of one or more LDEVs).

copy pair
Denotes a primary and secondary volume pair linked by the volume replication functionality of a storage system. Also called paired volumes. In this manual, copy pair is sometimes referred to simply as a pair.
**copy pair state**
A value that represents the status of both a primary volume and a secondary volume. The copy pair state displayed in Replication Manager corresponds to the copy pair status displayed in prerequisite products (such as Device Manager, CCI, and Business Continuity Manager) and in storage system operation management software (such as Storage Navigator and Storage Navigator Modular).

**copy pair status**
A value that represents the status of a copy pair. Six status values are defined in Replication Manager: error, suspend, copying, sync, simplex, and unknown. Each status is indicated by an icon. The copy pair status is determined by the combination of the copy pair states of the primary and secondary volumes. Also called pair status.

**copy progress**
Progress status of the volume replication functionality executed by the storage system. Replication Manager displays the copy progress, which depends on the copy pair status, for items that are Active or Inactive. For Active items, the copy progress is displayed when the copy pair status is copying or sync. For Inactive items, the copy progress is displayed when the copy pair status is error or suspend.

**CSV**
Comma Separated Value

**CU (Control Unit)**
A virtual control unit created in an enterprise-class storage system. Also called a CU image. The LDEVs created in a storage system are connected to a single CU, and a number is assigned to each CU for identifying its LDEVs. Therefore, volumes (LDEVs) in a storage system are specified by the CU number (CU#) and LDEV number.

**D**

**DAD (Device Address Domain)**
A DAD is a group of volumes that is managed by Business Continuity Manager. Volumes are registered in a DAD during a volume scan (discovery) by Business Continuity Manager. Depending on the type of volume scan, volumes are assigned the local DAD, Non Gen’ed DAD, or remote DAD attribute.

**DAD ID**
A name that identifies a DAD.

**dataset**
Defines the location for storing a file (a volume area accessible by applications) on the mainframe host and defines the attribute values of that file. Creation of a file on the mainframe host requires that a dataset be assigned in advance.
delta resync
A status in which synchronization processing is performed by copying differential data to a Universal Replicator copy pair in which part of the copy pair exists on the local site and part exists on a remote site in a 3DC Multi-Target configuration.

device group
An LDEV grouping function supported by Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, and HUS VM storage systems.

Device Manager
Software that enables integrated management of disk resources and the hardware configuration of storage systems. Device Manager can be used to operate and manage multiple storage systems.

DEVN (Device Number)
A device number that is assigned to identify an LDEV when it is being used by a mainframe system. A DEVN is expressed as a 4-digit hexadecimal number.

disk configuration definition file
A file containing a list of volumes managed by Business Continuity Manager. The data in the file is created or added to when volume discovery is performed. The file name matches the DADID.

disk list
A list of disk configuration definition files.

DKC
Disk Controller

DMLU
Differential Management LU

Dummy DEVN
A dummy DEVN is assigned by the user during a Non Gen'ed scan or remote scan. This information allows Business Continuity Manager to manage volumes to which no DEVNs have been assigned by the mainframe host.

E

Emulation Type
The types of LUs with varying attributes supported by the USP_V, VSP, VSP G1000, VSP G1500, VSP F1500, VSP G200, G400, G600, G800, VSP F200, F400, F600, F800, and HUS VM series. Also referred to as Emulation Mode.
Extended Consistency Group (EXCTG)
An attribute for maintaining data integrity between the copy pairs contained in
consistency groups. In principle, each copy group container is assigned this attribute.
This attribute ensures data integrity between P-VOLs and S-VOLs across multiple
storage systems. This attribute is available only in a mainframe environment.

F
FC
Fibre Channel
FMC
Flash Memory Compressed

G
GAD
Global-active device. A high-availability solution for Hitachi VSP G1000, VSP G1500,
VSP F1500, and VSP Gx00 storage systems. A GAD configuration comprises mirrored
volumes that accept read/write I/O on both the main and reserve sides. For more
information on GAD configuration and management, see the Global-Active Device User

Gen’ed Volume
A volume recognized by a mainframe host.

GUI
Graphical User Interface

H
HAM
High Availability Manager.

Hitachi Command Suite Common Component
A component that bundles common functions used by Hitachi Command Suite products.
Installed as part of Replication Manager, this component provides functions such as
single logon, integrated output of logs, commands for starting and stopping services, a
common GUI interface, and more.

HORCM Instance
The basic unit of CCI software structure. Each copy of a CCI on a server is a CCI
instance. Each instance uses a defined configuration file to manage volume relationships
while maintaining awareness of the other CCI instances. Each CCI instance normally resides on one server (one node). If two or more nodes are run on a single server (e.g., for test operations), it is possible to activate two or more instances using instance numbers. Also referred to as the CCI instance.

**host storage domain**
A group defined in Device Manager that is used to strengthen the security of volumes in storage systems. By associating and grouping hosts and volumes by storage system port, host storage domains can be used to restrict access from hosts to volumes. Device Manager defines the host groups set up with the storage system LUN security function as host storage domains. Host storage domains for storage systems that do not have host groups are defined in the same manner as if they had been set with the LUN security function.

**Host Group**
Host Storage Domain

**HTML**
HyperText Markup Language

**HTTP**
HyperText Transfer Protocol

**HTTPS**
HyperText Transfer Protocol Security

**HUS VM**
Hitachi Unified Storage VM.

**HyperDelta/Hyperswap**
A synchronous Peer to Peer Remote Copy (PPRC) technology for use within a single data center. Data is copied from the primary storage device to a secondary storage device. In the event of a failure on the primary storage device, the system automatically makes the secondary storage device the primary, usually without disrupting running applications. (HyperDelta is the Hitachi nomenclature for this technology.)

**I**

**IHS**
IBM HTTP Server

**information source**
Replication Manager manages information about the copy pairs managed by Device Manager servers, instances of Business Continuity Manager, or instances of Mainframe Agent installed at a number of different sites. These programs provide information to Replication Manager and are called *information sources*. 
IP
   Internet Protocol

iSCSI
   Internet Small Computer System Interface

L

LAN
   Local Area Network

LDAP
   Lightweight Directory Access Protocol

LDEV (Logical DEVICE)
   A volume created in a storage system known as an LDEV (logical device) in both mainframe and open systems.

LDKC
   Logical Disk Controller

Local Scan
   A volume scan that Business Continuity Manager can perform on Gen'ed volumes. The local DAT attribute is assigned to the disk configuration definition file in which the discovered volumes are stored.

Local Device Manager
   Device Manager on the management server on which Replication Manager resides.

LU (Logical Unit)
   A volume created in a storage system - known as an LU (logical unit) in an open system. Volumes created on midrange storage systems, however, are called LDEVs in Replication Manager.

LUN (Logical Unit Number)
   A management number assigned to an LU in a storage system. A LUN is a number assigned to identify an LU for the port in the storage system to which the LU is connected, either by the port or by the host group assigned to the port. An open system host uses a LUN to access a particular LU.

LUSE
   LU Size Expansion
Mainframe Agent
Software used to acquire information about mainframe system hosts and storage systems. In conjunction with Mainframe Agent, Replication Manager monitors configuration and status information about copy pairs created using PPRC.

MCU
Main Control Unit

MFA
Mainframe Agent

MIB (Management Information Base)
A database that defines the structure of information used by SNMP. The MIB used for Replication Manager defines the information set for alerts, such as monitored targets, conditions, and messages.

multi-target configuration
A copy pair configuration with a one-to-many relationship between the primary and secondary volumes. Information from one volume is copied to multiple volumes.

N

NAS
Network Attached Storage

NIC
Network Interface Card

N:1 configuration
A configuration in which multiple configuration definition files are managed by the primary volume server and one definition configuration file is managed by the secondary volume server.

N:N configuration
A configuration in which multiple configuration definition files are managed by both the primary volume server and the secondary volume server.

Non-Gen’ed Scan
A volume scan that can be performed on Non Gen’ed volumes within the site where Business Continuity Manager resides. The Non Gen’ed DAD attribute is assigned to the disk configuration definition file in which the discovered volumes are stored.
Non-Gen’ed Volume
A volume that is not recognized by a mainframe host.

O

OS
Operating System

P

pair
In this manual, pair means copy pair.

pair status
Indicates the current status of the copy pair. Replication Manager uses six status values: error, suspend, copying, sync, simplex, and unknown. Pair status is also called copy pair status.

paired volumes
Denotes a primary and secondary volume pair linked by the volume replication functionality of a storage system. Also called a copy pair. In this manual, copy pair is sometimes written simply as pair.

PPRC
Peer-to-Peer Remote Copy

prefix
The prefix portion of a copy group definition file (prefix.GRP.copy-group-id) created by Business Continuity Manager or Mainframe Agent. Copy group definition files are created individually by prefix, so Replication Manager uses this prefix as a unique name to identify copy group definition files created by Business Continuity Manager or Mainframe Agent.

P-VOL (primary volume)
The source volume that is copied to another volume using the volume replication functionality of a storage system.

property files
Generic term for the files that define the Replication Manager operating environment. The Replication Manager operating environment can be modified by changing the appropriate property files.
Quorum Disk
A GAD configuration includes a Quorum Disk to determine the owner node in case of failure of the primary or secondary storage system, allowing operations to continue without interruption.

RACF (Remote Access Control Facility)
Functionality for controlling user authentication and resource access on the mainframe host.

RADIUS
Remote Authentication Dial In User Service

Remote Device Manager
A Device Manager server that is managed by Replication Manager as an information source, but is running on a on a different management server from Replication Manager. A Device Manager server running at the primary site can also be a remote Device Manager if it is running on a management server that is not running Replication Manager.

RCU
Remote Control Unit

refresh
The term refresh refers to updating the database that is maintained by Replication Manager using the most recent information. This database stores copy pair configuration information and copy pair status information obtained from Device Manager servers, Device Manager agents, Business Continuity Manager, and Mainframe Agent.

remote path
A logical path linking storage systems that is used for remote copying (replication of volumes between storage systems). In this manual, logical path is a generic term for a path that links the local storage system MCU (or primary DKC) with the remote storage system RCU (or secondary DKC) in enterprise-class storage systems, as well as linking the local storage system with the remote system on midrange storage systems.

Remote Scan
A volume scan that can be performed on Non Gen'ed volumes outside the site where Business Continuity Manager resides. The remote DAD attribute is assigned to the disk configuration definition file in which the discovered volumes are stored.
Route List
A list that defines the relationship of the connections between the command devices in storage systems and that indicates the routes of commands issued by Business Continuity Manager. This list is required for performing operations such as remote scans by a command device.

S
SAN
Storage Area Network
SATA
Serial ATA

Snapshot Group
A group of pairs created using Copy-on-Write Snapshot/Thin Image. Use of a snapshot group allows the same operation to be applied to more than one pair at a time. Like device groups, snapshot groups are managed in the storage system rather than the configuration definition file.

SP-VOL (secondary-primary volume)
The volume located in the middle of a cascade structure, when a cascade structure is used by the volume replication functionality of a storage system. Indicates the secondary volume in an upper level copy pair or the primary volume in a lower level copy pair.

S-VOL (secondary volume)
The copy destination volume of two volumes that are associated in a copy pair by a storage system volume replication functionality.

SNMP
Simple Network Management Protocol

SSD
Solid State Drive

SSL
Secure Sockets Layer

storage system
An external storage device (storage system) connected to a host.

summary pair status
By displaying only the summary status for the copy pairs in each copy group, Replication Manager allows users to quickly check copy pair status. Replication Manager
determines the summary copy pair status for each copy function (such as ShadowImage and TrueCopy) in turn.

SVP
Service Processor

T

Thin Image
Software that has Copy-on-Write Snapshot functionality as well as Copy after Write functionality installed in Virtual Storage Platform, VSP G1000, VSP G1500, VSP F1500, VSP Gx00 models, VSP Fx00 models, or HUS VM. Thin Image creates a Thin Image pool that adapts the DP pool feature as a data pool. If necessary, you can also create the volume which is copied data of an entire volume instead of just the differential data.

TrueCopy
Software that duplicates volumes between storage systems. TrueCopy duplicates all data on the volumes. Three types of TrueCopy are provided: synchronous TrueCopy Sync, asynchronous TrueCopy Async, and asynchronous TrueCopy Extended Distance. For more information, see the TrueCopy manuals.

TrueCopy Modular Distributed (TCMD)
Software that provides the Fan-In/Fan-Out function of the AMS2000 and HUS100 series. Fan-In indicates that the cabinet connection is in an N:1 configuration. Fan-Out indicates that the cabinet connection is in a 1:N configuration.

U

Universal Replicator
Software that asynchronously duplicates multiple volumes between storage systems. Universal Replicator temporarily stores differential data on a journal volume and then duplicates the data. Universal Replicator can duplicate data on remote sites; it can also be used to create 3DC multi-target and cascade configurations among multiple sites. For more information, see the Universal Replicator manuals.

UR x UR
Abbreviation for a combination of Universal Replicator pairs.

URL
Uniform Resource Locator
V

V-VOL
Special volume that can be specified as an S-VOL for copy pair functions that rely on Copy-on-Write Snapshot/Thin Image. To use Copy-on-Write Snapshot/Thin Image, this must first be defined as corresponding to a volume that will become a P-VOL in the Copy-on-Write Snapshot/Thin Image Pool.

Virtual Command Device
A command device to which a connection is established over an IP network. It refers to an SVP, or CTL1/CTL2, or a virtual command device server.

Virtual Command Device Server
A server that functions as a relay for pair management commands. It corresponds to the virtual command device server described in the Command Control Interface User and Reference Guide.

virtual ID
Resources can be assigned virtual IDs to enable migration without having to stop the resource. For more information, refer to the Hitachi Command Suite User Guide.

virtual storage machine
A virtual storage system that allows multiple resource groups to be treated as a single device. For more information, refer to the Hitachi Command Suite User Guide.

VMA
Volume Management Area

VOLSER
The label of a volume assigned by the mainframe host.

volume
A collective name for the logical devices (LDEVs) and logical units (LUs) that are created in a storage system.

volume replication functionality
A generic term used to refer to functionality used to perform high-speed duplication of volumes in storage systems. This functionality allows volumes to be duplicated from software, such as ShadowImage or TrueCopy, that is loaded in the storage system. This functionality can be used once the license for it has been registered.

W

World Wide Node Name (WWNN)
A name to distinguish between individual devices connected to the Fibre Channel network (like the HBA interface card or host).
World Wide Port Name (WWPN)
Name to distinguish between individual ports on a device connected to the Fibre Channel network.
access control
  users and permissions  6-2
accounts
  adding users  6-6
  automatic locking  21-4
  changing passwords  19-4, 19-10
  locking  19-11, 19-12
  removing users  19-6, 19-7
  unlocking  19-13
advanced options
  force-split  10-134
  swap  10-134
  takeover  10-133
  takeover-recovery (recreate)  10-135
  takeover-recovery (resync)  10-135
agent user script  23-45
alerts
  and volume switching  10-141
  automarking, disabling  10-26, 17-6
  changing  17-5
  completion for  9-3
  conditions for  9-2
  copy license usage threshold  9-3
  copy pair status  9-3
  deleting  17-6
  Detected Pair list  17-4
  Detected Pairs  17-4
  disabling/enabling  17-3
  editing  17-5
  error handling  24-2
  exporting history  25-3
  limits  9-4
  management  17-2
marking as completed  17-5
monitored targets, adding  9-13
performance threshold  9-3
retention  9-4
setting conditions for copy groups  9-9
SNMP trap  9-2
testing  17-4
viewing  17-3
write delay time  9-2
alters
  metrics  9-2
application
  resources  10-66
  server  10-4, 10-66, 10-68
Application Agent
  adding  4-6
  and discovery  4-6
  editing  22-3
  options  4-8
  refreshing  4-14
  removing  22-6
  setting up  4-8
Applications view  3-13
associated tasks  10-53
asynchronous  12-15
At-Time Split  10-26
authentication  19-4, 19-10
  method, changing  19-15
  users and permissions  6-2
authorization
  linking to an external server  19-16
base.properties file 11-12
base.repository.synchronize.polling property 11-12
batch operation 10-130
bitmap 12-17
buffer usage 12-16
  checking 12-20
  Monitoring Resource Utilization (Pools and Journal Groups) 12-19
  performance monitoring 12-15
  system monitoring 12-2
Business Continuity Manager (BCM)
  adding an instance 4-4
  copy group configuration options 10-78
  distribution hosts 5-8
  interaction with Replication Manager 10-15, 10-70
  overlapping configuration definition files 4-6
  prerequisites for changing copy pair configuration (mainframe) 10-70
  prerequisites for pair configuration (mainframe systems) 10-15
  removing an instance 22-6

C
C/T delta 12-16, 25-2
  alert settings 9-2
    checking for each copy group 12-18
  exporting history 25-4, 27-2
cache 8-28
candidate
devices 8-19
  volumes 8-24, 8-28
capacity 8-24, 10-13, 14-12
  expanding journal group 15-10
  licensed 18-3
cascade configuration
defining 10-39
  limitations 10-39
  permitted topologies 10-38
CCI
  architecture 1-4
  command devices 8-11
  horctakeover 10-38
Change Pair Status Wizard
  about 10-125
  advanced options 10-132, 10-143

basic options 10-132, 10-143
checkpoint files 23-20
class 10-33
CLI
  copy pair status 11-4
  refreshing configuration information 11-12
command device
  adding 8-13
  command devices 8-11
deleting 15-3
  editing 15-3
Conceal Secondary Volumes option 4-10
configuration definition file 10-11
default location 10-12
importing 10-83
configuration information
display dependencies B-7
monitoring 12-3
  refreshing 11-12
container
  changing copy pair status for 10-128
  copy group combinations supported 10-32
  creating with multiple copy groups 10-31
  defined 10-25
  pair configurations view 3-11
copy group
  associating with pair groups 10-30
  belonging to host 14-9
  changing copy pair status 10-128
  checking 12-6
  checking copy pair statuses 12-14
  configuration options 10-78
  defined 10-25
  defined in storage 10-153
deleting copy pairs from 10-82
distribution 10-62, 10-63, 10-64
distribution, disruption 10-64
editing by setting copy type 10-76
My Copy Groups 7-8, 7-9
My Copy Groups, creating 7-13
My Copy Groups, displaying 12-8
My Copy Groups, editing 13-3
Pair Configurations view 14-9
performance 12-16
refreshing status 10-132
requirements for pair configuration (mainframe) 10-25
settings (mainframe) 10-78
settings, editing 10-77
Index-4

Hitachi Replication Manager User Guide
adding (to resource group) 6-12
adding (to site) 7-5
copy groups belonging to 14-9
prefixes belonging to 14-11
removing (from resource group) 20-4
removing (from site) 16-5
viewing individual 14-6
viewing list 14-5
volumes belonging to 12-13
HTTP 4-3
HTTPS 4-3

I
IBM HTTP Server 4-4
ID
  users and permissions 6-2
import
  existing configuration definition files 10-83
inflow control 8-28
information source Glossary 7
information sources
  about 4-2
  adding 4-2
  and multiple Replication Manager servers B-9
  editing 22-2
  registering 4-2
  removing 22-4
  viewing 22-2
information stores 23-62
restoring 23-34
initial copy activities, maximum 15-11
IP address 4-3, 4-4, 14-11, 22-2, 22-3, B-7
IPv6 4-4, 22-3

J
JNLG 8-29, 8-30, 15-9, 15-10, 25-5
expanding journal group capacity 15-10
journal groups
  about 8-25
  adding 8-30
  deleting 15-10
  editing 15-9
  expanding capacity 15-10
  journal volume usage 25-5
  wizard 8-29
journal usage
exporting 25-5
exporting for each copy group 25-4

K
KAVN00123-I 9-14
KAVN00124-I 9-14
KAVN00126-I 9-14
KAVN00127-I 9-14

L
last distributed time 10-65
last refresh 11-8, 11-9, 11-17
LDAP 6-2, 19-14
LDEV 10-13, 11-8, 14-15, 15-3, B-7
  Viewing LDEV Information (Mainframe Systems) 14-13
LDKC 12-5, 12-14
  Viewing LDEV Information (Mainframe Systems) 14-13
license
  about 18-2
  editing 18-3
  viewing 18-3
line speed 8-28
loading status 23-43
local_MU 23-4
log reader agent 23-60
logging in/out 2-7
account locking 19-11
resource groups 6-8
login URL 2-7
login window 2-7
LU 10-13
LUN 10-21, 14-6, 14-7, 14-12, 14-15
  viewing in Hosts view 14-15
  viewing in Storage Systems view 14-14
LUSE 10-13

M
mainframe
  operations supported 10-124
  tasks supported 10-57
  volume discovery 5-2
Mainframe Agent
  adding an instance 4-4
architecture 1-4
architecture 1-4
displayed Information B-7
displayed Information B-7
editing an instance 22-3
editing an instance 22-3
information sources 4-2
information sources 4-2
refreshing configuration information 11-12
refreshing configuration information 11-12
removing instance 22-6
removing instance 22-6
sample configurations 1-6
sample configurations 1-6
maintenance 10-136
maintenance 10-136
maintenance mode 26-2, 26-3
maintenance mode 26-2, 26-3
management role 6-2
management role 6-2
management server 2-3, 4-2
management server 2-3, 4-2
environment 2-7
environment 2-7
exauth.properties file 6-2
exauth.properties file 6-2
sample configurations 1-6
sample configurations 1-6
MCU
MCU
remote paths 8-14
remote paths 8-14
Setting up Remote Paths 8-14
Setting up Remote Paths 8-14
metadata 12-20
metadata 12-20
metrics
metrics
system monitoring 12-2
system monitoring 12-2
MIB definition file 9-6, 9-8, 9-9, 9-11, 9-12
MIB definition file 9-6, 9-8, 9-9, 9-11, 9-12
modes
modes
viewing operation mode 26-3
viewing operation mode 26-3
monitored targets 9-13
monitored targets 9-13
mount (replicas) 23-60
mount (replicas) 23-60
MU Number 10-29
MU Number 10-29
multi target 10-32
multi target 10-32
multi-target configurations
multi-target configurations
permitted topologies 10-38
permitted topologies 10-38
My Copy Groups
My Copy Groups
about 7-8
about 7-8
displaying 12-8
displaying 12-8
editing 13-3
editing 13-3
managing (overview) 7-9
managing (overview) 7-9
monitoring 12-8
monitoring 12-8
viewing 13-2
viewing 13-2

N
N
Non Gen’ed
Non Gen’ed
types of volume scan 5-4
types of volume scan 5-4
volume restrictions 5-6
volume restrictions 5-6
normal mode 26-3
normal mode 26-3

O
O
operation mode
operation mode
changing 26-3
changing 26-3

P
P
P-VOL 10-9
P-VOL 10-9
pair configuration
pair configuration
association 10-75
association 10-75
copy group requirements 10-25
copy group requirements 10-25
creating 10-21
creating 10-21
deleting 10-82
deleting 10-82
editing by associating 10-71
editing by associating 10-71
prerequisites (mainframe) 10-15
prerequisites (mainframe) 10-15
wizard, about 10-4
wizard, about 10-4
Pair Configuration Wizard
Pair Configuration Wizard
launching 10-6
launching 10-6
Pair Configurations view 14-9
Pair Configurations view 14-9
pair management
pair management
copy groups defined in storage 10-153
copy groups defined in storage 10-153
virtual command devices 10-145
virtual command devices 10-145
pair management server 14-11
pair management server 14-11
adding (to site) 7-7
adding (to site) 7-7
redundant 2-3
redundant 2-3
removing 16-5
removing 16-5
pair names
pair names
editing 10-22
editing 10-22
pair status
pair status
changing 10-113
changing 10-113
checking 12-12
checking 12-12
confirm during task execution 10-132
confirm during task execution 10-132
monitoring 12-7, 12-11
monitoring 12-7, 12-11
monitoring(Monitoring Pair Status using Alerts) 12-8
monitoring(Monitoring Pair Status using Alerts) 12-8
monitoring, conditions for each copy group 9-6
monitoring, conditions for each copy group 9-6
monitoring, setting conditions for each copy pair 9-8
monitoring, setting conditions for each copy pair 9-8
refresh interval 12-11
refresh interval 12-11
Split (SSWS) 10-133
Split (SSWS) 10-133
wizard 10-126
wizard 10-126
Paired LUN List 10-6
Paired LUN List 10-6
paired LUN list 14-15
paired LUN list 14-15
parallel count 4-11
parallel count 4-11
parity group 8-28, 15-10
parity group 8-28, 15-10
passwords
passwords
changing 19-4, 19-10
changing 19-4, 19-10
conditions 21-3
conditions 21-3
conditions, changing 21-3
conditions, changing 21-3
path group ID, editing 10-80
path group ID, editing 10-80
path watch time 8-28
path watch time 8-28
performance alerts 12-15, 17-3
journal groups 9-10
monitoring 9-5, 12-2
monitoring, setting conditions for each copy group 9-9
monitoring, setting conditions for each pool 9-11
remote copies 12-16
permanent license key 18-2, 18-3
permissions about 6-2
assigning 6-2
changing 6-7
summary 19-8
user roles 6-3
pool
adding 8-24
deleting 15-9
editing 15-8
volume usage, history 25-6
volumes (about) 8-21
power saving 10-113
PPRC B-7
Pre-distribution 10-62, 10-64
prefixes
belonging to a host (mainframe) 14-11
multiple (mainframe) B-9
viewing (mainframe) 12-7
prerequisite tasks 10-53
primary host 10-63
Provisioning Manager
and replica operations 23-27

R
RADIUS 6-2, 19-14
RCU
remote paths 8-14
Setting up Remote Paths 8-14
recovery
operations 10-132
scenarios 10-136
Recovery Point/Time Objectives (RPO/RTO) 1-2
refresh
configuration information 11-12
copy group 10-132
for each information source 11-10
for each pair management server 11-11
for each volume 11-8
host 11-8
interval 9-14, 9-15, 11-10, 11-16
interval (management information) 11-2
remote copy
monitoring performance 12-15
performance 12-16
remote paths 8-14
remote paths
about 8-14
conditions 8-15
creating 8-14, 8-16
deleting 15-6
editing 15-4
managing 15-4
wizard 8-16
remote_MU 23-4
replica
generation 10-29
replicas
about 23-3, 23-27, 23-28
check status workflow 23-61
concealing secondary volumes 4-10
configuration requirements 23-20
confirming 23-61
create (workflow) 23-27
creating 23-14, 23-29
data protection status 12-22, 12-23
data types 23-20
generations 10-13, 23-3
information stores 23-34
mounting/unmounting 23-60
precautions 23-7, 23-26
resources 23-62
restoring 23-16, 23-36
restoring (simple) 23-36
restoring from history 23-38
roll forward 23-31
rotation 23-3
scheduling 23-30
tape 23-52
tape backups 23-45
VDI Meta File Generation Timeout 4-14
verification 4-11
Replication Manager
operating mode 26-3
sample configurations 1-6
troubleshooting 24-4
resource group

Hitachi Replication Manager User Guide
viewing individual 14-7
viewing information (open systems) 14-15
volume information 14-12
subscription agent 23-60
swap operation 10-134
sysplex name 14-11
system
accounts 6-2

T

takeback
defined 10-132
takeover
defined 10-132
forced 10-138
operation 10-133
takeover-recovery (resync/recreate) operation 10-135
tape backups 23-30, 23-52
commands 23-55
scripts 23-45
target
configuration 10-38
configuration, 3DC multi target 10-40
defining multi-target or cascade configuration 10-39
devices 8-19
Target Generation option 23-3
tasks
associated and prerequisite 10-53
canceling 10-60
CLI 27-6
deleting 10-61
editing 10-58
execute later with CLI 10-53
list 10-60
scheduling 10-57
status 10-55
temporary license key 18-2, 24-2
transaction logs 23-20, 23-31, 23-43
transaction replication 23-57
TrueCopy
Async 8-14, 10-33, 12-15, 12-16, 12-17, 12-20
Extended Distance 8-17, 8-21, 10-33, 12-2,
12-15, 12-16, 12-17
Synchronous 8-14, 8-17, 10-33, 10-40, 12-17

U

Universal Replicator 8-14, 8-25, 10-26, 10-33,
10-38, 10-40, 12-2, 12-15, 12-17
unlock
user accounts 19-13
unmanaged resources 6-8
unpaired LUNs/DEVNs 10-6, 10-21, 14-6, 14-15
usage rate 8-24
user roles
about 6-3
and permissions 6-5
and wizards 6-6
changing 19-5
users
adding 6-6
adding to resource group 6-13
authentication method 19-14, 19-15
authorization method 19-16
deleting 19-7
deleting(Deleting Users) 19-6
list 19-3
logging in/out 2-7
login window 21-5
password, changing 19-4, 19-10
permissions 6-2
profiles, editing 19-9
profiles, viewing 19-9
removing (from resource group) 20-5

V

V-VOLs
and CVS installation 8-8
conditions for adding 8-7
creating 8-6, 8-9
deleting 15-2
deleting multiple 15-2
deleting, conditions 15-2
managing 15-2
prerequisites 8-7
setting up 8-6
wizard 8-8, 8-9
VDI Meta File Generation Timeout 4-14
verification
replicas 4-11
virtual command devices 10-145
VOL 8-14
volume
belonging to a host 14-12
candidates 10-23
conditions for adding (mainframe) 10-20
mainframe discovery 5-2
selecting multiple candidates 10-24
selection restrictions 10-18, 10-20

Volume Scan
about 5-3
range 5-5, 5-6
range(Setting Volume Ranges for Volume Scan) 5-5
types 5-4
Volume scan restrictions 5-6

W

warning banner
about 21-5
deleting 21-6
editing 21-6
previewing 21-6

wizards
Add Command Devices 8-13
Add DLMUs 8-19
and user roles 6-6
Change Pair Status 10-125
Create Alert Settings 9-5
Create Journal Group 8-28
Create Pool 8-24
Create Remote Path 8-16
Create V-VOL 8-8
Pair Configuration 10-4, 10-6
pair management 10-4
WMS 8-11, 8-17, 8-21, 10-12, 10-13, 10-113

workflows
creating 10-53
deleting 10-67
editing 10-67
viewing 10-66
write delay time 12-2, 12-16, 12-18, 24-2
performance monitoring 12-15
write snapshot 8-21, 10-13, 12-15, 12-16, 12-17

Index-10

Hitachi Replication Manager User Guide