



# **Sun Cluster Geographic Edition Data Replication Guide for Hitachi TrueCopy**



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Part No: 820-6217-10  
January 2009, Revision A

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# Contents

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<b>Preface</b> .....	7
<b>1 Replicating Data With Hitachi TrueCopy Software</b> .....	11
Administering Data Replication in a Hitachi TrueCopy Protection Group .....	11
Initial Configuration of Hitachi TrueCopy Software .....	13
Overview of Initial Configuration Process .....	13
Configuration Requirements and Guidelines .....	13
Configuring Data Replication With Hitachi TrueCopy Software on the Primary Cluster .....	14
Configuring Data Replication With Hitachi TrueCopy Software on the Secondary Cluster .....	19
<b>2 Administering Hitachi TrueCopy Protection Groups</b> .....	27
Strategies for Creating Hitachi TrueCopy Protection Groups .....	27
Creating a Protection Group While the Application Is Offline .....	28
Creating a Protection Group While the Application Is Online .....	29
Creating, Modifying, Validating, and Deleting a Hitachi TrueCopy Protection Group .....	32
▼ How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters .....	32
Requirements to Support Oracle Real Application Clusters With Data Replication Software .....	34
▼ How to Create a Protection Group for Oracle Real Application Clusters .....	35
How the Data Replication Subsystem Validates the Device Group .....	39
▼ How to Modify a Hitachi TrueCopy Protection Group .....	39
Validating a Hitachi TrueCopy Protection Group .....	40
▼ How to Delete a Hitachi TrueCopy Protection Group .....	41
Administering Hitachi TrueCopy Application Resource Groups .....	43
▼ How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group ...	43

▼ How to Delete an Application Resource Group From a Hitachi TrueCopy Protection Group .....	45
Administering Hitachi TrueCopy Data Replication Device Groups .....	46
▼ How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group .	46
Validations Made by the Data Replication Subsystem .....	48
How the State of the Hitachi TrueCopy Device Group Is Validated .....	49
▼ How to Modify a Hitachi TrueCopy Data Replication Device Group .....	52
▼ How to Delete a Data Replication Device Group From a Hitachi TrueCopy Protection Group .....	53
Replicating the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster ...	54
▼ How to Replicate the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster .....	54
Activating a Hitachi TrueCopy Protection Group .....	56
▼ How to Activate a Hitachi TrueCopy Protection Group .....	58
Deactivating a Hitachi TrueCopy Protection Group .....	60
▼ How to Deactivate a Hitachi TrueCopy Protection Group .....	61
Resynchronizing a Hitachi TrueCopy Protection Group .....	64
▼ How to Resynchronize a Protection Group .....	64
Checking the Runtime Status of Hitachi TrueCopy Data Replication .....	65
Displaying a Hitachi TrueCopy Runtime Status Overview .....	65
Displaying a Detailed Hitachi TrueCopy Runtime Status .....	66
<b>3 Migrating Services That Use Hitachi TrueCopy Data Replication .....</b>	<b>69</b>
Detecting Cluster Failure on a System That Uses Hitachi TrueCopy Data Replication .....	69
Detecting Primary Cluster Failure .....	69
Detecting Secondary Cluster Failure .....	70
Migrating Services That Use Hitachi TrueCopy Data Replication With a Switchover .....	71
Validations That Occur Before a Switchover .....	71
Results of a Switchover From a Replication Perspective .....	72
▼ How to Switch Over a Hitachi TrueCopy Protection Group From Primary to Secondary .....	72
Forcing a Takeover on a System That Uses Hitachi TrueCopy Data Replication .....	73
Validations That Occur Before a Takeover .....	74
Results of a Takeover From a Replication Perspective .....	75
▼ How to Force Immediate Takeover of Hitachi TrueCopy Services by a Secondary Cluster .....	76

Recovering Services to a Cluster on a System That Uses Hitachi TrueCopy Replication .....	77
▼ How to Resynchronize and Revalidate the Protection Group Configuration .....	77
▼ How to Perform a Failback-Switchover on a System That Uses Hitachi TrueCopy Replication .....	79
▼ How to Perform a Failback-Takeover on a System That Uses Hitachi TrueCopy Replication .....	82
Recovering From a Switchover Failure on a System That Uses Hitachi TrueCopy Replication .....	86
Switchover Failure Conditions .....	87
Recovering From Switchover Failure .....	88
▼ How to Make the Original Primary Cluster Primary for a Hitachi TrueCopy Protection Group .....	88
▼ How to Make the Original Secondary Cluster Primary for a Hitachi TrueCopy Protection Group .....	89
Recovering From a Hitachi TrueCopy Data Replication Error .....	90
How to Detect Data Replication Errors .....	90
▼ How to Recover From a Hitachi TrueCopy Data Replication Error .....	91
<b>A Sun Cluster Geographic Edition Properties for Hitachi TrueCopy .....</b>	<b>93</b>
Hitachi TrueCopy Properties .....	93
Hitachi TrueCopy Properties That Must Not Be Changed .....	94
<b>Index .....</b>	<b>95</b>



# Preface

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*Sun Cluster Geographic Edition Data Replication Guide for Hitachi TrueCopy* provides procedures for administering Hitachi TrueCopy data replication with Sun™ Cluster Geographic Edition software. This document is intended for experienced system administrators with extensive knowledge of Sun software and hardware. This document is not to be used as a planning or presales guide.

The instructions in this book assume knowledge of the Solaris™ Operating System (Solaris OS), of Sun Cluster software, and expertise with the volume manager software that is used with Sun Cluster software.

## Related Books

Information about related Sun Cluster Geographic Edition topics is available in the documentation that is listed in the following table. All Sun Cluster Geographic Edition documentation is available at <http://docs.sun.com>.

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Topic	Documentation
Overview	<i>Sun Cluster Geographic Edition Overview</i>
	<i>Sun Cluster Geographic Edition 3.2 1/09 Documentation Center</i>
Installation	<i>Sun Cluster Geographic Edition Installation Guide</i>
Data Replication	<i>Sun Cluster Geographic Edition Data Replication Guide for EMC Symmetrix Remote Data Facility</i>
	<i>Sun Cluster Geographic Edition Data Replication Guide for Hitachi TrueCopy</i>
	<i>Sun Cluster Geographic Edition Data Replication Guide for Oracle Data Guard</i>
	<i>Sun Cluster Geographic Edition Data Replication Guide for Sun StorageTek Availability Suite</i>

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Topic	Documentation
System administration	<i>Sun Cluster Geographic Edition System Administration Guide</i> <i>Sun Cluster Quick Reference</i>

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Information about related Sun Cluster topics is available in the documentation that is listed in the following table. All Sun Cluster documentation is available at <http://docs.sun.com>.

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Topic	Documentation
Overview	<i>Sun Cluster Overview for Solaris OS</i> <i>Sun Cluster 3.2 1/09 Documentation Center</i>
Concepts	<i>Sun Cluster Concepts Guide for Solaris OS</i>
Hardware installation and administration	<i>Sun Cluster 3.1 - 3.2 Hardware Administration Manual for Solaris OS</i> Individual hardware administration guides
Software installation	<i>Sun Cluster Software Installation Guide for Solaris OS</i> <i>Sun Cluster Quick Start Guide for Solaris OS</i>
Data service installation and administration	<i>Sun Cluster Data Services Planning and Administration Guide for Solaris OS</i> Individual data service guides
Data service development	<i>Sun Cluster Data Services Developer's Guide for Solaris OS</i>
System administration	<i>Sun Cluster System Administration Guide for Solaris OS</i> <i>Sun Cluster Quick Reference</i>
Software upgrade	<i>Sun Cluster Upgrade Guide for Solaris OS</i>
Error messages	<i>Sun Cluster Error Messages Guide for Solaris OS</i>
Command and function references	<i>Sun Cluster Reference Manual for Solaris OS</i> <i>Sun Cluster Data Services Reference Manual for Solaris OS</i> <i>Sun Cluster Quorum Server Reference Manual for Solaris OS</i>

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For a complete list of Sun Cluster documentation, see the release notes for your release of Sun Cluster Geographic Edition software at <http://wikis.sun.com/display/SunCluster/Home/>.



## Using UNIX Commands

This document contains information about commands that are used to install, configure, or administer a Sun Cluster Geographic Edition configuration. This document might not contain complete information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following sources for this information:

- Online documentation for the Solaris software system
- Other software documentation that you received with your system
- Solaris OS man pages

## Related Third-Party Web Site References

Third-party URLs are referenced in this document and provide additional, related information.

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- Documentation (<http://www.sun.com/documentation/>)
- Support (<http://www.sun.com/support/>)
- Training (<http://www.sun.com/training/>)

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## Typographic Conventions

The following table describes the typographic conventions that are used in this book.

TABLE P-1 Typographic Conventions

Typeface	Meaning	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name% you have mail.</code>
<b>AaBbCc123</b>	What you type, contrasted with onscreen computer output	<code>machine_name% su</code> Password:
<i>aabbcc123</i>	Placeholder: replace with a real name or value	The command to remove a file is <i>rm filename</i> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. <b>Note:</b> Some emphasized items appear bold online.

## Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	<code>machine_name%</code>
C shell for superuser	<code>machine_name#</code>
Bourne shell and Korn shell	<code>\$</code>
Bourne shell and Korn shell for superuser	<code>#</code>

# Replicating Data With Hitachi TrueCopy Software

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During data replication, data from a primary cluster is copied to a backup or secondary cluster. The secondary cluster can be located at a geographically separated site from the primary cluster. This distance depends on the distance support that is available from your data replication product.

The Sun Cluster Geographic Edition software supports the use of Hitachi TrueCopy software for data replication. Before you start replicating data with Hitachi TrueCopy software, you must be familiar with the Hitachi TrueCopy documentation, have the Hitachi TrueCopy product, and have the latest Hitachi TrueCopy patches installed on your system. For information about installing the Hitachi TrueCopy software, see the Hitachi TrueCopy product documentation.

This chapter contains the procedures for configuring and administering data replication with Hitachi TrueCopy software. The chapter contains the following sections:

- [“Administering Data Replication in a Hitachi TrueCopy Protection Group”](#) on page 11
- [“Initial Configuration of Hitachi TrueCopy Software”](#) on page 13

For information about creating and deleting data replication device groups, see [“Administering Hitachi TrueCopy Data Replication Device Groups”](#) on page 46. For information about obtaining a global and a detailed runtime status of replication, see [“Checking the Runtime Status of Hitachi TrueCopy Data Replication”](#) on page 65.

## Administering Data Replication in a Hitachi TrueCopy Protection Group

This section summarizes the steps for configuring Hitachi TrueCopy data replication in a protection group.

TABLE 1-1 Administration Tasks for Hitachi TrueCopy Data Replication

Task	Description
Review configuration requirements and guidelines, and perform an initial configuration of the Hitachi TrueCopy software.	See “Initial Configuration of Hitachi TrueCopy Software” on page 13.
Create a protection group that is configured for Hitachi TrueCopy data replication.	See “How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters” on page 32 or “How to Create a Protection Group for Oracle Real Application Clusters” on page 35.
Add a device group that is controlled by Hitachi TrueCopy.	See “How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group” on page 46.
Add an application resource group to the protection group.	See “How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group” on page 43.
Replicate the protection group configuration to a secondary cluster.	See “How to Replicate the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster” on page 54.
Test the configured partnership and protection groups to validate the setup.	Perform a trial switchover or takeover and test some simple failure scenarios. See Chapter 3, “Migrating Services That Use Hitachi TrueCopy Data Replication.”
Activate the protection group.	See “How to Activate a Hitachi TrueCopy Protection Group” on page 58.
Check the runtime status of replication.	See “Checking the Runtime Status of Hitachi TrueCopy Data Replication” on page 65.
Detect failure.	See “Detecting Cluster Failure on a System That Uses Hitachi TrueCopy Data Replication” on page 69.
Migrate services by using a switchover.	See “Migrating Services That Use Hitachi TrueCopy Data Replication With a Switchover” on page 71.
Migrate services by using a takeover.	See “Forcing a Takeover on a System That Uses Hitachi TrueCopy Data Replication” on page 73.
Recover data after forcing a takeover.	See “Recovering Services to a Cluster on a System That Uses Hitachi TrueCopy Replication” on page 77.
Detect and recover from a data replication error.	See “Recovering From a Hitachi TrueCopy Data Replication Error” on page 90.

# Initial Configuration of Hitachi TrueCopy Software

This section describes how to configure Hitachi TrueCopy software on the primary and secondary cluster. It also includes information about the preconditions for creating Hitachi TrueCopy protection groups. This section provides the following information:

- “Overview of Initial Configuration Process” on page 13
- “Configuration Requirements and Guidelines” on page 13
- “Configuring Data Replication With Hitachi TrueCopy Software on the Primary Cluster” on page 14
- “Configuring Data Replication With Hitachi TrueCopy Software on the Secondary Cluster” on page 19

## Overview of Initial Configuration Process

Initial configuration of the primary and secondary clusters includes the following:

- Configuring a Hitachi TrueCopy device group, `devgroup1`, with the required number of disks
- If you are using raw-disk device groups, configuring a raw-disk group `rawdg`
- If you are using VERITAS Volume Manager:
  - Configuring the VERITAS Volume Manager disk group, `oradg1`
  - Configuring the VERITAS Volume Manager volume, `vol1`
  - Configuring the Sun Cluster device group for the VERITAS Volume Manager disk group, `oradg1`
- Configuring the file system, which includes creating the file system, creating mount points, and adding entries to the `/etc/vfstab` file
- Creating an application resource group, `apprg1`, which contains a `HASStoragePlus` resource

## Configuration Requirements and Guidelines

Observe the following requirements and guidelines:

- If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support using a Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See “[Using Storage-Based Data Replication Within a Cluster](#)” in *Sun Cluster System Administration Guide for Solaris OS* for more information.
- If you use the Hitachi TrueCopy Command Control Interface (CCI) for data replication, you must use RAID Manager. For information about which version you should use, see the *Sun Cluster Geographic Edition Installation Guide*.

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**Note** – This model requires specific hardware configurations with Sun StorEdge™ 9970/9980 Array or Hitachi Lightning 9900 Series Storage. Contact your Sun service representative for information about Sun Cluster configurations that are currently supported.

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- Device pairs that have a requirement for I/O consistency must belong to the same device group.
- A Hitachi TrueCopy device group that is managed by Sun Cluster Geographic Edition software must not share the same CTGID with any other Hitachi TrueCopy device group that is on the system.
- Sun Cluster Geographic Edition software uses the default CCI instance to manage the Hitachi TrueCopy devices. Sun Cluster Geographic Edition software starts the default CCI instance whenever a TrueCopy device group is managed by Sun Cluster Geographic Edition software. Applications that are not under the control of Sun Cluster Geographic Edition software can also use the default CCI instance or any other instances without risk to Sun Cluster Geographic Edition or application processes or data.
- Sun Cluster Geographic Edition software supports the hardware configurations that are supported by the Sun Cluster software. Contact your Sun service representative for information about current supported Sun Cluster configurations.

## Configuring Data Replication With Hitachi TrueCopy Software on the Primary Cluster

This section describes the steps you must perform on the primary cluster before you can configure Hitachi TrueCopy data replication in Sun Cluster Geographic Edition software. To illustrate each step, this section uses an example of two disks, or LUNs, that are called d1 and d2. These disks are in a Hitachi TrueCopy array that holds data for an application that is called apprg1.

### Configuring the `/etc/horcm.conf` File

Configure Hitachi TrueCopy device groups on shared disks in the primary cluster by editing the `/etc/horcm.conf` file on each node of the cluster that has access to the Hitachi array. Disks d1 and d2 are configured to belong to a Hitachi TrueCopy device group, `devgroup1`. The application, `apprg1`, can run on all nodes that have Hitachi TrueCopy device groups configured.

The following table describes the configuration information from our example that is found in the `/etc/horcm.conf` file.

TABLE 1-2 Example Section of the /etc/horcm.conf File on the Primary Cluster

dev_group	dev_name	port number	TargetID	LU number	MU number
devgroup1	pair1	CL1-A	0	1	
devgroup1	pair2	CL1-A	0	2	

The configuration information in the table indicates that the Hitachi TrueCopy device group, devgroup1, contains two pairs. The first pair, pair1, is from the d1 disk, which is identified by the tuple <CL1-A, 0, 1>. The second pair, pair2, is from the d2 disk and is identified by the tuple <CL1-A, 0, 2>. The replicas of disks d1 and d2 are located in a geographically separated Hitachi TrueCopy array. The remote Hitachi TrueCopy is connected to the partner cluster.

## ▼ How to Set Up Raw-Disk Device Groups for Sun Cluster Geographic Edition Systems

Sun Cluster Geographic Edition supports the use of raw-disk device groups in addition to various volume managers. When you initially configure Sun Cluster, device groups are automatically configured for each raw device in the cluster. Use this procedure to reconfigure these automatically created device groups for use with Sun Cluster Geographic Edition.

### 1 For the devices that you want to use, unconfigure the predefined device groups.

The following commands remove the predefined device groups for d7 and d8.

```
phys-paris-1# cldevicegroup disable dsk/d7 dsk/d8
phys-paris-1# cldevicegroup offline dsk/d7 dsk/d8
phys-paris-1# cldevicegroup delete dsk/d7 dsk/d8
```

### 2 Create the new raw-disk device group, including the desired devices.

Ensure that the new DID does not contain any slashes. The following command creates a global device group rawdg containing d7 and d8.

```
phys-paris-1# cldevicegroup create -n phys-paris-1,phys-paris-2 \
-t rawdisk -d d7,d8 rawdg
```

## Example 1-1 Configuring a Raw-Disk Device Group

The following commands illustrate configuring the device group on the primary cluster, configuring the same device group on the partner cluster, and adding the group to a Hitachi TrueCopy protection group.

*Remove the automatically created device groups from the primary cluster.*

```
phys-paris-1# cldevicegroup disable dsk/d7 dsk/d8
phys-paris-1# cldevicegroup offline dsk/d7 dsk/d8
phys-paris-1# cldevicegroup delete dsk/d7 dsk/d8
```

Create the raw-disk device group on the primary cluster.

```
phys-paris-1# cldevicegroup create -n phys-paris-1,phys-paris-2 \  
-t rawdisk -d d7,d8 rawdg
```

Remove the automatically created device groups from the partner cluster.

```
phys-newyork-1# cldevicegroup disable dsk/d5 dsk/d6  
phys-newyork-1# cldevicegroup offline dsk/d5 dsk/d6  
phys-newyork-1# cldevicegroup delete dsk/d5 dsk/d6
```

Create the raw-disk device group on the partner cluster.

```
phys-newyork-1# cldevicegroup create -n phys-newyork-1,phys-newyork-2 \  
-t rawdisk -d d5,d6 rawdg
```

Add the raw-disk device group to the protection group rawpg.

```
phys-paris-1# geogg create -d truecopy -p Nodelist=phys-paris-1,phys-paris-2 \  
-o Primary -p cluster_dgs=rawdg -s paris-newyork-ps rawpg
```

**Next Steps** When configuring the partner cluster, create a raw-disk device group of the same name as the one you created here. See [“How to Replicate the Configuration Information From the Primary Cluster When Using Raw-Disk Device Groups”](#) on page 24 for the instructions about this task.

Once you have configured the device group on both clusters, you can use the device group name wherever one is required in Sun Cluster Geographic Edition commands such as geogg.

## ▼ How to Configure the VERITAS Volume Manager Volumes for Use With Hitachi TrueCopy Replication

Hitachi TrueCopy supports VERITAS Volume Manager volumes and raw-disk device groups. If you are using VERITAS Volume Manager, you must configure VERITAS Volume Manager volumes on disks d1 and d2.



---

**Caution** – If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See [“Using Storage-Based Data Replication Within a Cluster”](#) in *Sun Cluster System Administration Guide for Solaris OS* for more information.

---

- 1 Create VERITAS Volume Manager disk groups on shared disks in cluster-paris.**  
For example, the d1 and d2 disks are configured as part of a VERITAS Volume Manager disk group, which is called oradg1, by using commands, such as vxdiskadm and vxdg.
- 2 After configuration is complete, verify that the disk group was created by using the vxdg list command.**

This command should list oradg1 as a disk group.



### 3 Create the VERITAS Volume Manager volume.

For example, a volume that is called `vol1` is created in the `oradg1` disk group. The appropriate VERITAS Volume Manager commands, such as `vxassist`, are used to configure the volume.

**Next Steps** To complete your configuration, proceed to “[How to Configure the Sun Cluster Device Group That Is Controlled by Hitachi TrueCopy Software](#)” on page 17 to create the Sun Cluster device group for this disk group.

## ▼ How to Configure the Sun Cluster Device Group That Is Controlled by Hitachi TrueCopy Software

**Before You Begin** If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See “[Using Storage-Based Data Replication Within a Cluster](#)” in *Sun Cluster System Administration Guide for Solaris OS* for more information.

### 1 Register the VERITAS Volume Manager disk group that you configured in the previous procedure.

Use the Sun Cluster command `cldevicegroup`.

For more information about this command, refer to the `cldevicegroup(1CL)` man page.

### 2 Create a mount directory on each node of the cluster.

```
phys-newyork-1# mkdir -p /mounts/sample
phys-newyork-2# mkdir -p /mounts/sample
```

### 3 Synchronize the VERITAS Volume Manager configuration with Sun Cluster software, again by using the `cldevicegroup` command.

### 4 After configuration is complete, verify the disk group registration.

```
# cldevicegroup status
```

The VERITAS Volume Manager disk group, `oradg1`, should be displayed in the output.

For more information about the `cldevicegroup` command, see the `cldevicegroup(1CL)` man page.

## ▼ How to Configure a Highly Available File System for Hitachi TrueCopy Replication

**Before You Begin** Before you configure the file system on `cluster-paris`, ensure that the Sun Cluster entities you require, such as application resource groups, device groups, and mount points, have already been configured.

If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See [“Using Storage-Based Data Replication Within a Cluster”](#) in *Sun Cluster System Administration Guide for Solaris OS* for more information.

- 1 **Create the required file system on the vol1 volume at the command line.**
- 2 **Add an entry to the /etc/vfstab file that contains information such as the mount location.**  
Whether the file system is to be mounted locally or globally depends on various factors, such as your performance requirements, or the type of application resource group you are using.

---

**Note** – You must set the mount at boot field in this file to no. This value prevents the file system from mounting on the secondary cluster at cluster startup. Instead, the Sun Cluster software and the Sun Cluster Geographic Edition framework handle mounting the file system by using the HASStoragePlus resource when the application is brought online on the primary cluster. Data must not be mounted on the secondary cluster or data on the primary will not be replicated to the secondary cluster. Otherwise, the data will not be replicated from the primary cluster to the secondary cluster.

---

- 3 **Add the HASStoragePlus resource to the application resource group, apprg1.**  
Adding the resource to the application resource group ensures that the necessary file systems are remounted before the application is brought online.  
For more information about the HASStoragePlus resource type, refer to the [Sun Cluster Data Services Planning and Administration Guide for Solaris OS](#).

### Example 1–2 Configuring a Highly Available Cluster Global File System

This example assumes that the apprg1 resource group already exists.

1. Create a UNIX file system (UFS).

```
phys-paris-1# newfs dev/vx/dsk/oradg1/vol1
```

The following entry is created in the /etc/vfstab file:

```
# /dev/vs/dsk/oradg1/vol1 /dev/vx/rdisk/oradg1/vol1 /mounts/sample \
ufs 2 no logging
```

2. Add the HASStoragePlus resource type.

```
phys-paris-1# clresource create -g apprg1 -t SUNW.HASStoragePlus \
-p FilesystemMountPoints=/mounts/sample -p Affinityon=TRUE \
-p GlobalDevicePaths=oradg1 rs-has
```

## Configuring Data Replication With Hitachi TrueCopy Software on the Secondary Cluster

This section describes the steps you must complete on the secondary cluster before you can configure Hitachi TrueCopy data replication in Sun Cluster Geographic Edition software.

### Configuring the `/etc/horcm.conf` File

You must configure the Hitachi TrueCopy device group on shared disks in the secondary cluster as you did on the primary cluster by editing the `/etc/horcm.conf` file on each node of the cluster that has access to the Hitachi array. Disks `d1` and `d2` are configured to belong to a Hitachi TrueCopy device group that is called `devgroup1`. The application, `apprg1`, can run on all nodes that have Hitachi TrueCopy device groups configured.

The following table describes the configuration information from the example that is found in the `/etc/horcm.conf` file.

TABLE 1-3 Example Section of the `/etc/horcm.conf` File on the Secondary Cluster

dev_group	dev_name	port number	TargetID	LU number	MU number
devgroup1	pair1	CL1-C	0	20	
devgroup1	pair2	CL1-C	0	21	

The configuration information in the table indicates that the Hitachi TrueCopy device group, `devgroup1`, contains two pairs. The first pair, `pair1`, is from the `d1` disk, which is identified by the tuple `<CL1-C, 0, 20>`. The second pair, `pair2`, is from the `d2` disk and is identified by the tuple `<CL1-C, 0, 21>`.

After you have configured the `/etc/horcm.conf` file on the secondary cluster, you can see the status of the pairs by using the `pairdisplay` command as follows:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 54321 1.. SMPL ---- - - - - - - - - - -
devgroup1 pair1(R) (CL1-C , 0, 20)12345 609..SMPL ---- - - - - - - - - - -
devgroup1 pair2(L) (CL1-A , 0, 2) 54321 2.. SMPL ---- - - - - - - - - - -
devgroup1 pair2(R) (CL1-C , 0, 21)12345 610..SMPL ---- - - - - - - - - - -
```

## Configuring the Other Entities on the Secondary Cluster

Next, you need to configure any volume manager, the Sun Cluster device groups, and the highly available cluster file system. This process is slightly different depending upon whether you are using VERITAS Volume Manager or raw-disk device groups. The following procedures provide instructions:

- [“How to Replicate the VERITAS Volume Manager Configuration Information From the Primary Cluster” on page 20](#)
- [“How to Create a Copy of the Volume Manager Configuration” on page 22](#)
- [“How to Replicate the Configuration Information From the Primary Cluster When Using Raw-Disk Device Groups” on page 24](#)

### ▼ How to Replicate the VERITAS Volume Manager Configuration Information From the Primary Cluster

**Before You Begin** If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See [“Using Storage-Based Data Replication Within a Cluster” in \*Sun Cluster System Administration Guide for Solaris OS\*](#) for more information.

#### 1 Start replication for the devgroup1 device group.

```
phys-paris-1# paircreate -g devgroup1 -vl -f async
```

```
phys-paris-1# pairdisplay -g devgroup1
```

```
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 54321 1..P-VOL COPY ASYNC ,12345 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)12345 609..S-VOL COPY ASYNC ,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 54321 2..P-VOL COPY ASYNC ,12345 610 -
devgroup1 pair2(R) (CL1-C , 0, 21)12345 610..S-VOL COPY ASYNC ,----- 2 -
```

#### 2 Wait for the state of the pair to become PAIR on the secondary cluster.

```
phys-newyork-1# pairdisplay -g devgroup1
```

```
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL PAIR ASYNC ,-----, 1 -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PAIR ASYNC,12345, 609 -
devgroup1 pair2(L) (CL1-C , 0, 21)12345 610..S-VOL PAIR ASYNC ,-----, 2 -
devgroup1 pair2(R) (CL1-A , 0, 2)54321 2..P-VOL PAIR ASYNC,12345, 610 -
```

#### 3 Split the pair by using the pairsplit command and confirm that the secondary volumes on cluster-newyork are writable by using the -rw option.

```
phys-newyork-1# pairsplit -g devgroup1 -rw
```

```
phys-newyork-1# pairdisplay -g devgroup1
```

```
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL SSUS ASYNC ,----- 1 -
```

```

devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PSUS ASYNC,12345 609 W
devgroup1 pair2(L) (CL1-C , 0,21) 12345 610..S-VOL SSUS ASYNC,----- 2 -
devgroup1 pair2(R) (CL1-A , 0, 2) 54321 2..P-VOL PSUS ASYNC,12345 610 W

```

**4 Import the VERITAS Volume Manager disk group, oradg1.**

```
phys-newyork-1# vxdg -C import oradg1
```

**5 Verify that the VERITAS Volume Manager disk group was successfully imported.**

```
phys-newyork-1# vxdg list
```

**6 Enable the VERITAS Volume Manager volume.**

```
phys-newyork-1# /usr/sbin/vxrecover -g oradg1 -s -b
```

**7 Verify that the VERITAS Volume Manager volumes are recognized and enabled.**

```
phys-newyork-1# vxprint
```

**8 Register the VERITAS Volume Manager disk group, oradg1, in Sun Cluster.**

```
phys-newyork-1# cldevicegroup create -t vxvm -n phys-newyork-1,phys-newyork-2 oradg1
```

**9 Synchronize the volume manager information with the Sun Cluster device group and verify the output.**

```
phys-newyork-1# cldevicegroup sync oradg1
phys-newyork-1# cldevicegroup status
```

**10 Add an entry to the /etc/vfstab file on phys-newyork-1.**

```
phys-newyork-1# /dev/vx/dsk/oradg1/vol1 /dev/vx/rdisk/oradg1/vol1 \
/mounts/sample ufs 2 no logging
```

**11 Create a mount directory on phys-newyork-1.**

```
phys-newyork-1# mkdir -p /mounts/sample
```

**12 Create an application resource group, apprg1, by using the scrgadm command.**

```
phys-newyork-1# clresourcegroup create apprg1
```

**13 Create the HASStoragePlus resource in apprg1.**

```
phys-newyork-1# clresource create -g apprg1 -t SUNW.HASStoragePlus \
-p FilesystemMountPoints=/mounts/sample -p Affinityon=TRUE \
-p GlobalDevicePaths=oradg1 rs-hasp
```

This HASStoragePlus resource is required for Sun Cluster Geographic Edition systems, because the software relies on the resource to bring the device groups and file systems online when the protection group starts on the primary cluster.

- 14 If necessary, confirm that the application resource group is correctly configured by bringing it online and taking it offline again.**

```
phys-newyork-1# clresourcegroup switch -emM -n phys-newyork-1 apprg1
phys-newyork-1# clresourcegroup offline apprg1
```

- 15 Unmount the file system.**

```
phys-newyork-1# umount /mounts/sample
```

- 16 Take the Sun Cluster device group offline.**

```
phys-newyork-1# cldevicegroup offline oradg1
```

- 17 Verify that the VERITAS Volume Manager disk group was deported.**

```
phys-newyork-1# vxdg list
```

- 18 Reestablish the Hitachi TrueCopy pair.**

```
phys-newyork-1# pairresync -g devgroup1
phys-newyork-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL PAIR ASYNC,----- 1 -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PAIR ASYNC,12345 609 W
devgroup1 pair2(L) (CL1-C , 0,21) 12345 610..S-VOL PAIR ASYNC,----- 2 -
devgroup1 pair2(R) (CL1-A , 0, 2) 54321 2..P-VOL PAIR ASYNC,12345 610 W
```

Initial configuration on the secondary cluster is now complete.

## ▼ How to Create a Copy of the Volume Manager Configuration

This task copies the volume manager configuration from the primary cluster, `cluster-paris`, to LUNs of the secondary cluster, `cluster-newyork`, by using the VERITAS Volume Manager commands `vxdiskadm` and `vxassist` command.

---

**Note** – The device group, `devgroup1`, must be in the SMPL state throughout this procedure.

---

- 1 Confirm that the pair is in the SMPL state.**

```
phys-newyork-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..SMPL ---- -,----- -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..SMPL ---- -,----- -
devgroup1 pair2(L) (CL1-C , 0, 21)12345 610..SMPL ---- -,----- -
devgroup1 pair2(R) (CL1-A , 0, 2) 54321 2..SMPL ---- -,----- -
```

- 2 Create VERITAS Volume Manager disk groups on shared disks in `cluster-paris`.**

For example, the `d1` and `d2` disks are configured as part of a VERITAS Volume Manager disk group, which is called `oradg1`, by using commands, such as `vxdiskadm` and `vxdg`.

- 3 After configuration is complete, verify that the disk group was created by using the `vx dg list` command.**

This command should list `oradg1` as a disk group.

- 4 Create the VERITAS Volume Manager volume.**

For example, a volume that is called `vol1` is created in the `oradg1` disk group. The appropriate VERITAS Volume Manager commands, such as `vxassist`, are used to configure the volume.

- 5 Import the VERITAS Volume Manager disk group.**

```
phys-newyork-1# vx dg -C import oradg1
```

- 6 Verify that the VERITAS Volume Manager disk group was successfully imported.**

```
phys-newyork-1# vx dg list
```

- 7 Enable the VERITAS Volume Manager volume.**

```
phys-newyork-1# /usr/sbin/vxrecover -g oradg1 -s -b
```

- 8 Verify that the VERITAS Volume Manager volumes are recognized and enabled.**

```
phys-newyork-1# vxprint
```

- 9 Register the VERITAS Volume Manager disk group, `oradg1`, in Sun Cluster.**

```
phys-newyork-1# cldevicegroup create -t vxvm -n phys-newyork-1,phys-newyork-2 oradg1
```

- 10 Synchronize the VERITAS Volume Manager information with the Sun Cluster device group and verify the output.**

```
phys-newyork-1# cldevicegroup sync oradg1
```

```
phys-newyork-1# cldevicegroup status
```

- 11 Create a UNIX file system.**

```
phys-newyork-1# newfs dev/vx/dsk/oradg1/vol1
```

- 12 Add an entry to the `/etc/vfstab` file on `phys-newyork-1`.**

```
/dev/vx/dsk/oradg1/vol1 /dev/vx/rdisk/oradg1/vol1 /mounts/sample ufs 2 no logging
```

- 13 Create a mount directory on `phys-newyork-1`.**

```
phys-newyork-1# mkdir -p /mounts/sample
```

- 14 Create an application resource group, `apprg1`, by using the `clresourcegroup` command.**

```
phys-newyork-1# clresourcegroup create apprg1
```

**15 Create the HASStoragePlus resource in apprg1.**

```
phys-newyork-1# clresource create -g apprg1 -t SUNW.HASStoragePlus \
-p FilesystemMountPoints=/mounts/sample -p Affinityon=TRUE \
-p GlobalDevicePaths=oradg1 rs-hasp
```

This HASStoragePlus resource is required for Sun Cluster Geographic Edition systems, because the software relies on the resource to bring the device groups and file systems online when the protection group starts on the primary cluster.

**16 If necessary, confirm that the application resource group is correctly configured by bringing it online and taking it offline again.**

```
phys-newyork-1# clresourcegroup switch -emM -n phys-newyork-1 apprg1
phys-newyork-1# clresourcegroup offline apprg1
```

**17 Unmount the file system.**

```
phys-newyork-1# umount /mounts/sample
```

**18 Take the Sun Cluster device group offline.**

```
phys-newyork-1# cldevicegroup offline oradg1
```

**19 Verify that the VERITAS Volume Manager disk group was deported.**

```
phys-newyork-1# vxdg list
```

**20 Verify that the pair is still in the SMPL state.**

```
phys-newyork-1# pairedisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..SMPL ---- -,-----,----- ---- -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..SMPL ---- -,-----,----- ---- -
devgroup1 pair2(L) (CL1-C , 0, 21)12345 610..SMPL ---- -,-----,----- ---- -
devgroup1 pair2(R) (CL1-A, 0, 2) 54321 2..SMPL ---- -,-----,----- ---- -
```

## ▼ How to Replicate the Configuration Information From the Primary Cluster When Using Raw-Disk Device Groups

**Before You Begin** If you are using storage-based replication, do not configure a replicated volume as a quorum device. The Sun Cluster Geographic Edition software does not support Hitachi TrueCopy S-VOL and Command Device as a Sun Cluster quorum device. See [“Using Storage-Based Data Replication Within a Cluster”](#) in *Sun Cluster System Administration Guide for Solaris OS* for more information.

**1 Start replication for the devgroup1 device group.**

```
phys-paris-1# paircreate -g devgroup1 -vl -f async
```

```
phys-paris-1# pairedisplay -g devgroup1
```



```

Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 54321 1..P-VOL COPY ASYNC ,12345 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)12345 609..S-VOL COPY ASYNC ,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 54321 2..P-VOL COPY ASYNC ,12345 610 -
devgroup1 pair2(R) (CL1-C , 0, 21)12345 610..S-VOL COPY ASYNC ,----- 2 -

```

## 2 Wait for the state of the pair to become PAIR on the secondary cluster.

```

phys-newyork-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL PAIR ASYNC,-----, 1 -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PAIR ASYNC,12345, 609 -
devgroup1 pair2(L) (CL1-C , 0, 21)12345 610..S-VOL PAIR ASYNC,-----, 2 -
devgroup1 pair2(R) (CL1-A , 0, 2)54321 2..P-VOL PAIR ASYNC,12345, 610 -

```

## 3 Split the pair by using the pairsplit command and confirm that the secondary volumes on cluster-newyork are writable by using the -rw option.

```

phys-newyork-1# pairsplit -g devgroup1 -rw
phys-newyork-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL SSUS ASYNC,----- 1 -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PSUS ASYNC,12345 609 W
devgroup1 pair2(L) (CL1-C , 0,21) 12345 610..S-VOL SSUS ASYNC,----- 2 -
devgroup1 pair2(R) (CL1-A , 0, 2) 54321 2..P-VOL PSUS ASYNC,12345 610 W

```

## 4 Create a raw-disk device group on the partner cluster.

Use the same device group name that you used on the primary cluster.

You can use the same DIDs on each cluster. In the following command, the newyork cluster is the partner of the paris cluster.

```

phys-newyork-1# cldevicegroup disable dsk/d5 dsk/d6
phys-newyork-1# cldevicegroup offline dsk/d5 dsk/d6
phys-newyork-1# cldevicegroup delete dsk/d5 dsk/d6
phys-newyork-1# cldevicegroup create -n phys-newyork-1,phys-newyork-2 \
-t rawdisk -d d5,d6 rawdg
phys-newyork-1# /usr/cluster/lib/dcs/dgconv -d d5 rawdg
phys-newyork-1# /usr/cluster/lib/dcs/dgconv -d d6 rawdg

```

## 5 Synchronize the volume manager information with the Sun Cluster device group and verify the output.

```

phys-newyork-1# cldevicegroup sync rawdg1
phys-newyork-1# cldevicegroup status

```

## 6 Add an entry to the /etc/vfstab file on each node of the newyork cluster.

```

/dev/global/dsk/d5s2 /dev/global/rdisk/d5s2 /mounts/sample ufs 2 no logging

```

**7 Create a mount directory on each node of the newyork cluster.**

```
phys-newyork-1# mkdir -p /mounts/sample
phys-newyork-2# mkdir -p /mounts/sample
```

**8 Create an application resource group, apprg1, by using the clresourcegroup command.**

```
phys-newyork-1# clresourcegroup create apprg1
```

**9 Create the HASStoragePlus resource in apprg1.**

```
phys-newyork-1# clresource create -g apprg1 -t SUNW.HASStoragePlus \
-p FilesystemMountPoints=/mounts/sample -p Affinityon=TRUE \
-p GlobalDevicePaths=rawd1 rs-hasp
```

This HASStoragePlus resource is required for Sun Cluster Geographic Edition systems, because the software relies on the resource to bring the device groups and file systems online when the protection group starts on the primary cluster.

**10 If necessary, confirm that the application resource group is correctly configured by bringing it online and taking it offline again.**

```
phys-newyork-1# clresourcegroup switch -emM -n phys-newyork-1 apprg1
phys-newyork-1# clresourcegroup offline apprg1
```

**11 Unmount the file system.**

```
phys-newyork-1# umount /mounts/sample
```

**12 Take the Sun Cluster device group offline.**

```
phys-newyork-1# cldevicegroup offline rawd1
```

**13 Reestablish the Hitachi TrueCopy pair.**

```
phys-newyork-1# pairresync -g devgroup1
phys-newyork-1# pairedisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL PAIR ASYNC,----- 1 -
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PAIR ASYNC,12345 609 W
devgroup1 pair2(L) (CL1-C , 0,21) 12345 610..S-VOL PAIR ASYNC,----- 2 -
devgroup1 pair2(R) (CL1-A , 0, 2) 54321 2..P-VOL PAIR ASYNC,12345 610 W
```

Initial configuration on the secondary cluster is now complete.

# Administering Hitachi TrueCopy Protection Groups

---

This chapter contains the procedures for configuring and administering data replication with Hitachi TrueCopy software. The chapter contains the following sections:

- “Strategies for Creating Hitachi TrueCopy Protection Groups” on page 27
- “Creating, Modifying, Validating, and Deleting a Hitachi TrueCopy Protection Group” on page 32
- “Administering Hitachi TrueCopy Application Resource Groups” on page 43
- “Administering Hitachi TrueCopy Data Replication Device Groups” on page 46
- “Replicating the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster” on page 54
- “Activating a Hitachi TrueCopy Protection Group” on page 56
- “Deactivating a Hitachi TrueCopy Protection Group” on page 60
- “Resynchronizing a Hitachi TrueCopy Protection Group” on page 64
- “Checking the Runtime Status of Hitachi TrueCopy Data Replication” on page 65

## Strategies for Creating Hitachi TrueCopy Protection Groups

Before you begin creating protection groups, consider the following strategies:

- Taking the application offline before creating the protection group.  
This strategy is the most straightforward because you use a single command to create the protection group on one cluster, retrieve the information on the other cluster, and start the protection group. However, because the protection group is not brought online until the end of the process, you must take the application resource group offline to add it to the protection group.
- Creating the protection group while the application remains online.  
While this strategy allows you to create a protection group without any application outage, it requires issuing more commands.

The following sections describe the steps for each strategy.

- [“Creating a Protection Group While the Application Is Offline”](#) on page 28
- [“Creating a Protection Group While the Application Is Online”](#) on page 29

## Creating a Protection Group While the Application Is Offline

To create a protection group while the application resource group is offline, complete the following steps.

- Create the protection group from a cluster node.  
For more information, see [“How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters”](#) on page 32 or [“How to Create a Protection Group for Oracle Real Application Clusters”](#) on page 35.
- Add the data replication device group to the protection group.  
For more information, see [“How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group”](#) on page 46.
- Take the application resource group offline.
- Add the application resource group to the protection group.  
For more information, see [“How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group”](#) on page 43.
- On the other cluster, retrieve the protection group configuration.  
For more information, see [“How to Replicate the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster”](#) on page 54.
- From either cluster, start the protection group globally.  
For more information, see [“How to Activate a Hitachi TrueCopy Protection Group”](#) on page 58.

## Creating a Protection Group While the Application Is Online

To add an existing application resource group to a new protection group without taking the application offline, complete the following steps on the cluster where the application resource group is online.

- Create the protection group from a cluster node.  
For more information, see [“How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters”](#) on page 32 or [“How to Create a Protection Group for Oracle Real Application Clusters”](#) on page 35.
- Add the data replication device group to the protection group.  
For more information, see [“How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group”](#) on page 46.
- Start the protection group locally.  
For more information, see [“How to Activate a Hitachi TrueCopy Protection Group”](#) on page 58.
- Add the application resource group to the protection group.  
For more information, see [“How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group”](#) on page 43.

Complete the following steps on the other cluster.

- Retrieve the protection group configuration.  
For more information, see [“How to Replicate the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster”](#) on page 54.
- Activate the protection group locally.  
For more information, see [“How to Activate a Hitachi TrueCopy Protection Group”](#) on page 58.

### EXAMPLE 2-1 Creating a Hitachi TrueCopy Protection Group While the Application Remains Online

This example creates a protection group without taking the application offline.

In this example, the `apprg1` resource group is online on the `cluster-paris` cluster.

1. Create the protection group on `cluster-paris`.

```
phys-paris-1# geogg create -d truecopy -p Nodelist=phys-paris-1,phys-paris-2 \
-o Primary -s paris-newyork-ps tcpg
Protection group "tcpg" has been successfully created
```

2. Add the device group, `tcdg`, to the protection group.

**EXAMPLE 2-1** Creating a Hitachi TrueCopy Protection Group While the Application Remains Online  
(Continued)

```
phys-paris-1# geopg add-device-group -p fence_level=async tcpg tcpg
```

3. Activate the protection group locally.

```
phys-paris-1# geopg start -e local tcpg
Processing operation... this may take a while...
Protection group "tcpg" successfully started.
```

4. Add to the protection group an application resource group that is already online.

```
phys-paris-1# geopg add-resource-group apprg1 tcpg
Following resource groups were successfully inserted:
    "apprg1"
```

5. Verify that the application resource group was added successfully.

```
phys-paris-1# geoadm status
Cluster: cluster-paris

Partnership "paris-newyork-ps" : OK
  Partner clusters           : newyork
  Synchronization           : OK
  ICRM Connection            : OK

Heartbeat "hb_cluster-paris-cluster-newyork" monitoring \
"paris-newyork-ps" OK
  Plug-in "ping-plugin"      : Inactive
  Plug-in "tcp_udp_plugin"   : OK

Protection group "tcpg"      : Degraded
  Partnership                 : paris-newyork-ps
  Synchronization             : OK

Cluster cluster-paris       : Degraded
  Role                         : Primary
  Configuration                : OK
  Data replication            : Degraded
  Resource groups              : OK

Cluster cluster-newyork     : Unknown
  Role                         : Unknown
  Configuration                : Unknown
  Data Replication             : Unknown
  Resource Groups              : Unknown
```

6. On a node of the partner cluster, retrieve the protection group.

**EXAMPLE 2-1** Creating a Hitachi TrueCopy Protection Group While the Application Remains Online  
(Continued)

```
phys-newyork-1# geopg get -s paris-newyork-ps tcpg
Protection group "tcpg" has been successfully created.
```

7. Activate the protection group locally on the partner cluster.

```
phys-newyork-1# geopg start -e local tcpg
Processing operation... this may take a while...
Protection group "tcpg" successfully started.
```

8. Verify that the protection group was successfully created and activated.

Running the `geoadm status` command on `cluster-paris` produces the following output:

```
phys-paris-1# geoadm status
Cluster: cluster-paris

Partnership "paris-newyork-ps"      : OK
  Partner clusters                  : newyork
  Synchronization                   : OK
  ICRM Connection                    : OK

Heartbeat "hb_cluster-paris~cluster-newyork" monitoring \
"paris-newyork-ps": OK
  Plug-in "ping-plugin"             : Inactive
  Plug-in "tcp_udp_plugin"          : OK

Protection group "tcpg"              : Degraded
  Partnership                       : paris-newyork-ps
  Synchronization                   : OK

Cluster cluster-paris                : Degraded
  Role                              : Primary
  Configuration                      : OK
  Data replication                   : Degraded
  Resource groups                    : OK

Cluster cluster-newyork              : Degraded
  Role                              : Secondary
  Configuration                      : OK
  Data Replication                   : Degraded
  Resource Groups                    : OK
```

# Creating, Modifying, Validating, and Deleting a Hitachi TrueCopy Protection Group

This section contains procedures for the following tasks:

- “How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters” on page 32
- “Requirements to Support Oracle Real Application Clusters With Data Replication Software” on page 34
- “How to Create a Protection Group for Oracle Real Application Clusters” on page 35
- “How the Data Replication Subsystem Validates the Device Group” on page 39
- “How to Modify a Hitachi TrueCopy Protection Group” on page 39
- “Validating a Hitachi TrueCopy Protection Group” on page 40
- “How to Delete a Hitachi TrueCopy Protection Group” on page 41

---

**Note** – You can create protection groups that are not configured to use data replication. To create a protection group that does not use a data replication subsystem, omit the `-d datareplicationtype` option when you use the `geopg` command. The `geoadm status` command shows a state for these protection groups of Degraded.

For more information, see “Creating a Protection Group That Does Not Require Data Replication” in *Sun Cluster Geographic Edition System Administration Guide*.

---

## ▼ How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters

Use the steps in this task to create and configure a Hitachi TrueCopy protection group. If you want to use Oracle Real Application Clusters, see “How to Create a Protection Group for Oracle Real Application Clusters” on page 35.

**Before You Begin** Before you create a protection group, ensure that the following conditions are met:

- The local cluster is a member of a partnership.
- The protection group you are creating does not already exist.

---

**Note** – Protection group names are unique in the global Sun Cluster Geographic Edition namespace. You cannot use the same protection group name in two partnerships on the same system.

---



You can also replicate the existing configuration of a protection group from a remote cluster to the local cluster. For more information, see [“Replicating the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster”](#) on page 54.

## 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

## 2 Create a new protection group by using the `geopg create` command.

This command creates a protection group on all nodes of the local cluster.

```
# geopg create -s partnershipname -o localrole -d truecopy [-p property [-p...]] \  
protectiongroupname
```

-s <i>partnershipname</i>	Specifies the name of the partnership.
-o <i>localrole</i>	Specifies the role of this protection group on the local cluster as either primary or secondary.
-d <b>truecopy</b>	Specifies that the protection group data is replicated by the Hitachi TrueCopy software.
-p <i>propertysetting</i>	Specifies the properties of the protection group.

You can specify the following properties:

- **Description** – Describes the protection group.
- **Timeout** – Specifies the timeout period for the protection group in seconds.
- **NodeList** – Lists the host names of the machines that can be primary for the replication subsystem.
- **Cluster\_dgs** – Lists the device groups where the data is written.

For more information about the properties you can set, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

*protectiongroupname* Specifies the name of the protection group.

For information about the names and values that are supported by Sun Cluster Geographic Edition software, see [Appendix B, “Legal Names and Values of Sun Cluster Geographic Edition Entities,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

For more information about the `geopg` command, refer to the `geopg(1M)` man page.

**Example 2-2** Creating and Configuring a Hitachi TrueCopy Protection Group

This example creates a Hitachi TrueCopy protection group on `cluster-paris`, which is set as the primary cluster.

```
# geopg create -s paris-newyork-ps -o primary -d truecopy \  
-p Nodelist=phys-paris-1,phys-paris-2 tcpg
```

**Example 2-3** Creating a Hitachi TrueCopy Protection Group for Application Resource Groups That Are Online

This example creates a Hitachi TrueCopy protection group, `tcpg`, for an application resource group, `resourcegroup1`, that is currently online on `cluster-newyork`.

1. Create the protection group without the application resource group.

```
# geopg create -s paris-newyork-ps -o primary -d truecopy \  
-p nodelist=phys-paris-1,phys-paris-2 tcpg
```

2. Activate the protection group.

```
# geopg start -e local tcpg
```

3. Add the application resource group.

```
# geopg add-resource-group resourcegroup1 tcpg
```

## Requirements to Support Oracle Real Application Clusters With Data Replication Software

Sun Cluster Geographic Edition software supports Oracle Real Application Clusters with Hitachi TrueCopy software. Observe the following requirements when you configure Oracle Real Application Clusters:

- Each CRS OCR and Voting Disk Location must be in its own device group on each cluster and cannot be replicated.
- Static data such as CRS and database binaries are not required to be replicated. But this data must be accessible from all nodes of both clusters.
- You must create a `SUNW.ScalDeviceGroup` resource in its own resource group for the device group that holds dynamic database files. This resource group must be separate from the resource group that holds the clusterware `SUNW.ScalDeviceGroup` resource.

- To be able to leave RAC infrastructure resource groups outside of Sun Cluster Geographic Edition control, you must run Sun Cluster Geographic Edition binaries on both cluster partners and set the RAC protection group `External_Dependency_Allowed` property to `true`.
- Do not add the CRS OCR and Voting Disk device group to the protection group's `cluster_dgs` property.
- Do not add RAC infrastructure resource groups to the protection group. Only add the `rac_server_proxy` resource group and resource groups for device groups that are replicated to the protection group. Also, you must set to `false` the `auto_start_on_new_cluster` resource group property for the `rac_server_proxy` resource group and resource groups and for device groups that are replicated.
- When you use a cluster file system for an Oracle RAC file system, such as a flash recovery area, alert, or trace log files, you must manually create on both clusters a separate resource group that uses the `HASStoragePlus` resource to bring online these corresponding file systems. You must set a strong resource dependency from nonClusterware `SUNW.ScalDeviceGroup` resources to this `HASStoragePlus` resource. Then add this `HASStoragePlus` resource group to the RAC protection group.

## ▼ How to Create a Protection Group for Oracle Real Application Clusters

**Before You Begin** Before you create a protection group for Oracle Real Application Clusters (RAC), ensure that the following conditions are met:

- Read [“Requirements to Support Oracle Real Application Clusters With Data Replication Software”](#) on page 34.
- The node list of the protection group must be the same as the node list of RAC framework resource group.
- If one cluster is running RAC on a different number of nodes than another cluster, ensure that all nodes on both clusters have the same resource groups defined.
- *If you are using the VERITAS Volume Manager cluster feature to manage data*, you must specify the cluster feature disk group and Sun Cluster device groups for other data volumes in the `cluster_dgs` property.

When a cluster and the VERITAS Volume Manager cluster feature software restart, the RAC framework automatically tries to import all cluster feature device groups that were imported already before cluster went down. Therefore, the attempt to import the device groups to the original primary fails.

## 1 Log in to a cluster node on the primary cluster.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “Sun Cluster Geographic Edition Software and RBAC” in *Sun Cluster Geographic Edition System Administration Guide*.

## 2 Create a new protection group by using the `geopg create` command.

This command creates a protection group on all nodes of the local cluster.

```
# geopg create -s partnershipname -o localrole -d truecopy \
-p External_Dependency_Allowed=true [-p property [-p...]] protectiongroupname
```

<code>-s partnershipname</code>	Specifies the name of the partnership.
<code>-o localrole</code>	Specifies the role of this protection group on the local cluster as primary.
<code>-d truecopy</code>	Specifies that the protection group data is replicated by the Hitachi TrueCopy software.
<code>-p propertysetting</code>	Specifies the properties of the protection group.

You can specify the following properties:

- `Description` – Describes the protection group.
- `External_Dependency_Allowed` - Specifies whether to allow any dependencies between resource groups and resources that belong to this protection group and resource groups and resources that do not belong to this protection group. For RAC, set this property to `true`.
- `Timeout` – Specifies the timeout period for the protection group in seconds.
- `NodeList` – Lists the host names of the machines that can be primary for the replication subsystem.
- `Cluster_dgs` – Specifies the VERITAS Volume Manager cluster feature disk group where the data is written.

For more information about the properties you can set, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

<code>protectiongroupname</code>	Specifies the name of the protection group.
----------------------------------	---

For information about the names and values that are supported by Sun Cluster Geographic Edition software, see [Appendix B, “Legal Names and Values of Sun Cluster Geographic Edition Entities,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

For more information about the `geopg` command, refer to the [geopg\(1M\)](#) man page.

**3 Add a Hitachi TrueCopy device group to the protection group.**

```
# geopg add-device-group [-p property [-p...]] protectiongroupname
```

*-p propertysetting* Specifies the properties of the protection group.

You can specify the `Fence_level` properties which defines the fence level that is used by the disk device group. The fence level determines the level of consistency among the primary and secondary volumes for that disk device group. You must set this to `never`.




---

**Caution** – To avoid application failure on the primary cluster, specify a `Fence_level` of `never` or `async`. If the `Fence_level` parameter is not set to `never` or `async`, data replication might not function properly when the secondary site goes down.

If you specify a `Fence_level` of `never`, the data replication roles do not change after you perform a takeover.

Do not use programs that would prevent the `Fence_level` parameter from being set to `data` or `status` because these values might be required in special circumstances.

If you have special requirements to use a `Fence_level` of `data` or `status`, consult your Sun representative.

---

For more information about the properties you can set, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

*protectiongroupname* Specifies the name of the protection group.

**4 Add to the protection group only the `rac_server_proxy` resource group and resource groups for device groups that are replicated.**


---

**Note** – Do not add the RAC framework resource group to the protection group. This ensures that, if the protection group becomes secondary on the node, the framework resource group does not become unmanaged. In addition, multiple RAC databases can be on the cluster, and the databases can be under Sun Cluster Geographic Edition control or not under its control.

---

```
# geopg add-resource-group resourcegroup protectiongroupname
```

*resourcegroup* Specifies a comma-separated list of resource groups to add to or delete from the protection group. The specified resource groups must already be defined.

The protection group must be online before you add a resource group. The `geopg add -resource -group` command fails when a protection group is offline and the resource group that is being added is online.

---

**Note** – If a protection group has already been started at the time that you add a resource group, the resource group remains unmanaged. You must start the resource group manually by running the `geopg start` command.

---

*protectiongroupname* Specifies the name of the protection group.

#### Example 2–4 Creating a Protection Group for RAC

This example creates the protection group `pg1` which uses RAC and the cluster feature.

A cluster feature disk group `racdbdg` controls the data which is replicated by the Hitachi TrueCopy device group `VG01`. The node list of the RAC framework resource group is set to all nodes of the cluster.

1. Create the protection group on the primary cluster with the cluster feature disk group `racdbdg`.

```
# geopg create -s pts1 -o PRIMARY -d Truecopy \
-p cluster_dgs=racdbdg -p external_dependency_allowed=true pg1
Protection group "pg1" successfully created.
```

2. Add the Hitachi TrueCopy device group `VG01` to protection group `pg1`.

```
# geopg add-device-group --property fence_level=never VG01 pg1
Device group "VG01" successfully added to the protection group "pg1".
```

3. Add the `rac_server_proxy-rg` resource group and the replicated device-group resource groups, `hasp4rac-rg` and `sca1dbdg-rg`, to the protection group.

```
# geopg add-resource-group rac_server_proxy-rg,hasp4rac-rg,\
sca1dbdg-rg pg1
```

## How the Data Replication Subsystem Validates the Device Group

Before creating the protection group, the data replication layer validates that the `horcmd` daemon is running.

The data replication layer validates that the `horcmd` daemon is running on at least one node that is specified in the `NodeList` property.

If the `Cluster_dgs` property is specified, then the data replication layer verifies that the device group specified is a valid Sun Cluster device group. The data replication layer also verifies that the device group is of a valid type.

---

**Note** – The device groups that are specified in the `Cluster_dgs` property must be written to only by applications that belong to the protection group. This property must not specify device groups that receive information from applications outside the protection group.

---

A Sun Cluster resource group is automatically created when the protection group is created.

This resource in this resource group monitors data replication. The name of the Hitachi TrueCopy data replication resource group is `rg-tc-protectiongroupname`.



---

**Caution** – These automatically created replication resource groups are for Sun Cluster Geographic Edition internal implementation purposes only. Use caution when you modify these resource groups by using Sun Cluster commands.

---

## ▼ How to Modify a Hitachi TrueCopy Protection Group

**Before You Begin** Before modifying the configuration of your protection group, ensure that the protection group you want to modify exists locally.

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “[Sun Cluster Geographic Edition Software and RBAC](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

## 2 Modify the configuration of the protection group.

This command modifies the properties of a protection group on all nodes of the local cluster. If the partner cluster contains a protection group of the same name, this command also propagates the new configuration information to the partner cluster.

```
# geopg set-prop -p property [-p...] protectiongroupname
```

*-p propertysetting* Specifies the properties of the protection group.

For more information about the properties you can set, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

*protectiongroupname* Specifies the name of the protection group.

For information about the names and values that are supported by Sun Cluster Geographic Edition software, see [Appendix B, “Legal Names and Values of Sun Cluster Geographic Edition Entities,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

For more information about the `geopg` command, refer to the `geopg(1M)` man page.

### Example 2-5 Modifying the Configuration of a Protection Group

This example modifies the `Timeout` property of the protection group that was created in [Example 2-2](#).

```
# geopg set-prop -p Timeout=400 tcpg
```

## Validating a Hitachi TrueCopy Protection Group

During protection group validation, the Hitachi TrueCopy data replication subsystem validates the following:

- The `horcmd` daemon is running on at least one node that is specified in the `NodeList` property of the protection group. The data replication layer also confirms that a path to a Hitachi TrueCopy storage device exists from the node on which the `horcmd` daemon is running.
- The device group specified is a valid Sun Cluster device group or a CVM device group if the `Cluster_dgs` property is specified. The data replication layer also verifies that the device group is of a valid type.
- The properties are validated for each Hitachi TrueCopy device group that has been added to the protection group.



When the `geoadm status` output displays that the Configuration status of a protection group is Error, you can validate the configuration by using the `geopg validate` command. This command checks the current state of the protection group and its entities.

If the protection group and its entities are valid, then the Configuration status of the protection groups is set to OK. If the `geopg validate` command finds an error in the configuration files, then the command displays a message about the error and the configuration remains in the error state. In such a case, you can fix the error in the configuration, and run the `geopg validate` command again.

## ▼ How to Validate a Hitachi TrueCopy Protection Group

**Before You Begin** Ensure that the protection group you want to validate exists locally and that the Common Agent Container is online on all nodes of both clusters in the partnership.

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “Sun Cluster Geographic Edition Software and RBAC” in *Sun Cluster Geographic Edition System Administration Guide*.

### 2 Validate the configuration of the protection group.

This command validates the configuration of the protection group on the local cluster only. To validate the protection group configuration on the partner cluster, run the command again on the partner cluster.

```
# geopg validate protectiongroupname
```

*protectiongroupname* Specifies a unique name that identifies a single protection group

### Example 2-6 Validating the Configuration of a Protection Group

This example validates a protection group.

```
# geopg validate tcpg
```

## ▼ How to Delete a Hitachi TrueCopy Protection Group

**Before You Begin** If you want to delete the protection group everywhere, you must run the `geopg delete` command on each cluster where the protection group exists.

Before deleting a protection group, ensure that the following conditions are met:

- The protection group you want to delete exists locally.
- The protection group is offline on the local cluster.

**Note** – You must remove the application resource groups from the protection group in order to keep the application resource groups online while deleting the protection group. See [Example 2–8](#) and [Example 2–10](#) for examples of this procedure.

---

**1 Log in to a node on the primary cluster.**

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “[Sun Cluster Geographic Edition Software and RBAC](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

**2 Delete the protection group.**

This command deletes the configuration of the protection group from the local cluster. The command also removes the replication resource group for each Hitachi TrueCopy device group in the protection group. This command does not alter the pair state of the Hitachi TrueCopy device group.

```
# geopg delete protectiongroupname
```

*protectiongroupname* Specifies the name of the protection group

**3 To delete the protection group on the secondary cluster, repeat step 1 and step 2 on cluster-newyork.**

### Example 2–7 Deleting a Protection Group

This example deletes a protection group from both partner clusters.

cluster-paris is the primary cluster. For a reminder of the sample cluster configuration, see “[Example Sun Cluster Geographic Edition Cluster Configuration](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

```
# rlogin phys-paris-1 -l root
phys-paris-1# geopg delete tcpg
# rlogin phys-newyork-1 -l root
phys-newyork-1# geopg delete tcpg
```

### Example 2–8 Deleting a Hitachi TrueCopy Protection Group While Keeping Application Resource Groups Online

This example keeps online two application resource groups, apprg1 and apprg2, while deleting their protection group, tcpg. Remove the application resource groups from the protection group, then delete the protection group.

```
# geopg remove-resource-group apprg1,apprg2 tcpg
# geopg stop -e global tcpg
# geopg delete tcpg
```

## Administering Hitachi TrueCopy Application Resource Groups

To make an application highly available, the application must be managed as a resource in an application resource group.

All the entities you configure for the application resource group on the primary cluster, such as application resources, installation, application configuration files, and resource groups, must be replicated to the secondary cluster. The resource group names must be identical on both clusters. Also, the data that the application resource uses must be replicated to the secondary cluster.

This section contains information about the following tasks:

- [“How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group” on page 43](#)
- [“How to Delete an Application Resource Group From a Hitachi TrueCopy Protection Group” on page 45](#)

### ▼ How to Add an Application Resource Group to a Hitachi TrueCopy Protection Group

**Before You Begin** You can add an existing resource group to the list of application resource groups for a protection group. Before you add an application resource group to a protection group, ensure that the following conditions are met:

- The protection group is defined.
- The resource group exists on both clusters and is in an appropriate state.
- The `Auto_start_on_new_cluster` property of the resource group is set to `False`. You can view this property by using the `clresourcegroup` command.

```
# clresourcegroup show -p auto_start_on_new_cluster apprg
```

When you bring a protection group online on the primary cluster, you should bring the application resources groups participating in that protection group online only on the same primary cluster. Setting the `Auto_start_on_new_cluster` property to `False` prevents the Sun Cluster resource group manager from automatically starting the application resource groups. In this case, the start up of resource groups is reserved to the Sun Cluster Geographic Edition software.

Application resource groups should be online only on the primary cluster when the protection group is activated.

Set the `Auto_start_on_new_cluster` property to `False` as follows:

```
# clresourcegroup set -p Auto_start_on_new_cluster=False apprg
```

- The application resource group must not have dependencies on resource groups and resources outside of this protection group. To add several application resource groups that share dependencies, you must add the application resource groups to the protection group in a single operation. If you add the application resource groups separately, the operation fails.

The protection group can be activated or deactivated and the resource group can be either `Online` or `Unmanaged`.

If the resource group is `Unmanaged` and the protection group is `Active` after the configuration of the protection group has changed, the local state of the protection group becomes `Degraded`.

If the resource group to add is `Online` and the protection group is deactivated, the request is rejected. You must activate the protection group before adding an active resource group.

## 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

## 2 Add an application resource group to the protection group.

This command adds an application resource group to a protection group on the local cluster. Then the command propagates the new configuration information to the partner cluster if the partner cluster contains a protection group of the same name.

```
# geopg add-resource-group resourcegrouplist protectiongroup
```

*resourcegrouplist* Specifies the name of the application resource group. You can specify more than one resource group in a comma-separated list.

*protectiongroup* Specifies the name of the protection group.

For information about the names and values that are supported by Sun Cluster Geographic Edition software, see [Appendix B, “Legal Names and Values of Sun Cluster Geographic Edition Entities,” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

If the add operation is unsuccessful on the local cluster, the configuration of the protection group is not modified. Otherwise, the `Configuration` status is set to `OK` on the local cluster.

If the `Configuration` status is `OK` on the local cluster, but the add operation is unsuccessful on the partner cluster, the `Configuration` status is set to `Error` on the partner cluster.

After the application resource group is added to the protection group, the application resource group is managed as an entity of the protection group. Then the application resource group is affected by protection group operations such as start, stop, switchover, and takeover.

### Example 2-9 Adding an Application Resource Group to a Protection Group

This example adds two application resource groups, `apprg1` and `apprg2`, to `tcpg`.

```
# geogg add-resource-group apprg1,apprg2 tcpg
```

## ▼ How to Delete an Application Resource Group From a Hitachi TrueCopy Protection Group

You can remove an application resource group from a protection group without altering the state or contents of an application resource group.

**Before You Begin** Ensure that the following conditions are met:

- The protection group is defined on the local cluster.
- The resource group to be removed is part of the application resource groups of the protection group. For example, you cannot remove a resource group that belongs to the data replication management entity.

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “[Sun Cluster Geographic Edition Software and RBAC](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

### 2 Remove the application resource group from the protection group.

This command removes an application resource group from the protection group on the local cluster. If the partner cluster contains a protection group of the same name, then the command removes the application resource group from the protection group on the partner cluster.

```
# geogg remove-resource-group resourcegrouplist protectiongroup
```

*resourcegrouplist* Specifies the name of the application resource group. You can specify more than one resource group in a comma-separated list.

*protectiongroup* Specifies the name of the protection group.

If the remove operation is unsuccessful on the local cluster, the configuration of the protection group is not modified. Otherwise, the Configuration status is set to OK on the local cluster.

If the Configuration status is OK on the local cluster, but the remove operation is unsuccessful on the partner cluster, the Configuration status is set to Error on the partner cluster.

### **Example 2–10** Deleting an Application Resource Group From a Protection Group

This example removes two application resource groups, apprg1 and apprg2, from tcpg.

```
# geopg remove-resource-group apprg1,apprg2 tcpg
```

## **Administering Hitachi TrueCopy Data Replication Device Groups**

This section provides the following information about administering Hitachi TrueCopy data replication device groups:

- [“How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group” on page 46](#)
- [“Validations Made by the Data Replication Subsystem” on page 48](#)
- [“How the State of the Hitachi TrueCopy Device Group Is Validated” on page 49](#)
- [“How to Modify a Hitachi TrueCopy Data Replication Device Group” on page 52](#)
- [“How to Delete a Data Replication Device Group From a Hitachi TrueCopy Protection Group” on page 53](#)

For details about configuring a Hitachi TrueCopy data replication protection group, see [“How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters” on page 32](#).

### **▼ How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group**

#### **1 Log in to a cluster node.**

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

## 2 Create a data replication device group in the protection group.

This command adds a device group to a protection group on the local cluster and propagates the new configuration to the partner cluster if the partner cluster contains a protection group of the same name.

```
# geopg add-device-group -p property [-p...] devicegroupname protectiongroupname
```

*-p property* Specifies the properties of the data replication device group.

You can specify the `Fence_level` property which defines the fence level that is used by the device group. The fence level determines the level of consistency among the primary and secondary volumes for that device group.

You can set this property to `data`, `status`, `never`, or `async`. When you use a `Fence_level` of `never` or `async`, the application can continue to write to the primary cluster even after failure on the secondary cluster. However, when you set the `Fence_level` property to `data` or `status`, the application on the primary cluster might fail because the secondary cluster is not available for the following reasons:

- Data replication link failure
- Secondary cluster and storage is down
- Storage on the secondary cluster is down




---

**Caution** – To avoid application failure on the primary cluster, specify a `Fence_level` of `never` or `async`.

If you specify a `Fence_level` of `never`, the data replication roles do not change after you perform a takeover.

If you have special requirements to use a `Fence_level` of `data` or `status`, consult your Sun representative.

---

The other properties you can specify depend on the type of data replication you are using. For details about these properties, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

*devicegroupname* Specifies the name of the new data replication device group.

*protectiongroupname* Specifies the name of the protection group that will contain the new data replication device group.

For information about the names and values that are supported by Sun Cluster Geographic Edition software, see [Appendix B, “Legal Names and Values of Sun Cluster Geographic Edition Entities,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

For more information about the `geopg` command, refer to the [geopg\(1M\)](#) man page.

### Example 2–11 Adding a Data Replication Device Group to a Hitachi TrueCopy Protection Group

This example creates a Hitachi TrueCopy data replication device group in the `tcpg` protection group.

```
# geopg add-device-group -p Fence_level=data devgroup1 tcpg
```

## Validations Made by the Data Replication Subsystem

When the Hitachi TrueCopy device group, configured as `dev_group` in the `/etc/horcm.conf` file, is added to a protection group, the data replication layer makes the following validations.

- Validates that the `horcmd` daemon is running on at least one node in the `NodeList` property of the protection group.
- Checks that the path to the storage device exists from all the nodes that are specified in the `NodeList` property. The storage device controls the new Hitachi TrueCopy device group.
- The Hitachi TrueCopy device group properties that are specified in the `geopg add-device-group` command are validated as described in the following table.

Hitachi TrueCopy Device Group Property	Validation
<code>devicegroupname</code>	Checks that the specified Hitachi TrueCopy device group is configured on all of the cluster nodes that are specified in the <code>NodeList</code> property.
<code>Fence_level</code>	<p>If a pair is already established for this Hitachi TrueCopy device group, the data replication layer checks that the specified <code>Fence_level</code> matches the already established fence level.</p> <p>If a pair is not yet established, for example, if a pair is in the <code>SMPL</code> state, any <code>Fence_level</code> is accepted.</p>

When a Hitachi TrueCopy device group is added to a protection group, a Sun Cluster resource is automatically created by this command. This resource monitors data replication. The name of the resource is `r-tc-protectiongroupname-devicegroupname`. This resource is placed in the corresponding Sun Cluster resource group, which is named `rg-tc-protectiongroupname`.





**Caution** – You must use caution before you modify these replication resources with Sun Cluster commands. These resources are for internal implementation purposes only.

## How the State of the Hitachi TrueCopy Device Group Is Validated

For validation purposes, Sun Cluster Geographic Edition gives each Hitachi TrueCopy device group a state according to the current state of its pair. This state is returned by the `pairvolchk -g devicegroup -ss` command.

The remainder of this section describes the individual device group states and how these states are validated against the local role of the protection group.

### Determining the State of an Individual Hitachi TrueCopy Device Group

An individual Hitachi TrueCopy device group can be in one of the following states:

- SMPL
- Regular Primary
- Regular Secondary
- Takeover Primary
- Takeover Secondary

The state of a particular device group is determined by using the value that is returned by the `pairvolchk -g devicegroup -ss` command. The following table describes the device group state associated with the values returned by the `pairvolchk` command.

TABLE 2-1 Individual Hitachi TrueCopy Device Group States

Output of <code>pairvolchk</code>	Individual Device Group State
11 = SMPL	SMPL
22 / 42 = PVOL_COPY 23 / 42 = PVOL_PAIR 26 / 46 = PVOL_PDUB 47 = PVOL_PFUL 48 = PVOL_PFUS	Regular Primary

TABLE 2-1 Individual Hitachi TrueCopy Device Group States (Continued)

Output of pairvolchk	Individual Device Group State
24 / 44 = PVOL_PSUS 25 / 45 = PVOL_PSUE For these return codes, determining the individual device group category requires that the horcmd process be active on the remote cluster so that the remote-pair-state for this device group can be obtained.	Regular Primary, if remote-cluster-state !=SSWS or Takeover Secondary, if remote-cluster-state == SSWS SSWS, when you use the pairdisplay -g devicegroup -fc command.
32 / 52 = SVOL_COPY 33 / 53 = SVOL_PAIR 35 / 55 = SVOL_PSUE 36 / 56 = SVOL_PDUB 57 = SVOL_PFUL 58 = SVOL_PFUS	Regular Secondary
34 / 54 = SVOL_PSUS	Regular Secondary, if local-cluster-state !=SSWS or Takeover Primary, if local-cluster-state == SSWS SSWS, when you use the pairdisplay -g devicegroup -fc command.

## Determining the Aggregate Hitachi TrueCopy Device Group State

If a protection group contains only one Hitachi TrueCopy device group, then the aggregate device group state is the same as the individual device group state.

When a protection group contains multiple Hitachi TrueCopy device groups, the aggregate device group state is obtained as described in the following table.

TABLE 2-2 Conditions That Determine the Aggregate Device Group State

Condition	Aggregate Device Group State
All individual device group states are SMPL	SMPL
All individual device group states are either Regular Primary or SMPL	Regular Primary

TABLE 2-2 Conditions That Determine the Aggregate Device Group State (Continued)

Condition	Aggregate Device Group State
All individual device group states are either Regular Secondary or SMPL	Regular Secondary
All individual device group states are either Takeover Primary or SMPL	Takeover Primary
All individual device group states are either Takeover Secondary or SMPL	Takeover Secondary

The aggregate device group state cannot be obtained for any other combination of individual device group states. This is considered a pair-state validation failure.

## Validating the Local Role of the Protection Group Against the Aggregate Device Group State

The local role of a Hitachi TrueCopy protection group is validated against the aggregate device group state as described in the following table.

TABLE 2-3 Validating the Aggregate Device Group State Against the Local Role of a Protection Group

Aggregate Device Group State	Valid Local Protection Group Role
SMPL	primary or secondary
Regular Primary	primary
Regular Secondary	secondary
Takeover Primary	primary
Takeover Secondary	secondary

EXAMPLE 2-12 Validating the Aggregate Device Group State

This example validates the state of a Hitachi TrueCopy device group against the role of the Hitachi TrueCopy protection group to which it belongs.

First, the protection group is created as follows:

```
phys-paris-1# geopg create -s paris-newyork-ps -o primary -d truecopy tcpg
```

A device group, devgroup1, is added to the protection group, tcpg, as follows:

```
phys-paris-1# geopg add-device-group -p fence_level=async devgroup1 tcpg
```

The current state of a Hitachi TrueCopy device group, devgroup1, is provided in the output of the pairdisplay command as follows:

**EXAMPLE 2-12** Validating the Aggregate Device Group State (Continued)

```

phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..P-VOL PAIR ASYNC,54321 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..S-VOL PAIR ASYNC,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..P-VOL PAIR ASYNC,54321 610 -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..S-VOL PAIR ASYNC,----- 2 -

```

The `pairvolchk -g <DG> -ss` command is run and returns a value of 23.

```

phys-paris-1# pairvolchk -g devgroup1 -ss
pairvolchk : Volstat is P-VOL.[status = PAIR fence = ASYNC]
phys-paris-1# echo $?
23

```

The output of the `pairvolchk` command is 23, which corresponds in [Table 2-1](#) to an individual device group state of Regular Primary. Because the protection group contains only one device group, the aggregate device group state is the same as the individual device group state. The device group state is valid because the local role of the protection group, specified by the `-o` option, is `primary`, as specified in [Table 2-3](#).

## ▼ How to Modify a Hitachi TrueCopy Data Replication Device Group

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “[Sun Cluster Geographic Edition Software and RBAC](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

### 2 Modify the device group.

This command modifies the properties of a device group in a protection group on the local cluster. Then the command propagates the new configuration to the partner cluster if the partner cluster contains a protection group of the same name.

```
# geogg modify-device-group -p property [-p...] TCdevicegroupname protectiongroupname
-p property

```

Specifies the properties of the data replication device group.

For more information about the properties you can set, see [Appendix A, “Standard Sun Cluster Geographic Edition Properties,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

*TCdevicegroupname* Specifies the name of the new data replication device group.

*protectiongroupname* Specifies the name of the protection group that will contain the new data replication device group.

### Example 2–13 Modifying the Properties of a Hitachi TrueCopy Data Replication Device Group

This example modifies the properties of a data replication device group that is part of a Hitachi TrueCopy protection group.

```
# geopg modify-device-group -p fence_level=async tc dg tcpg
```

## ▼ How to Delete a Data Replication Device Group From a Hitachi TrueCopy Protection Group

**Before You Begin** You might delete a data replication device group from a protection group if you added a data replication device group to a protection group. Normally, after an application is configured to write to a set of disks, you would not change the disks.

Deleting a data replication device group does not stop replication or change the replication status of the data replication device group.

For information about deleting protection groups, refer to [“How to Delete a Hitachi TrueCopy Protection Group” on page 41](#). For information about deleting application resource groups from a protection group, refer to [“How to Delete an Application Resource Group From a Hitachi TrueCopy Protection Group” on page 45](#).

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

### 2 Remove the device group.

This command removes a device group from a protection group on the local cluster. Then the command propagates the new configuration to the partner cluster if the partner cluster contains a protection group of the same name.

```
# geopg remove-device-group devicegroupname protectiongroupname
```

*devicegroupname* Specifies the name of the data replication device group

*protectiongroupname* Specifies the name of the protection group

When a device group is deleted from a Hitachi TrueCopy protection group, the corresponding Sun Cluster resource, `r-tc-protectiongroupname-devicegroupname`, is removed from the

replication resource group. As a result, the deleted device group is no longer monitored. The resource group is removed when the protection group is deleted.

#### **Example 2-14** Deleting a Replication Device Group From a Hitachi TrueCopy Protection Group

This example removes a Hitachi TrueCopy data replication device group.

```
# geopg remove-device-group tcdg tcpg
```

## Replicating the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster

After you have configured data replication, resource groups, and resources on your primary and secondary clusters, you can replicate the configuration of the protection group to the secondary cluster.

### ▼ How to Replicate the Hitachi TrueCopy Protection Group Configuration to a Secondary Cluster

**Before You Begin** Before you replicate the configuration of a Hitachi TrueCopy protection group to a secondary cluster, ensure that the following conditions are met:

- The protection group is defined on the remote cluster, not on the local cluster.
- The device groups in the protection group on the remote cluster exist on the local cluster.
- The application resource groups in the protection group on the remote cluster exist on the local cluster.
- The `Auto_start_on_new_cluster` property of the resource group is set to `False`. You can view this property by using the `clresourcegroup` command.

```
# clresourcegroup show -p auto_start_on_new_cluster apprg
```

Setting the `Auto_start_on_new_cluster` property to `False` prevents the Sun Cluster resource group manager from automatically starting the resource groups in the protection group. Therefore, after the Sun Cluster Geographic Edition software restarts and communicates with the remote cluster to ensure that the remote cluster is running and that the remote cluster is the secondary cluster for that resource group. The Sun Cluster Geographic Edition software does not automatically start the resource group on the primary cluster.

Application resource groups should be online only on primary cluster when the protection group is activated.

Set the `Auto_start_on_new_cluster` property to `False` as follows:

```
# clresourcegroup set -p Auto_start_on_new_cluster=False apprg1
```

## 1 Log in to `phys-newyork-1`.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

`phys-newyork-1` is the only node on the secondary cluster. For a reminder of which node is `phys-newyork-1`, see [“Example Sun Cluster Geographic Edition Cluster Configuration” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

## 2 Replicate the protection group configuration to the partner cluster by using the `geopg get` command.

This command retrieves the configuration information of the protection group from the remote cluster and creates the protection group on the local cluster.

```
phys-newyork-1# geopg get -s partnershipname [protectiongroup]
```

`-s partnershipname` Specifies the name of the partnership from which the protection group configuration information should be retrieved and the name of the partnership where the protection will be created locally.

`protectiongroup` Specifies the name of the protection group.

If no protection group is specified, then all protection groups that exist in the specified partnership on the remote partner are created on the local cluster.

---

**Note** – The `geopg get` command replicates Sun Cluster Geographic Edition related entities. For information about how to replicate Sun Cluster entities, see [“Replicating and Upgrading Configuration Data for Resource Groups, Resource Types, and Resources” in \*Sun Cluster Data Services Planning and Administration Guide for Solaris OS\*](#).

---

### Example 2–15 Replicating the Hitachi TrueCopy Protection Group to a Partner Cluster

This example replicates the configuration of `tcpg` from `cluster-paris` to `cluster-newyork`.

```
# rlogin phys-newyork-1 -l root
phys-newyork-1# geopg get -s paris-newyork-ps tcpg
```

## Activating a Hitachi TrueCopy Protection Group

When you activate a protection group, the protection group assumes the role that you assigned to it during configuration. For more information about configuring protection groups, see [“How to Create and Configure a Hitachi TrueCopy Protection Group That Does Not Use Oracle Real Application Clusters”](#) on page 32.

You can activate a protection group in the following ways:

- Globally – Activates a protection group on both clusters where the protection group is configured.
- On the primary cluster only – Secondary cluster remains inactive.
- On the secondary cluster only – Primary cluster remains inactive.

Activating a Hitachi TrueCopy protection group on a cluster has the following effect on the data replication layer:

- The data replication configuration of the protection group is validated. During validation, the current local role of a protection group is compared with the aggregate device group state as described in [Table 2-3](#). If validation is successful, data replication is started.
- Data replication is started on the data replication device groups that are configured for the protection group, no matter whether the activation occurs on a primary or secondary cluster. Data is always replicated from the cluster on which the local role of the protection group is primary to the cluster on which the local role of the protection group is secondary.

Application handling proceeds only after data replication has been started successfully.

Activating a protection group has the following effect on the application layer:

- When a protection group is activated on the primary cluster, the application resource groups that are configured for the protection group are also started.
- When a protection group is activated on the secondary cluster, the application resource groups are *not* started.

The Hitachi TrueCopy command that is used to start data replication depends on the following factors:

- Aggregate device group state
- Local role of the protection group
- Current pair state

The following table describes the Hitachi TrueCopy command that is used to start data replication for each of the possible combinations of factors. In the commands, *dg* is the device group name and *fl* is the fence level that is configured for the device group.



TABLE 2-4 Commands Used to Start Hitachi TrueCopy Data Replication

Aggregate Device Group State	Valid Local Protection Group Role	Hitachi TrueCopy Start Command
SMPL	primary or secondary	<p>paircreate -vl -g dg -f fl</p> <p>paircreate -vr -g dg -f fl</p> <p>Both commands require that the horcmd process is running on the remote cluster.</p>
Regular Primary	primary	<p>If the local state code is 22, 23, 25, 26, 29, 42, 43, 45, 46, or 47, no command is run because data is already being replicated.</p> <p>If the local state code is 24, 44, or 48, then the following command is run: pairresync -g dg [-l].</p> <p>If the local state code is 11, then the following command is run: paircreate -vl -g dg -f fl.</p> <p>Both commands require that the horcmd process is running on the remote cluster.</p>
Regular Secondary	secondary	<p>If the local state code is 32, 33, 35, 36, 39, 52, 53, 55, 56, or 57, no command is run because data is already being replicated.</p> <p>If the local state code is 34, 54, or 58, then the following command is run: pairresync -g dg</p> <p>If the local state code is 11, the following command is run: paircreate -vr -g dg -f fl</p> <p>Both commands require that the horcmd process is up on the remote cluster.</p>
Takeover Primary	primary	<p>If the local state code is 34 or 54, the following command is run: pairresync -swaps -g.</p> <p>If the local state code is 11, then the following command is run: paircreate -vl -g dg -f fl.</p> <p>The paircreate command requires that the horcmd process is running on the remote cluster.</p>

TABLE 2-4 Commands Used to Start Hitachi TrueCopy Data Replication (Continued)

Aggregate Device Group State	Valid Local Protection Group Role	Hitachi TrueCopy Start Command
Takeover Secondary	secondary	<p>If the local state code is 24, 44, 25, or 45, the following command is run: <code>pairresync -swapp -g dg</code>.</p> <p>If the local state code is 11, the following command is run: <code>paircreate -vr -g dg -f fl</code>.</p> <p>Both commands require that the <code>horcmd</code> process is running on the remote cluster.</p>

## ▼ How to Activate a Hitachi TrueCopy Protection Group

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “Sun Cluster Geographic Edition Software and RBAC” in *Sun Cluster Geographic Edition System Administration Guide*.

### 2 Activate the protection group.

When you activate a protection group, its application resource groups are also brought online.

```
# geogg start -e scope [-n] protectiongroupname
```

`-e scope`

Specifies the scope of the command.

If the scope is `Local`, then the command operates on the local cluster only. If the scope is `Global`, the command operates on both clusters that deploy the protection group.

---

**Note** – The property values, such as `Global` and `Local`, are *not* case sensitive.

---

`-n`

Prevents the start of data replication at protection group startup.

If you omit this option, the data replication subsystem starts at the same time as the protection group.

*protectiongroupname*

Specifies the name of the protection group.

The `geogg start` command uses Sun Cluster commands to bring resource groups and resources online.

## Example 2–16 How the Sun Cluster Geographic Edition Software Issues the Command to Start Replication

This example illustrates how the Sun Cluster Geographic Edition determines the Hitachi TrueCopy command that is used to start data replication.

First, the Hitachi TrueCopy protection group is created.

```
phys-paris-1# geopg create -s paris-newyork-ps -o primary -d truecopy tcpg
```

A device group, devgroup1, is added to the protection group.

```
phys-paris-1# geopg add-device-group -p fence_level=async devgroup1 tcpg
```

The current state of a Hitachi TrueCopy device group, devgroup1, is provided in the output of the pairdisplay command:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..SMPL ---- -, ----- -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..SMPL ---- -, ----- -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..SMPL ---- -, ----- -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..SMPL ---- -, ----- -
```

The aggregate device group state is SMPL.

Next, the protection group, tcpg, is activated by using the geopg start command.

```
phys-paris-1# geopg start -e local tcpg
```

The Sun Cluster Geographic Edition software runs the paircreate -g devgroup1 -vl -f async command at the data replication level. If the command is successful, the state of devgroup1 is provided in the output of the pairdisplay command:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..P-VOL COPY ASYNC,54321 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..S-VOL COPY ASYNC,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..P-VOL COPY ASYNC,54321 610 -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..S-VOL COPY ASYNC,----- 2 -
```

## Example 2–17 Activating a Hitachi TrueCopy Protection Group Globally

This example activates a protection group globally.

```
# geopg start -e global tcpg
```

The protection group, `tcpg`, is activated on both clusters where the protection group is configured.

### **Example 2-18** Activating a Hitachi TrueCopy Protection Group Locally

This example activates a protection group on a local cluster only. This local cluster might be a primary cluster or a secondary cluster, depending on the role of the cluster.

```
# geopg start -e local tcpg
```

## **Deactivating a Hitachi TrueCopy Protection Group**

You can deactivate a protection group on the following levels:

- Globally – Deactivates a protection group on both clusters where the protection group is configured
- On the primary cluster only – Secondary cluster remains active
- On the secondary cluster only – Primary cluster remains active

Deactivating a Hitachi TrueCopy protection group on a cluster has the following effect on the data replication layer:

- The data replication configuration of the protection group is validated. During validation, the current local role of the protection group is compared with the aggregate device group state as described in [Table 2-3](#). If validation is successful, data replication is stopped.
- Data replication is stopped on the data replication device groups that are configured for the protection group, whether the deactivation occurs on a primary or secondary cluster.

Deactivating a protection group has the following effect on the application layer:

- When a protection group is deactivated on the primary cluster, all of the application resource groups that are configured for the protection group are stopped and unmanaged.
- When a protection group is deactivated on the secondary cluster, the resource groups on the secondary cluster are not affected. Application resource groups that are configured for the protection group might remain active on the primary cluster, depending on the activation state of the primary cluster.

The Hitachi TrueCopy command that is used to stop data replication depends on the following factors:

- Aggregate device group state
- Local role of the protection group
- Current pair state

The following table describes the Hitachi TrueCopy command used to stop data replication for each of the possible combinations of factors. In the commands, dg is the device group name.

TABLE 2-5 Commands Used to Stop Hitachi TrueCopy Data Replication

Aggregate Device Group State	Valid Local Protection Group Role	Hitachi TrueCopy Stop Command
SMPL	primary or secondary	No command is run because no data is being replicated.
Regular Primary	primary	If the local state code is 22, 23, 26, 29, 42, 43, 46, or 47, then the following command is run: pairsplit -g dg [-l].  If the local state code is 11, 24, 25, 44, 45, or 48, then no command is run because no data is being replicated.
Regular Secondary	secondary	If the local state code is 32, 33, 35, 36, 39, 52, 53, 55, 56, or 57, the following command is run: pairsplit -g dg.  If the local state code is 33 or 53 and the remote state is PSUE, no command is run to stop replication.  If the local state code is 11, 34, 54, or 58, then no command is run because no data is being replicated.
Takeover Primary	primary	No command is run because no data is being replicated.
Takeover Secondary	secondary	No command is run because no data is being replicated.

## ▼ How to Deactivate a Hitachi TrueCopy Protection Group

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in Sun Cluster Geographic Edition System Administration Guide](#).

### 2 Deactivate the protection group.

When you deactivate a protection group, its application resource groups are also unmanaged.

```
# geopg stop -e scope [-D] protectiongroupname
```

<code>-e scope</code>	<p>Specifies the scope of the command.</p> <p>If the scope is <code>Local</code>, then the command operates on the local cluster only. If the scope is <code>Global</code>, the command operates on both clusters where the protection group is deployed.</p> <hr/> <p><b>Note</b> – The property values, such as <code>Global</code> and <code>Local</code>, are <i>not</i> case sensitive.</p> <hr/>
<code>-D</code>	<p>Specifies that only data replication should be stopped and the protection group should be online.</p> <p>If you omit this option, the data replication subsystem and the protection group are both stopped.</p>
<code>protectiongroupname</code>	<p>Specifies the name of the protection group.</p>

### Example 2–19 How the Sun Cluster Geographic Edition Software Issues the Command to Stop Replication

This example illustrates how the Sun Cluster Geographic Edition software determines the Hitachi TrueCopy command that is used to stop data replication.

The current state of the Hitachi TrueCopy device group, `devgroup1`, is provided in the output of the `pairdisplay` command:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..P-VOL PAIR ASYNC,54321 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..S-VOL PAIR ASYNC,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..P-VOL PAIR ASYNC,54321 610 -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..S-VOL PAIR ASYNC,----- 2 -
```

A device group, `devgroup1`, is added to the protection group as follows:

```
phys-paris-1# geogp add-device-group -p fence_level=async devgroup1 tcpg
```

The Sun Cluster Geographic Edition software runs the `pairvolchk -g <DG> -ss` command at the data replication level, which returns a value of 43.

```
# pairvolchk -g devgroup1 -ss
Volstat is P-VOL.[status = PAIR fence = ASYNC]
phys-paris-1# echo $?
43
```

Next, the protection group, `tcpg`, is deactivated by using the `geogp stop` command.

```
phys-paris-1# geogp stop -s local tcpg
```

The Sun Cluster Geographic Edition software runs the `pairsplit -g devgroup1` command at the data replication level.

If the command is successful, the state of `devgroup1` is provided in the output of the `pairdisplay` command:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..P-VOL PSUS ASYNC,54321 609 -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..S-VOL SSUS ASYNC,----- 1 -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..P-VOL PSUS ASYNC,54321 610 -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..S-VOL SSUS ASYNC,----- 2 -
```

### Example 2–20 Deactivating a Protection Group on All Clusters

This example deactivates a protection group on all clusters.

```
# geogp stop -e global tcpg
```

### Example 2–21 Deactivating a Protection Group on a Local Cluster

This example deactivates a protection group on the local cluster.

```
# geogp stop -e local tcpg
```

### Example 2–22 Stopping Data Replication While Leaving the Protection Group Online

This example stops only data replication on a local cluster.

```
# geogp stop -e local -D tcpg
```

If the administrator decides later to deactivate both the protection group and its underlying data replication subsystem, the administrator can rerun the command without the `-D` option:

```
# geogp stop -e local tcpg
```

**Example 2–23** Deactivating a Hitachi TrueCopy Protection Group While Keeping Application Resource Groups Online

This example keeps two application resource groups, `apprg1` and `apprg2`, online while deactivating their protection group, `tcpg`, on both clusters.

1. Remove the application resource groups from the protection group.

```
# geopg remove-resource-group apprg1,apprg2 tcpg
```

2. Deactivate the protection group.

```
# geopg stop -e global tcpg
```

## Resynchronizing a Hitachi TrueCopy Protection Group

You can resynchronize the configuration information of the local protection group with the configuration information that is retrieved from the partner cluster. You need to resynchronize a protection group when its Synchronization status in the output of the `geoadm status` command is `Error`.

For example, you might need to resynchronize protection groups after booting the cluster. For more information, see [“Booting a Cluster” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

Resynchronizing a protection group updates only entities that are related to Sun Cluster Geographic Edition software. For information about how to update Sun Cluster entities, see [“Replicating and Upgrading Configuration Data for Resource Groups, Resource Types, and Resources” in \*Sun Cluster Data Services Planning and Administration Guide for Solaris OS\*](#).

### ▼ How to Resynchronize a Protection Group

**Before You Begin** The protection group must be deactivated on the cluster where you are running the `geopg update` command. For information about deactivating a protection group, see [“Deactivating a Hitachi TrueCopy Protection Group” on page 60](#).

#### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

#### 2 Resynchronize the protection group.

```
# geopg update protectiongroupname
```



*protectiongroupname* Specifies the name of the protection group

### Example 2–24 Resynchronizing a Protection Group

This example resynchronizes a protection group.

```
# geopg update tcpg
```

## Checking the Runtime Status of Hitachi TrueCopy Data Replication

You can obtain an overall view of the status of replication, as well as a more detailed runtime status of the Hitachi TrueCopy replication resource groups. The following sections describe the procedures for checking each status.

- [“Displaying a Hitachi TrueCopy Runtime Status Overview” on page 65](#)
- [“Displaying a Detailed Hitachi TrueCopy Runtime Status” on page 66](#)

### Displaying a Hitachi TrueCopy Runtime Status Overview

The status of each Hitachi TrueCopy data replication resource indicates the status of replication on a particular device group. The status of all the resources under a protection group are aggregated in the replication status. This replication status is the second component of the protection group state. For more information about the states of protection groups, refer to [“Monitoring the Runtime Status of the Sun Cluster Geographic Edition Software” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

To view the overall status of replication, look at the protection group state as described in the following procedure.

#### ▼ How to Check the Overall Runtime Status of Replication

- 1 Access a node of the cluster where the protection group has been defined.

You must be assigned the Basic Solaris User RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

## 2 Check the runtime status of replication.

# `geoadm status`

Refer to the Protection Group section of the output for replication information. The information that is displayed by this command includes the following:

- Whether the local cluster is enabled for partnership participation
- Whether the local cluster is involved in a partnership
- Status of the heartbeat configuration
- Status of the defined protection groups
- Status of current transactions

## 3 Check the runtime status of data replication for each Hitachi TrueCopy device group.

# `clresource status`

Refer to the Status and Status Message fields for the data replication device group you want to check.

**See Also** For more information about these fields, see [Table 2–6](#).

# Displaying a Detailed Hitachi TrueCopy Runtime Status

The Sun Cluster Geographic Edition software internally creates and maintains one replication resource group for each protection group. The name of the replication resource group has the following format:

*rg-tc\_truecopyprotectiongroupname*

If you add a Hitachi TrueCopy device group to a protection group, Sun Cluster Geographic Edition software creates a resource for each device group. This resource monitors the status of replication for its device group. The name of each resource has the following format:

*r-tc-truecopyprotectiongroupname-truecopydevicegroupname*

You can monitor the status of replication of this device group by checking the Status and Status Message of this resource. Use the `clresource status` command to display the resource status and the status message.

The following table describes the Status and Status Message values that are returned by the `clresource status` command when the State of the Hitachi TrueCopy replication resource group is `Online`.

TABLE 2-6 Status and Status Messages of an Online Hitachi TrueCopy Replication Resource Group

Status	Status Message
Online	P-Vol/S-Vol:PAIR
Online	P-Vol/S-Vol:PAIR:Remote horcmd not reachable
Online	P-Vol/S-Vol:PFUL
Online	P-Vol/S-Vol:PFUL:Remote horcmd not reachable
Degraded	SMPL:SMPL
Degraded	SMPL:SMPL:Remote horcmd not reachable
Degraded	P-Vol/S-Vol:COPY
Degraded	P-Vol/S-Vol:COPY:Remote horcmd not reachable
Degraded	P-Vol/S-Vol:PSUS
Degraded	P-Vol/S-Vol:PSUS:Remote horcmd not reachable
Degraded	P-Vol/S-Vol:PFUS
Degraded	P-Vol/S-Vol:PFUS:Remote horcmd not reachable
Faulted	P-Vol/S-Vol:PDFUB
Faulted	P-Vol/S-Vol:PDUB:Remote horcmd not reachable
Faulted	P-Vol/S-Vol:PSUE
Faulted	P-Vol/S-Vol:PSUE:Remote horcmd not reachable
Degraded	S-Vol:SSWS:Takeover Volumes
Faulted	P-Vol/S-Vol:Suspicious role configuration. Actual Role=x, Config Role=y

For more information about these values, refer to the Hitachi TrueCopy documentation.

For more information about the `clresource status` command, see the [clresource\(1CL\)](#) man page.



# Migrating Services That Use Hitachi TrueCopy Data Replication

---

This chapter provides information about migrating services for maintenance or as a result of cluster failure. This chapter contains the following sections:

- “Detecting Cluster Failure on a System That Uses Hitachi TrueCopy Data Replication” on page 69
- “Migrating Services That Use Hitachi TrueCopy Data Replication With a Switchover” on page 71
- “Forcing a Takeover on a System That Uses Hitachi TrueCopy Data Replication” on page 73
- “Recovering Services to a Cluster on a System That Uses Hitachi TrueCopy Replication” on page 77
- “Recovering From a Switchover Failure on a System That Uses Hitachi TrueCopy Replication” on page 86
- “Recovering From a Hitachi TrueCopy Data Replication Error” on page 90

## Detecting Cluster Failure on a System That Uses Hitachi TrueCopy Data Replication

This section describes the internal processes that occur when failure is detected on a primary or a secondary cluster.

- “Detecting Primary Cluster Failure” on page 69
- “Detecting Secondary Cluster Failure” on page 70

### Detecting Primary Cluster Failure

When the primary cluster for a given protection group fails, the secondary cluster in the partnership detects the failure. The cluster that fails might be a member of more than one partnership, resulting in multiple failure detections.

The following actions take place when a primary cluster failure occurs. During a failure, the appropriate protection groups are in the Unknown state.

- Heartbeat failure is detected by a partner cluster.
- The heartbeat is activated in emergency mode to verify that the heartbeat loss is not transient and that the primary cluster has failed. The heartbeat remains in the OnLine state during this default timeout interval, while the heartbeat mechanism continues to retry the primary cluster.

This query interval is set by using the `Query_interval` heartbeat property. If the heartbeat still fails after the interval you configured, a heartbeat-lost event is generated and logged in the system log. When you use the default interval, the emergency-mode retry behavior might delay heartbeat-loss notification for about nine minutes. Messages are displayed in the graphical user interface (GUI) and in the output of the `geoadm status` command.

For more information about logging, see “[Viewing the Sun Cluster Geographic Edition Log Messages](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

## Detecting Secondary Cluster Failure

When a secondary cluster for a given protection group fails, a cluster in the same partnership detects the failure. The cluster that failed might be a member of more than one partnership, resulting in multiple failure detections.

During failure detection, the following actions occur:

- Heartbeat failure is detected by a partner cluster.
- The heartbeat is activated in emergency mode to verify that the secondary cluster is dead.
- The cluster notifies the administrator. The system detects all protection groups for which the cluster that failed was acting as secondary. The state of the appropriate protection groups is marked Unknown.

# Migrating Services That Use Hitachi TrueCopy Data Replication With a Switchover

Perform a switchover of a Hitachi TrueCopy protection group when you want to migrate services to the partner cluster in an orderly fashion. A switchover consists of the following:

- Application services are offline on the former primary cluster, `cluster-paris`.  
For a reminder of which cluster is `cluster-paris`, see “[Example Sun Cluster Geographic Edition Cluster Configuration](#)” in *Sun Cluster Geographic Edition System Administration Guide*.
- The data replication role is reversed and now continues to run from the new primary, `cluster-newyork`, to the former primary, `cluster-paris`.
- Application services are brought online on the new primary cluster, `cluster-newyork`.

This section provides the following information:

- “[Validations That Occur Before a Switchover](#)” on page 71
- “[Results of a Switchover From a Replication Perspective](#)” on page 72
- “[How to Switch Over a Hitachi TrueCopy Protection Group From Primary to Secondary](#)” on page 72

## Validations That Occur Before a Switchover

When a switchover is initiated by using the `geopg switchover` command, the data replication subsystem runs several validations on both clusters. The switchover is performed only if the validation step succeeds on both clusters.

First, the replication subsystem checks that the Hitachi TrueCopy device group is in a valid aggregate device group state. Then, it checks that the local device group states on the target primary cluster, `cluster-newyork`, are 23, 33, 43, or 53. The local device group state is returned by the `pairvolchk -g device-group-name -ss` command. These values correspond to a `PVOL_PAIR` or `SVOL_PAIR` state. The Hitachi TrueCopy commands that are run on the new primary cluster, `cluster-newyork`, are described in the following table.

TABLE 3-1 Hitachi TrueCopy Switchover Validations on the New Primary Cluster

Aggregate Device Group State	Valid Device Group State on Local Cluster	Hitachi TrueCopy Switchover Commands That Are Run on <code>cluster-newyork</code>
SMPL	None	None
Regular primary	23, 43	No command is run, because the Hitachi TrueCopy device group is already in the <code>PVOL_PAIR</code> state.

TABLE 3-1 Hitachi TrueCopy Switchover Validations on the New Primary Cluster (Continued)

Aggregate Device Group State	Valid Device Group State on Local Cluster	Hitachi TrueCopy Switchover Commands That Are Run on cluster-newyork
Regular secondary	33, 53	horctakeover -g dg [-t]  The -t option is specified when the fence_level of the Hitachi TrueCopy device group is async. The value is calculated as 80% of the Timeout property of the protection group. For example, if the protection group has a Timeout of 200 seconds, the value of -t used in this command is 80% of 200 seconds, or 160 seconds.
Takeover primary	None	None
Takeover secondary	None	None

## Results of a Switchover From a Replication Perspective

After a successful switchover, at the data replication level the roles of the primary and secondary volumes have been switched. The PVOL\_PAIR volumes that were in place before the switchover become the SVOL\_PAIR volumes. The SVOL\_PAIR volumes in place before the switchover become the PVOL\_PAIR volumes. Data replication will continue from the new PVOL\_PAIR volumes to the new SVOL\_PAIR volumes.

The Local\_role property of the protection group is also switched regardless of whether the application could be brought online on the new primary cluster as part of the switchover operation. On the cluster on which the protection group had a Local\_role of Secondary, the Local\_role property of the protection group becomes Primary. On the cluster on which the protection group had a Local\_role of Primary, the Local\_role property of the protection group becomes Secondary.

### ▼ How to Switch Over a Hitachi TrueCopy Protection Group From Primary to Secondary

**Before You Begin** For a successful switchover, data replication must be active between the primary and the secondary clusters and data volumes on the two clusters must be synchronized.

Before you switch over a protection group from the primary cluster to the secondary cluster, ensure that the following conditions are met:

- The Sun Cluster Geographic Edition software is running on the both clusters.
- The secondary cluster is a member of a partnership.
- Both cluster partners can be reached.
- The protection group is in the OK state.





**Caution** – If you have configured the `Cluster_dgs` property, only applications that belong to the protection group can write to the device groups specified in the `Cluster_dgs` property.

### 1 Log in to a cluster node.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see “Sun Cluster Geographic Edition Software and RBAC” in *Sun Cluster Geographic Edition System Administration Guide*.

### 2 Initiate the switchover.

The application resource groups that are a part of the protection group are stopped and started during the switchover.

```
# geopg switchover [-f] -m newprimarycluster protectiongroupname
```

`-f` Forces the command to perform the operation without asking you for confirmation

`-m newprimarycluster` Specifies the name of the cluster that is to be the new primary cluster for the protection group

`protectiongroupname` Specifies the name of the protection group

#### Example 3-1 Forcing a Switchover From Primary to Secondary

This example performs a switchover to the secondary cluster.

```
# geopg switchover -f -m cluster-newyork tcpg
```

## Forcing a Takeover on a System That Uses Hitachi TrueCopy Data Replication

Perform a takeover when applications need to be brought online on the secondary cluster regardless of whether the data is completely consistent between the primary volume and the secondary volume. The information in this section assumes that the protection group has been started.

The following steps occur after a takeover is initiated:

- If the former primary cluster, `cluster-paris`, can be reached and the protection group is not locked for notification handling or some other reason, the application services are taken offline on the former primary cluster.

For a reminder of which cluster is `cluster-paris`, see “[Example Sun Cluster Geographic Edition Cluster Configuration](#)” in *Sun Cluster Geographic Edition System Administration Guide*.

- Data volumes of the former primary cluster, `cluster-paris`, are taken over by the new primary cluster, `cluster-newyork`.

---

**Note** – This data might not be consistent with the original primary volumes. After the takeover, data replication from the new primary cluster, `cluster-newyork`, to the former primary cluster, `cluster-paris`, is stopped.

---

- Application services are brought online on the new primary cluster, `cluster-newyork`.

For details about the possible conditions of the primary and secondary cluster before and after takeover, see [Appendix C, “Takeover Postconditions,”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

The following sections describe the steps you must perform to force a takeover by a secondary cluster.

- “[Validations That Occur Before a Takeover](#)” on page 74
- “[Results of a Takeover From a Replication Perspective](#)” on page 75
- “[How to Force Immediate Takeover of Hitachi TrueCopy Services by a Secondary Cluster](#)” on page 76

## Validations That Occur Before a Takeover

When a takeover is initiated by using the `geopg takeover` command, the data replication subsystem runs several validations on both clusters. These steps are conducted on the original primary cluster only if the primary cluster can be reached. If validation on the original primary cluster fails, the takeover still occurs.

First, the replication subsystem checks that the Hitachi TrueCopy device group is in a valid aggregate device group state. Then, the replication subsystem checks that the local device group states on the target primary cluster, `cluster-newyork`, are not 32 or 52. These values correspond to a `SVOL_COPY` state, for which the `horctakeover` command fails. The Hitachi TrueCopy commands that are used for the takeover are described in the following table.

TABLE 3-2 Hitachi TrueCopy Takeover Validations on the New Primary Cluster

Aggregate Device Group State	Valid Local State Device Group State	Hitachi TrueCopy Takeover Commands That Are Run on <code>cluster-newyork</code>
SMPL	All	No command is run.
Regular primary	All	No command is run.
Regular secondary	All Regular secondary states except 32 or 52  For a list of Regular secondary states, refer to <a href="#">Table 2-1</a> and <a href="#">Table 2-2</a> .	<code>horctakeover -S -g dg [-t]</code>  The <code>-t</code> option is given when the <code>fence_level</code> of the Hitachi TrueCopy device group is <code>async</code> . The value is calculated as 80% of the <code>Timeout</code> property of the protection group. For example, if the protection group has a <code>Timeout</code> of 200 seconds, the value of <code>-t</code> used in this command will be 80% of 200 seconds, or 160 seconds.
Takeover primary	All	No command is run.
Takeover secondary	All	<code>pairsplit -R-g dg pairsplit -S-g dg</code>

## Results of a Takeover From a Replication Perspective

From a replication perspective, after a successful takeover, the `Local_role` property of the protection group is changed to reflect the new role, it is immaterial whether the application could be brought online on the new primary cluster as part of the takeover operation. On `cluster-newyork`, where the protection group had a `Local_role` of `Secondary`, the `Local_role` property of the protection group becomes `Primary`. On `cluster-paris`, where the protection group had a `Local_role` of `Primary`, the following might occur:

- If the cluster can be reached, the `Local_role` property of the protection group becomes `Secondary`.
- If the cluster cannot be reached, the `Local_role` property of the protection group remains `Primary`.

If the takeover is successful, the applications are brought online. You do not need to run a separate `geopg start` command.



**Caution** – After a successful takeover, data replication between the new primary cluster, `cluster-newyork`, and the old primary cluster, `cluster-paris`, is stopped. If you want to run a `geopg start` command, you must use the `-n` option to prevent replication from resuming.

## ▼ How to Force Immediate Takeover of Hitachi TrueCopy Services by a Secondary Cluster

**Before You Begin** Before you force the secondary cluster to assume the activity of the primary cluster, ensure that the following conditions are met:

- Sun Cluster Geographic Edition software is running on the cluster.
- The cluster is a member of a partnership.
- The Configuration status of the protection group is OK on the secondary cluster.

### 1 Log in to a node in the secondary cluster.

You must be assigned the Geo Management RBAC rights profile to complete this procedure. For more information about RBAC, see [“Sun Cluster Geographic Edition Software and RBAC” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

### 2 Initiate the takeover.

```
# geopg takeover [-f] protectiongroupname
```

-f Forces the command to perform the operation without your confirmation

*protectiongroupname* Specifies the name of the protection group

### Example 3–2 Forcing a Takeover by a Secondary Cluster

This example forces the takeover of tcpg by the secondary cluster cluster-newyork.

The phys-newyork-1 cluster is the first node of the secondary cluster. For a reminder of which node is phys-newyork-1, see [“Example Sun Cluster Geographic Edition Cluster Configuration” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

```
phys-newyork-1# geopg takeover -f tcpg
```

**Next Steps** For information about the state of the primary and secondary clusters after a takeover, see [Appendix C, “Takeover Postconditions,” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

# Recovering Services to a Cluster on a System That Uses Hitachi TrueCopy Replication

After a successful takeover operation, the secondary cluster, `cluster-newyork`, becomes the primary for the protection group and the services are online on the secondary cluster. After the recovery of the original primary cluster, `cluster-paris`, the services can be brought online again on the original primary by using a process called *failback*.

Sun Cluster Geographic Edition software supports the following kinds of failback:

- **Failback-switchover.** During a failback-switchover, applications are brought online again on the original primary cluster, `cluster-paris`, after the data of the original primary cluster was resynchronized with the data on the secondary cluster, `cluster-newyork`.

For a reminder of which clusters are `cluster-paris` and `cluster-newyork`, see [“Example Sun Cluster Geographic Edition Cluster Configuration”](#) in *Sun Cluster Geographic Edition System Administration Guide*.

- **Failback-takeover.** During a failback-takeover, applications are brought online again on the original primary cluster, `cluster-paris`, and use the current data on the original primary cluster. Any updates that occurred on the secondary cluster, `cluster-newyork`, while it was acting as primary are discarded.

To continue using the new primary, `cluster-newyork`, as the primary cluster and the original primary cluster, `cluster-paris`, as the secondary after the original primary is running again, resynchronize and revalidate the protection group configuration without performing a switchover or takeover.

This section provides the following information:

- [“How to Resynchronize and Revalidate the Protection Group Configuration”](#) on page 77
- [“How to Perform a Failback-Switchover on a System That Uses Hitachi TrueCopy Replication”](#) on page 79
- [“How to Perform a Failback-Takeover on a System That Uses Hitachi TrueCopy Replication”](#) on page 82

## ▼ How to Resynchronize and Revalidate the Protection Group Configuration

Use this procedure to resynchronize and revalidate data on the original primary cluster, `cluster-paris`, with the data on the current primary cluster, `cluster-newyork`.

**Before You Begin** Before you resynchronize and revalidate the protection group configuration, a takeover has occurred on `cluster-newyork`. The clusters now have the following roles:

- If the original primary cluster, `cluster-paris`, has been down, confirm that the cluster is booted and that the Sun Cluster Geographic Edition infrastructure is enabled on the cluster. For more information about booting a cluster, see [“Booting a Cluster” in Sun Cluster Geographic Edition System Administration Guide](#).
- The protection group on `cluster-newyork` has the primary role.
- The protection group on `cluster-paris` has either the primary role or secondary role, depending on whether `cluster-paris` could be reached during the takeover from `cluster-newyork`.

**1 Resynchronize the original primary cluster, `cluster-paris`, with the current primary cluster, `cluster-newyork`.**

`cluster-paris` forfeits its own configuration and replicates the `cluster-newyork` configuration locally. Resynchronize both the partnership and protection group configurations.

**a. On `cluster-paris`, resynchronize the partnership.**

```
# geops update partnershipname
```

*partnershipname* Specifies the name of the partnership

---

**Note** – You need to perform this step only once, even if you are resynchronizing multiple protection groups.

---

For more information about synchronizing partnerships, see [“Resynchronizing a Partnership” in Sun Cluster Geographic Edition System Administration Guide](#).

**b. On `cluster-paris`, resynchronize each protection group.**

Because the role of the protection group on `cluster-newyork` is primary, this step ensures that the role of the protection group on `cluster-paris` is secondary.

```
# geopg update protectiongroupname
```

*protectiongroupname* Specifies the name of the protection group

For more information about synchronizing protection groups, see [“Resynchronizing a Hitachi TrueCopy Protection Group” on page 64](#).

**2 On `cluster-paris`, validate the cluster configuration for each protection group.**

```
# geopg validate protectiongroupname
```

*protectiongroupname* Specifies a unique name that identifies a single protection group

For more information, see [“How to Validate a Hitachi TrueCopy Protection Group” on page 41](#).

**3 On cluster-paris, activate each protection group.**

Because the protection group on `cluster-paris` has a role of secondary, the `geopg start` command does not restart the application on `cluster-paris`.

```
# geopg start -e local protectiongroupname
```

`-e local` Specifies the scope of the command.

By specifying a `local` scope, the command operates on the local cluster only.

*protectiongroupname* Specifies the name of the protection group.




---

**Caution** – Do not use the `-n` option because the data needs to be synchronized from the current primary, `cluster-newyork`, to the current secondary, `cluster-paris`.

---

Because the protection group has a role of secondary, the data is synchronized from the current primary, `cluster-newyork`, to the current secondary, `cluster-paris`.

For more information about the `geopg start` command, see [“How to Activate a Hitachi TrueCopy Protection Group” on page 58](#).

**4 Confirm that the data is completely synchronized.**

The state of the protection group on `cluster-newyork` must be OK.

```
phys-newyork-1# geoadm status
```

Refer to the Protection Group section of the output.

The protection group has a local state of OK when the Hitachi TrueCopy device groups on `cluster-newyork` have a state of `PVOL_PAIR` and the Hitachi TrueCopy device groups on `cluster-paris` have a state of `SVOL_PAIR`.

## ▼ How to Perform a Failback-Switchover on a System That Uses Hitachi TrueCopy Replication

Use this procedure to restart an application on the original primary cluster, `cluster-paris`, after the data on this cluster has been resynchronized with the data on the current primary cluster, `cluster-newyork`.

---

**Note** – The failback procedures apply only to clusters in a partnership. You need to perform the following procedure only once per partnership.

---

**Before You Begin** Before you perform a failback-switchover, a takeover has occurred on `cluster-newyork`. The clusters have the following roles:

- If the original primary cluster, `cluster-paris`, has been down, confirm that the cluster is booted and that the Sun Cluster Geographic Edition infrastructure is enabled on the cluster. For more information about booting a cluster, see [“Booting a Cluster” in Sun Cluster Geographic Edition System Administration Guide](#).
- The protection group on `cluster-newyork` has the primary role.
- The protection group on `cluster-paris` has either the primary role or secondary role, depending on whether `cluster-paris` could be reached during the takeover from `cluster-newyork`.

**1 Resynchronize the original primary cluster, `cluster-paris`, with the current primary cluster, `cluster-newyork`.**

`cluster-paris` forfeits its own configuration and replicates the `cluster-newyork` configuration locally. Resynchronize both the partnership and protection group configurations.

**a. On `cluster-paris`, resynchronize the partnership.**

```
phys-paris-1# geops update partnershipname
```

*partnershipname* Specifies the name of the partnership

---

**Note** – You need to perform this step only once per partnership, even if you are performing a failback-switchover for multiple protection groups in the partnership.

---

For more information about synchronizing partnerships, see [“Resynchronizing a Partnership” in Sun Cluster Geographic Edition System Administration Guide](#).

**b. Determine whether the protection group on the original primary cluster, `cluster-paris`, is active.**

```
phys-paris-1# geoadm status
```

**c. If the protection group on the original primary cluster is active, stop it.**

```
phys-paris-1# geogg stop -e local protectiongroupname
```

**d. Verify that the protection group is stopped.**

```
phys-paris-1# geoadm status
```

**e. On `cluster-paris`, resynchronize each protection group.**

Because the local role of the protection group on `cluster-newyork` is now primary, this step ensures that the role of the protection group on `cluster-paris` becomes secondary.

```
phys-paris-1# geogg update protectiongroupname
```



*protectiongroupname* Specifies the name of the protection group

For more information about synchronizing protection groups, see [“Resynchronizing a Hitachi TrueCopy Protection Group”](#) on page 64.

## 2 On `cluster-paris`, validate the cluster configuration for each protection group.

Ensure that the protection group is not in an error state. A protection group cannot be started when it is in an error state.

```
phys-paris-1# geogg validate protectiongroupname
```

*protectiongroupname* Specifies a unique name that identifies a single protection group

For more information, see [“How to Validate a Hitachi TrueCopy Protection Group”](#) on page 41.

## 3 On `cluster-paris`, activate each protection group.

Because the protection group on `cluster-paris` has a role of secondary, the `geogg start` command does not restart the application on `cluster-paris`.

```
phys-paris-1# geogg start -e local protectiongroupname
```

`-e local` Specifies the scope of the command.

By specifying a `local` scope, the command operates on the local cluster only.

*protectiongroupname* Specifies the name of the protection group.




---

**Caution** – Do not use the `-n` option because the data needs to be synchronized from the current primary, `cluster-newyork`, to the current secondary, `cluster-paris`.

---

Because the protection group has a role of secondary, the data is synchronized from the current primary, `cluster-newyork`, to the current secondary, `cluster-paris`.

For more information about the `geogg start` command, see [“How to Activate a Hitachi TrueCopy Protection Group”](#) on page 58.

## 4 Confirm that the data is completely synchronized.

The state of the protection group on `cluster-newyork` must be OK.

```
phys-newyork-1# geoadm status
```

Refer to the Protection Group section of the output.

The protection group has a local state of OK when the Hitachi TrueCopy device groups on `cluster-newyork` have a state of `PVOL_PAIR` and the Hitachi TrueCopy device groups on `cluster-paris` have a state of `SVOL_PAIR`.

- 5 **On both partner clusters, ensure that the protection group is activated.**

```
# geoadm status
```

- 6 **On either cluster, perform a switchover from `cluster-newyork` to `cluster-paris` for each protection group.**

```
# geopg switchover [-f] -m clusterparis protectiongroupname
```

For more information, see [“How to Switch Over a Hitachi TrueCopy Protection Group From Primary to Secondary”](#) on page 72.

`cluster-paris` resumes its original role as primary cluster for the protection group.

- 7 **Ensure that the switchover was performed successfully.**

Verify that the protection group is now primary on `cluster-paris` and secondary on `cluster-newyork` and that the state for Data replication and Resource groups is OK on both clusters.

```
# geoadm status
```

Check the runtime status of the application resource group and data replication for each Hitachi TrueCopy protection group.

```
# clresourcegroup status -v
# clresource status -v
```

Refer to the Status and Status Message fields that are presented for the data replication device group you want to check. For more information about these fields, see [Table 2-1](#).

For more information about the runtime status of data replication see, [“Checking the Runtime Status of Hitachi TrueCopy Data Replication”](#) on page 65.

## ▼ **How to Perform a Failback-Takeover on a System That Uses Hitachi TrueCopy Replication**

Use this procedure to restart an application on the original primary cluster, `cluster-paris`, and use the current data on the original primary cluster. Any updates that occurred on the secondary cluster, `cluster-newyork`, while it was acting as primary are discarded.

The failback procedures apply only to clusters in a partnership. You need to perform the following procedure only once per partnership.

---

**Note** – Conditionally, you can resume using the data on the original primary, `cluster-paris`. You must not have replicated data from the new primary, `cluster-newyork`, to the original primary cluster, `cluster-paris`, at any point after the takeover operation on `cluster-newyork`. To prevent data replication between the new primary and the original primary, you must use the `-n` option when you run the `geopg start` command.

---

**Before You Begin** Ensure that the clusters have the following roles:

- The protection group on `cluster-newyork` has the primary role.
- The protection group on `cluster-paris` has either the primary role or secondary role, depending on whether the protection group could be reached during the takeover.

**1 Resynchronize the original primary cluster, `cluster-paris`, with the original secondary cluster, `cluster-newyork`.**

`cluster-paris` forfeits its own configuration and replicates the `cluster-newyork` configuration locally.

**a. On `cluster-paris`, resynchronize the partnership.**

```
phys-paris-1# geops update partnershipname
```

*partnershipname* Specifies the name of the partnership

---

**Note** – You need to perform this step only once per partnership, even if you are performing a failback-takeover for multiple protection groups in the partnership.

---

For more information about synchronizing partnerships, see [“Resynchronizing a Partnership” in \*Sun Cluster Geographic Edition System Administration Guide\*](#).

**b. Determine whether the protection group on the original primary cluster, `cluster-paris`, is active.**

```
phys-paris-1# geoadm status
```

**c. If the protection group on the original primary cluster is active, stop it.**

```
phys-paris-1# geopg stop -e local protectiongroupname
```

**d. Verify that the protection group is stopped.**

```
phys-paris-1# geoadm status
```

**e. Place the Hitachi TrueCopy device group, `devgroup1`, in the SMPL state.**

Use the `pairsplit` commands to place the Hitachi TrueCopy device groups that are in the protection group on both `cluster-paris` and `cluster-newyork` in the SMPL state. The

`pairsplit` command you use depends on the pair state of the Hitachi TrueCopy device group. The following table gives some examples of the command you need to use on `cluster-paris` for some typical pair states.

Pair State on <code>cluster-paris</code>	Pair State on <code>cluster-newyork</code>	<code>pairsplit</code> Command Used on <code>cluster-paris</code>
PSUS or PSUE	SSWS	<code>pairsplit -R -g dname</code> <code>pairsplit -S -g dname</code>
SSUS	PSUS	<code>pairsplit -S -g dname</code>

If the command is successful, the state of `devgroup1` is provided in the output of the `pairdisplay` command:

```
phys-paris-1# pairdisplay -g devgroup1
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#,P/S,Status,Fence,Seq#,P-LDEV# M
devgroup1 pair1(L) (CL1-A , 0, 1) 12345 1..SMPL ---- -,----- ---- -
devgroup1 pair1(R) (CL1-C , 0, 20)54321 609..SMPL ---- -,----- ---- -
devgroup1 pair2(L) (CL1-A , 0, 2) 12345 2..SMPL ---- -,----- ---- -
devgroup1 pair2(R) (CL1-C , 0,21) 54321 610..SMPL ---- -,----- ---- -
```

**f. On `cluster-paris`, resynchronize each protection group.**

```
phys-paris-1# geopg update protectiongroupname
```

*protectiongroupname* Specifies the name of the protection group

For more information about resynchronizing protection groups, see [“How to Resynchronize a Protection Group” on page 64](#).

**2 On `cluster-paris`, validate the configuration for each protection group.**

Ensure that the protection group is not in an error state. A protection group cannot be started when it is in an error state.

```
phys-paris-1# geopg validate protectiongroupname
```

*protectiongroupname* Specifies a unique name that identifies a single protection group

For more information, see [“How to Validate a Hitachi TrueCopy Protection Group” on page 41](#).

**3 On `cluster-paris`, activate each protection group in the secondary role *without data replication*.**

Because the protection group on `cluster-paris` has a role of secondary, the `geopg start` command does not restart the application on `cluster-paris`.

```
phys-paris-1# geopg start -e local -n protectiongroupname
```



- n Prevents the start of data replication at protection group startup.  
If you omit this option, the data replication subsystem starts at the same time as the protection group.
- protectiongroupname* Specifies the name of the protection group.

For more information about the `geopg start` command, see [“How to Activate a Hitachi TrueCopy Protection Group” on page 58](#).

## 6 Ensure that the takeover was performed successfully.

Verify that the protection group is now primary on `cluster-paris` and secondary on `cluster-newyork` and that the state for “Data replication” and “Resource groups” is OK on both clusters.

```
# geoadm status
```

Check the runtime status of the application resource group and data replication for each Hitachi TrueCopy protection group.

```
# clresourcegroup status -v  
# clresource status -v
```

Refer to the Status and Status Message fields that are presented for the data replication device group you want to check. For more information about these fields, see [Table 2-1](#).

For more information about the runtime status of data replication, see [“Checking the Runtime Status of Hitachi TrueCopy Data Replication” on page 65](#).

# Recovering From a Switchover Failure on a System That Uses Hitachi TrueCopy Replication

When you run the `geopg switchover` command, the `horctakeover` command runs at the Hitachi TrueCopy data replication level. If the `horctakeover` command returns a value of 1, the switchover is successful.

In Hitachi TrueCopy terminology, a switchover is called a *swap-takeover*. In some cases, the `horctakeover` command might not be able to perform a *swap-takeover*. In these cases, a return value other than 1 is returned, which is considered a switchover failure.

---

**Note** – In a failure, the `horctakeover` command usually returns a value of 5, which indicates a SVOL-SSUS-takeover.

---

One reason the `horctakeover` command might fail to perform a swap-takeover is because the data replication link, ESCON/FC, is down.

Any result other than a swap-takeover implies that the secondary volumes might not be fully synchronized with the primary volumes. Sun Cluster Geographic Edition software does not start the applications on the new intended primary cluster in a switchover failure scenario.

The remainder of this section describes the initial conditions that lead to a switchover failure and how to recover from a switchover failure.

- [“Switchover Failure Conditions” on page 87](#)
- [“Recovering From Switchover Failure” on page 88](#)
- [“How to Make the Original Primary Cluster Primary for a Hitachi TrueCopy Protection Group” on page 88](#)
- [“How to Make the Original Secondary Cluster Primary for a Hitachi TrueCopy Protection Group” on page 89](#)

## Switchover Failure Conditions

This section describes a switchover failure scenario. In this scenario, `cluster-paris` is the original primary cluster and `cluster-newyork` is the original secondary cluster.

A switchover switches the services from `cluster-paris` to `cluster-newyork` as follows:

```
phys-newyork-1# geopg switchover -f -m cluster-newyork tcpg
```

While processing the `geopg switchover` command, the `horctakeover` command performs an SVOL-SSUS-takeover and returns a value of 5 for the Hitachi TrueCopy device group, `devgroup1`. As a result, the `geopg switchover` command returns with the following failure message:

```
Processing operation... this may take a while ...
"Switchover" failed for the following reason:
    Switchover failed for Truecopy DG devgroup1
```

After this failure message has been issued, the two clusters are in the following states:

```
cluster-paris:
    tcpg role: Secondary
cluster-newyork:
    tcpg role: Secondary
```

```
phys-newyork-1# pairdisplay -g devgroup1 -fc
Group PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S, Status,Fence,%, P-LDEV# M
devgroup1 pair1(L) (CL1-C , 0, 20)12345 609..S-VOL SSWS ASYNC,100 1 -
```

```
devgroup1 pair1(R) (CL1-A , 0, 1) 54321 1..P-VOL PSUS ASYNC,100 609 -
```

## Recovering From Switchover Failure

This section describes procedures to recover from the failure scenario described in the previous section. These procedures bring the application online on the appropriate cluster.

1. Place the Hitachi TrueCopy device group, `devgroup1`, in the SMPL state.

Use the `pairsplit` commands to place the device groups that are in the protection group on both `cluster-paris` and `cluster-newyork` in the SMPL state. For the pair states that are shown in the previous section, run the following `pairsplit` commands:

```
phys-newyork-1# pairsplit -R -g devgroup1
phys-newyork-1# pairsplit -S -g devgroup1
```

2. Designate one of the clusters Primary for the protection group.

Designate the original primary cluster, `cluster-paris`, Primary for the protection group if you intend to start the application on the original primary cluster. The application uses the current data on the original primary cluster.

Designate the original secondary cluster, `cluster-newyork`, Primary for the protection group if you intend to start the application on the original secondary cluster. The application uses the current data on the original secondary cluster.




---

**Caution** – Because the `horctakeover` command did not perform a swap-takeover, the data volumes on `cluster-newyork` might not be synchronized with the data volumes on `cluster-paris`. If you intend to start the application with the same data that appears on the original primary cluster, you must not make the original secondary cluster Primary.

---

## ▼ How to Make the Original Primary Cluster Primary for a Hitachi TrueCopy Protection Group

- 1 Deactivate the protection group on the original primary cluster.

```
phys-paris-1# geopg stop -e Local tcpg
```

- 2 Resynchronize the configuration of the protection group.

This command updates the configuration of the protection group on `cluster-paris` with the configuration information of the protection group on `cluster-newyork`.

```
phys-paris-1# geopg update tcpg
```



After the `geopg update` command completes successfully, `tcpg` has the following role on each cluster:

```
cluster-paris:
    tcpg role: Primary
cluster-newyork:
    tcpg role: secondary
```

### 3 Activate the protection group on both clusters in the partnership.

```
phys-paris-1# geopg start -e Global tcpg
```

This command starts the application on `cluster-paris`. Data replication starts from `cluster-paris` to `cluster-newyork`.

## ▼ How to Make the Original Secondary Cluster Primary for a Hitachi TrueCopy Protection Group

### 1 Resynchronize the configuration of the protection group.

This command updates the configuration of the protection group on `cluster-newyork` with the configuration information of the protection group on `cluster-paris`.

```
phys-newyork-1# geopg update tcpg
```

After the `geopg update` command completes successfully, `tcpg` has the following role on each cluster:

```
cluster-paris:
    tcpg role: Secondary
cluster-newyork:
    tcpg role: Primary
```

### 2 Activate the protection group on both clusters in the partnership.

```
phys-newyork-1# geopg start -e Global tcpg
```

This command starts the application on `cluster-newyork`. Data replication starts from `cluster-newyork` to `cluster-paris`.




---

**Caution** – This command overwrites the data on `cluster-paris`.

---

# Recovering From a Hitachi TrueCopy Data Replication Error

When an error occurs at the data replication level, the error is reflected in the status of the resource in the replication resource group of the relevant device group.

This section provides the following information:

- “How to Detect Data Replication Errors” on page 90
- “How to Recover From a Hitachi TrueCopy Data Replication Error” on page 91

## How to Detect Data Replication Errors

For information about how different Resource status values map to actual replication pair states, see [Table 2-6](#).

You can check the status of the replication resources by using the `clresource status` command as follows:

```
phys-paris-1# clresource status -v
```

Running the `clresource status` command might return the following:

```
=== Cluster Resources ===
```

Resource Name	de Name	State	Status Message
r-tc-tcpg1-devgroup1	phys-paris-2	Offline	Offline
	phys-paris-1	Online	Faulted - P-VOL:PSUE
hasp4nfs	phys-paris-2	Offline	Offline
	phys-paris-1	Offline	Offline

The aggregate resource status for all device groups in the protection group is provided by using the `geoadm status` command. For example, the output of the `clresource status` command in the preceding example indicates that the Hitachi TrueCopy device group, `devgroup1`, is in the PSUE state on `cluster-paris`. [Table 2-6](#) indicates that the PSUE state corresponds to a resource status of FAULTED. So, the data replication state of the protection group is also FAULTED. This state is reflected in the output of the `geoadm status` command, which displays the state of the protection group as Error.

```
phys-paris-1# geoadm status
Cluster: cluster-paris
```

```
Partnership "paris-newyork-ps" : OK
Partner clusters                : cluster-newyork
```

```

Synchronization                : OK
ICRM Connection                 : OK

Heartbeat "paris-to-newyork" monitoring "cluster-newyork": OK
Heartbeat plug-in "ping_plugin" : Inactive
Heartbeat plug-in "tcp_udp_plugin" : OK

Protection group "tcpg" : Error
Partnership              : paris-newyork-ps
Synchronization         : OK

Cluster cluster-paris : Error
Role                    : Primary
PG activation state     : Activated
Configuration           : OK
Data replication        : Error
Resource groups         : OK

Cluster cluster-newyork : Error
Role                    : Secondary
PG activation state     : Activated
Configuration           : OK
Data replication        : Error
Resource groups         : OK

Pending Operations
Protection Group        : "tcpg"
Operations              : start

```

## ▼ How to Recover From a Hitachi TrueCopy Data Replication Error

To recover from an error state, you might perform some or all of the steps in the following procedure.

- 1 Use the procedures in the Hitachi TrueCopy documentation to determine the causes of the FAULTED state. This state is indicated as PSUE.**
- 2 Recover from the faulted state by using the Hitachi TrueCopy procedures.**  
If the recovery procedures change the state of the device group, this state is automatically detected by the resource and is reported as a new protection group state.
- 3 Revalidate the protection group configuration.**

```
phys-paris-1# geopg validate protectiongroupname
```

*protectiongroupname* Specifies the name of the Hitachi TrueCopy protection group

**4 Review the status of the protection group configuration.**

phys-paris-1# **geopg list** *protectiongroupname*

*protectiongroupname* Specifies the name of the Hitachi TrueCopy protection group

**5 Review the runtime status of the protection group.**

phys-paris-1# **geoadm status**

# Sun Cluster Geographic Edition Properties for Hitachi TrueCopy

---

This appendix provides the properties of Sun Cluster Geographic Edition data replication device groups.

This appendix contains the following sections:

- [“Hitachi TrueCopy Properties” on page 93](#)
- [“Hitachi TrueCopy Properties That Must Not Be Changed” on page 94](#)

---

**Note** – The property values, such as True and False, are *not* case sensitive.

---

## Hitachi TrueCopy Properties

The following table describes the Hitachi TrueCopy properties that the Sun Cluster Geographic Edition software defines.

TABLE A-1 Hitachi TrueCopy Properties

Property	Description
Data Replication Property: Cluster_dgs (string array)	<p>Lists the device groups where the data is written. The list is comma delimited. Only applications that belong to the protection group should write to these device groups.</p> <p>Tuning recommendations: This property can only be tuned when the protection group is offline.</p> <p>Category: Optional</p> <p>Default: Empty</p>

TABLE A-1 Hitachi TrueCopy Properties (Continued)

Property	Description
Data Replication Property: NodeList (string array)	<p>Lists the host names of the machines that can be primary for the replication mechanism. This list is comma delimited.</p> <p>Tuning recommendations: This property can be tuned at any time.</p> <p>Category: Optional</p> <p>Default: All nodes in the cluster</p>
Device Group Property: Fence_level (enum)	<p>Defines the fence level that is used by the device group. The fence level determines the level of consistency among the primary and secondary volumes for that device group. Possible values are Never and Async. To use the data or status fence levels, contact your Sun representative.</p> <p><b>Note</b> – If you specify a Fence_level of never, the data replication roles do not change after you perform a takeover.</p> <p>For more information about setting this property, see <a href="#">“How to Add a Data Replication Device Group to a Hitachi TrueCopy Protection Group”</a> on page 46.</p> <p>Tuning recommendations: This property can only be tuned when the protection group is offline.</p> <p>Category: Required</p> <p>Default: None</p>

## Hitachi TrueCopy Properties That Must Not Be Changed

The Sun Cluster Geographic Edition software internally changes some properties for the SUNWscg reptc resource type. Therefore, you must not edit these properties manually.

For Hitachi TrueCopy, do not edit the following properties:

- Dev\_group – Specifies the Hitachi TrueCopy device group that contains the volumes that are being replicated.
- Replication\_role – Defines the local data replication role.

# Index

---

## A

- activating protection groups, 56-60
- administering
  - data replication, 11-26, 27-67
  - device groups, 46-54
- administration tasks, 11-12
- aggregate state, of device groups, 50-51
- application resource groups
  - administering, 43-46
  - creating, 43-45
  - removing, 45-46

## C

- commands
  - to start replication, 57-58
  - to stop replication, 61
- configuring
  - device groups, 17
  - /etc/horcm.conf file
    - on primary cluster, 14-15
    - on secondary cluster, 19
  - Hitachi TrueCopy software, 13-26
    - on primary cluster, 14-18
    - on secondary cluster, 19-26
  - Hitachi TrueCopy volume
    - on primary cluster, 16-17
  - local file system, 17-18
  - protection groups, 32-34
- creating
  - application resource group, 43-45

## creating (*Continued*)

- protection groups, 32-34
  - while application offline, 28
  - while application online, 29-31
- replication device group, 46-48

## D

- data recovery, 77-86
  - failback-switchover, 79-82
  - failback-takeover, 82-86
- deactivating protection groups, 60-64
- deleting
  - application resource groups, 45-46
  - protection groups, 41-43
  - replication device group, 53-54
- detecting failure, 69-70
- device groups
  - adding to protection group, 46-48
  - administering, 46-54
  - configuring, 17
  - modifying, 52-53
  - property validations, 48-49
  - removing, 53-54
  - state validations, 49-52
    - aggregate state, 50-51
    - individual state, 49-50
- DID, with raw-disk device groups, 15-16

**E**

- error
  - detection, 90-91
  - recovery, 91-92
- /etc/horcm.conf file
  - on primary cluster, 14-15
  - on secondary cluster, 19

**F**

- failback-switchover, 79-82
- failback-takeover, 82-86
- failure
  - detecting, 69-70
  - primary cluster, 69-70
  - secondary cluster, 70
- failure conditions, switchover, 87-88

**H**

- HAStoragePlus resource, configuring, 17-18
- Hitachi TrueCopy
  - activating protection groups, 56-60
  - administering data replication with, 11-26, 27-67
  - administration tasks, 11-12
  - configuring primary cluster, 14-18
  - data recovery, 77-86
    - failback-switchover, 79-82
    - failback-takeover, 82-86
  - deactivating protection groups, 60-64
  - detecting failure, 69-70
  - device groups
    - properties, 48-49
    - subsystem validations, 48-49
  - initial software configuration, 13-26
  - migrating services that use, 69-92
  - properties of, 93-94
  - recovering from errors, 90-92
  - recovering from switchover failure, 86-89
  - runtime status
    - detailed, 66-67
    - overall, 65-66
    - state and status messages, 67

Hitachi TrueCopy (*Continued*)

- starting replication, 57-58
- stopping replication, 61
- horctakeover command, switchover failure, 86-89

**I**

- individual state, of device groups, 49-50

**L**

- local file-system configuration, 17-18

**M**

- migrating services, 69-92
- modifying
  - protection groups, 39-40
  - replication device group, 52-53

**P**

- primary cluster
  - configuration of, 14-18
  - data recovery, 77-86
  - failure detection, 69-70
  - restoring as primary, 88-89
  - switchover, 71-73
- properties, Hitachi TrueCopy, 93-94
- protection groups
  - activating, 56-60
  - adding application resource group to, 43-45
  - adding device group to, 46-48
  - configuring, 32-34
  - creating, 32-34
    - while application offline, 28
    - while application online, 29-31
    - while application resource group online, 34
  - creation strategies, 27-31
  - deactivating, 60-64
  - deleting, 41-43



protection groups (*Continued*)

- local role
  - validated against aggregate state, 51-52
- modifying, 39-40
- modifying device group from, 52-53
- removing
  - application resource groups, 45-46
  - device group from, 53-54
- replicating configuration of, 54-55
- resynchronizing, 64-65
- validating, 40-41, 41

**R**

raw-disk device groups, 15-16

## recovery

- See* data recovery
- from replication error, 90-92
- from switchover failure, 86-89

## replication

- adding device group, 46-48
- configuration, 24-26
- detecting errors in, 90-91
- error recovery, 90-92
- forcing takeover, 73-76
- Hitachi TrueCopy software, 11-26
- Hitachi TrueCopy start command, 57-58
- Hitachi TrueCopy stop command, 61
- initial configuration of, 13-26
- migrating services that use, 69-92
- modifying device group, 52-53
- protection group configuration, 54-55
- removing device groups, 53-54
- runtime status details, 66-67
- runtime status of, 65-67
- runtime status overview, 65-66
- switchover failure recovery, 86-89
- task summary, 11-12
- volume manager configuration, 20-22

## resource groups

- application, 43-46
- Hitachi TrueCopy
  - replication status, 67

resynchronizing, protection groups, 64-65

## runtime status

- detailed, 66-67
- overview, 65-66
- replication, 65-67
- state and status messages, 67

**S**

## secondary cluster

- configuring, 19-26
- failure detection, 70
- making primary, 89
- switchover, 71-73

state, device group, 49-52

switchover, 71-73

## failure

- conditions, 87-88
- recovering from, 88
- Hitachi TrueCopy, 72-73
- results of, 72
- validations, 71-72

switchover failure, recovering from, 86-89

**T**

takeover, 73-76

- failback-switchover, 79-82
- failback-takeover, 82-86
- forcing, 76
- results of, 75-76
- validations, 74-75

TrueCopy, *See* Hitachi TrueCopy**V**

## validating

- device group properties, 48-49
- protection groups, 40-41, 41
- VERITAS Volume Manager, 17
- volume set, configuring, 16-17

