

Cluster Server Agent for HP 3PAR Remote Copy Installation and Configuration Guide

AIX, HP-UX, Linux, Solaris

7.0

Cluster Server Agent for HP 3PAR Remote Copy Installation and Configuration Guide

The software described in this book is furnished under a license agreement and may be used only in accordance with the terms of the agreement.

Agent Version: 7.0

Document version: 7.0 Rev 0

Legal Notice

Copyright © 2016 Veritas Technologies LLC. All rights reserved.

Veritas and the Veritas Logo are trademarks or registered trademarks of Veritas Technologies LLC or its affiliates in the U.S. and other countries. Other names may be trademarks of their respective owners.

This product may contain third party software for which Veritas is required to provide attribution to the third party ("Third Party Programs"). Some of the Third Party Programs are available under open source or free software licenses. The License Agreement accompanying the Software does not alter any rights or obligations you may have under those open source or free software licenses. Please see the Third Party Legal Notice Appendix to this Documentation or TPIP ReadMe File accompanying this product for more information on the Third Party Programs.

The product described in this document is distributed under licenses restricting its use, copying, distribution, and decompilation/reverse engineering. No part of this document may be reproduced in any form by any means without prior written authorization of Veritas Technologies LLC and its licensors, if any.

THE DOCUMENTATION IS PROVIDED "AS IS" AND ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID. VERITAS TECHNOLOGIES LLC SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, PERFORMANCE, OR USE OF THIS DOCUMENTATION. THE INFORMATION CONTAINED IN THIS DOCUMENTATION IS SUBJECT TO CHANGE WITHOUT NOTICE.

The Licensed Software and Documentation are deemed to be commercial computer software as defined in FAR 12.212 and subject to restricted rights as defined in FAR Section 52.227-19 "Commercial Computer Software - Restricted Rights" and DFARS 227.7202, et seq. "Commercial Computer Software and Commercial Computer Software Documentation," as applicable, and any successor regulations, whether delivered by Veritas as on premises or hosted services. Any use, modification, reproduction release, performance, display or disclosure of the Licensed Software and Documentation by the U.S. Government shall be solely in accordance with the terms of this Agreement.

Veritas Technologies LLC
500 E Middlefield Road
Mountain View, CA 94043

<http://www.veritas.com>

Technical Support

Technical Support maintains support centers globally. Technical Support's primary role is to respond to specific queries about product features and functionality. The Technical Support group also creates content for our online Knowledge Base. The Technical Support group works collaboratively with the other functional areas within the company to answer your questions in a timely fashion.

Our support offerings include the following:

- A range of support options that give you the flexibility to select the right amount of service for any size organization
- Telephone and/or Web-based support that provides rapid response and up-to-the-minute information
- Upgrade assurance that delivers software upgrades
- Global support purchased on a regional business hours or 24 hours a day, 7 days a week basis
- Premium service offerings that include Account Management Services

For information about our support offerings, you can visit our website at the following URL:

www.veritas.com/support

All support services will be delivered in accordance with your support agreement and the then-current enterprise technical support policy.

Contacting Technical Support

Customers with a current support agreement may access Technical Support information at the following URL:

www.veritas.com/support

Before contacting Technical Support, make sure you have satisfied the system requirements that are listed in your product documentation. Also, you should be at the computer on which the problem occurred, in case it is necessary to replicate the problem.

When you contact Technical Support, please have the following information available:

- Product release level
- Hardware information
- Available memory, disk space, and NIC information

- Operating system
- Version and patch level
- Network topology
- Router, gateway, and IP address information
- Problem description:
 - Error messages and log files
 - Troubleshooting that was performed before contacting Technical Support
 - Recent software configuration changes and network changes

Licensing and registration

If your product requires registration or a license key, access our technical support Web page at the following URL:

www.veritas.com/support

Customer service

Customer service information is available at the following URL:

www.veritas.com/support

Customer Service is available to assist with non-technical questions, such as the following types of issues:

- Questions regarding product licensing or serialization
- Product registration updates, such as address or name changes
- General product information (features, language availability, local dealers)
- Latest information about product updates and upgrades
- Information about upgrade assurance and support contracts
- Advice about technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs, DVDs, or manuals

Support agreement resources

If you want to contact us regarding an existing support agreement, please contact the support agreement administration team for your region as follows:

Worldwide (except Japan)

CustomerCare@veritas.com

Japan

CustomerCare_Japan@veritas.com

Contents

Technical Support	4
Chapter 1 Introducing the agent for HP 3PAR Remote Copy	9
About the agent for HP 3PAR Remote Copy	9
Supported software	10
Typical HP 3PAR Remote Copy setup in a VCS cluster	10
HP 3PAR Remote Copy agent functions	11
About the agent's online function	14
Chapter 2 Installing and removing the agent for HP 3PAR Remote Copy	16
Before you install the agent for HP 3PAR Remote Copy	16
Installing the agent for HP 3PAR Remote Copy	16
Installing the agent IPS package on Oracle Solaris 11 systems	18
Installing agent packages on Solaris brand non-global zones	18
Upgrading the agent for HP 3PAR Remote Copy	19
Removing the agent for HP 3PAR Remote Copy	20
Chapter 3 Configuring the agent	21
Configuration concepts for the 3PAR Remote Copy agent	21
Resource type definition for the 3PAR Remote Copy agent	21
Attribute definitions for the 3PAR Remote Copy agent	22
Sample configuration for the 3PAR Remote Copy agent	24
Before you configure the agent for HP 3PAR Remote Copy	25
About cluster heartbeats	25
To set up a passwordless SSH	26
Configuring the agent for HP 3PAR Remote Copy	26
Configuring the agent to compute RPO	27
Configuring the agent in CVM environment	28

Chapter 4	Managing and testing clustering support for HP 3PAR Remote Copy	29
	Typical test setup for the HP 3PAR Remote Copy agent	30
	How VCS recovers from various disasters in an HA/DR setup with HP 3PAR Remote Copy	31
	Failure scenarios in global clusters and replicated data clusters	31
	Testing global service group migration between global clusters	35
	Testing service group migration between replicated data clusters	37
	Testing all hosts failure in a global cluster	38
	Testing all hosts failure in a replicated data cluster	39
Index		41

Introducing the agent for HP 3PAR Remote Copy

This chapter includes the following topics:

- [About the agent for HP 3PAR Remote Copy](#)
- [Supported software](#)
- [Typical HP 3PAR Remote Copy setup in a VCS cluster](#)
- [HP 3PAR Remote Copy agent functions](#)

About the agent for HP 3PAR Remote Copy

The Cluster Server agent for HP 3PAR Remote Copy provides support for application failover and recovery. The agent provides this support in environments that use 3PAR Remote Copy functionality to copy a Remote Copy group from one InServ Storage Server to another.

The agent provides this support for applications that are protected by the HP 3PAR Remote Copy replication feature in VCS global clusters and replicated data clusters.

The agent supports the synchronous and periodic modes of replication with the mirror_config policy.

Note: When the mode of replication is periodic, you must configure the synchronization period for the volume group before using the agent. There is no default synchronization period.

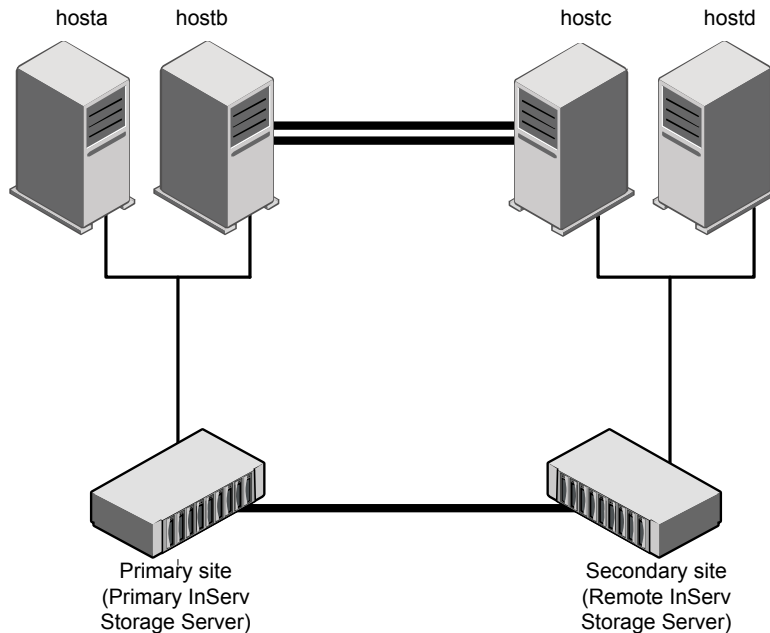
Supported software

For information on the software versions that the agent for HP 3PAR Remote Copy supports, see the Veritas Services and Operations Readiness Tools (SORT) site: <https://sort.veritas.com/agents>.

Typical HP 3PAR Remote Copy setup in a VCS cluster

Figure 1-1 displays a typical cluster setup in a 3PAR Remote Copy environment.

Figure 1-1 Typical clustering setup for the agent



VCS clusters that use 3PAR Remote Copy for copying Remote Copy groups from one InServ Storage Server to another, use the following hardware infrastructure:

- The Primary InServ Storage Server, also known as the primary server, has the primary volume group. A volume group has one or more Remote Copy volumes that are logically related and for which there is a cross-volume ordering of writes. The primary volume group contains the set of volumes to be copied.

- The Remote InServ Storage Server, also known as the secondary or backup server, has the secondary volume group. The secondary volume group contains the volumes that are copied from the primary server.
- The Remote InServ Storage Server must be at a significant distance to survive a disaster that may occur at the primary site.

HP 3PAR Remote Copy agent functions

The Cluster Server agent for 3PAR Remote Copy monitors and manages the state of copied volumes that are attached to VCS nodes.

The agent performs the following functions:

online	<p>Makes the Remote Copy group writable for the application. If one or more volumes are in the read only (RO) state, the agent runs a <code>setrcopygroup</code> command to enable read-write access to the volumes.</p> <p>See “About the agent's online function” on page 14.</p> <p>If the state of all local devices is read-write enabled (RW), the agent creates a lock file on the local host. The lock file indicates that the resource is online.</p>
offline	<p>Removes the lock file on the local host. The agent does not run any Remote Copy commands because taking the resource offline is not indicative of the intention to give up the volumes.</p>
monitor	<p>Verifies that the lock file exists. If the lock file exists, the monitor function reports the status of the resource as online. If the lock file does not exist, the monitor function reports the status of the resource as offline.</p>

open	<p>Removes the lock file on the host where the function is called. This operation prevents potential concurrency violation if the service group fails over to another node.</p> <p>Note that the agent does not remove the lock file if the agent was started after running the following command:</p> <pre>hastop <-all -local> -force</pre>
clean	<p>Determines if it is safe to fault the resource if the online function fails or times out.</p>
info	<p>Populates the value of the data transfer role and the state of the Remote Group in the ResourceInfo attribute. For example, the state could be Started or Stopped.</p>
action/recover	<p>This action function is meant to run when the failed primary comes back online and is used for groups on which the failover operation has already been run.</p> <p>This action function changes the matching primary volume groups on the backup system to secondary volume groups and then starts and synchronizes the specified group.</p> <p>This action function executes the <code>setrcopygroups -recover <i>groupname</i></code> command.</p>
action/restore	<p>This action function is used on groups on which the recover operation has already been run.</p> <p>This action function returns specified groups to their natural direction and starts them.</p> <p>This action function executes the <code>setrcopygroups restore <i>groupname</i></code> command.</p>

action/revert

This action function is meant to run when failed primary comes back online and is used for groups on which the failover operation has already been run.

Unlike the action/recover function, this action function discards the data written on the failover group and synchronizes the group to the point at which failover took place.

This action function executes the `setrcopygroup reverse -current groupname` command.

Note: The action/revert operation results in the loss of any data that is written to the primary volumes from the time that their groups were stopped.

action/startrcopygroup

Starts remote copy for the specified group. The agent invokes the `startrcopygroup` command to 3PAR InServe storage server.

action/PreSwitch

This action function ensures that the remote site cluster can come online during a planned failover within a GCO configuration.

The VCS engine on the remote cluster invokes the PreSwitch action on all the resources of the remote site during a planned failover using the `hagrp -switch` command. For this, the PreSwitch attribute must be set to 1. The option `-nopre` indicates that the VCS engine must switch the servicegroup regardless of the value of the PreSwitch service group attribute.

If running the PreSwitch action fails, the failover should not occur. This minimizes the application downtime and data loss.

For more information on the PreSwitch action and the PreSwitch feature in the VCS engine, refer to the *Cluster Server Administrator's Guide*.

action/syncrcopy	Synchronizes the specified remote copy group. The agent invokes the <code>syncrcopy</code> command to the 3PAR InServe storage server.
action/getremoteinfo	Prints the group role, status, replication mode, and synchronization status of the Remote Copy group from the host where it is executed.
action/GetCurrentRPO	<p>Fetches the current point in time RPO. Invoke this action function on the DR system where the ComputeDRSLA attribute is set to 1. The RPO is computed in seconds.</p> <p>Note: The agent does not store the computed RPO; make a note of the RPO for future reference.</p>
attr_changed	<p>Monitors the changes in the attribute GroupName. If the group name is changed, the instructions are logged in for the changes to be effective. Also monitors the ComputeDRSLA attribute.</p> <p>Depending on the new value of the ComputeDRSLA attribute, this function either initiates or terminates the process of computing the RPO.</p>

Note: The agent uses the following internal action functions to compute the RPO: StartRPOComputation, StopRPOComputation, StartWriter, ReportRPOData.

About the agent's online function

The agent checks the role of the volume group that is specified in the Group Information.

If the role is Primary or Primary-rev, the agent comes online directly.

If the role is Secondary or Secondary-Rev, the agent validates that the Sync status is not New or NotSynced. After validating the Sync status, the agent checks the target status.

If the target status is Ready and Sync status is Synced, the agent attempts to switch the roles in the following manner:

- If the value of the ForceSync attribute is 0, the agent does not run the `syncrcopy` command to synchronize the logical virtual volumes of a group.
- If the value of the ForceSync attribute is 1, the agent runs the `syncrcopy` command to synchronize the logical virtual volumes of a group.

Note: The ForceSync attribute is applicable only to the periodic mode of replication.

- If the value of the SwapRole attribute is 0, the agent retains the natural direction of replication as is and switches the role.
- If the value of the SwapRole attribute is 1, the agent reverses the natural direction of replication to switch the roles.

If the target status is Failed and Sync status is Stopped or Stale, the agent attempts to change the roles in the following manner:

- If the value of the AutoTakeover attribute is 0, the agent does not take any action.
- If the value of the AutoTakeover attribute is 1, the agent executes the failover command.

After the switch role or change role commands are successfully executed, the agent brings the RemoteCopy resource online.

Installing and removing the agent for HP 3PAR Remote Copy

This chapter includes the following topics:

- [Before you install the agent for HP 3PAR Remote Copy](#)
- [Installing the agent for HP 3PAR Remote Copy](#)
- [Upgrading the agent for HP 3PAR Remote Copy](#)
- [Removing the agent for HP 3PAR Remote Copy](#)

Before you install the agent for HP 3PAR Remote Copy

Before you install the Cluster Server agent for HP 3PAR Remote Copy, ensure that you install and configure the VCS on all nodes in the cluster.

Set up replication and the required hardware infrastructure. For information about setting up Oracle RAC environment, refer to the *Storage Foundation for Oracle RAC Configuration and Upgrade Guide*.

See [“Typical HP 3PAR Remote Copy setup in a VCS cluster”](#) on page 10.

Installing the agent for HP 3PAR Remote Copy

You must install the HP 3PAR Remote Copy agent on each node in the cluster. In global cluster environments, install the agent on each node in each cluster.

To install the agent in a VCS environment

- 1 Download the Agent Pack from the Veritas Services and Operations Readiness Tools (SORT) site: <https://sort.veritas.com/agents>.

You can download the complete Agent Pack tar file or the individual agent tar file.

- 2 Uncompress the file to a temporary location, say /tmp.
- 3 If you downloaded the complete Agent Pack tar file, navigate to the directory containing the package for the platform running in your environment.

AIX `cdl/aix/vcs/replication/3parrc_agent/
agent_version/pkgs/`

Linux `cdl/linux/generic/vcs/replication/3parrc_agent/
agent_version/rpms/`

Solaris `cdl/solaris/dist_arch/vcs/replication/3parrc_agent/
agent_version/pkgs/`

If you downloaded the individual agent tar file, navigate to the pkgs directory (for AIX, and Solaris), or the rpms directory (for Linux).

- 4 Log in as a superuser.
- 5 Install the package.

AIX `# installp -ac -d VRTSvcsrte.bff VRTSvcsrte`

Linux `# rpm -ihv \
VRTSvcsrte-AgentVersion-Linux_GENERIC.noarch.rpm`

Solaris `# pkgadd -d . VRTSvcsrte`

Note: On successful installation of the agent, if VCS is running, the agent types definition is automatically added to the VCS configuration.

Installing the agent IPS package on Oracle Solaris 11 systems

To install the agent IPS package on an Oracle Solaris 11 system

- 1 Copy the `VRTSvcsrsrc.p5p` package from the `pkgs` directory to the system in the `/tmp/install` directory.
- 2 Disable the publishers that are not reachable as package install may fail if any of the already added repositories are unreachable.

```
# pkg set-publisher --disable <publisher name>
```

where the publisher name is obtained using the `pkg publisher` command.

- 3 Add a file-based repository in the system.

```
# pkg set-publisher -g /tmp/install/VRTSvcsrsrc.p5p Symantec
```

- 4 Install the package.

```
# pkg install --accept VRTSvcsrsrc
```

- 5 Remove the publisher from the system.

```
# pkg unset-publisher Symantec
```

- 6 Enable the publishers that were disabled earlier.

```
# pkg set-publisher --enable <publisher name>
```

Installing agent packages on Solaris brand non-global zones

With Oracle Solaris 11, you must install the agent package inside non-global zones. The native non-global zones are known as Solaris brand zones.

To install the agent package on Solaris brand non-global zones

- 1 Ensure that the SMF service `svc:/application/pkg/system-repository:default` and `svc:/application/pkg/zones-proxyd:default` are online on the global zone.

```
# svcs svc:/application/pkg/system-repository:default
```

```
# svcs svc:/application/pkg/zones-proxyd:default
```

- 2 Log on to the non-global zone as a superuser.
- 3 Ensure that the SMF service `svc:/application/pkg/zones-proxy-client:default` is online inside non-global zone:

```
# svcs svc:/application/pkg/zones-proxy-client:default
```

- 4 Copy the `VRTSvcsrsrc.p5p` package from the `pkgs` directory to the non-global zone (for example, to the `/tmp/install` directory).

- 5 Disable the publishers that are not reachable, as package install may fail if any of the already added repositories are unreachable.

```
# pkg set-publisher --disable <publisher name>
```

- 6 Add a file-based repository in the non-global zone.

```
# pkg set-publisher -g/tmp/install/VRTSvcsrc.p5p Symantec
```

- 7 Install the package.

```
# pkg install --accept VRTSvcsrc
```

- 8 Remove the publisher on the non-global zone.

```
# pkg unset-publisher Symantec
```

- 9 Clear the state of the SMF service, as setting the file-based repository causes the SMF service svc:/application/pkg/system-repository:default to go into the maintenance state.

```
# svcadm clear svc:/application/pkg/system-repository:default
```

- 10 Enable the publishers that were disabled earlier.

```
# pkg set-publisher --enable <publisher>
```

Note: Perform steps 2 through 10 on each non-global zone.

Upgrading the agent for HP 3PAR Remote Copy

You must upgrade the agent on each node in the cluster.

To upgrade the agent software

- 1 Save the VCS configuration and stop the VCS engine.

```
# haconf -dump -makero  
# hastop -all -force
```

- 2 Remove the agent from the node.

See [“Removing the agent for HP 3PAR Remote Copy”](#) on page 20.

- 3 Delete the file /etc/VRTSvcs/conf/config/RemoteCopyTypes.cf.

- 4 Install the current version of the agent.

See [“Installing the agent for HP 3PAR Remote Copy”](#) on page 16.

- 5 Copy the file RemoteCopyTypes.cf from the directory /etc/VRTSvcs/conf/ to the /etc/VRTSvcs/conf/config directory.

- 6 Repeat step 2 through step 5 on each node.
- 7 From a node in the cluster, edit your configuration file
/etc/VRTSvcsrc/conf/config/main.cf.

Configure the new attributes, if applicable.
- 8 Verify the configuration by running the following command:


```
# hacf -verify config
```
- 9 Start VCS on local node first.
- 10 Start VCS on other nodes.

Removing the agent for HP 3PAR Remote Copy

Before you attempt to remove the agent, make sure the application service group is not online.

You must remove the 3PAR Remote Copy agent from each node in the cluster.

To remove the agent, type the following command on each node. Answer prompts accordingly:

AIX # installp -u VRTSvcsrc.rte

Linux # rpm -e VRTSvcsrc

Solaris # pkgrm VRTSvcsrc

Note: To uninstall the agent IPS package on a Solaris 11 system:

```
# pkg uninstall VRTSvcsrc
```

Configuring the agent

This chapter includes the following topics:

- [Configuration concepts for the 3PAR Remote Copy agent](#)
- [Before you configure the agent for HP 3PAR Remote Copy](#)
- [To set up a passwordless SSH](#)
- [Configuring the agent for HP 3PAR Remote Copy](#)

Configuration concepts for the 3PAR Remote Copy agent

Review the resource type definition and the attribute definitions for the agent.

Resource type definition for the 3PAR Remote Copy agent

```
type RemoteCopy (
    static keylist RegList = { ComputeDRSLA }
    static keylist SupportedActions = { PreSwitch, recover, revert,
    restore, startrcopygroup, syncrcopy, ReportRPOData, StartWriter,
    GetCurrentRPO, StartRPOComputation, StopRPOComputation,
    getremoteinfo }
    static str ArgList[] = { StorageServer, UserName, GroupName,
    SSHBinary, SSHPathToIDFile, AutoTakeover, SwapRoles, ForceSync,
    ComputeDRSLA, CLIBinary, PasswordFile }
    str StorageServer
    str UserName
    str GroupName
    str CLIBinary
    str PasswordFile
```

```
str SSHBinary = "/usr/bin/ssh"  
str SSHPathToIDFile  
int AutoTakeover = 0  
int SwapRoles = 0  
int ForceSync = 0  
int ComputeDRSLA = 0  
temp str VCSResLock  
)
```

Attribute definitions for the 3PAR Remote Copy agent

Table 3-1 describes the required attributes for the HP 3PAR Remote Copy agent.

Table 3-1 Required attributes

Attribute	Description
StorageServer	<p>Specifies the name or the IP address of the 3PAR InServ Storage Server at the current site.</p> <p>Type-dimension: string-scalar</p> <p>Example: 10.182.200.100</p> <p>Example: c1062-inserv-f400</p>
UserName	<p>Specifies the user name that is used to connect to the 3PAR InServ Storage Server at the current site.</p> <p>Type-dimension: string-scalar</p> <p>Example: admin</p>
Password	<p>Specifies the HP 3PAR password file that is used to connect to the 3PAR InServ Storage Server at the current site.</p> <p>Type-dimension: string-scalar</p> <p>Example: /3par/passfile</p>
CLIBinary	<p>Contains the absolute path to the HP 3PAR CLI binary.</p> <p>Type-dimension: string-scalar</p> <p>Example: /opt/3PAR/inform_cli_3.2.1/cli</p>
SSHBinary	<p>Contains the absolute path to the SSH binary. SSH is the mode of communication with the 3PAR InServ Storage Server.</p> <p>Default: /usr/bin/ssh</p> <p>Type-dimension: string-scalar</p>

Table 3-1 Required attributes (*continued*)

Attribute	Description
SSHPathToIDFile	<p>Contains the absolute path to the identity file that is used for authenticating the host with the 3PAR InServ Storage Server. The corresponding public key must be added on the storage server so that it can correctly authenticate the host.</p> <p>Type-dimension: string-scalar</p> <p>Example: /keys/rpa_rsa</p>
GroupName	<p>Specifies the group name in which Remote Copy is configured on the Storage Server.</p> <p>Type-dimension: string-scalar</p> <p>Example: Oracle_Grp</p>
AutoTakeover	<p>Indicates if the agent should enable read/write access to the local group in the replication relationship when the Group is in an inactive state (Stopped).</p> <p>If it is set to 0, the agent will not enable read/write access when the replication is in an inactive state.</p> <p>Type-dimension: integer-scalar</p> <p>Default: 0</p>
SwapRoles	<p>Specifies if the roles of the Remote Copy group must be swapped at the time of failover.</p> <p>If it is set to 1, the primary group is set to Secondary and vice-versa. If it is set to 0, the roles remain the same.</p> <p>Roles are swapped only when the status of the target is Ready.</p> <p>Type-dimension: integer-scalar</p> <p>Default: 0</p>
ForceSync	<p>Determines if Remote Copy groups must be synchronized before failover. If the value of this attribute is set to 1, groups are forced to synchronize before failover.</p> <p>This attribute is applicable only to the periodic mode of replication.</p> <p>Type-dimension: integer-scalar</p> <p>Default: 0</p>

Note: Communication to the HP 3PAR InServ Storage Server can occur either through CLI or SSH. For SSH mode of communication, ensure that SSHBinary and SSHPathToIDFile attributes are configured. For CLI mode of communication, ensure that CLIBinary and Password attributes are configured.

Table 3-2 describes the optional attributes for the HP 3PAR Remote Copy agent.

Table 3-2 Optional attributes

Attribute	Description
ComputeDRSLA	Used to enable or disable Recovery Point Objective (RPO) computation. Set this attribute on any one node in the disaster recovery (DR) cluster. Setting this attribute to 1 starts the RPO computation process. Ensure that you reset this attribute to 0 after you use the GetCurrentRPO action function to check the RPO. Type-dimension: integer-scalar Default: 0

Table 3-3 describes the internal attributes for the HP 3PAR Remote Copy agent.

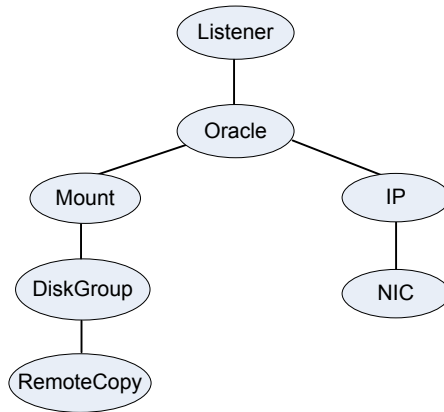
Table 3-3 Internal attributes

Attribute	Description
Tagging	Used for maintaining the process of computing RPO. Type-dimension: temporary boolean
VCSResLock	Used to ensure the serialized management in case of a parallel application. Type-dimension: temporary string Note: This is an internal attribute. Do not modify.

Sample configuration for the 3PAR Remote Copy agent

Figure 3-1 shows the dependency graph for a VCS service group with a resource of type RemoteCopy.

Figure 3-1 Sample configuration for the 3PAR Remote Copy agent



Before you configure the agent for HP 3PAR Remote Copy

Before you configure the agent, review the following information:

- Set up the passwordless ssh from all VCS hosts to the 3PAR InServ storage server.
 See [“To set up a passwordless SSH”](#) on page 26.
- Verify that you have installed the agent on all systems in the cluster.
- Verify the hardware setup for the agent.
 See [“Typical HP 3PAR Remote Copy setup in a VCS cluster”](#) on page 10.
- Make sure that the cluster has an effective heartbeat mechanism in place.
 See [“About cluster heartbeats”](#) on page 25.

About cluster heartbeats

In a global cluster, VCS sends ICMP pings over the public network between the two sites for network heartbeating. To minimize the risk of split-brain, VCS sends ICMP pings to highly available IP addresses. VCS global clusters also notify the administrators when the sites cannot communicate.

To minimize the chances of split-brain, use the steward process.

To set up a passwordless SSH

To generate SSH keys on a VCS node and setup passwordless ssh to the 3PAR InForm Storage Server perform the following steps:

- 1 Log on to host (VCS node).
- 2 Generate public and private RSA keys using ssh-keygen with no passphrase. For example:

```
bash-3.00# ssh-keygen -b 1024 -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (//.ssh/id_rsa): test_rsa
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in test_rsa.
Your public key has been saved in test_rsa.pub.
The key fingerprint is:
05:c1:ce:d0:f7:a1:9f:d1:33:20:bf:c2:9b:35:c8:43 root@thor393
```

- 3 Copy the above-generated public key and add it on the 3PAR InForm Storage Server using the `setsshkey -add` command.
- 4 To cache the Storage Server key on to the host for further use, run the following command from the host

```
#/usr/bin/ssh -i <path to RSA private key file> -l
<Storage server user name> <IP address of the Storage server >
<dummy_remotecopy_command>
```

For example:# /usr/bin/ssh -i /test_rsa -l 3paradm 10.182.1.29
showversion

A message appears, asking you to cache the host key with that of the Storage Server.

- 5 Type **Yes** and press **Enter**.
- 6 Repeat the above steps on each VCS node where the service group contains the Remote Copy resource.

Configuring the agent for HP 3PAR Remote Copy

You can configure clustered application in a disaster recovery environment by:

- Converting their devices to 3PAR Remote Copy devices
- Synchronizing the devices

- Adding the HP 3PAR Remote Copy agent to the service group

After configuration, the application service group must follow the dependency diagram.

See [“Sample configuration for the 3PAR Remote Copy agent”](#) on page 24.

Note: You must not change the replication state of devices from primary to secondary and from secondary to primary, outside of a VCS setup. The agent for HP 3PAR Remote Copy fails to detect a change in the replication state if the role reversal is done externally and RoleMonitor is disabled.

Configuring the agent to compute RPO

In a global cluster environment, the agent for HP 3PAR Remote Copy can compute the recovery point objective (RPO), which is a disaster recovery (DR) SLA. In a DR configuration where data is replicated asynchronously to the DR site, the DR site data is not always as current as the primary site data.

RPO is the maximum acceptable amount of data loss in case of a disaster at the primary site. The agent computes RPO in terms of time, that is, in seconds.

Note: The agent calculates RPO in a global cluster environment in an SFHA configuration with VxVM disk groups.

Before you configure the agent to compute the RPO, ensure that the following pre-requisites are met:

- The service group containing the RemoteCopy resource and the VxVM disk group resource are online at the production site.
- The disk group resource is dependent on the RemoteCopy resource.

To configure the agent to compute the RPO:

- 1 In the DR cluster, on any one of the nodes where devices are asynchronously replicated and where the service group is configured, run the following command to start the RPO computation:

```
hares -modify RemoteCopy_resource_name ComputeDRSLA 1 -sys  
system_name.
```

- 2 Run the following command on the same node in the DR cluster:

```
hares -action RemoteCopy_resource_name GetCurrentRPO -sys  
system_name
```

The action entry point displays the RPO. The agent does not store the computed RPO; make a note of the RPO for future reference.

If the RPO is not reported, it indicates that the agent needs more time to finish computing the RPO. Wait for some more time before you run the GetCurrentRPO action function again.

- 3 To stop RPO computation, run the following command:

```
hares -modify RemoteCopy_resource_name ComputeDRSLA 0 -sys  
system_name
```

Configuring the agent in CVM environment

To configure the agent in CVM environment

- 1 Configure the SupportedActions attribute for the CVMVolDg resource.
- 2 Add the following keys to the list: import and deport.
- 3 Run the following commands to add the entry points to the CVMVolDg resource:

```
haconf -makerw  
  
hatype -modify CVMVolDg SupportedActions import deport  
  
haconf -dump -makero
```

Note that the SupportedActions attribute is a resource type attribute which defines a list of action tokens for the resource.

While modifying the SupportedActions attribute, preserve existing attribute value if any, and append import and deport to it .

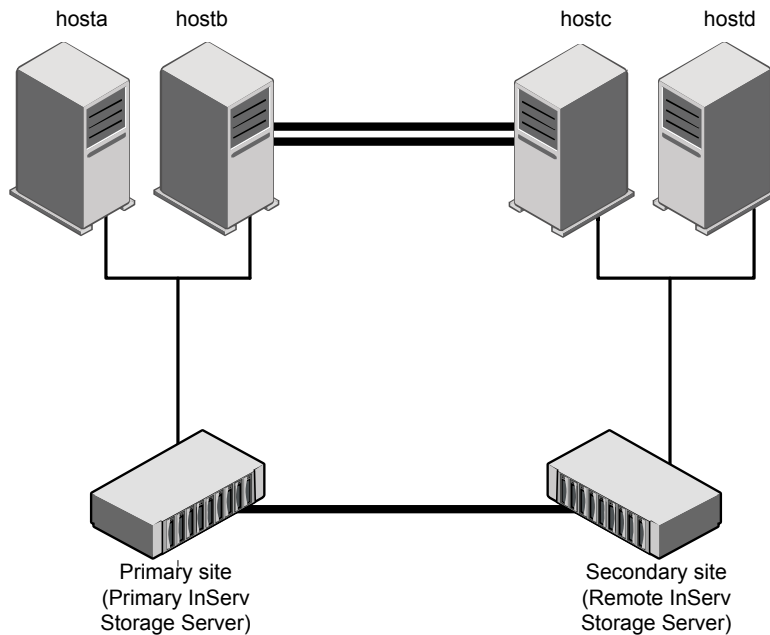
Managing and testing clustering support for HP 3PAR Remote Copy

This chapter includes the following topics:

- [Typical test setup for the HP 3PAR Remote Copy agent](#)
- [How VCS recovers from various disasters in an HA/DR setup with HP 3PAR Remote Copy](#)
- [Testing global service group migration between global clusters](#)
- [Testing service group migration between replicated data clusters](#)
- [Testing all hosts failure in a global cluster](#)
- [Testing all hosts failure in a replicated data cluster](#)

Typical test setup for the HP 3PAR Remote Copy agent

Figure 4-1 Typical test setup



A typical test environment includes the following characteristics:

- A primary site, an HP 3PAR RemoteCopy cluster, is attached to the primary storage and the primary application hosts.
- A secondary site, an HP 3PAR RemoteCopy cluster, is attached to the secondary storage and the secondary application hosts.
- Remote replication is established between the InServ storage servers at the primary and secondary sites.
- Two hosts (for example, Host A and Host B) are attached to the primary site HP 3PAR InServ storage server.
- Two hosts (for example, Host C and Host D) are attached to the secondary site HP 3PAR InServ storage server.
- At the primary site, passwordless SSH configuration is established on the hosts (Host A and Host B) and the primary site HP 3PAR InServ storage server so

that the hosts can communicate by SSH with the primary site HP 3PAR InServ storage server.

- Similarly, at the secondary site, passwordless SSH is established on the hosts (Host C and Host D) and the secondary site HP 3PAR InServ storage server so that the hosts can communicate by SSH with the secondary site HP 3PAR InServ storage server.
- The application runs on Host A, which is connected to the primary site HP 3PAR InServ storage server.

How VCS recovers from various disasters in an HA/DR setup with HP 3PAR Remote Copy

This section covers the failure scenarios and how VCS responds to the failures for the following DR cluster configurations:

Global clusters (GCO configuration)	When a site-wide global service group or system fault occurs, VCS failover behavior depends on the value of the ClusterFailOverPolicy attribute for the faulted global service group. The VCS agent for HP 3PAR Remote Copy ensures safe and exclusive access to the configured HP 3PAR Remote Copy devices.
Replicated data clusters (RDC configuration)	When service group or system faults occur, VCS failover behavior depends on the value of the AutoFailOver attribute for the faulted service group. The VCS agent for HP 3PAR Remote Copy ensures safe and exclusive access to the configured HP 3PAR Remote Copy devices.

Failure scenarios in global clusters and replicated data clusters

[Table 4-1](#) lists the failure scenarios in a global cluster configuration and describes the behavior of VCS and the agent in response to the failure.

Refer to the *Cluster Server Administrator's Guide* for more information on the DR configurations and the global service group attributes.

Table 4-1 Failure scenarios in global cluster and replicated data cluster configurations with the Cluster Server agent for HP 3PAR Remote Copy

Failure	Description and VCS response
Application failure	<p>Application cannot start successfully on any hosts at the primary site.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> ■ Causes global service group at the primary site to fault and displays an alert to indicate the fault. ■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> ■ Auto or Connected—VCS automatically brings the faulted global group online at the secondary site. ■ Manual—No action. You must bring the global group online at the secondary site. <p>Agent response:</p> <ul style="list-style-type: none"> ■ The agent Write enables the devices at the secondary site. ■ If the value of the SwapRoles attribute of the resource is 1, the agent changes the role of the secondary site to Primary and the role of the original primary site to Secondary. ■ If the value of the SwapRoles attribute of the resource is 0, the agent changes the role of the secondary site to Primary-Rev and the role of the original primary to Secondary-Rev.

Table 4-1 Failure scenarios in global cluster and replicated data cluster configurations with the Cluster Server agent for HP 3PAR Remote Copy (*continued*)

Failure	Description and VCS response
Host failure	<p>All hosts at the primary site fail.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> ■ Displays an alert to indicate the primary cluster fault. ■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> ■ Auto—VCS automatically brings the faulted global group online at the secondary site. ■ Manual or Connected—No action. You must bring the global group online at the secondary site. <p>Agent response:</p> <ul style="list-style-type: none"> ■ The agent write enables the devices at the secondary site. ■ Depending on the value of the SwapRoles attribute of the resource, the agent does the following: <ul style="list-style-type: none"> ■ If the value of the SwapRoles attribute of the resource is 1, the agent changes the role of the secondary site to Primary and the role of the original primary site to Secondary. ■ If the value of the SwapRoles attribute of the resource is 0, the agent changes the role of the secondary site to Primary-Rev and the role of the original primary to Secondary-Rev. ■ If the replication mode is Periodic, then depending on the value of the ForceSync attribute, the agent does the following: <ul style="list-style-type: none"> ■ If the value of the ForceSync attribute is 1, the resource fails to come online. ■ If the value of the ForceSync attribute is 0, the resource comes online.

Table 4-1 Failure scenarios in global cluster and replicated data cluster configurations with the Cluster Server agent for HP 3PAR Remote Copy (*continued*)

Failure	Description and VCS response
Site failure	<p>All hosts and the storage at the primary site fail.</p> <p>A site failure renders the target node in a FAILED state.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> ■ Displays an alert to indicate the cluster fault. ■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> ■ Auto—VCS automatically brings the faulted global group online at the secondary site. ■ Manual or Connected—No action. You must bring the global group online at the secondary site. <p>Agent response: If the target status is Failed and Sync status is Stopped or Stale, the agent attempts to change the roles in the following manner:</p> <ul style="list-style-type: none"> ■ If the value of the AutoTakeover attribute is 0, the agent does not take any action. ■ If the value of the AutoTakeover attribute is 1, the agent executes the failover command.
Network failure	<p>The network connectivity and the replication link between the sites fail.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> ■ VCS at each site concludes that the remote cluster has faulted. ■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> ■ Manual or Connected—No action. You must confirm the cause of the network failure from the cluster administrator at the remote site and fix the issue. ■ Auto—VCS brings the global group online at the secondary site which may lead to a site-wide split brain. The site-wide split brain causes data divergence between the devices on the primary and the secondary arrays. <p>When the network (wac and replication) connectivity restores, you must manually resync the data.</p> <p>Note: Veritas recommends that the value of the ClusterFailOverPolicy attribute is set to Manual for all global groups to prevent unintended failovers due to transient network failures.</p> <p>Agent response: Similar to the site failure.</p>

Table 4-1 Failure scenarios in global cluster and replicated data cluster configurations with the Cluster Server agent for HP 3PAR Remote Copy *(continued)*

Failure	Description and VCS response
Storage failure	<p>The array at the primary site fails.</p> <p>A storage failure at the primary site renders the target node in the Failed state.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> Causes the global service group at the primary site to fault and displays an alert to indicate the fault. Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> Auto or Connected—VCS automatically brings the faulted global service group online at the secondary site. Manual—No action. You must bring the global group online at the secondary site. <p>Agent response: Similar to the site failure.</p>

Testing global service group migration between global clusters

After you configure the VCS agent for HP 3PAR Remote Copy, verify that the global service group can migrate to hosts across the clusters.

To test the global service group migration in global cluster setup using the VCS GUI

- 1 In the **Service Groups** tab of the Cluster Explorer configuration tree, right-click the global service group and click **Online** to bring the service group online on the primary cluster.

- 2 To switch over the global service group from the primary cluster to the secondary cluster, right-click the service group and select **Remote Switch**.

The global service group comes online on the secondary cluster. Now the secondary cluster role changes to Primary-Rev and the original primary cluster role changes to Secondary-Rev. If the SwapRoles attribute is set to 1, the secondary cluster role changes to Primary and the original primary cluster role changes to Secondary.

The latest data is available after migration.

- 3 To switch back the global service group to its original primary cluster, right-click the service group and select **Remote Switch**.

The global service group comes online on its original primary cluster, and the latest data is available.

To test the global service group migration in global cluster setup using the command line interface (CLI)

- 1 Switch over the global service group from the primary cluster to the secondary cluster.

Perform the following steps:

- Switch the global service group from the primary cluster to any node in the secondary cluster.

```
hagrp -switch global_group -any -clus cluster_name
```

VCS brings the global service group online on a node at the secondary cluster.

- Verify that the HP 3PAR Remote Copy devices at the secondary cluster are write-enabled.

- 2 Switch back the global service group from the secondary cluster to the primary cluster.

Perform the following steps:

- Switch the global service group from the secondary cluster to the primary cluster.

```
hagrp -switch global_group -any -clus cluster_name
```

VCS brings the global service group online at the primary cluster.

- Verify that the HP 3PAR Remote Copy devices at the secondary cluster are write-enabled.

Testing service group migration between replicated data clusters

After you configure the VCS agent for HP 3PAR Remote Copy, verify that the service group can migrate to hosts across the sites.

To test the service group migration in replicated data cluster setup using the VCS GUI

- 1 In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group and click **Online** to bring the service group online on the primary site.
- 2 To switch over the service group from the primary site to the secondary site, right-click the service group and select **Switch To**.

The service group comes online on the secondary site. Now the secondary site role changes to Primary-Rev and the original primary site role changes to Secondary-Rev. If the SwapRoles attribute is set to 1, the secondary site role changes to Primary and the original primary site role changes to Secondary.

The latest data is available after migration.

- 3 To switch back the service group to its original primary site, right-click the service group and select **Switch To**.

The service group comes online on its original primary site, and the latest data is available.

To test the service group migration in replicated data cluster setup using the command line interface (CLI)

- 1 Switch over the service group from the primary site to the secondary site.

Perform the following steps:

- Switch the service group from the primary site to any node in the secondary site.

```
hagrp -switch service_group -to sys_name
```

VCS brings the service group online on a node at the secondary site.

- Verify that the HP 3PAR Remote Copy devices at the secondary site are write-enabled

- 2 Switch back the service group from the secondary site to the primary site.

Perform the following steps:

- Switch the service group from the secondary site to the primary site.
`hagrp -switch service_group -to sys_name`
VCS brings the service group online at the primary site.
- Verify that the HP 3PAR Remote Copy devices at the secondary site are write-enabled.

Testing all hosts failure in a global cluster

Perform the following procedure to test how VCS recovers after all hosts at the primary cluster fail.

To test disaster recovery for all hosts failure in global cluster setup, using the VCS GUI

- 1 Halt or shut down all the hosts at the primary cluster.
The value of the ClusterFailOverPolicy attribute for the faulted global group determines the VCS failover behavior.
 - Auto—VCS brings the faulted global service group online at the secondary cluster.
 - Manual or Connected—You must bring the global service group online at the secondary cluster.
In the **Service Groups** tab of the Cluster Explorer configuration tree, right-click the service group and click **Online**.
- 2 Verify that the 3PAR Remote Copy devices at the secondary cluster are write-enabled.

Verify that the latest data is available.

To test disaster recovery for all hosts failure in global cluster setup, using the command line interface (CLI)

- 1 Halt the hosts at the primary cluster.
The value of the ClusterFailOverPolicy attribute for the faulted global group determines the VCS failover behavior.
 - Auto—VCS brings the faulted global service group online at the secondary cluster.
 - Manual or Connected—You must bring the global service group online at the secondary cluster.
On a node in the secondary cluster, run the following command:

```
hagrp -online -force global_group -any
```

- 2 Run the following command to verify that the global service group is online at the secondary cluster:

```
hagrp -state global_group
```

- 3 Verify that the 3PAR Remote Copy devices at the secondary cluster are write-enabled.

Verify that the latest data is available.

Testing all hosts failure in a replicated data cluster

Perform the following procedure to test how VCS recovers after all hosts at the primary site fail.

To test disaster recovery for all hosts failure in replicated data cluster setup, using the VCS GUI

- 1 Halt or shut down all the hosts at the primary site.

The value of the ClusterFailOverPolicy attribute for the faulted global group determines the VCS failover behavior.

- Auto—VCS brings the faulted global service group online at the secondary site.
- Manual or Connected—You must bring the global service group online at the secondary site.
In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group and click **Online**.

- 2 Verify that the 3PAR Remote Copy devices at the secondary site are write-enabled.

Verify that the latest data is available.

To test disaster recovery for all hosts failure in replicated data cluster setup, using the command line interface (CLI)

- 1 Halt the hosts at the primary site.

The value of the ClusterFailOverPolicy attribute for the faulted global group determines the VCS failover behavior.

- Auto—VCS brings the faulted global service group online at the secondary site.
- Manual or Connected—You must bring the global service group online at the secondary site.

On a node in the secondary site, run the following command:

```
hagrp -online -force service_group sys_name
```

- 2** Run the following command to verify that the global service group is online at the secondary site:

```
hagrp -state service_group
```

- 3** Verify that the 3PAR Remote Copy devices at the secondary site are write-enabled.

Verify that the latest data is available.

Index

A

- action function 11
- attribute definitions
 - AutoTakeover 22
 - ComputeDRSLA 22
 - ForceSync 22
 - GroupName 22
 - SSHBinary 22
 - SSHPATHToIDFile 22
 - StorageServer 22
 - SwapRoles 22
 - Tagging 22
 - UserName 22

C

- clean function 11
- cluster
 - heartbeats 25

D

- disaster recovery 31

F

- failure scenarios 31
 - global clusters 31
 - application failure 31
 - host failure 31
 - network failure 31
 - replication link failure 31
 - site failure 31
 - storage failure 31
- functions
 - action 11
 - clean 11
 - monitor 11
 - offline 11
 - online 11
 - open 11

G

- global clusters
 - failure scenarios 31

H

- HP 3PAR Remote Copy agent
 - about 9
 - attribute definitions 22
 - passwordless ssh 26
 - resource type definition 21
 - supported modes 9
 - typical setup 10

I

- installing the agent
 - AIX systems 16
 - Linux systems 16
 - Solaris systems 16

M

- monitor function 11

O

- offline function 11
- online function 11
- open functions 11

R

- Recovery Point Objective (RPO)
 - Configuring RPO computation support 27

S

- sample configuration 24

T

- Testing
 - all hosts failure in GCO 38
 - all hosts failure in RDC 39

Testing (*continued*)

- service group migration in GCO 35
- service group migration in RDC 37

U

uninstalling the agent

- AIX systems 20
- Linux systems 20
- Solaris systems 20