

VERITAS Cluster Server Enterprise Agent 4.1.01 for Network Appliance SnapMirror

Installation and Configuration Guide

AIX, HP-UX, Linux, Solaris

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Preface

This document describes how to install and configure the VERITAS Cluster Server (VCS) enterprise agent for Network Appliance SnapMirror.

If this document is dated more than six months prior to the date you are installing your enterprise agent, contact VERITAS Technical Support to confirm you have the latest supported versions of the application and operating system.

How this guide is organized

- ◆ [Chapter 1. “Introduction” on page 1](#) introduces the VCS enterprise agent for Network Appliance SnapMirror and describes its operations.
- ◆ [Chapter 2. “Installing and removing the agent” on page 5](#) describes the required hardware setup and provides instructions on installing the Network Appliance SnapMirror agent.
- ◆ [Chapter 3. “Configuring the agent” on page 9](#) describes key configuration concepts and provides instructions on configuring the agent.
- ◆ [Chapter 4. “Managing and Testing Clustering Support for SnapMirror” on page 17](#) provides test scenarios and expected outcomes.



VERITAS Cluster Server documentation

The following documents, along with the online help and the Release Notes, comprise the VCS documentation:

Title	File Name
<i>VERITAS Cluster Server Installation Guide</i>	<code>vcs_install.pdf</code>
<i>VERITAS Cluster Server User's Guide</i>	<code>vcs_users.pdf</code>
<i>VERITAS Cluster Server Bundled Agents Reference Guide</i>	<code>vcs_bundled_agents.pdf</code>
<i>VERITAS Cluster Server Agent Developer's Guide</i>	<code>vcs_agent_dev.pdf</code>

See the VCS Release Notes for a complete list of documents and VCS agent guides.

Conventions

The following conventions apply throughout the documentation set.

Typeface/Font	Usage
bold	names of screens, windows, tabs, dialog boxes, options, buttons
<i>italic</i>	new terms, book titles, emphasis, variables in tables or body text
<code>Courier</code>	computer output, command references within text
Courier (bold)	command-line user input, keywords in grammar syntax
<i>Courier</i> (bold, italic)	variables in a command
#	UNIX superuser prompt (all shells)



Getting help

For technical assistance, visit <http://support.veritas.com> and select phone or email support. This site also provides access to resources such as TechNotes, product alerts, software downloads, hardware compatibility lists, and our customer email notification service. Use the Knowledge Base Search feature to access additional product information, including current and past releases of VERITAS documentation.

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Introduction

1

The VCS enterprise agent for Network Appliance SnapMirror provides failover support and recovery in environments employing SnapMirror to replicate data between Network Appliance Filer and Fabric Attached Storage devices.

About the Network Appliance SnapMirror agent

The VCS enterprise agent for Network Appliance SnapMirror monitors and manages the state of replicated filer devices attached to hosts. The agent ensures that at one time, only one host has safe exclusive access to the configured filer devices.

The agent determines the current role of the filer volumes with respect to replication and promotes a read-only target to a read-write source during a wide-area failover.

The agent supports NFS only as the data transfer protocol between host and filer; iSCSI connections to the filer are not supported.

The agent can be used in single VCS replicated data clusters and multi-cluster environments set up using the VCS Global Cluster Option.

Supported software and hardware

The agent supports VCS 4.0 and VCS 4.1.

The agent supports the following versions of Network Appliance hardware and software:

- ◆ Network Appliance FAS devices (any model).
- ◆ Network Appliance ONTAP 6.4 and above.

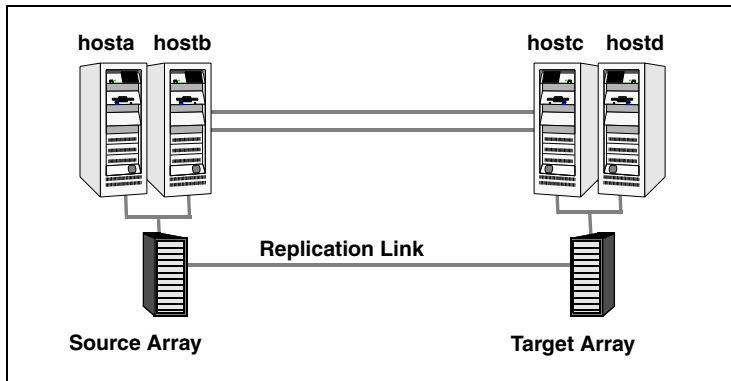
The agent does *not* support the following:

- ◆ NetApp F800 filer series.
- ◆ The iSCSI protocol.
- ◆ NetApp SnapMirror in the synchronous mode.



Typical setup

Clustering in a SnapMirror environment typically consists of the following hardware infrastructure:



- ✓ One or more *source hosts* physically attached to a Network Appliance device via an ethernet cable but supporting NFS as the transport protocol.
- ✓ One or more *target hosts* attached to a second filer with similar characteristics as the source hosts, however the volumes are SnapMirror targets.
- ✓ Network heartbeating between the two data centers to determine their health; this could be LLT or TCP/IP.

See “[About cluster heartbeats](#)” on page 12.

- ✓ In a replicated data cluster environment, all hosts are part of the same cluster. You must connect them with dual, dedicated networks that support LLT.
- ✓ In a global cluster environment, you must attach all hosts in the same cluster to the same filer.

Agent functions

The Network Appliance SnapMirror agent performs the following functions.

Agent Function (Entry Point)	Description
online	If the state of the local filer device is source, the agent creates a lock file to indicate that the resource can come online. If the filer is a target, the agent attempts to reverse the direction of replication by promoting the local filer to a source and the original source to a target. If the original source is down, the agent performs a <i>mirror breakoff</i> to enable local write access. If the original source ever returns to life, you must resynchronize data manually. The online entry point touches a lock file if read-write access is enabled successfully.
offline	The agent removes the lock file. The agent does not perform any filer operations because taking the resource offline is no indication of a pending role swap.
monitor	Verifies that the lock file exists. If the lock file exists, the monitor entry point reports the status of the resource as online. If the lock file does not exist, the monitor entry point reports the status of the resource as offline.
open	Removes the lock file on the system on which this entry point is called. This prevents potential concurrency violation if the group fails over to another node Note The agent does not remove the lock file if the agent was started after an <code>hastop -force</code> command.
clean	Performs the same operation as offline.





Installing and removing the agent

Install the agent after setting up your cluster. For information about installing and configuring VCS, see the *VERITAS Cluster Server Installation Guide*.

Installing the agent

You must install the Network Appliance SnapMirror agent on each node in the cluster. In global cluster environments, install the agent on each node in each cluster.

▼ To install the agent on AIX systems

1. Determine the device access name of the CD drive:

```
# cd /dev
# lsdev -C -c cdrom
```

The output resembles:

```
cd0 Available 10-60-00-4,0 16 Bit SCSI Multimedia CD-ROM Drive
```

In this example, the CD device access name is `cd0`.

2. Insert the CD into a drive connected to the system.

3. Mount the CD:

```
# mkdir -p /cdrom
# mount -V cdrfs -o ro /dev/cd0 /cdrom
```

4. Add the filesets for the software:

```
# cd /cdrom
# installp -ac -d
/cdrom/aix/replication/ntap_agent/4.1.01.0/pkgs/VRTSvcsna.rte.bff
VRTSvcsna
```



▼ **To install the agent on HP-UX systems**

1. Insert the disc into a drive connected to the host.
2. Create a mount point directory, `/cdrom`, if it does not exist. The directory must have read-write permissions.

3. Determine the block device file for the disc drive:

```
# ioscan -fnC disk
```

For example, the listing may indicate the block device is `/dev/dsk/c1t2d0`.

4. Start the Portable File System (PFS).

```
# nohup pfs_mountd &
# nohup pfsd &
```

5. Mount the disc:

```
# /usr/sbin/pfs_mount -t rrip /dev/dsk/c#t#d# /cdrom
```

The variable `/c#t#d#` represents the location of the drive.

6. Install the agent software. Type a command depending on the operating system on the node.

For HP-UX (PA) type:

```
# swinstall -s
/cdrom/hpux/replication/ntap_agent/4.1.01.0/PA/depot/
VRTSvcсна
```

For HP-UX (IA) type:

```
# swinstall -s
/cdrom/hpux/replication/ntap_agent/4.1.01.0/IA/depot/
VRTSvcсна
```

▼ To install the agent on Linux systems

1. Log in as root.
2. Insert the software disc into a drive connected to the system and mount the disc.

```
# mount -o ro /dev/cdrom /mnt/cdrom
```

3. Navigate to the /mnt directory:

```
# cd /mnt/cdrom
```

4. Navigate to the linux directory:

```
# cd linux
```

5. Navigate to the location of the agent binaries for the Linux distribution and architecture in your cluster:

```
/platform/replication/ntap_agent/4.1.01.0/rpms/
```

The variable *platform* represents the Linux distribution and architecture: *redhatlinux*, *redhatlinuxIA64*, *redhatlinuxX86_64*, *suselinux*, *suselinuxIA64*, *suselinuxX86_64*.

6. Install the agent software:

```
# rpm -ivh agentrpm
```

The variable *agentrpm* represents the agent package, located in the *rpms* directory.

▼ To install the agent on Solaris systems

1. Create a temporary directory for installation:

```
# mkdir /tmp/install
```

2. Insert the disc into a drive connected to the system. Type the command:

```
# cd /cdrom/cdrom0
```

3. Navigate to the location of the agent binaries:

```
# cd /solaris/sparc/replication/ntap_agent/4.1.01.0/pkgs/
```

4. Install the agent package:

```
# pkgadd -d . VRTSvcsna
```



Removing the agent

Before attempting to remove the agent, make sure the application service group is not online. You must remove the agent from each node in the cluster.

▼ To remove the agent from an AIX cluster

- ❖ Type the following command on each system to remove the agent. Answer prompts accordingly:

```
# installp -u VRTSvcsna
```

▼ To remove the agent from an HP-UX cluster

- ❖ Type the following command on each system to remove the agent. Answer prompts accordingly:

```
# swremove VRTSvcsna
```

▼ To remove the agent from a Linux cluster

- ❖ Type one of the following commands, depending on the operating system on the cluster node.

For Red Hat Enterprise Linux 4 (RHEL 4):

```
# rpm -e VRTSvcsna-4.1.01.0-GA_RHEL4.i686.rpm
```

For SUSE Linux Enterprise Server 9 (SLES 9):

```
# rpm -e VRTSvcsna-4.1.01.0-GA_SLES9.i586.rpm
```

Repeat these instructions on each node in the cluster.

▼ To remove the agent from a Solaris cluster

- ❖ Type the following command on each system to remove the agent. Answer prompts accordingly:

```
# pkgrm VRTSvcsna
```


Configuring the agent

3

Configuring the NetApp SnapMirror agent in a VCS service group involves defining values for the agent attributes and configuring resource dependencies. Volumes of filer device groups are configured as resources of type NetAppSnapMirror.



Configuration Concepts

Review the configuration concepts and failure scenarios for the agent.

Resource type Definition

The Network Appliance SnapMirror agent is represented by the NetAppSnapMirror resource type in VCS.

```
type NetAppSnapMirror (
    static int ActionTimeout = 120
    static keylist SupportedActions = { update, reestablish, swap }
    static int MonitorInterval = 300
    static int NumThreads = 1
    static str ArgList[] = { VolumeName, SnapMirrorSchedule,
        LocalFilerName, LocalFilerPword, RemoteFilerName,
        RemoteFilerPword }
    str VolumeName
    str SnapMirrorSchedule
    str LocalFilerName
    str LocalFilerPword
    str RemoteFilerName
    str RemoteFilerPword
)
```

Attribute Definitions

The table lists the agent attributes and their definitions.

Attribute	Type-Dimension	Description
LocalFilerName	string-scalar	Specifies the DNS resolvable name of the local NetApp filer
LocalFilerPword	string-scalar	A valid encrypted password for the root user on the local filer. If you are entering the password from the command line, run the <code>vcseencrypt</code> command to encrypt the password. Do not encrypt passwords when entering them from the GUI. If you do not specify a password, the agent uses the <code>hosts.equiv</code> file on filer to determine access rights.
RemoteFilerName	string-scalar	Specifies the DNS resolvable name of the remote NetApp filer
RemoteFilerPword	string-scalar	A valid encrypted password for the root user on the remote filer. If you are entering the password from the command line, run the <code>vcseencrypt</code> command to encrypt the password. Do not encrypt passwords when entering them from the GUI. If you do not specify a password, the agent uses the <code>hosts.equiv</code> file on filer to determine access rights.
VolumeName	string-scalar	Specifies the name of the replicated volume on the filer. Use same case for the volume name as on the filer since this attribute value is case sensitive.
SnapMirrorSchedule	string-scalar	Specifies the schedule the destination uses for updating data. This attribute should be left empty when used with NetApp SnapManager. Example: 0-59/5 * * *



Sample Configuration

SnapMirror related resources may be configured as follows. The locally attached filer is named netapp1, there is one filer volume "unixvol":

```
Mount ntap (
    MountPoint = "/ntap"
    BlockDevice = "netapp1:/vol/unixvol"
    FSType = nfs
    FsckOpt = "-n"
)

NetAppSnapMirror sm (
    VolumeName = unixvol
    SnapMirrorSchedule = "0-59/5 * * *"
    LocalFilerName = netapp1
    LocalFilerPword = aoaMboDodOhmPocMe
    RemoteFilerName = netapp2
    RemoteFilerPword = aoaMboDodOhmPocMe
)
```

ntap requires sm

About cluster heartbeats

In a replicated data cluster, robust heartbeating is accomplished through dual, dedicated networks over which the Low Latency Transport (LLT) runs. Additionally, you can configure a low-priority heartbeat across public networks.

In a global cluster, network heartbeating is accomplished by sending ICMP pings over the public network between the two sites. VCS global clusters minimize the risk of split-brain by sending ICMP pings to highly available IP addresses and by notifying administrators when the sites cannot communicate.

Host or application failure

In a global cluster environment, if the primary host running the application fails, or the application itself fails, VCS detects the outage and recommend failing over to the DR site.

Since in this case both filers are healthy, the VCS agents for SnapMirror would attempt a data migration, meaning taking over the target data and reversing the role of replication. This involves:

- ◆ Performing a mirror break, which enables write access to the target (via the NetAppSnapMirror agent).
- ◆ Updating the SnapMirror configuration to demote the original source to a target, and begin replicating from the new source (also via the NetAppSnapMirror agent).
- ◆ Mounting the filer volumes using the Mount agent, and specifying “nfs” as the FSType.
- ◆ Starting the application services (via the VCS agents for various applications).

Total Site Disaster

In a global cluster environment, if the site running the application fails, VCS detects the outage and recommend failing over to the DR site.

The agent for SnapMirror attempts a data migration, meaning taking over the target data and reversing the role of replication. This involves:

- ◆ Performing a mirror break, which enables write access to the target (via the NetAppSnapMirror agent).
- ◆ Updating the SnapMirror configuration to demote the original source to a target, and begin replicating from the new source (also via the NetAppSnapMirror agent).
- ◆ Mounting the filer volumes using the Mount agent, and specifying “nfs” as the FSType.
- ◆ Starting the application services (via the VCS agents for various applications).

If the original filer returns, the you must resynchrnoize the filer.



Configuring the Agent

Before configuring the agent, review the following information:

- ✓ Verify the clustering infrastructure is in place. If you plan to configure the agent in a global cluster, make sure the global service group for the application is configured. If you plan to configure the agent in a replicated data cluster, make sure the required replication infrastructure is in place and that the application is configured. See the *VERITAS Cluster Server User's Guide* for more information.
- ✓ Verify the agent is installed on all systems in the cluster.
- ✓ Verify the hardware infrastructure required for the agents is in place.
See “[Typical setup](#)” on page 2.
- ✓ Review the configuration concepts, which present information about how VCS behaves during failover and how you can set attributes to customize VCS behavior.
See “[Configuration Concepts](#)” on page 10.
- ✓ Review the agents' resource type definition and its attribute definitions.
See “[Resource type Definition](#)” on page 10.
- ✓ Make sure the cluster has an effective heartbeat mechanism in place.
See “[About cluster heartbeats](#)” on page 12.

Note You can automate the mounting of filer volumes through VCS by configuring a resource of type Mount as the parent of the NetAppSnapMirror resource and setting the FSType attribute of the Mount resource to nfs. You must also configure the filer to export the volumes to the clustered hosts.

▼ To configure the agent in a global cluster

1. Start Cluster Manager and log on to the cluster.
2. If the agent resource type (NetAppSnapMirror) is not added to your configuration, add it. From the Cluster Explorer **File** menu, choose **Import Types** and select `/etc/VRTSvcs/conf/NetAppSnapMirrorTypes.cf`.
3. Click **Import**.
4. Save the configuration.
5. Perform the following tasks for each service group in each cluster that uses replicated data:



- ◆ Add a resource of type NetAppSnapMirror at the bottom of the service group.
- ◆ Configure the attributes of the NetAppSnapMirror resource.
- ◆ If the service group is not configured as a global group, configure the service group using the Global Group Configuration Wizard. See the *VERITAS Cluster Server User's Guide* for more information.
- ◆ Change the ClusterFailOverPolicy from the default, if necessary. VERITAS recommends keeping the default, which is Manual, to minimize the chance of failing over on a split-brain.

▼ **To configure the agent in a replicated data cluster**

1. Start Cluster Manager and log on to the cluster.
2. If the agent resource type (NetAppSnapMirror) is not added to your configuration, add it. From the Cluster Explorer **File** menu, choose **Import Types** and select `/etc/VRTSvcs/conf/NetAppSnapMirrorTypes.cf`.
Click **Import**.
Save the configuration.
3. In each service group that uses replicated data, add a resource of type NetAppSnapMirror at the bottom of the service group.
4. Configure the attributes of the NetAppSnapMirror resource. Note that some attributes must be localized to reflect values for hosts attached to different arrays.
5. Set the SystemZones attribute for the service group to reflect which hosts are attached to the same array.

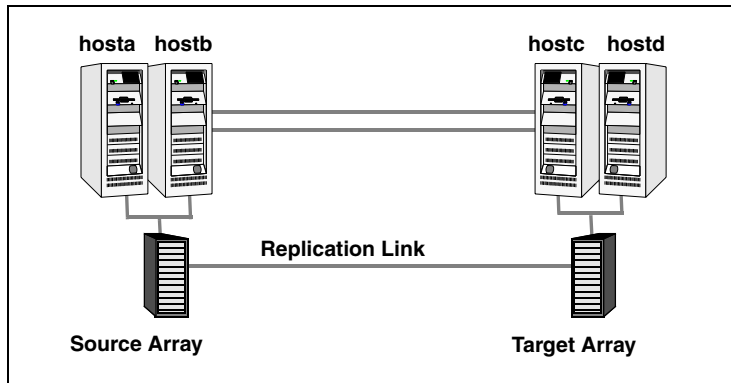




Managing and Testing Clustering Support for SnapMirror

4

After configuring the NetApp SnapMirror agent in a VCS environment, you can perform some basic tests to verify the implementation. These tests assume the following environment:



Two hosts (hosta and host b) are connected to a filer, and other hosts (hostc and host d) are connected to a another filer at the DR site. A single heartbeat over a shared network connects the two sites. The two clusters are managed as a unit by the VCS Global Cluster Option.



Testing Service Group Migration

Verify the service group can migrate to different hosts in the cluster.

▼ To perform the service group migration test

1. Migrate the service group to a host attached to the same array. In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group.
2. Click **Switch To**, and click the system attached to the same array (hostb) from the menu.
3. Migrate the service group to a host attached to a different array. In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group.
4. Click **Switch To**, and click the system attached to the another array (hostc) from the menu.

The local volumes become source volumes and the original volumes become targets.

5. Migrate the service group to its original host. In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group.
6. Click **Switch To**, and click the system on which the group was initially online (hosta).



Testing host failure

In this scenario, the host where the application runs is lost. Eventually all the hosts in the system zone or cluster are lost.

▼ To perform the host failure test

1. Halt the host where the application runs (hosta).

2. Halt or shut down hostb.

In a global cluster, a cluster down alert appears and gives you the opportunity to fail over the service group manually.

In a replicated data cluster, the group fails over to hostc or hostd depending on the FailOverPolicy in the cluster.

3. Switch the service group to its original host when VCS starts. In the Service Groups tab of the Cluster Explorer configuration tree, right-click the service group.
4. Click **Switch To**, and click the system on which the service group was initially online (hosta).

Performing the disaster test

Test how robust your cluster is in case of a disaster.

▼ To perform a disaster test

1. Shut down the host on which the service group is online as well as the filer to which it is attached.

If shutting down the filer is not feasible, disconnect it from the network so that it is not visible to the remote site.

2. In a global cluster, the administrator is notified of the failure. The administrator can then initiate the failover by declaring an outage.
3. Reboot the host and restart the filer. After the filer comes up, issue the swap action to resynchronize all data back to the source. After the resynchronization completes, switch the application back to the primary node.





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