Veritas™ Cluster Server Installation Guide

Solaris

5.1

Veritas Cluster Server Installation 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.

Product version: 5.1

Document version: 5.1.1

Legal Notice

Symantec Corporation
350 Ellis Street
Mountain View, CA 94043

http://www.symantec.com

Technical Support

Symantec 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 Symantec to answer your questions in a timely fashion. For example, the Technical Support group works with Product Engineering and Symantec Security Response to provide alerting services and virus definition updates.

Symantec's maintenance 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 Web-based support that provides rapid response and up-to-the-minute information
- Upgrade assurance that delivers automatic software upgrade protection
- Global support that is available 24 hours a day, 7 days a week
- Advanced features, including Account Management Services

For information about Symantec's Maintenance Programs, you can visit our Web site at the following URL:

www.symantec.com/business/support/index.jsp

Contacting Technical Support

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

www.symantec.com/business/support/contact_techsupp_static.jsp

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 Symantec
  - Recent software configuration changes and network changes

Licensing and registration

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

customercare.symantec.com

Customer service

Customer service information is available at the following URL:

www.symantec.com/customercare

Customer Service is available to assist with 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 maintenance contracts
- Information about the Symantec Buying Programs
- Advice about Symantec's technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs or manuals

Documentation feedback

Your feedback on product documentation is important to us. Send suggestions for improvements and reports on errors or omissions. Include the title and document version (located on the second page), and chapter and section titles of the text on which you are reporting. Send feedback to:

sfha_docs@symantec.com

Maintenance agreement resources

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

Asia-Pacific and Japan	customercare_apac@symantec.com
Europe, Middle-East, and Africa	semea@symantec.com
North America and Latin America	supportsolutions@symantec.com

Additional enterprise services

Symantec offers a comprehensive set of services that allow you to maximize your investment in Symantec products and to develop your knowledge, expertise, and global insight, which enable you to manage your business risks proactively.

Enterprise services that are available include the following:

Symantec Early Warning Solutions	These solutions provide early warning of cyber attacks, comprehensive threat analysis, and countermeasures to prevent attacks before they occur.
Managed Security Services	These services remove the burden of managing and monitoring security devices and events, ensuring rapid response to real threats.
Consulting Services	Symantec Consulting Services provide on-site technical expertise from Symantec and its trusted partners. Symantec Consulting Services offer a variety of prepackaged and customizable options that include assessment, design, implementation, monitoring, and management capabilities. Each is focused on establishing and maintaining the integrity and availability of your IT resources.
Educational Services	Educational Services provide a full array of technical training, security education, security certification, and awareness communication programs.

To access more information about Enterprise services, please visit our Web site at the following URL:

www.symantec.com

Select your country or language from the site index.

Contents

Section 1

Installation overview and planning

Chapter 1

Introducing VCS

This chapter includes the following topics:

About Veritas Cluster Server

Veritas™ Cluster Server by Symantec is a high-availability solution for cluster configurations. Veritas Cluster Server (VCS) monitors systems and application services, and restarts services when hardware or software fails.

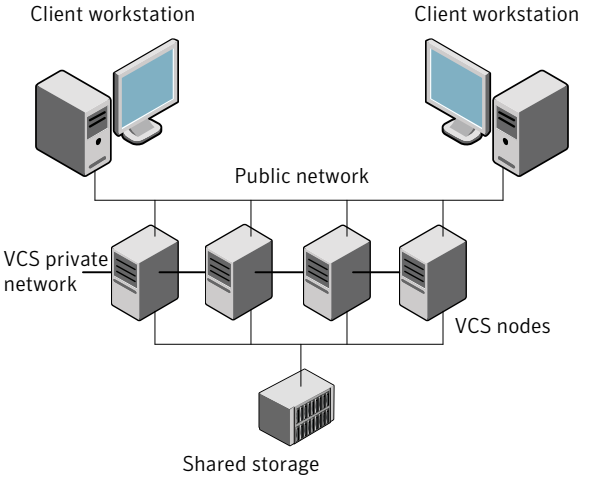
About VCS basics

A single VCS cluster consists of multiple systems that are connected in various combinations to shared storage devices. When a system is part of a VCS cluster, it is a node. VCS monitors and controls applications running in the cluster on nodes, and restarts applications in response to a variety of hardware or software faults.

Applications can continue to operate with little or no downtime. In some cases, such as NFS, this continuation is transparent to high-level applications and users. In other cases, a user might have to retry an operation, such as a Web server reloading a page.

Figure 1-1 illustrates a typical VCS configuration of four nodes that are connected to shared storage.

Figure 1-1 Example of a four-node VCS cluster



Client workstations receive service over the public network from applications running on VCS nodes. VCS monitors the nodes and their services. VCS nodes in the cluster communicate over a private network.

VCS configuration files are as follows:

- main.cf—Defines the cluster, including services groups and resources.
- types.cf—Defines the resource types.
- /etc/default/vcs—Defines the startup and the shutdown behavior of VCS during system reboot and shutdown.

The main.cf and types.cf files reside in the /etc/VRTSvcs/conf/config folder by default.

See "About the VCS configuration files" on page 310.

About multiple nodes

VCS runs in a replicated state on each node in the cluster. A private network enables the nodes to share identical state information about all resources. The private network also recognizes active nodes, the nodes that join or leave the cluster, and failed nodes. The private network requires two communication channels to guard against network partitions.

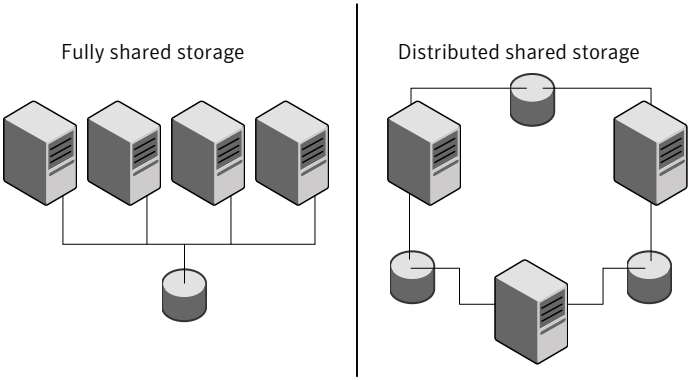
About shared storage

A VCS hardware configuration typically consists of multiple nodes that are connected to shared storage through I/O channels. Shared storage provides multiple systems with an access path to the same data. It also enables VCS to restart applications on alternate nodes when a node fails, which ensures high availability.

VCS nodes can only access physically-attached storage.

Figure 1-2 illustrates the flexibility of VCS shared storage configurations.

Figure 1-2 Two examples of shared storage configurations



About LLT and GAB

VCS uses two components, LLT and GAB, to share data over private networks among systems. These components provide the performance and reliability that VCS requires.

LLT (Low Latency Transport) provides fast, kernel-to-kernel communications, and monitors network connections.

LLT configuration files are as follows:

- /etc/llthosts—lists all the nodes in the cluster
- /etc/lltab—describes the local system's private network links to the other nodes in the cluster

GAB (Group Membership and Atomic Broadcast) provides the global message order that is required to maintain a synchronized state among the nodes. It monitors disk communications such as the VCS heartbeat utility. The /etc/gabtab file is the GAB configuration file.

LLT and GAB initialization configuration files include:

- /etc/default/llt
- /etc/default/gab

See "About the LLT and GAB configuration files" on page 307.

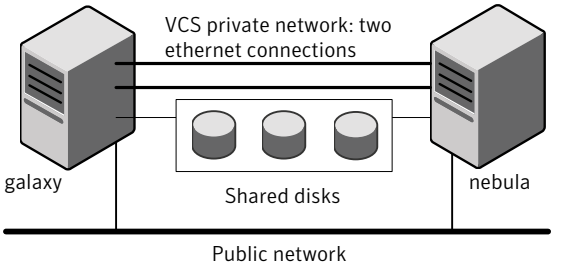
About network channels for heartbeating

For the VCS private network, two network channels must be available to carry heartbeat information. These network connections also transmit other VCS-related information.

Each Solaris cluster configuration requires at least two network channels between the systems. The requirement for two channels protects your cluster against network partitioning. For more information on network partitioning, refer to the *Veritas Cluster Server Administrator's Guide*.

Figure 1-3 illustrates a two-node VCS cluster where the nodes galaxy and nebula have two private network connections.

Figure 1-3 Two Ethernet connections connecting two nodes



About preexisting network partitions

A preexisting network partition refers to a failure in the communication channels that occurs while the systems are down and VCS cannot respond. When the systems start, VCS seeding reduces vulnerability to network partitioning, regardless of the cause of the failure.

About VCS seeding

To protect your cluster from a preexisting network partition, VCS uses a seed. A seed is a function of GAB that determines whether or not all nodes have joined a cluster. For this determination, GAB requires that you declare the number of nodes in the cluster. Note that only seeded nodes can run VCS.

GAB automatically seeds nodes under the following conditions:

- An unseeded node communicates with a seeded node
- All nodes in the cluster are unseeded but can communicate with each other

When the last system starts and joins the cluster, the cluster seeds and starts VCS on all nodes. You can then bring down and restart nodes in any combination. Seeding remains in effect as long as at least one instance of VCS is running somewhere in the cluster.

Perform a manual seed to run VCS from a cold start when one or more systems of the cluster are unavailable. VCS does not start service groups on a system until it has a seed.

About Veritas product licensing

This release of the Veritas products introduces the option to install without a license key. The keyless license strategy does not eliminate the need to obtain a license. A software license is a legal instrument governing the usage or redistribution of copyright protected software. The administrator and company representatives must ensure that a server or cluster is entitled to the license level for the products installed. Symantec reserves the right to ensure entitlement and compliance through auditing.

If you encounter problems while licensing this product, visit the Symantec licensing support website.

The Veritas product installer prompts you to select one of the following licensing methods:

- Install a license key for the product and features that you want to install.
  When you purchase a Symantec product, you receive a License Key certificate. The certificate specifies the product keys and the number of product licenses purchased.
- Continue to install without a license key.
  The installer prompts for the product modes and options that you want to install, and then sets the required product level.
  Within 60 days of choosing this option, you must install a valid license key corresponding to the license level entitled or continue with keyless licensing by managing the server or cluster with a management server. If you do not comply with the above terms, continuing to use the Veritas product is a violation of your end user license agreement, and results in warning messages.
  For more information about keyless licensing, see the following URL:
  http://go.symantec.com/sfhakeyless

If you upgrade to this release from a prior release of the Veritas software, the product installer does not change the license keys that are already installed. The existing license keys may not activate new features in this release.

If you upgrade with the product installer, or if you install or upgrade with a method other than the product installer, you must do one of the following to license the products:

- Run the `vxkeyless` command to set the product level for the products you have purchased. This option also requires that you manage the server or cluster with a management server.
  See "Setting or changing the product level for keyless licensing" on page 197.
  See the `vxkeyless(1m)` manual page.
- Use the `vxlicinst` command to install a valid product license key for the 5.1 products you have purchased.
  See the `vxlicinst(1m)` manual page.

You can also use the above options to change the product levels to another level that you are authorized to use. For example, you can add the replication option to the installed product. You must ensure that you have the appropriate license for the product level and options in use.

Note: In order to change from one product stack to another, additional steps may be required.

We recommend updating to keyless licensing for the following reasons:

- enables 5.1 functionality.
- allows you to change the product level easily.

About VCS features

You can use the Veritas Operation Services to assess your setup for VCS installation.

See "About Veritas Operations Services" on page 27.

VCS offers the following features that you can configure during VCS configuration:

VCS notifications	See "About VCS notifications" on page 27.
VCS global clusters	See "About global clusters" on page 28.
I/O fencing	See "About I/O fencing" on page 28.

About Veritas Operations Services

Veritas Operations Services (VOS) is a Web-based application that is designed specifically for Veritas CommandCentral and Veritas Storage Foundation and High Availability products. VOS increases operational efficiency and helps improve application availability.

VOS automates and simplifies administrator tasks, including:

- Determining if systems are ready to install or upgrade Veritas products
- Gathering deployment and usage information on Veritas products
- Receiving notifications about the latest updates for:
  - Patches
  - Hardware Compatibility Lists (HCLs)
  - Array Support Libraries (ASLs)
  - Array Policy Modules (APMs)
- Determining whether your Veritas product configurations conform to best practices
- Managing server and environmental configuration data from a single Website
- Interpreting Unified Message Identifier (UMI) codes and their solutions
- Identifying and downloading patches for Veritas products

To access VOS, go to:

http://vos.symantec.com/

About VCS notifications

You can configure both SNMP and SMTP notifications for VCS. Symantec recommends you to configure one of these notifications. You have the following options:

- Configure SNMP trap notification of VCS events using the VCS Notifier component
- Configure SMTP email notification of VCS events using the VCS Notifier component.

See the *Veritas Cluster Server Administrator's Guide*.

About global clusters

Global clusters provide the ability to fail over applications between geographically distributed clusters when disaster occurs. You require a separate license to configure global clusters. You must add this license during the installation. The installer only asks about configuring global clusters if you have used the global cluster license.

See the *Veritas Cluster Server Administrator's Guide*.

About I/O fencing

I/O fencing protects the data on shared disks when nodes in a cluster detect a change in the cluster membership that indicates a split-brain condition.

See the *Veritas Cluster Server Administrator's Guide*.

The fencing operation determines the following:

- The nodes that must retain access to the shared storage
- The nodes that must be ejected from the cluster

This decision prevents possible data corruption. The installvcs program installs the VCS I/O fencing driver, VRTSvxfen. To protect data on shared disks, you must configure I/O fencing after you install and configure VCS.

I/O fencing technology uses coordination points for arbitration in the event of a network partition.

You can configure I/O fencing to use one or both of the following components as coordination points:

Coordinator disk	I/O fencing that uses coordinator disks is referred to as disk-based I/O fencing. Disk-based I/O fencing ensures data integrity in a single cluster.
Coordination point server (CP server)	I/O fencing that uses at least one CP server system is referred to as server-based I/O fencing. Server-based I/O fencing ensures data integrity in multiple clusters.

Note: Symantec recommends that you use I/O fencing to protect your cluster against split-brain situations.

About VCS optional components

You can add the following optional components to VCS:

Symantec Product Authentication Service	See "About Symantec Product Authentication Service (AT)" on page 29.
Veritas Cluster Server Management Console	See "About Veritas Cluster Server Management Console" on page 30.
Cluster Manager (Java console)	See "About Cluster Manager (Java Console)" on page 30.
VCS Simulator	See "About VCS Simulator" on page 30.

To configure most optional components, install all packages when the installation program prompts you. Note that most consoles are separate downloads.

About Symantec Product Authentication Service (AT)

VCS uses Symantec Product Authentication Service (AT) to provide secure communication between cluster nodes and clients. It uses digital certificates for authentication and SSL to encrypt communication over the public network to secure communications.

AT uses the following brokers to establish trust relationship between the cluster components:

- Root broker
  A root broker serves as the main registration and certification authority; it has a self-signed certificate and can authenticate other brokers. The root broker is only used during initial creation of an authentication broker.
  A root broker on a stable external system can serve multiple clusters. Symantec recommends that you install a single root broker on a utility system. The utility system, such as an email server or domain controller, can be highly available.
  You can also configure one of the nodes in the VCS cluster to serve as a root and an authentication broker.
- Authentication brokers
  Authentication brokers serve as intermediate registration and certification authorities. Authentication brokers have root-signed certificates. Each node in VCS serves as an authentication broker.

See Symantec Product Authentication Service documentation for more information.

See "Preparing to configure the clusters in secure mode" on page 83.

About Cluster Manager (Java Console)

Cluster Manager (Java Console) offers complete administration capabilities for your cluster. Use the different views in the Java Console to monitor clusters and VCS objects, including service groups, systems, resources, and resource types.

You can download the console from http://go.symantec.com/vcsmc.

Symantec also offers the Veritas Cluster Server (VCS) Management Console to manage clusters.

See "About Veritas Cluster Server Management Console" on page 30.

See *Veritas Cluster Server Administrator's Guide*.

About Veritas Cluster Server Management Console

Veritas Cluster Server Management Console is a high availability management solution that enables monitoring and administering clusters from a single Web console.

You can configure Veritas Cluster Server Management Console to manage multiple clusters.

Refer to the *Veritas Cluster Server Management Console Implementation Guide* for installation, upgrade, and configuration instructions.

For information on updates and patches for VCS Management Console, see http://seer.entsupport.symantec.com/docs/308405.htm.

To download the most current version of VCS Management Console, go to http://www.symantec.com/business/cluster-server and click **Utilities**.

About VCS Simulator

VCS Simulator enables you to simulate and test cluster configurations. Use VCS Simulator to view and modify service group and resource configurations and test failover behavior. VCS Simulator can be run on a stand-alone system and does not require any additional hardware. VCS Simulator can be installed only a Windows operating system.

VCS Simulator runs an identical version of the VCS High Availability Daemon (HAD) as in a cluster, ensuring that failover decisions are identical to those in an actual cluster.

You can test configurations from different operating systems using VCS Simulator. For example, you can run VCS Simulator on a Windows system and test VCS configurations for Windows, Linux, and Solaris clusters. VCS Simulator also enables creating and testing global clusters.

You can administer VCS Simulator from the Java Console or from the command line.

To download VCS Simulator, go to http://www.symantec.com/business/cluster-server and click **Utilities**.

Chapter 2

Planning to install VCS

This chapter includes the following topics:

VCS installation requirements

You can install VCS on clusters of up to 32 systems. Every node where you want to install VCS must meet the hardware and the software requirements.

This is document version 5.1.0. Before you continue, make sure that you are using the current version of this guide. It is online at:

http://sfdoccentral.symantec.com/sf/5.1/solaris/pdf/vcs_install.pdf

For important updates regarding this release, review the Late-Breaking News TechNote on the Symantec Technical Support website:

http://entsupport.symantec.com/docs/334829

The hardware compatibility list contains information about supported hardware and is updated regularly. For the latest information on supported hardware visit the following URL:

http://entsupport.symantec.com/docs/330441

Before installing or upgrading Veritas Cluster Server, review the current compatibility list to confirm the compatibility of your hardware and software.

Hardware requirements

Table 2-1 lists the hardware requirements for a VCS cluster.

Table 2-1 Hardware requirements for a VCS cluster

Item	Description
VCS nodes	From 1 to 32 SPARC or x64 systems running Solaris 9 or later as appropriate.
DVD drive	One drive in a system that can communicate to all the nodes in the cluster.
Disks	Typical VCS configurations require that shared disks support the applications that migrate between systems in the cluster. The VCS I/O fencing feature requires that all data and coordinator disks support SCSI-3 Persistent Reservations (PR).
Disk space	See "Required disk space" on page 34. **Note:** VCS may require more temporary disk space during installation than the specified disk space.
Ethernet controllers	In addition to the built-in public Ethernet controller, VCS requires at least one more Ethernet interface per system. Symantec recommends two additional interfaces. You can also configure aggregated interfaces. Symantec recommends that you turn off the spanning tree algorithm on the LLT switches.
Fibre Channel or SCSI host bus adapters	Typical VCS configuration requires at least one SCSI or Fibre Channel Host Bus Adapter per system for shared data disks.
RAM	Each VCS node requires at least 256 megabytes.

Required disk space

Table 2-2 shows the approximate disk space usage for Veritas Cluster Server packages.

Table 2-2 Disk space requirements and totals

Packages	/	/usr	/opt	/var
Minimal	7 MB	8 MB	254 MB	1 MB
Recommended	7 MB	8 MB	277 MB	1 MB
All	7 MB	8 MB	319 MB	1 MB

Note: When you use the uninstall program to uninstall VCS, ensure that 254 MB of disk space is available in `/var/tmp`.

Supported Solaris operating systems

This release of the Veritas products is supported on the following Solaris operating systems:

- Solaris 9 (SPARC Platform 32-bit and 64-bit)
- Solaris 10 (SPARC or x64 Platform 64-bit)

If necessary, upgrade Solaris before you install the Veritas products.

Install all the latest required Solaris patches listed in the product *Release Notes*.

For important updates regarding this release, review the Late-Breaking News TechNote on the Symantec Technical Support website:

http://entsupport.symantec.com/docs/334829

Required Solaris patches for VCS

Before you install your Symantec products on Solaris, read the following TechNote and perform the instructions in it:

http://entsupport.symantec.com/docs/334829

Supported software

VCS supports the following volume managers and file systems:

- Veritas Storage Foundation (SF): Veritas Volume Manager (VxVM) with Veritas File System (VxFS)

  VCS 5.1 supports the following versions of SF:

  - SF 5.0 MP3
    - VxVM 5.0 with VxFS 5.0
    - VxVM 5.0 MP1 with VxFS 5.0 MP1 (Solaris SPARC only)
    - VxVM 5.0 MP3 with VxFS 5.0 MP3
  - SF 5.1
    - VxVM 5.1 with VxFS 5.1

Note: VCS supports the previous version of SF and the next version of SF to facilitate product upgrades.

Patches required for JRE from Sun

The GUI modules for VCS use the Java Run Time Environment from Sun Microsystems. You need to obtain and install the latest Solaris-specific patches to enable the modules to function properly. Visit the Sun web site to download the packages.

I/O fencing requirements

Depending on whether you plan to configure disk-based fencing or server-based fencing, make sure that you meet the requirements for coordination points:

- Coordinator disks
  See "Coordinator disk requirements for I/O fencing" on page 36.
- CP servers
  See "CP server requirements" on page 37.

To configure disk-based fencing or to configure server-based fencing with at least one coordinator disk, make sure a version of Veritas Volume Manager (VxVM) that supports SCSI-3 persistent reservations (SCSI-3 PR) is installed on the VCS cluster.

See the *Veritas Storage Foundation and High Availability Installation Guide*.

Coordinator disk requirements for I/O fencing

Make sure that the I/O fencing coordinator disks meet the following requirements:

- For disk-based I/O fencing, you must have three coordinator disks.
- The coordinator disks can be raw devices, DMP devices, or iSCSI devices.
  You must use DMP disk policy for iSCSI-based coordinator disks.
  For the latest information on supported hardware visit the following URL:
  http://entsupport.symantec.com/docs/283161
- Each of the coordinator disks must use a physically separate disk or LUN.
  Symantec recommends using the smallest possible LUNs for coordinator disks.
- Each of the coordinator disks should exist on a different disk array, if possible.
- The coordinator disks must support SCSI-3 persistent reservations.
- Symantec recommends using hardware-based mirroring for coordinator disks.

- Coordinator disks must not be used to store data or must not be included in disk groups that store user data.
- Coordinator disks cannot be the special devices that array vendors use. For example, you cannot use EMC gatekeeper devices as coordinator disks.

CP server requirements

The following requirements must be met for a CP server installation:

- CP server hardware-specific requirements
- OS requirements
- Networking requirements (and recommendations)
- Security requirements

For the basic hardware requirements for the VCS/SFHA cluster to host the CP server, refer to the appropriate VCS or SFHA installation and configuration guide.

Table 2-3 lists additional requirements for hosting the CP server.

Table 2-3 CP server hardware requirements

Hardware required	Description
Disk space	To host the CP server on a VCS cluster or SFHA cluster, each host requires the following file system space: ■ 550 MB in the /opt directory (additionally, the language pack requires another 15 MB) ■ 300 MB in /usr ■ 20 MB in /var
Storage	When CP server is hosted on an SFHA cluster, there must be shared storage between the CP servers.
RAM	Each CP server requires at least 512 MB.
CP server to client node physical link	A secure TCP/IP connection is required to connect the CP server(s) to the VCS cluster.

Table 2-4 displays the CP server supported operating systems and versions.

Table 2-4 CP server supported operating systems and versions

CP server	Operating system and version
CP server hosted on a VCS single node cluster or CP server hosted on an SFHA cluster	■ Solaris 9 (SPARC) ■ Solaris 10 (SPARC or x86) ■ Linux (RHEL5, SLES10, SLES11)

For networking requirements, Symantec recommends that network access from the VCS clusters to the CP servers should be made highly-available and redundant. The network connections require either a secure LAN or VPN.

The CP server uses the TCP/IP protocol to connect to and communicate with the VCS cluster(s) by these network paths. The CP server listens for messages from the VCS cluster(s) using TCP port 14250. This is the default port that can be changed during a CP server configuration.

Note: The CP server supports either Internet Protocol version 4 or version 6 (IPv4 or IPv6 addresses) when communicating with the VCS clusters. If the CP server is configured to use an IPv6 virtual IP address, then the VCS clusters should also be on the IPv6 network where the CP server is being hosted.

When placing the CP server (s) within a specific network configuration, the number of hops from the different VCS cluster nodes to the CP server (s) should be taken into consideration. As a best practices procedure, Symantec recommends that the number of hops from the different VCS cluster nodes to the CP server(s) should be equal. This ensures that if an event occurs that results in an I/O fencing scenario, there is no bias in the race due to the number of hops between the nodes.

For secure communications between the VCS cluster and CP server, be sure to consider the following requirements and suggestions:

- If security is configured, both VCS and the customized fencing framework can use secure channels for communication. Configuring VCS in secure mode and CP server or VCS cluster in non-secure mode is supported, but configuring VCS in non-secure mode and CP server in secure mode is not supported.
- In a secure communication environment, all CP servers that are used by the VCS cluster must be configured with security enabled. A configuration where the VCS cluster uses some CP servers running with security enabled and other CP servers running with security disabled is not supported.
- The CP server and VCS clusters should also use the same root broker. If the same root broker is not being used, then trust can be established between the cluster nodes and CP server for the secure communication. Trust can be established by the installer when configuring fencing.

- For non-secure communication between CP server and VCS clusters, there is no need to configure Symantec Product Authentication Service. In non-secure mode, authorization is still provided by CP server for the VCS cluster users. The authorization that is performed only ensures that authorized users can perform appropriate actions as per their user privileges on the CP server.

For additional information, see *Veritas Cluster Server Administrator's Guide*.

VCS installation methods

Table 2-5 lists the different methods you can choose to install and configure VCS:

Table 2-5 VCS installation methods

Method	Description
Interactive installation using the script-based installer	You can use one of the following script-based installers: ■ Veritas product installer Use to install and configure multiple Veritas products. ■ installvcs program Use to install and configure just VCS. The script-based installer asks you a series of questions and installs and configures VCS based on the information you provide.
Interactive installation using the web-based installer	You can use a web-interface to install and configure VCS.
Automated installation using the VCS response files	At the end of each successful simulated or actual installation and configuration, the installer creates response files. You can use these response files to perform multiple installations to set up a large VCS cluster.
Manual installation using the Solaris commands and utilities	You can install VCS using the operating system pkgadd command and then manually configure VCS. You can also install VCS using the JumpStart utility.

About the VCS installation program

You can access the installvcs program from the command line or through the Veritas product installer.

The VCS installation program is interactive and manages the following tasks:

- Licensing VCS
- Installing VCS packages on multiple cluster systems
- Configuring VCS, by creating several detailed configuration files on each system
- Starting VCS processes

You can choose to configure different optional features, such as the following:

- SNMP and SMTP notification
- The Symantec Product Authentication Services feature
- The wide area Global Cluster feature

Review the highlights of the information for which installvcs program prompts you as you proceed to configure.

See "About preparing to install VCS" on page 51.

The uninstallvcs program, a companion to installvcs program, uninstalls VCS packages.

Features of the script-based installer

The script-based installer supports installing, configuring, upgrading, and uninstalling VCS. In addition, the script-based installer also provides command options to perform the following tasks:

- Check the systems for VCS installation requirements.
  See "Performing automated preinstallation check" on page 67.
- Upgrade VCS if a previous version of VCS currently runs on a cluster.
  See "Upgrading VCS using the script-based installer" on page 240.
- Start or stop VCS processes
  See "Starting and stopping processes for the Veritas products " on page 442.
- Enable or disable a cluster to run in secure mode using Symantec Product Authentication Service (VxAT)
  See the *Veritas Cluster Server Administrator's Guide*.
- Configure I/O fencing for the clusters to prevent data corruption
  See "Setting up disk-based I/O fencing using installvcs program" on page 133.

See "Setting up server-based I/O fencing using installvcs program" on page 140.

- Create a single-node cluster
  See "Creating a single-node cluster using the installer program" on page 420.
- Add a node to an existing cluster
  See "Adding nodes using the VCS installer" on page 347.
- Create a jumpstart finish script to install VCS using the JumpStart utility.
  See "Installing with JumpStart" on page 199.
- Perform automated installations using the values that are stored in a configuration file.
  See "Installing VCS using response files" on page 165.
  See "Configuring VCS using response files" on page 171.
  See "Upgrading VCS using response files" on page 261.

Interacting with the installvcs program

As you run the program, you are prompted to answer yes or no questions. A set of responses that resemble **[y, n, q, ?] (y)** typically follow these questions. The response within parentheses is the default, which you can select by pressing the Enter key. Enter the **?** character to get help to answer the prompt. Enter **q** to quit the installation.

Installation of VCS packages takes place only after you have confirmed the information. However, you must remove the partially installed VCS files before you run the installvcs program again.

During the installation, the installer prompts you to type information. The installer expects your responses to be within a certain range or in a specific format. The installer provides examples. If you are prompted to enter an item from a list, enter your selection exactly as it is shown in the list.

The installer also prompts you to answer a series of questions that are related to a configuration activity. For such questions, you can enter the **b** character to return to the first prompt in the series. When the installer displays a set of information items you have entered, you are prompted to confirm it. If you answer **n**, the program lets you reenter all of the information for the set.

You can install the VCS Java Console on a single system, which is not required to be part of the cluster. Note that the installvcs program does not install the VCS Java Console.

About the Web-based installer

The Web-based installer is a convenient GUI method to install the Veritas products. The Web-based installer also enables you to configure the product and verify preinstallation requirements.

The `webinstaller` script is used to start and stop the Veritas XPortal Server `xprtld` process. The `webinstaller` script can also be used to check the status of the XPortal Server.

When the `webinstaller` script starts the `xprtld` process, the script displays a URL. Use this URL to access the Web-based installer from a Web browser such as Internet Explorer or FireFox.

The Web installer creates log files whenever the Web installer is operating. While the installation processes are operating, the log files are located in a session-based directory under the `/var/tmp` directory. After the install process completes, the log files are located in the `/opt/VRTS/install/logs` directory. It is recommended that you keep the files for auditing, debugging, and future use.

The location of the Veritas XPortal Server configuration file is `/var/opt/webinstaller/xprtlid.conf`.

Features supported with Web-based installer

The Web-based installer works similarly to the script installer. For the initial release, certain new or advanced features available in the script installer are not available in the Web-based installer.

The following features are supported in the Web-based installer:

- Installing a product
- Uninstalling a product
- Upgrading a product
- Configuring a clustered product including:
  Required VCS configuration - Cluster name, Cluster ID, Heartbeat NICs
  Optional VCS configuration - Users, SMTP Notification, SNMP Notification, GCO required, Virtual IP
  SFCFS configuration - fencing enabled question
  Configuring Veritas Volume Manager and Veritas Volume Replicator with the installer is not required for this release.
- Starting a product
- Stopping a product
- Licensing a product

- Performing an installation precheck

About response files

The installer generates a "response file" after performing an installer task such as installation, configuration, uninstallation, or upgrade. These response files contain the details that you provided to the installer questions in the form of values for the response file variables. The response file also contains descriptions and explanations of the variables and their values.

You can also create a response file using the `-makeresponsefile` option of the installer.

The installer displays the location of the response file at the end of each successful installer task. The installer saves the response file in the default location for the install-related log files: /opt/VRTS/install/logs. If you provided a different log path using the `-logpath` option, the installer saves the response file in the path that you specified.

The format of the response file name is:
/opt/VRTS/install/logs/*installscript-YYYYMMDDHHSSxxx*
/*installscript-YYYYMMDDHHSSxxx*.response, where:

- *installscript* may be, for example: installer, webinstaller, installvcs program, or uninstallvcs program
- *YYYYMMDDHHSS* is the current date when the *installscript* is run and *xxx* are three random letters that the script generates for an installation instance

For example:
/opt/VRTS/install/logs/installer-200910101010ldS/installer-200910101010ldS.response

You can customize the response file as required to perform unattended installations using the `-responsefile` option of the installer. This method of automated installations is useful in the following cases:

- To perform multiple installations to set up a large VCS cluster.
  See "Installing VCS using response files" on page 165.
- To upgrade VCS on multiple systems in a large VCS cluster.
  See "Upgrading VCS using response files" on page 261.
- To uninstall VCS from multiple systems in a large VCS cluster.
  See "Uninstalling VCS using response files" on page 337.

Syntax in the response file

The syntax of the Perl statements that are included in the response file variables varies. It can depend on whether the variables require scalar or list values.

For example, in the case of a string value:

```
$CFG{Scalar_variable}="value";
```

or, in the case of an integer value:

```
$CFG{Scalar_variable}=123;
```

or, in the case of a list:

```
$CFG{List_variable}=["value", "value", "value"];
```

Typical VCS cluster setup models

VCS clusters support different failover configurations, storage configurations, and cluster topologies.

See the *Veritas Cluster Server Administrator's Guide* for more details.

Some of the typical VCS setup models are as follows:

- Basic VCS cluster with two nodes
  See Figure 2-1 on page 45.
  See Figure 2-2 on page 45.
- VCS clusters in secure mode using Symantec Product Authentication Service (AT)
  See Figure 2-3 on page 46.
- VCS clusters centrally managed using Veritas Cluster Server Management Console (VCS MC)
  See Figure 2-4 on page 47.
- VCS clusters with I/O fencing for data protection
  See "Typical VCS cluster configuration with disk-based I/O fencing" on page 99.
  See "Typical VCS cluster configuration with server-based I/O fencing" on page 99.
- VCS clusters such as global clusters, replicated data clusters, or campus clusters for disaster recovery
  See the *Veritas Cluster Server Administrator's Guide* for disaster recovery cluster configuration models.

Figure 2-1 illustrates a simple VCS cluster setup with two Solaris SPARC systems.

Figure 2-1 Typical two-node VCS cluster (Solaris SPARC systems)

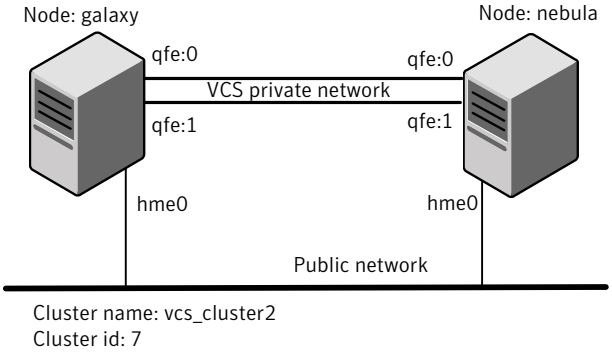


Figure 2-2 illustrates a a simple VCS cluster setup with two Solaris x64 systems.

Figure 2-2 Typical two-node VCS cluster (Solaris x64 systems)

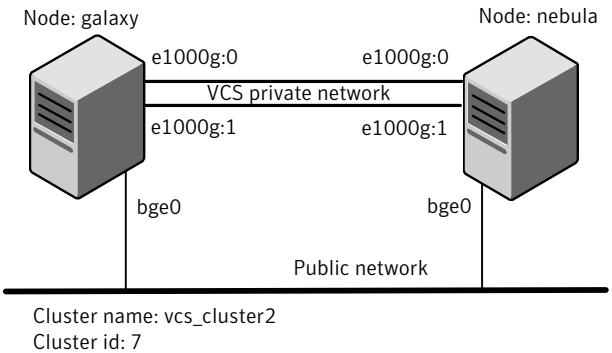


Figure 2-3 illustrates typical configuration of VCS clusters in secure mode. You can use one of the cluster nodes as AT root broker or you can use a stable system outside the cluster as AT root broker.

Figure 2-3 Typical configuration of VCS clusters in secure mode

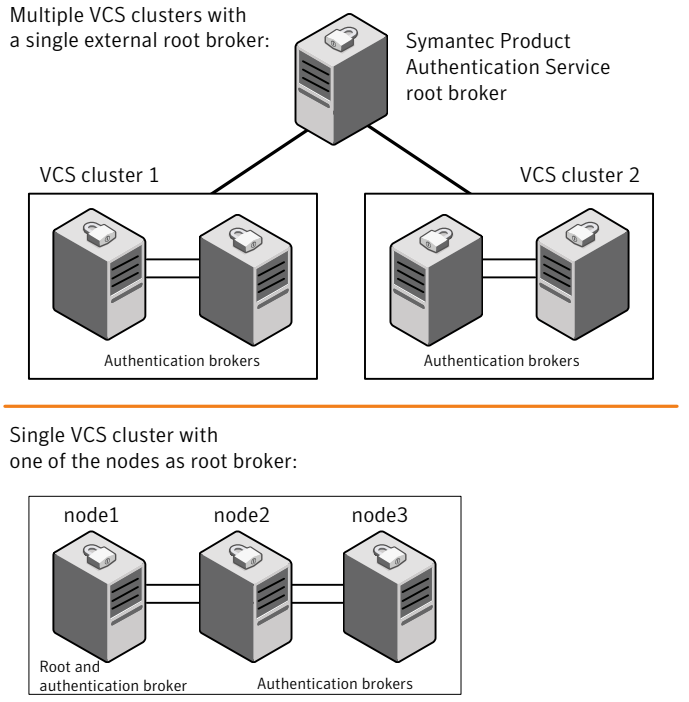
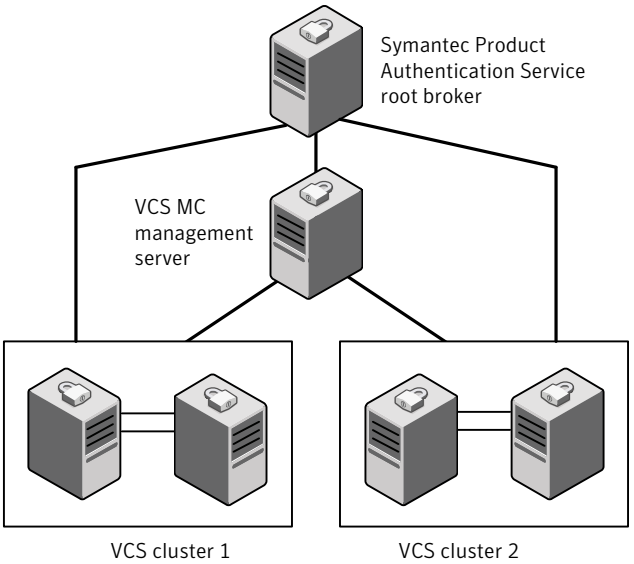


Figure 2-4 illustrates a typical setup of VCS clusters that are centrally managed using VCS Management Console. In this example, the setup uses a single external AT root broker which serves both the management server and the VCS clusters.

Figure 2-4 Typical configuration of VCS MC-managed clusters



Section 2

Preinstallation tasks

Chapter 3

Preparing to install VCS

This chapter includes the following topics:

About preparing to install VCS

Before you perform the preinstallation tasks, make sure you reviewed the installation requirements, set up the basic hardware, and planned your VCS setup.

See "VCS installation requirements" on page 33.

Performing preinstallation tasks

Table 3-1 lists the tasks you must perform before proceeding to install VCS.

Table 3-1 Preinstallation tasks

Task	Reference
Obtain license keys.	See "Obtaining VCS license keys" on page 52.
Set up the private network.	See "Setting up the private network" on page 53.
Enable communication between systems.	See "Setting up inter-system communication" on page 56.
Set up ssh on cluster systems.	See "Setting up ssh on cluster systems" on page 56.

Table 3-1 Preinstallation tasks *(continued)*

Task	Reference
Set up shared storage for I/O fencing (optional)	See "Setting up shared storage" on page 60.
Set the PATH and the MANPATH variables.	See "Setting the PATH variable" on page 64. See "Setting the MANPATH variable" on page 64.
Disable the abort sequence on SPARC systems.	See "Disabling the abort sequence on SPARC systems" on page 64.
Review basic instructions to optimize LLT media speeds.	See "Optimizing LLT media speed settings on private NICs" on page 66.
Review guidelines to help you set the LLT interconnects.	See "Guidelines for setting the media speed of the LLT interconnects" on page 66.
Install the patches that are required for Java Run Time environment from Sun.	See "Patches required for JRE from Sun" on page 36.
Prepare zone environments	See "Preparing zone environments" on page 66.
Mount the product disc	See "Mounting the product disc" on page 67.
Verify the systems before installation	See "Performing automated preinstallation check" on page 67.

Obtaining VCS license keys

If you decide to not use the keyless licensing, you must obtain and install a license key for VCS.

See "About Veritas product licensing" on page 25.

This product includes a License Key certificate. The certificate specifies the product keys and the number of product licenses purchased. A single key lets you install the product on the number and type of systems for which you purchased the license. A key may enable the operation of more products than are specified on the certificate. However, you are legally limited to the number of product licenses purchased. The product installation procedure describes how to activate the key.

To register and receive a software license key, go to the Symantec Licensing Portal at the following location:

https://licensing.symantec.com

Make sure you have your Software Product License document. You need information in this document to retrieve and manage license keys for your Symantec product. After you receive the license key, you can install the product.

Click the Help link at this site to access the *License Portal User Guide* and FAQ.

The VRTSvlic package enables product licensing. After the VRTSvlic is installed, the following commands and their manual pages are available on the system:

vxlicinst	Installs a license key for a Symantec product
vxlicrep	Displays currently installed licenses
vxlictest	Retrieves the features and their descriptions that are encoded in a license key

You can only install the Symantec software products for which you have purchased a license. The enclosed software discs might include other products for which you have not purchased a license.

Setting up the private network

VCS requires you to set up a private network between the systems that form a cluster. You can use either NICs or aggregated interfaces to set up private network.

You can use network switches instead of hubs. However, Sun systems assign the same MAC address to all interfaces by default. Thus, connecting two or more interfaces to a network switch can cause problems.

For example, consider the following case where:

- The IP address is configured on one interface and LLT on another
- Both interfaces are connected to a switch (assume separate VLANs)

The duplicate MAC address on the two switch ports can cause the switch to incorrectly redirect IP traffic to the LLT interface and vice versa. To avoid this issue, configure the system to assign unique MAC addresses by setting the `eeprom(1M)` parameter local-mac-address to true.

The following products make extensive use of the private cluster interconnects for distributed locking:

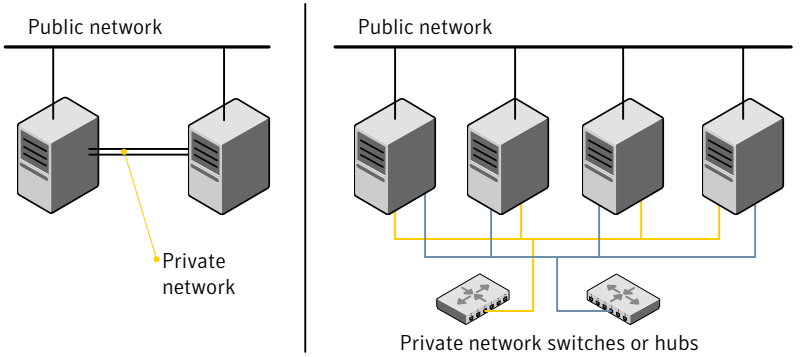
- Veritas Storage Foundation Cluster File System (CFS)
- Veritas Storage Foundation for Oracle RAC (SF Oracle RAC)

Symantec recommends network switches for the CFS and the SF Oracle RAC clusters due to their performance characteristics.

Refer to the *Veritas Cluster Server Administrator's Guide* to review VCS performance considerations.

Figure 3-1 shows two private networks for use with VCS.

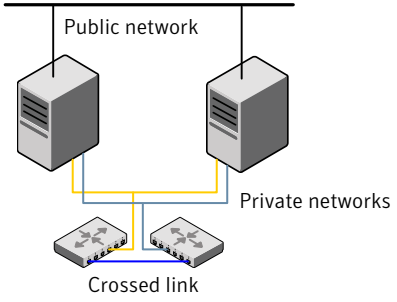
Figure 3-1 Private network setups: two-node and four-node clusters



Symantec recommends configuring two independent networks between the cluster nodes with a network switch for each network. You can also interconnect multiple layer 2 switches for advanced failure protection. Such connections for LLT are called cross-links.

Figure 3-2 shows a private network configuration with crossed links between the network switches.

Figure 3-2 Private network setup with crossed links



To set up the private network

1 Install the required network interface cards (NICs).

Create aggregated interfaces if you want to use these to set up private network.

2 Connect the VCS private Ethernet controllers on each system.

3 Use crossover Ethernet cables, switches, or independent hubs for each VCS communication network. Note that the crossover Ethernet cables are supported only on two systems.

Ensure that you meet the following requirements:

- The power to the switches or hubs must come from separate sources.
- On each system, you must use two independent network cards to provide redundancy.
- If a network interface is part of an aggregated interface, you must not configure the network interface under LLT. However, you can configure the aggregated interface under LLT.
- When you configure Ethernet switches for LLT private interconnect, disable the spanning tree algorithm on the ports used for the interconnect.

During the process of setting up heartbeat connections, consider a case where a failure removes all communications between the systems.

Note that a chance for data corruption exists under the following conditions:

- The systems still run, and
- The systems can access the shared storage.

4 Configure the Ethernet devices that are used for the private network such that the autonegotiation protocol is not used. You can achieve a more stable configuration with crossover cables if the autonegotiation protocol is not used.

To achieve this stable configuration, do one of the following:

- Edit the /etc/system file to disable autonegotiation on all Ethernet devices system-wide.
- Create a qfe.conf or bge.conf file in the /kernel/drv directory to disable autonegotiation for the individual devices that are used for private network.

Refer to the Sun Ethernet driver product documentation for information on these methods.

5 Test the network connections. Temporarily assign network addresses and use `telnet` or `ping` to verify communications.

LLT uses its own protocol, and does not use TCP/IP. So, you must ensure that the private network connections are used only for LLT communication and not for TCP/IP traffic. To verify this requirement, unplumb and unconfigure any temporary IP addresses that are configured on the network interfaces.

The installvcs program configures the private network in the cluster during configuration.

More information about configuring LLT for the private network links is in the manual installation chapter.

See "About VCS manual installation" on page 193.

Setting up inter-system communication

When you install VCS using the installvcs program, to install and configure the entire cluster at one time, make sure that communication between systems exists. By default the installer uses ssh. You must grant root privileges for the system where you run installvcs program. This privilege facilitates to issue ssh or rsh commands on all systems in the cluster. If ssh is used to communicate between systems, it must be configured in a way such that it operates without requests for passwords or passphrases. Similarly, rsh must be configured in such a way to not prompt for passwords.

If system communication is not possible between systems using ssh or rsh, you have recourse.

See "About VCS manual installation" on page 193.

Setting up ssh on cluster systems

Use the Secure Shell (ssh) to install VCS on all systems in a cluster from a system outside of the cluster. Before you start the installation process, verify that ssh is configured correctly.

Use Secure Shell (ssh) to do the following:

- Log on to another system over a network
- Execute commands on a remote system
- Copy files from one system to another

The ssh shell provides strong authentication and secure communications over channels. It is intended to replace rlogin, rsh, and rcp.

Configuring ssh

The procedure to configure ssh uses OpenSSH example file names and commands.

Note: You can configure ssh in other ways. Regardless of how ssh is configured, complete the last step in the example to verify the configuration.

To configure ssh

1. Log in as root on the source system from which you want to install the Veritas product.
2. To generate a DSA key pair on the source system, type the following:

   ```
   # ssh-keygen -t dsa
   ```

   System output similar to the following is displayed:

   ```
   Generating public/private dsa key pair.
   Enter file in which to save the key (//.ssh/id_dsa):
   ```

3. Press **Enter** to accept the default location of /.ssh/id_dsa. System output similar to the following is displayed:

   ```
   Enter passphrase (empty for no passphrase):
   ```

4. Do not enter a passphrase. Press **Enter**. Enter same passphrase again. Press **Enter** again.
5. Make sure the /.ssh directory is on all the target installation systems. If that directory is absent, create it on the target system and set the write permission to root only:

   ```
   # mkdir /.ssh
   # chmod go-w /
   # chmod 700 /.ssh
   # chmod go-rwx /.ssh
   ```

6 Make sure the secure file transfer program (SFTP) is enabled on all the target installation systems. To enable SFTP, the /etc/ssh/sshd_config file must contain the following two lines:

```
PermitRootLogin yes
Subsystem sftp /usr/lib/ssh/sftp-server
```

7 If the lines are not there, add them and restart SSH. To restart SSH on Solaris 10, type the following command:

```
# svcadm restart ssh
```

To restart on Solaris 9, type the following commands:

```
# /etc/init.d/sshd stop
# /etc/init.d/sshd start
```

8 To copy the public DSA key, /.ssh/id_dsa.pub to each target system, type the following commands:

```
# sftp target_sys
```

If you run this step for the first time on a system, output similar to the following appears:

```
Connecting to target_sys...
The authenticity of host 'target_sys (10.182.00.00)'
can't be established. DSA key fingerprint is
fb:6f:9e:61:91:9e:44:6b:87:86:ef:68:a6:fd:87:7d.
Are you sure you want to continue connecting (yes/no)?
```

9 Enter **yes**. Output similar to the following is displayed:

```
Warning: Permanently added 'target_sys,10.182.00.00'
(DSA) to the list of known hosts.
root@target_sys password:
```

10 Enter the root password.

11 At the sftp prompt, type the following command:

```
sftp> put /.ssh/id_dsa.pub
```

The following output is displayed:

```
Uploading /.ssh/id_dsa.pub to /id_dsa.pub
```

12 To quit the SFTP session, type the following command:

```
sftp> quit
```

13 To begin the ssh session on the target system, type the following command:

```
# ssh target_sys
```

14 Enter the root password at the prompt:

```
password:
```

15 After you log in, enter the following command to append the authorization key to the id_dsa.pub file:

```
# cat /id_dsa.pub >> /.ssh/authorized_keys
```

16 Delete the id_dsa.pub public key file. Before you delete this public key file, make sure to complete the following tasks:

- The file is copied to the target (host) system
- The file is added to the authorized keys file

To delete the id_dsa.pub public key file, type the following command:

```
# rm /id_dsa.pub
```

17 To log out of the ssh session, type the following command:

```
# exit
```

18 When you install from a source system that is also an installation target, add the local system id_dsa.pub key to the local /.ssh/authorized_key file. The installation can fail if the installation source system is not authenticated.

19 Run the following commands on the source installation system. These commands bring the private key into the shell environment and makes the key globally available for the user root:

```
# exec /usr/bin/ssh-agent $SHELL
# ssh-add
Identity added: /.ssh/identity
```

This step is shell-specific and is valid only while the shell is active. You must execute the procedure again if you close the shell during the session.

20 To verify that you can connect to the target system, type the following command:

```
# ssh -l root target_sys uname -a
```

The commands should execute on the remote system without any requests for a passphrase or password from the system.

Setting up shared storage

The following sections describe how to set up the SCSI and the Fiber Channel devices that the cluster systems share. For VCS I/O fencing, the data disks must support SCSI-3 persistent reservations. You need to configure a coordinator disk group that supports SCSI-3 PR and verify that it works.

See also the *Veritas Cluster Server Administrator's Guide* for a description of I/O fencing.

Setting up shared storage: SCSI disks

When SCSI devices are used for shared storage, the SCSI address or SCSI initiator ID of each node must be unique. Since each node typically has the default SCSI address of "7," the addresses of one or more nodes must be changed to avoid a conflict. In the following example, two nodes share SCSI devices. The SCSI address of one node is changed to "5" by using `nvedit` commands to edit the `nvramrc` script.

If you have more than two systems that share the SCSI bus, do the following:

- Use the same procedure to set up shared storage.
- Make sure to meet the following requirements:
  - The storage devices have power before any of the systems
  - Only one node runs at one time until each node's address is set to a unique value

To set up shared storage

1. Install the required SCSI host adapters on each node that connects to the storage, and make cable connections to the storage.

   Refer to the documentation that is shipped with the host adapters, the storage, and the systems.

2. With both nodes powered off, power on the storage devices.

3. Power on one system, but do not allow it to boot. If necessary, halt the system so that you can use the ok prompt.

   Note that only one system must run at a time to avoid address conflicts.

4. Find the paths to the host adapters:

   ```
   {0} ok show-disks
   ...b) /sbus@6,0/QLGC,isp@2,10000/sd
   ```

   The example output shows the path to one host adapter. You must include the path information without the "/sd" directory, in the `nvramrc` script. The path information varies from system to system.

5. Edit the `nvramrc` script on to change the scsi-initiator-id to 5. (The *Solaris OpenBoot 3.x Command Reference Manual* contains a full list of `nvedit` commands and keystrokes.) For example:

   ```
   {0} ok nvedit
   ```

   As you edit the script, note the following points:

   - Each line is numbered, 0:, 1:, 2:, and so on, as you enter the `nvedit` commands.
   - On the line where the scsi-initiator-id is set, insert exactly one space after the first quotation mark and before scsi-initiator-id.

   In this example, edit the nvramrc script as follows:

   ```
   0: probe-all
   1: cd /sbus@6,0/QLGC,isp@2,10000
   2: 5 " scsi-initiator-id" integer-property
   3: device-end
   4: install-console
   5: banner
   6: <CTRL-C>
   ```

6 Store the changes you make to the `nvramrc` script. The changes you make are temporary until you store them.

```
{0} ok nvstore
```

If you are not sure of the changes you made, you can re-edit the script without risk before you store it. You can display the contents of the `nvramrc` script by entering:

```
{0} ok printenv nvramrc
```

You can re-edit the file to make corrections:

```
{0} ok nvedit
```

Or, discard the changes if necessary by entering:

```
{0} ok nvquit
```

7 Instruct the OpenBoot PROM Monitor to use the `nvramrc` script on the node.

```
{0} ok setenv use-nvramrc? true
```

8 Reboot the node. If necessary, halt the system so that you can use the ok prompt.

9 Verify that the scsi-initiator-id has changed. Go to the ok prompt. Use the output of the show-disks command to find the paths for the host adapters. Then, display the properties for the paths. For example:

```
{0} ok show-disks
...b) /sbus@6,0/QLGC,isp@2,10000/sd
{0} ok cd /sbus@6,0/QLGC,isp@2,10000
{0} ok .properties
scsi-initiator-id     00000005
```

Permit the system to continue booting.

10 Boot the second node. If necessary, halt the system to use the ok prompt. Verify that the scsi-initiator-id is 7. Use the output of the `show-disks` command to find the paths for the host adapters. Then, display the properties for that paths. For example:

```
{0} ok show-disks
...b) /sbus@6,0/QLGC,isp@2,10000/sd
{0} ok cd /sbus@6,0/QLGC,isp@2,10000
{0} ok .properties
scsi-initiator-id      00000007
```

Permit the system to continue booting.

Setting up shared storage: Fiber channel

Perform the following steps to set up fiber channel.

To set up shared storage

1 Install the required FC-AL controllers.

2 Connect the FC-AL controllers and the shared storage devices to the same hub or switch.

All systems must see all the shared devices that are required to run the critical application. If you want to implement zoning for a fiber switch, make sure that no zoning prevents all systems from seeing all these shared devices.

3 Boot each system with the reconfigure devices option:

```
ok boot -r
```

4 After all systems have booted, use the `format(1m)` command to verify that each system can see all shared devices.

If Volume Manager is used, the same number of external disk devices must appear, but device nodes (c#t#d#s#) may differ.

If Volume Manger is not used, then you must meet the following requirements:

- The same number of external disk devices must appear.
- The device nodes must be identical for all devices on all systems.

Setting the PATH variable

Installation commands as well as other commands reside in the /opt/VRTS/bin directory. Add this directory to your PATH environment variable.

If you have any custom scripts located in /opt/VRTSvcs/bin directory, make sure to add the /opt/VRTSvcs/bin directory to your PATH environment variable.

To set the PATH variable

- Do one of the following:
  - For the Bourne Shell (sh or ksh), type:

    ```
    $ PATH=/opt/VRTS/bin:$PATH; export PATH
    ```

  - For the C Shell (csh or tcsh), type:

    ```
    $ setenv PATH :/opt/VRTS/bin:$PATH
    ```

Setting the MANPATH variable

Set the MANPATH variable to view the manual pages.

To set the MANPATH variable

- Do one of the following:
  - For the Bourne Shell (sh or ksh), type:

    ```
    $ MANPATH=/usr/share/man:/opt/VRTS/man; export MANPATH
    ```

  - For the C Shell (csh or tcsh), type:

    ```
    % setenv MANPATH /usr/share/man:/opt/VRTS/man
    ```

Disabling the abort sequence on SPARC systems

Most UNIX operating systems provide a method to perform a "break" or "console abort." The inherent problem when you abort a hung system is that it ceases to heartbeat in the cluster. When other cluster members believe that the aborted node is a failed node, these cluster members may begin corrective action.

Keep the following points in mind:

- The only action that you must perform following a system abort is to reset the system to achieve the following:
  - Preserve data integrity
  - Prevent the cluster from taking additional corrective actions
- Do not resume the processor as cluster membership may have changed and failover actions may already be in progress.
- To remove this potential problem on Sun SPARC systems, you should alias the `go` function in the OpenBoot eeprom to display a message.

To alias the go function to display a message

1. At the ok prompt, enter:

   ```
   nvedit
   ```

2. Press Ctrl+L to display the current contents of the nvramrc buffer.
3. Press Ctrl+N until the editor displays the last line of the buffer.
4. Add the following lines exactly as shown. Press Enter after adding each line.

   ```
   ." Aliasing the OpenBoot 'go' command! "
   : go ." It is inadvisable to use the 'go' command in a clustered
   environment. " cr
   ." Please use the 'power-off' or 'reset-all' commands instead. "
   cr
   ." Thank you, from your friendly neighborhood sysadmin. " ;
   ```

5. Press Ctrl+C to exit the nvramrc editor.
6. To verify that no errors exist, type the `nvrun` command. You should see only the following text:

   ```
   Aliasing the OpenBoot 'go' command!
   ```

7. Type the `nvstore` command to commit your changes to the non-volatile RAM (NVRAM) for use in subsequent reboots.
8. After you perform these commands, at reboot you see this output:

   ```
   Aliasing the OpenBoot 'go' command! go isn't unique.
   ```

Optimizing LLT media speed settings on private NICs

For optimal LLT communication among the cluster nodes, the interface cards on each node must use the same media speed settings. Also, the settings for the switches or the hubs that are used for the LLT interconnections must match that of the interface cards. Incorrect settings can cause poor network performance or even network failure.

Guidelines for setting the media speed of the LLT interconnects

Review the following guidelines for setting the media speed of the LLT interconnects:

- Symantec recommends that you manually set the same media speed setting on each Ethernet card on each node.
- If you have hubs or switches for LLT interconnects, then set the hub or switch port to the same setting as used on the cards on each node.
- If you use directly connected Ethernet links (using crossover cables), set the media speed to the highest value common to both cards, typically 1000_Full_Duplex.
- Symantec does not recommend using dissimilar network cards for private links.

Details for setting the media speeds for specific devices are outside of the scope of this manual. Consult the device's documentation for more information.

Preparing zone environments

You need to keep the following items in mind when you install or upgrade VCS in a zone environment.

- When you install or upgrade VCS using the installer program, all zones are upgraded (both global and non-global) unless they are detached and unmounted.
- If you install VCS on Solaris 10 systems that run non-global zones, you need to make sure that non-global zones do not inherit the /opt directory. Run the following command to make sure that the /opt directory is not in the inherit-pkg-dir clause:

```
# zonecfg -z zone_name info
zonepath: /export/home/zone1
autoboot: false
pool: yourpool
inherit-pkg-dir:
dir: /lib
```

```
inherit-pkg-dir:
dir: /platform
inherit-pkg-dir:
dir: /sbin
inherit-pkg-dir:
dir: /usr
```

If the /opt directory appears in the output, remove the /opt directory from the zone's configuration and reinstall the zone.

Mounting the product disc

You must have superuser (root) privileges to load the VCS software.

To mount the product disc

1. Log in as superuser on a system where you want to install VCS.

   The system from which you install VCS need not be part of the cluster. The systems must be in the same subnet.

2. Insert the product disc into a DVD drive that is connected to your system.

3. If Solaris volume management software is running on your system, the software disc automatically mounts as /cdrom/cdrom0.

4. If Solaris volume management software is not available to mount the DVD, you must mount it manually. After you insert the software disc, enter:

   ```
   # mount -F hsfs -o ro /dev/dsk/c0t6d0s2 /cdrom
   ```

   Where c0t6d0s2 is the default address for the disc drive.

Performing automated preinstallation check

Before you begin the installation of VCS software, you can check the readiness of the systems where you plan to install VCS. The command to start the preinstallation check is:

```
installvcs -precheck system1 system2 ...
```

You can use the Veritas Operation Services to assess your setup for VCS installation.

See "About Veritas Operations Services" on page 27.

To check the systems

1 Navigate to the folder that contains the installvcs program.

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

2 Start the preinstallation check:

```
# ./installvcs -precheck galaxy nebula
```

The program proceeds in a noninteractive mode to examine the systems for licenses, packages, disk space, and system-to-system communications.

3 Review the output as the program displays the results of the check and saves the results of the check in a log file.

See "Command options for installvcs program" on page 387.

Reformatting VCS configuration files on a stopped cluster

When you manually edit VCS configuration files (for example, the main.cf or types.cf file) you can potentially create formatting issues that may cause the installer to interpret the cluster configuration information incorrectly.

If you have manually edited any of the configuration files, you need to perform one of the following before you run the installation program:

- On a running cluster, perform an `haconf -dump` command. This command saves the configuration files and ensures that they do not have formatting errors before you run the installer.
- On cluster that is not running, perform the `hacf -cftocmd` and then the `hacf -cmdtocf` commands to format the configuration files.

Note: Remember to make back up copies of the configuration files before you edit them.

You also need to use this procedure if you have manually changed the configuration files before you perform the following actions using the installer:

- Upgrade VCS
- Uninstall VCS

For more information about the main.cf and types.cf files, refer to the *Veritas Cluster Server Administrator's Guide*.

To display the configuration files in the correct format on a running cluster

- Run the following commands to display the configuration files in the correct format:

```
# haconf -dump
```

To display the configuration files in the correct format on a stopped cluster

- Run the following commands to display the configuration files in the correct format:

```
# hacf -cftocmd config

# hacf -cmdtocf config
```

Getting your VCS installation and configuration information ready

The VCS installation and configuration program prompts you for information about certain VCS components.

When you perform the installation, prepare the following information:

- To install VCS packages you need:

The system names where you plan to install VCS	Example: **galaxy**, **nebula**
The required license keys	If you decide to use keyless licensing, you do not need to obtain license keys. However, you require to set up management server within 60 days to manage the cluster. See "About Veritas product licensing" on page 25. Depending on the type of installation, keys can include: ■ A valid site license key ■ A valid demo license key ■ A valid license key for VCS global clusters See "Obtaining VCS license keys" on page 52.

To decide which packages to install	■ Minimum packages—provides basic VCS functionality. ■ Recommended packages—provides full functionality of VCS without advanced features. ■ All packages—provides advanced feature functionality of VCS. The default option is to install the recommended packages. See "Viewing the list of VCS packages" on page 194.

- To configure VCS you need:

A name for the cluster	The cluster name must begin with a letter of the alphabet. The cluster name can contain only the characters "a" through "z", "A" through "Z", the numbers "0" through "9", the hyphen "-", and the underscore "_". Example: `vcs_cluster27`
A unique ID number for the cluster	A number in the range of 0-65535. Within the site that contains the cluster, each cluster must have a unique ID. Example: `7`
The device names of the NICs that the private networks use among systems	A network interface card that is not part of any aggregated interface, or an aggregated interface. Do not use the network interface card that is used for the public network, which is typically hme0 for SPARC and bge0 for x64. For example on a SPARC system: `qfe0, qfe1` For example on an x64 system: `e1000g0, e1000g1`

- To configure virtual IP address of the cluster (optional), you need:

The name of the public NIC for each node in the cluster	The device name for the NIC that provides public network access. Example: hme0

A virtual IP address of the NIC	You can enter either an IPv4 or an IPv6 address. This virtual IP address becomes a resource for use by the ClusterService group. The "Cluster Virtual IP address" can fail over to another cluster system. Example IPv4 address: 192.168.1.16 Example IPv6 address: 2001:454e:205a:110:203:baff:feee:10
The netmask for the virtual IPv4 address	The subnet that you use with the virtual IPv4 address. Example: 255.255.240.0
The prefix for the virtual IPv6 address	The prefix length for the virtual IPv6 address. Example: 64

- To configure VCS clusters in secure mode (optional), you need:

To decide the root broker system you want to use	You can use an external system or one of the nodes in the cluster to serve as root broker.
To decide which configuration mode you want to choose	Configuration modes are automatic, semiautomatic, and manual. If you want one of the nodes in the cluster to serve as root broker, you must choose automatic configuration mode. See "Preparing to configure the clusters in secure mode" on page 83.
For automatic mode (default)	If you use an external root broker system: ■ The name of the root broker system Example: `east` See "About Symantec Product Authentication Service (AT)" on page 29. ■ Access to the root broker system without use of a password. If you use one of the nodes in the cluster as root broker system: ■ Decide which node in the cluster you want the installer to configure as root and authentication broker. ■ The installer configures all other nodes in the cluster as authentication brokers.

For semiautomatic mode using encrypted files	The path for the encrypted files that you get from the root broker administrator. See "Creating encrypted files for the security infrastructure" on page 89.
For manual mode without using encrypted files	■ The fully-qualified hostname (FQDN) of the root broker . (e.g. east.symantecexample.com) The given example puts a system in the (DNS) domain symantecexample.com with the unqualified hostname east, which is designated as the root broker. ■ The root broker's security domain (e.g. **root@east.symantecexample.com**) ■ The root broker's port (e.g. **2821**) ■ The path to the local root hash (e.g. **/var/tmp/privatedir/root_hash**) ■ The authentication broker's identity and password on each cluster node (e.g. **galaxy.symantecexample.com** and **nebula.symantecexample.com**)

■ To add VCS users you need:

User names	VCS usernames are restricted to 1024 characters. Example: **smith**
User passwords	VCS passwords are restricted to 255 characters. Enter the password at the prompt.
To decide user privileges	Users have three levels of privileges: A=Administrator, O=Operator, or G=Guest. Example: **A**

■ To configure SMTP email notification (optional), you need:

The name of the public NIC for each node in the cluster	The device name for the NIC that provides public network access. Example: hme0
The domain-based address of the SMTP server	The SMTP server sends notification emails about the events within the cluster. Example: **smtp.symantecexample.com**

The email address of each SMTP recipient to be notified	Example: `john@symantecexample.com`
To decide the minimum severity of events for SMTP email notification	Events have four levels of severity: I=Information, W=Warning, E=Error, and S=SevereError. Example: `E`

- To configure SNMP trap notification (optional), you need:

The name of the public NIC for each node in the cluster	The device name for the NIC that provides public network access. Example: hme0
The port number for the SNMP trap daemon	The default port number is 162.
The system name for each SNMP console	Example: `saturn`
To decide the minimum severity of events for SNMP trap notification	Events have four levels of severity: I=Information, W=Warning, E=Error, and S=SevereError. Example: `E`

- To configure global clusters (optional), you need:

The name of the public NIC	You can use the same NIC that you used to configure the virtual IP of the cluster. Otherwise, specify appropriate values for the NIC. For example for SPARC systems: `hme0` For example for x64 systems: `bge0`
The virtual IP address of the NIC	You can use the same virtual IP address that you configured earlier for the cluster. Otherwise, specify appropriate values for the virtual IP address. Example: `192.168.1.16`
The netmask for the virtual IP address	You can use the same netmask that you used to configure the virtual IP of the cluster. Otherwise, specify appropriate values for the netmask. Example: `255.255.240.0`

- To configure I/O fencing:

See “About planning to configure I/O fencing” on page 97.

Section 3

Installation using the script-based installer

Chapter 4

Installing VCS

This chapter includes the following topics:

Installing VCS using the installer

Perform the following steps to install VCS.

To install VCS

1. Confirm that you are logged in as the superuser and you mounted the product disc.

   See "Mounting the product disc" on page 67.

2. Start the installation program. If you obtained VCS from an electronic download site, which does not include the Veritas product installer, use the installvcs program.

   Veritas product installer

   Perform the following steps to start the product installer:

   1. Start the installer.

      ```
      # ./installer
      ```

      The installer starts with a copyright message and specifies the directory where the logs are created.

   2. From the opening Selection Menu, choose `I` for "Install a Product."

   3. From the displayed list of products to install, choose: Veritas Cluster Server.

installvcs program Perform the following steps to start the product installer:

1 Navigate to the folder that contains the installvcs program.

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

2 Start the installvcs program.

```
# ./installvcs
```

The installer starts with a copyright message and specifies the directory where the logs are created.

3 Enter **y** to agree to the End User License Agreement (EULA).

```
Do you agree with the terms of the End User License Agreement
as specified in the EULA.pdf file present on media? [y,n,q,?] y
```

4 Choose the VCS packages that you want to install.

See "Veritas Cluster Server installation packages" on page 383.

Based on what packages you want to install, enter one of the following:

1 Installs only the minimal required VCS packages that provides basic functionality of the product.

2 Installs the recommended VCS packages that provides complete functionality of the product. This option does not install the optional VCS packages.

Note that this option is the default.

3 Installs all the VCS packages.

You must choose this option to configure any optional VCS feature.

4 Displays the VCS packages for each option.

```
Select the packages to be installed on all systems? [1-4,q,?]
(2) 3
```

5 Enter the names of the systems where you want to install VCS.

```
Enter the operating_system system names separated by spaces:
[q,?] (galaxy) galaxy nebula
```

For a single-node VCS installation, enter one name for the system.

See "Creating a single-node cluster using the installer program" on page 420.

The installer does the following for the systems:

- Checks that the local system that runs the installer can communicate with remote systems.
  If the installer finds ssh binaries, it confirms that ssh can operate without requests for passwords or passphrases.
  If the default communication method ssh fails, the installer attempts to use rsh.
- Makes sure the systems use one of the supported operating systems.
- Makes sure that the systems have the required operating system patches.
  If the installer reports that any of the patches are not available, install the patches on the system before proceeding with the VCS installation.
  See "Required Solaris patches for VCS" on page 35.
- Makes sure the systems install from the global zone.
- Checks for product licenses.
- Checks whether a previous version of VCS is installed.
  If a previous version of VCS is installed , the installer provides an option to upgrade to VCS 5.1.
  See "About upgrading to VCS 5.1" on page 233.
- Checks for the required file system space and makes sure that any processes that are running do not conflict with the installation.
  If requirements for installation are not met, the installer stops and indicates the actions that you must perform to proceed with the process.
- Checks whether any of the packages already exists on a system.
  If the current version of any package exists, the installer removes the package from the installation list for the system. If a previous version of any package exists, the installer replaces the package with the current version.

6 Review the list of packages that the installer would install on each node.

The installer installs the VCS packages on the systems galaxy and nebula.

7 Select the license type.

```
1) Enter a valid license key
2) Enable keyless licensing and complete system licensing later

How would you like to license the systems? [1-2,q] (2)
```

Based on what license type you want to use, enter one of the following:

1 You must have a valid license key. Enter the license key at the prompt:

```
Enter a VCS license key: [b,q,?]
XXXX-XXXX-XXXX-XXXX-XXXX
```

If you plan to configure global clusters, enter the corresponding license keys when the installer prompts for additional licenses.

```
Do you wish to enter additional licenses? [y,n,q,b] (n) y
```

2 The keyless license option enables you to install VCS without entering a key. However, to ensure compliance, keyless licensing requires that you manage the systems with a management server.

For more information, go to the following website:

http://go.symantec.com/sfhakeyless

Note that this option is the default.

If you plan to set up global clusters, enter **y** at the prompt.

```
Would you like to enable the Global Cluster Option? [y,n,q] (n) y
```

The installer registers the license and completes the installation process.

8 To configure VCS, enter y at the prompt. You can also configure VCS later.

```
Would you like to configure VCS on galaxy nebula [y,n,q] (n) n
```

See "Overview of tasks for VCS configuration using installvcs program" on page 115.

9 Enter y at the prompt to send the installation information to Symantec.

```
Would you like to send the information about this installation
to Symantec to help improve installation in the future? [y,n,q,?] (y) y
```

The installer provides an option to collect data about the installation process each time you complete an installation, upgrade, configuration, or uninstall of the product. The installer transfers the contents of the install log files to an internal Symantec site. The information is used only to gather metrics about how you use the installer. No personal customer data is collected, and no information will be shared by any other parties. Information gathered may include the product and the version installed or upgraded, how many systems were installed, and the time spent in any section of the install process.

10 After the installation, note the location of the installation log files, the summary file, and the response file for future reference.

The files provide the useful information that can assist you with the configuration and can also assist future configurations.

summary file	Lists the packages that are installed on each system.
log file	Details the entire installation.
response file	Contains the installation information that can be used to perform unattended or automated installations on other systems. See "Installing VCS using response files" on page 165.

Installing language packages

Before you install the language packages, do the following:

- Make sure `install_lp` command uses the *ssh* or *rsh* commands as root on all systems in the cluster.
- Make sure that permissions are granted for the system on which `install_lp` is run.

To install the language packages

1. Insert the language disc into the drive.

   The Solaris volume-management software automatically mounts the disc as /cdrom/cdrom0.

2. Change to the /cdrom/cdrom0 directory.

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

3. Install the language packages:

   ```
   # ./install_lp
   ```

Chapter 5

Preparing to configure VCS

This chapter includes the following topics:

Preparing to configure the clusters in secure mode

You can set up Symantec Product Authentication Service (AT) for the cluster during or after the VCS configuration.

If you want to enable or disable AT in a cluster that is online, run the following command:

```
# /opt/VRTS/install/installvcs -security
```

See the *Veritas Cluster Server Administrator's Guide* for instructions.

The prerequisites to configure a cluster in secure mode are as follows:

- A system in your enterprise that serves as root broker (RB).

  You can either use an external system as root broker, or use one of the cluster nodes as root broker.

  - To use an external root broker, identify an existing root broker system in your enterprise or install and configure root broker on a stable system.
    See "Installing the root broker for the security infrastructure" on page 87.
  - To use one of the cluster nodes as root broker, the installer does not require you to do any preparatory tasks.
    When you configure the cluster in secure mode using the installvcs program, choose the automatic mode and choose one of the nodes for the installer to configure as root broker.

Symantec recommends that you configure a single root broker system for your entire enterprise. If you use different root broker systems, then you must establish trust between the root brokers. For example, if the management server and the cluster use different root brokers, then you must establish trust.

- For external root broker, an authentication broker (AB) account for each node in the cluster is set up on the root broker system.
  See "Creating authentication broker accounts on root broker system" on page 88.
- The system clocks of the external root broker and authentication brokers must be in sync.

The installvcs program provides the following configuration modes:

Automatic mode	The external root broker system must allow rsh or ssh passwordless login to use this mode.
Semi-automatic mode	This mode requires encrypted files (BLOB files) from the AT administrator to configure a cluster in secure mode. The nodes in the cluster must allow rsh or ssh passwordless login. See "Setting up inter-system communication" on page 56.
Manual mode	This mode requires root_hash file and the root broker information from the AT administrator to configure a cluster in secure mode. The nodes in the cluster must allow rsh or ssh passwordless login. See "Setting up inter-system communication" on page 56.

Figure 5-1 depicts the flow of configuring VCS cluster in secure mode.

Figure 5-1 Workflow to configure VCS cluster in secure mode

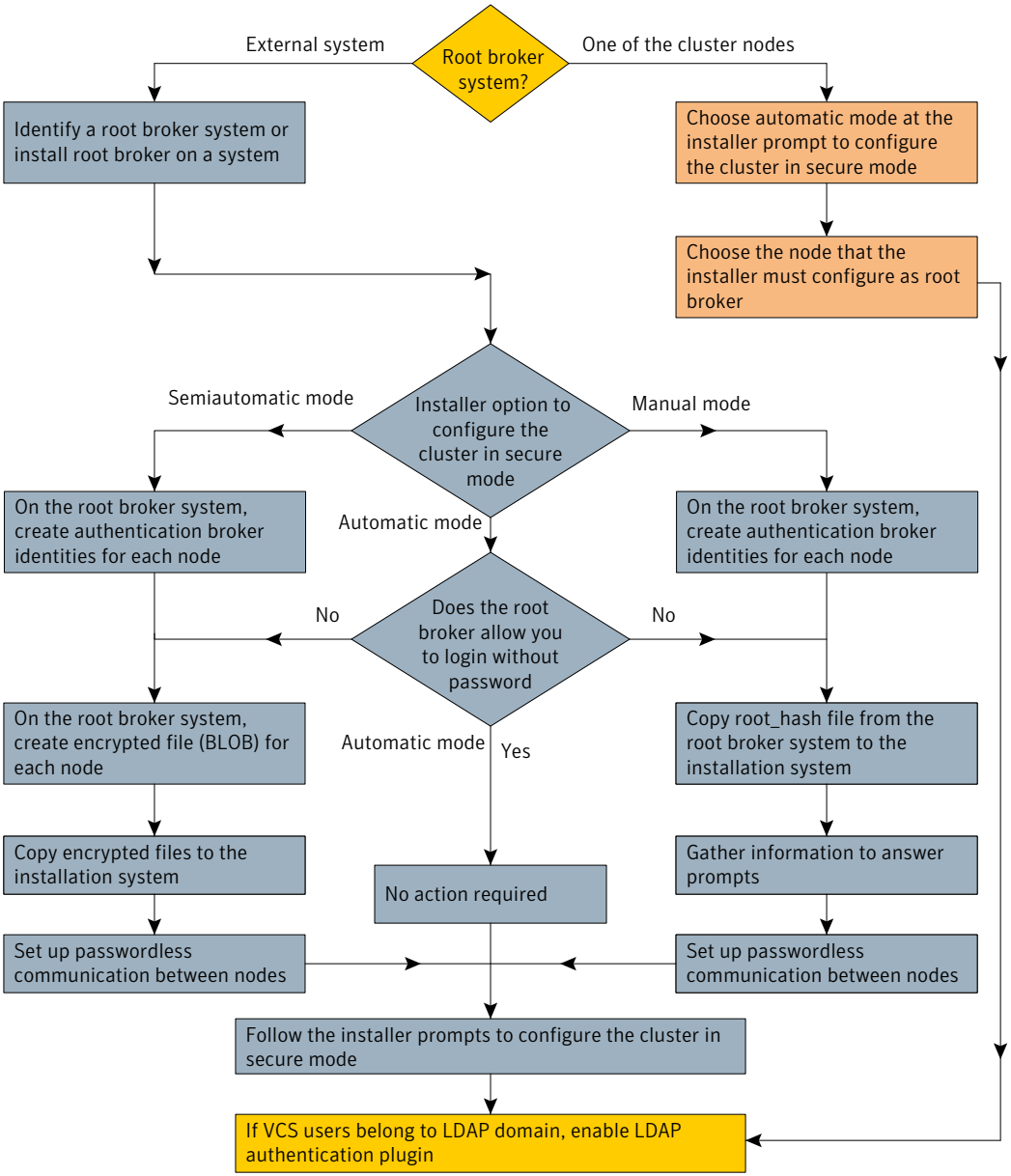


Table 5-1 lists the preparatory tasks in the order which the AT and VCS administrators must perform. These preparatory tasks apply only when you use an external root broker system for the cluster.

Table 5-1 Preparatory tasks to configure a cluster in secure mode (with an external root broker)

Tasks	Who performs this task
Decide one of the following configuration modes to set up a cluster in secure mode: ■ Automatic mode ■ Semi-automatic mode ■ Manual mode	VCS administrator
Install the root broker on a stable system in the enterprise. See "Installing the root broker for the security infrastructure" on page 87.	AT administrator
To use the semi-automatic mode or the manual mode, on the root broker system, create authentication broker accounts for each node in the cluster. See "Creating authentication broker accounts on root broker system" on page 88. AT administrator requires the following information from the VCS administrator: ■ Node names that are designated to serve as authentication brokers ■ Password for each authentication broker	AT administrator
To use the semi-automatic mode, create the encrypted files (BLOB files) for each node and provide the files to the VCS administrator. See "Creating encrypted files for the security infrastructure" on page 89. AT administrator requires the following additional information from the VCS administrator: ■ Administrator password for each authentication broker Typically, the password is the same for all nodes.	AT administrator
To use the manual mode, provide the root_hash file (/opt/VRTSat/bin/root_hash) from the root broker system to the VCS administrator.	AT administrator
Copy the files that are required to configure a cluster in secure mode to the system from where you plan to install and configure VCS. See "Preparing the installation system for the security infrastructure" on page 91.	VCS administrator

Installing the root broker for the security infrastructure

Install the root broker only if you plan to use AT to configure the cluster in secure mode. You can use a system outside the cluster or one of the systems within the cluster as root broker. If you plan to use an external broker, the root broker administrator must install and configure the root broker before you configure the Authentication Service for VCS. Symantec recommends that you install the root broker on a stable system that is outside the cluster.

You can also identify an existing root broker system in the data center to configure the cluster in secure mode. The root broker system can run AIX, HP-UX, Linux, or Solaris operating system.

See Symantec Product Authentication Service documentation for more information.

See "About Symantec Product Authentication Service (AT)" on page 29.

To install the root broker

1. Mount the product disc and start the installer.

   ```
   # ./installer
   ```

2. From the Task Menu, choose I for "Install a Product."
3. From the displayed list of products to install, choose: Symantec Product Authentication Service (AT).
4. Enter **y** to agree to the End User License Agreement (EULA).
5. Enter 2 to install the recommended packages.
6. Enter the name of the system where you want to install the Root Broker.

   ```
   Enter the operating system system names separated by spaces: venus
   ```

7. Review the output as the installer does the following:
   - Checks to make sure that VCS supports the operating system
   - Verifies that you install from the global zone
   - Checks if the packages are already on the system.

   The installer lists the packages that the program is about to install on the system. Press Enter to continue.
8. Review the output as the installer installs the root broker on the system.
9. After the installation, configure the root broker.

10 Select to configure the root broker from the three choices that the installer presents:

```
1)Root+AB Mode
2)Root Mode
3)AB Mode

Enter the mode in which you would like AT to be configured? [1-3,q] 2

Do you want the installer to do cluster configuration? [y,n,q] (n) n
```

11 Press Enter to continue and review the output as the installer starts the Authentication Service.

Creating authentication broker accounts on root broker system

On the root broker system, the administrator must create an authentication broker (AB) account for each node in the cluster.

To create authentication broker accounts on root broker system

1 Determine the root broker domain name. Enter the following command on the root broker system:

```
venus> # vssat showalltrustedcreds
```

For example, the domain name resembles "Domain Name: root@venus.symantecexample.com" in the output.

2 For each node in the cluster, verify whether an account exists on the root broker system.

For example, to verify that an account exists for node galaxy:

```
venus> # vssat showprpl --pdrtype root \
--domain root@venus.symantecexample.com --prplname galaxy
```

- If the output displays the principal account on root broker for the authentication broker on the node, then delete the existing principal accounts. For example:

```
venus> # vssat deleteprpl --pdrtype root \
--domain root@venus.symantecexample.com \
--prplname galaxy --silent
```

- If the output displays the following error, then the account for the given authentication broker is not created on this root broker:

```
"Failed To Get Attributes For Principal"
```

Proceed to step 3.

3 Create a principal account for each authentication broker in the cluster. For example:

```
venus> # vssat addprpl --pdrtype root --domain \
root@venus.symantecexample.com --prplname galaxy \
--password password --prpltype service
```

You must use this password that you create in the input file for the encrypted file.

Creating encrypted files for the security infrastructure

Create encrypted files (BLOB files) only if you plan to choose the semiautomatic mode that uses an encrypted file to configure the Authentication Service. The administrator must create the encrypted files on the root broker node. The administrator must create encrypted files for each node that is going to be a part of the cluster before you configure the Authentication Service for VCS.

To create encrypted files

1 Make a note of the following root broker information. This information is required for the input file for the encrypted file:

hash	The value of the root hash string, which consists of 40 characters. Execute the following command to find this value: `venus> # vssat showbrokerhash`
root_domain	The value for the domain name of the root broker system. Execute the following command to find this value: `venus> # vssat showalltrustedcreds`

2 Make a note of the following authentication broker information for each node. This information is required for the input file for the encrypted file:

identity	The value for the authentication broker identity, which you provided to create authentication broker principal on the root broker system. This is the value for the **--prplname** option of the `addprpl` command. See "Creating authentication broker accounts on root broker system" on page 88.
password	The value for the authentication broker password, which you provided to create authentication broker principal on the root broker system. This is the value for the **--password** option of the `addprpl` command. See "Creating authentication broker accounts on root broker system" on page 88.
broker_admin_password	The value for the authentication broker password for Administrator account on the node. This password must be at least five characters.

3 For each node in the cluster, create the input file for the encrypted file.

The installer presents the format of the input file for the encrypted file when you proceed to configure the Authentication Service using encrypted file. For example, the input file for authentication broker on galaxy resembles:

```
[setuptrust]
broker=venus.symantecexample.com
hash=758a33dbd6fae751630058ace3dedb54e562fe98
securitylevel=high

[configab]
identity=galaxy
password=password
root_domain=vx:root@venus.symantecexample.com
root_broker=venus.symantecexample.com:2821

start_broker=false
enable_pbx=false
```

4 Back up these input files that you created for the authentication broker on each node in the cluster.

Note that for security purposes, the command to create the output file for the encrypted file deletes the input file.

5 For each node in the cluster, create the output file for the encrypted file from the root broker system using the following command.

```
RootBroker> # vssat createpkg \
--in /path/to/blob/input/file.txt \
--out /path/to/encrypted/blob/file.txt \
--host_ctx AB-hostname
```

For example:

```
venus> # vssat createpkg --in /tmp/galaxy.blob.in \
--out /tmp/galaxy.blob.out --host_ctx galaxy
```

Note that this command creates an encrypted file even if you provide wrong password for "password=" entry. But such an encrypted file with wrong password fails to install on authentication broker node.

6 After you complete creating the output files for the encrypted file, you must copy these files to the installer node.

Preparing the installation system for the security infrastructure

The VCS administrator must gather the required information and prepare the installation system to configure a cluster in secure mode.

To prepare the installation system for the security infrastructure

- Depending on the configuration mode you decided to use, do one of the following:

Automatic mode	Do the following: ■ Gather the root broker system name from the AT administrator. ■ During VCS configuration, choose the configuration option 1 when the installvcs program prompts.
Semi-automatic mode	Do the following: ■ Copy the encrypted files (BLOB files) to the system from where you plan to install VCS. Note the path of these files that you copied to the installation system. ■ During VCS configuration, choose the configuration option 2 when the installvcs program prompts.

Manual mode	Do the following: ■ Copy the root_hash file that you fetched to the system from where you plan to install VCS. Note the path of the root hash file that you copied to the installation system. ■ Gather the root broker information such as name, fully qualified domain name, domain, and port from the AT administrator. ■ Note the principal name and password information for each authentication broker that you provided to the AT administrator to create the authentication broker accounts. ■ During VCS configuration, choose the configuration option 3 when the installvcs program prompts.

About configuring VCS clusters for data integrity

When a node fails, VCS takes corrective action and configures its components to reflect the altered membership. If an actual node failure did not occur and if the symptoms were identical to those of a failed node, then such corrective action would cause a split-brain situation.

Some example scenarios that can cause such split-brain situations are as follows:

- Broken set of private networks
  If a system in a two-node cluster fails, the system stops sending heartbeats over the private interconnects. The remaining node then takes corrective action. The failure of the private interconnects, instead of the actual nodes, presents identical symptoms and causes each node to determine its peer has departed. This situation typically results in data corruption because both nodes try to take control of data storage in an uncoordinated manner
- System that appears to have a system-hang
  If a system is so busy that it appears to stop responding, the other nodes could declare it as dead. This declaration may also occur for the nodes that use the hardware that supports a "break" and "resume" function. When a node drops to PROM level with a break and subsequently resumes operations, the other nodes may declare the system dead. They can declare it dead even if the system later returns and begins write operations.

I/O fencing is a feature that prevents data corruption in the event of a communication breakdown in a cluster. VCS uses I/O fencing to remove the risk that is associated with split-brain. I/O fencing allows write access for members of the active cluster. It blocks access to storage from non-members so that even a node that is alive is unable to cause damage.

After you install and configure VCS, you must configure I/O fencing in VCS to ensure data integrity.

You can configure disk-based I/O fencing or server-based I/O fencing either manually or using the installvcs program.

About I/O fencing components

The shared storage for VCS must support SCSI-3 persistent reservations to enable I/O fencing. VCS involves two types of shared storage:

- Data disks—Store shared data
  See "About data disks" on page 93.
- Coordination points—Act as a global lock during membership changes
  See "About coordination points" on page 93.

About data disks

Data disks are standard disk devices for data storage and are either physical disks or RAID Logical Units (LUNs).

These disks must support SCSI-3 PR and must be part of standard VxVM disk groups. VxVM is responsible for fencing data disks on a disk group basis. Disks that are added to a disk group and new paths that are discovered for a device are automatically fenced.

About coordination points

Coordination points provide a lock mechanism to determine which nodes get to fence off data drives from other nodes. A node must eject a peer from the coordination points before it can fence the peer from the data drives. Racing for control of the coordination points to fence data disks is the key to understand how fencing prevents split-brain.

The coordination points can either be disks or servers or both. Typically, a cluster must have three coordination points.

- Coordinator disks

  Disks that act as coordination points are called coordinator disks. Coordinator disks are three standard disks or LUNs set aside for I/O fencing during cluster reconfiguration. Coordinator disks do not serve any other storage purpose in the VCS configuration.

  You can configure coordinator disks to use Veritas Volume Manager Dynamic Multipathing (DMP) feature. Dynamic Multipathing (DMP) allows coordinator disks to take advantage of the path failover and the dynamic adding and removal capabilities of DMP. So, you can configure I/O fencing to use either

DMP devices or the underlying raw character devices. I/O fencing uses SCSI-3 disk policy that is either raw or dmp based on the disk device that you use. The disk policy is dmp by default.
See the *Veritas Volume Manager Administrator's Guide*.

- Coordination point servers

  The coordination point server (CP server) is a software solution which runs on a remote system or cluster. CP server provides arbitration functionality by allowing the VCS cluster nodes to perform the following tasks:

  - Self-register to become a member of an active VCS cluster (registered with CP server) with access to the data drives
  - Check which other nodes are registered as members of this activeVCS cluster
  - Self-unregister from this activeVCS cluster
  - Forcefully unregister other nodes (preempt) as members of this active VCS cluster

  In short, the CP server functions as another arbitration mechanism that integrates within the existing I/O fencing module.

Note: With the CP server, the fencing arbitration logic still remains on the VCS cluster.

Multiple VCS clusters running different operating systems can simultaneously access the CP server. TCP/IP based communication is used between the CP server and the VCS clusters.

About I/O fencing configuration files

Table 5-2 lists the I/O fencing configuration files.

Table 5-2 I/O fencing configuration files

File	Description
/etc/default/vxfen	This file stores the start and stop environment variables for I/O fencing: ■ VXFEN_START—Defines the startup behavior for the I/O fencing module after a system reboot. Valid values include: 1—Indicates that I/O fencing is enabled to start up. 0—Indicates that I/O fencing is disabled to start up. ■ VXFEN_STOP—Defines the shutdown behavior for the I/O fencing module during a system shutdown. Valid values include: 1—Indicates that I/O fencing is enabled to shut down. 0—Indicates that I/O fencing is disabled to shut down. The installer sets the value of these variables to 1 at the end of VCS configuration. If you manually configured VCS, you must make sure to set the values of these environment variables to 1.
/etc/vxfendg	This file includes the coordinator disk group information. This file is not applicable for server-based fencing.

Table 5-2 I/O fencing configuration files *(continued)*

File	Description
/etc/vxfenmode	This file contains the following parameters: ■ vxfen_mode ■ scsi3—For disk-based fencing ■ customized—For server-based fencing ■ disabled—To run the I/O fencing driver but not do any fencing operations. ■ vxfen_mechanism This parameter is applicable only for server-based fencing. Set the value as cps. ■ scsi3_disk_policy ■ dmp—Configure the vxfen module to use DMP devices The disk policy is dmp by default. If you use iSCSI devices, you must set the disk policy as dmp. ■ raw—Configure the vxfen module to use the underlying raw character devices **Note:** You must use the same SCSI-3 disk policy on all the nodes. ■ security This parameter is applicable only for server-based fencing. 1—Indicates that Symantec Product Authentication Service is used for CP server communications. This setting is the default. 0—Indicates that communication with the CP server is in non-secure mode. **Note:** The CP server and the VCS clusters must have the same security setting. ■ List of coordination points This list is required only for server-based fencing configuration. Coordination points in a server-based fencing can include coordinator disks, CP servers, or a mix of both. If you use coordinator disks, you must create a coordinator disk group with the coordinator disk names. Refer to the sample file /etc/vxfen.d/vxfenmode_cps for more information on how to specify the coordination points.

Table 5-2 I/O fencing configuration files *(continued)*

File	Description

/etc/vxfentab	When I/O fencing starts, the vxfen startup script creates this /etc/vxfentab file on each node. The startup script uses the contents of the /etc/vxfendg and /etc/vxfenmode files. Any time a system is rebooted, the fencing driver reinitializes the vxfentab file with the current list of all the coordinator points.
	Note: The /etc/vxfentab file is a generated file; do not modify this file.
	For disk-based I/O fencing, the /etc/vxfentab file on each node contains a list of all paths to each coordinator disk. An example of the /etc/vxfentab file in a disk-based fencing configuration on one node resembles as follows:
	■ Raw disk:
	`/dev/rdsk/c1t1d0s2`
	`/dev/rdsk/c2t1d0s2`
	`/dev/rdsk/c3t1d2s2`
	■ DMP disk:
	`/dev/vx/rdmp/c1t1d0s2`
	`/dev/vx/rdmp/c2t1d0s2`
	`/dev/vx/rdmp/c3t1d0s2`
	For server-based fencing, the /etc/vxfentab file also includes the security settings information.

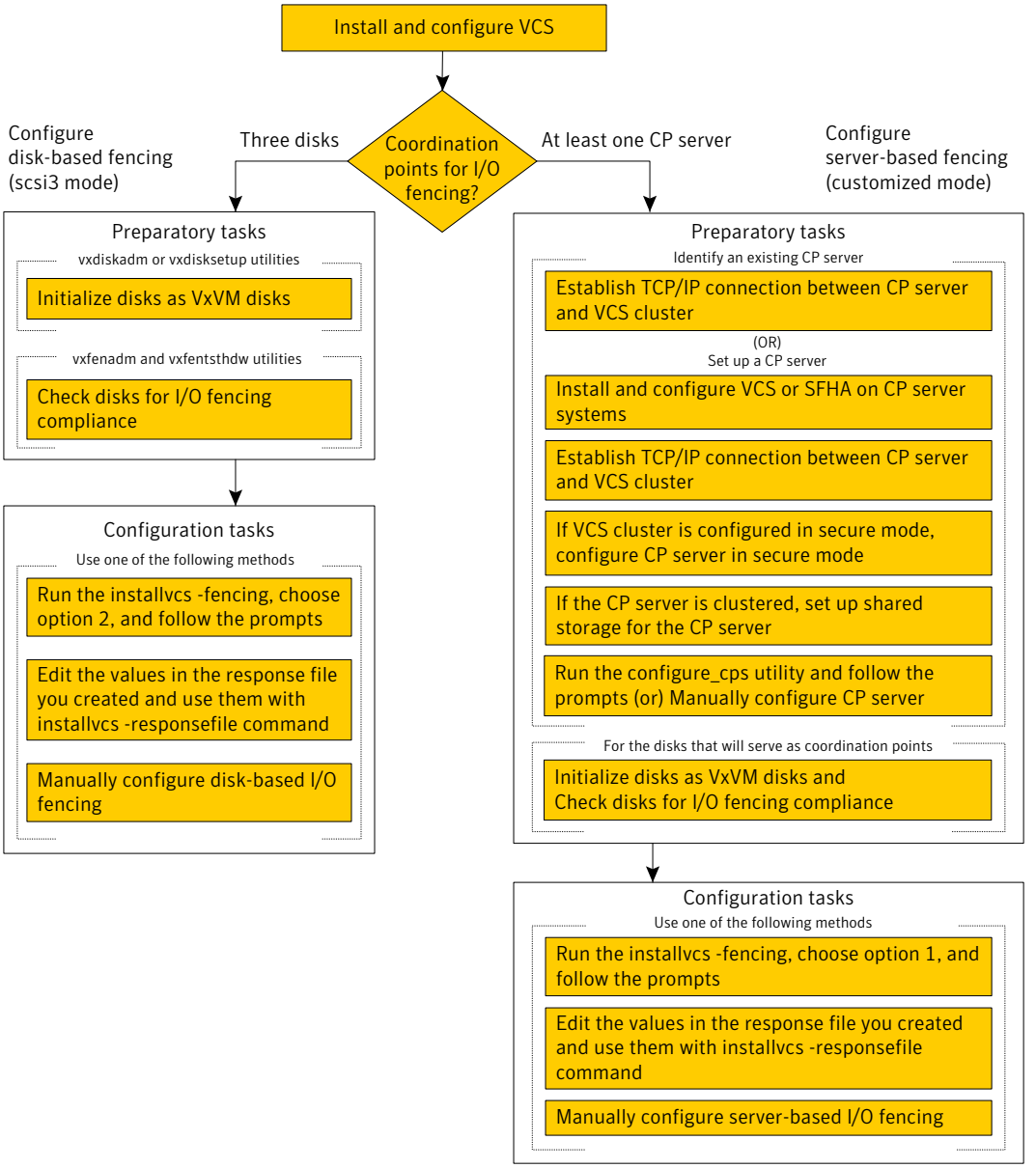
About planning to configure I/O fencing

After you configure VCS with the installer, the installer starts VCS with I/O fencing in disabled mode. To use I/O fencing in the cluster for data integrity, you must configure I/O fencing.

You can configure either disk-based I/O fencing or server-based I/O fencing. If your enterprise setup has multiple clusters that use VCS for clustering, Symantec recommends you to configure server-based I/O fencing. After you perform the preparatory tasks, you can use the installvcs program to configure I/O fencing. You can also use response files or manually configure I/O fencing.

Figure 5-2 illustrates a high-level flowchart to configure I/O fencing for the VCS cluster.

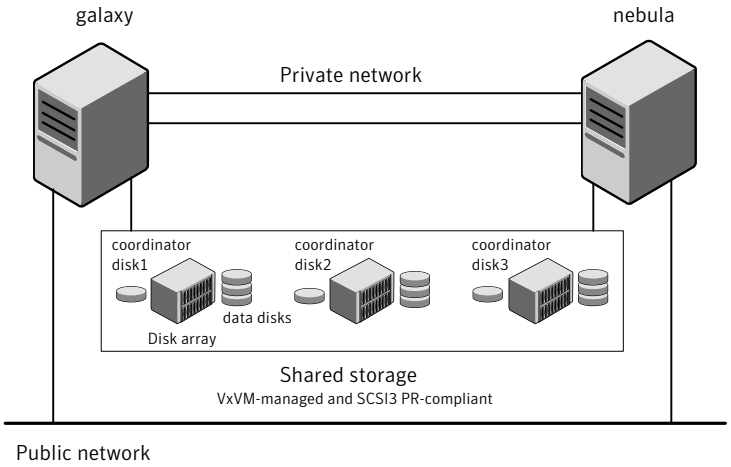
Figure 5-2 Workflow to configure I/O fencing



Typical VCS cluster configuration with disk-based I/O fencing

Figure 5-3 displays a typical VCS configuration with two nodes and shared storage. The configuration uses three coordinator disks for I/O fencing.

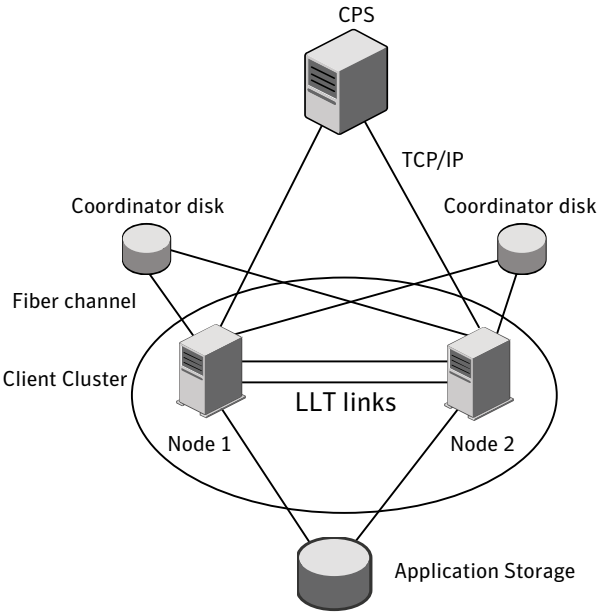
Figure 5-3 Typical VCS cluster configuration with disk-based I/O fencing



Typical VCS cluster configuration with server-based I/O fencing

Figure 5-4 displays a configuration using a VCS cluster (with two nodes), a single CP server, and two coordinator disks. The nodes within the VCS cluster are connected to and communicate with each other using LLT links.

Figure 5-4 CP server, VCS cluster, and coordinator disks



Recommended CP server configurations

This section discusses the following recommended CP server configurations:

- A CP server configuration where multiple VCS clusters use 3 CP servers as their coordination points
- A CP server configuration where multiple VCS clusters use a single CP server and multiple pairs of coordinator disks (2) as their coordination points

---

Note: Although the recommended CP server configurations use three coordination points, three or more odd number of coordination points may be used for I/O fencing. In a configuration where multiple VCS clusters share a common set of CP server coordination points, the VCS VCS cluster as well as the CP server use a Universally Unique Identifier(UUID) to uniquely identify a VCS cluster.

Figure 5-5 displays a configuration using a single CP server that is connected to multiple VCS clusters with each VCS cluster also using two coordinator disks.

Figure 5-5 Single CP server connecting to multiple VCS clusters

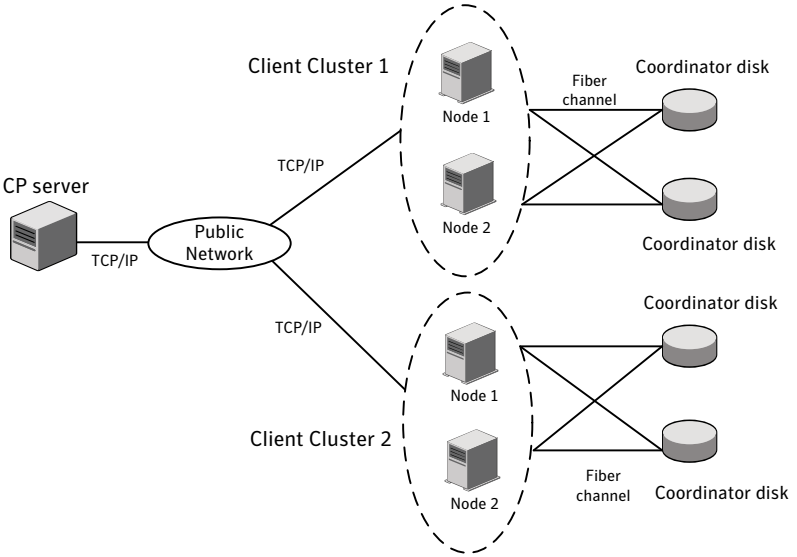
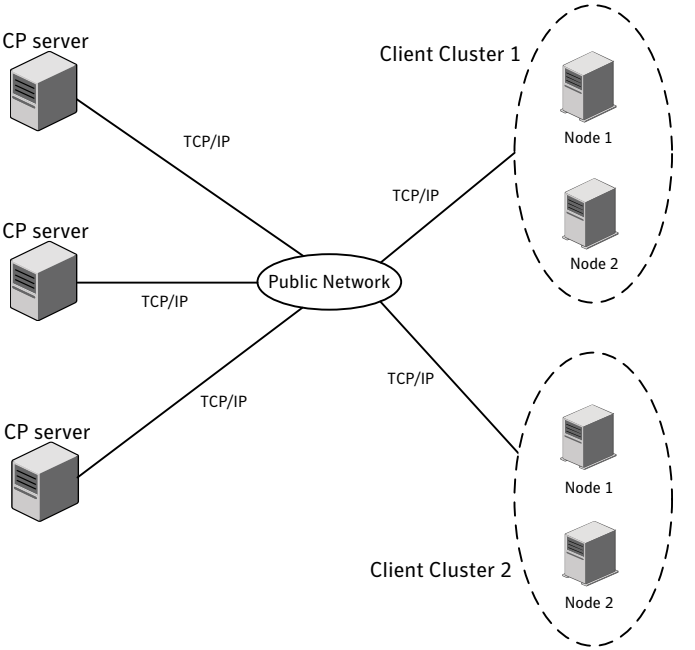


Figure 5-6 displays a configuration using 3 CP servers that are connected to multiple VCS clusters.

Figure 5-6 Three CP servers connecting to multiple VCS clusters



For detailed deployment diagrams for server-based fencing:

See "Configuration diagrams for setting up server-based I/O fencing" on page 449.

Setting up the CP server

The following preparations must be taken before running the configuration utility.

To prepare to configure the CP server

1. Ensure that VCS is installed and configured for hosting CP server on a single node VCS cluster, or that SFHA is installed and configured for hosting CP server on an SFHA cluster.

   Refer to the appropriate VCS or SFHA installation and configuration guide to configure the VCS or SFHA cluster using the installer.

2. If the CP server is hosted on an SFHA cluster, configure fencing in enabled mode during the SFHA configuration using either the installer or manually.

3 Decide if you want to secure the communication between the CP server and VCS clusters using the Symantec Product Authentication Service (AT).

Symantec recommends setting up security for the CP server and VCS cluster communications.

For information about configuring security on the CP server:

See "Configuring security on the CP server" on page 104.

4 Choose a name for the CP server.

The CP server name should not contain any special characters.

5 Choose a port number for the CP server.

Allocate a TCP/IP port for use by the CP server.

The default port number is 14250. Alternatively, the user can specify any other valid port from the following valid port range: 49152-65535.

6 If CP server is hosted on an SFHA cluster, then set up shared storage for the CP server database.

For information about setting up shared storage for the CP server database:

See "Setting up shared storage for the CP server database" on page 105.

7 Choose a valid virtual IP address, network interface, and netmask for the CP server.

Installing the CP server using the installer

This section describes how to use the installer to install all CP server-related packages on a single node or SFHA cluster hosting the CP server. This installation procedure also installs the packages that are required to provide secure communication between the VCS cluster and CP server.

The installation is performed from the common VCS or SFHA DVD, so that the user can proceed to configure CP server on that node or cluster.

The following procedure describes how to install CP server on a single node or cluster.

To install CP server using the VCS installer on a single node or the SFHA installer on an SFHA cluster

1 Review the CP server hardware and networking requirements, and set up the CP server hardware and network.

2 Establish network connections between the CP server(s) and the VCS clusters through the TCP/IP network. This step requires that you have valid IP addresses, hostnames, and netmasks set up for the CP servers.

3 For installing CP server on a single node:

- Install VCS 5.1 onto the system where you are installing the CP server.
  Installing VCS 5.1 also installs CP server on the system.

When installing VCS 5.1, be sure to select the complete installation option and not the minimum package installation option. The VRTScps package is only part of the complete installation.

4 For installing CP server to be hosted on an SFHA cluster:

- Install SFHA 5.1 onto each system where you are installing CP server to be hosted on a cluster.
  Installing SFHA 5.1 also installs CP server on the system.
  Refer to the *Veritas Storage Foundation™ and High Availability Installation Guide* for instructions on installing SFHA 5.1.

When installing SFHA 5.1, be sure to select the complete installation option and not the minimum package installation option. The VRTScps package is only part of the complete installation.

5 Proceed to configure the single node or SFHA cluster for CP server.

Configuring security on the CP server

This section describes configuring security on the CP server. You must configure security on the CP server only if you want to secure the communication between the CP server and the VCS cluster.

Note: If Symantec™ Product Authentication Service has already been configured during VCS configuration, skip this section.

The CP server cluster needs to be configured for security with Symantec™ Product Authentication Service using the installer (`installvcs -security` command). This step secures the HAD communication, besides ensuring that the service group configuration for making the authentication broker (essentially VxSS service group) is highly available.

For additional information:

See "Preparing to configure the clusters in secure mode" on page 83.

Setting up shared storage for the CP server database

To set up shared storage for the CP server database

1. Create a disk group containing the disk(s). Two disks are required for creating a mirrored volume.

   For a command example:

   ```
   # vxdg init cps_dg  disk1 disk2
   ```

2. Import the disk group if it's not already imported.

   For a command example:

   ```
   # vxdg import cps_dg
   ```

3. Create a mirrored volume over the disk group.

   Symantec recommends a mirrored volume for hosting the CP server database.

   For a command example:

   ```
   # vxassist -g cps_dg make cps_vol volume size layout=mirror
   ```

4. Create a file system over the volume.

   The CP server configuration utility only supports vxfs file system type. If you use an alternate file system, then configure CP server manually.

   Symantec recommends the vxfs file system type.

   If your CP server runs on a Solaris system, enter the following command:

   ```
   # mkfs -F vxfs /dev/vx/rdmp/cps_dg/cps_volume
   ```

   If your CP server runs on a Linux system, enter the following command::

   ```
   # mkfs -t vxfs /dev/vx/rdmp/cps_dg/cps_volume
   ```

Configuring the CP server using the configuration utility

Ensure that the preparatory steps for configuring a CP server have been performed.

The configuration utility can be used to configure the CP server. The configuration utility is part of the VRTScps package. The following procedure describes how to configure CP server on a single node VCS cluster or on an SFHA cluster.

If the CP server is being hosted on SFHA cluster, ensure that passwordless ssh/rsh is configured on the cluster nodes.

Note: CP server is supported on Linux and Solaris operating systems only.

To configure hosting for the CP server on a single node VCS cluster or on an SFHA cluster

1 Ensure that the tasks required to prepare the CP server for configuration are completed:

See "Setting up the CP server" on page 102.

2 To run the configuration script, enter the following command on the node where you want to configure the CP server:

```
# /opt/VRTScps/bin/configure_cps.pl
```

If the CP server is being configured on SFHA cluster, the utility uses ssh by default for communication with the other nodes.

Use the -n option for using rsh communication.

3 The Veritas Coordination Point Server Configuration utility appears with an option menu and note.

```
VERITAS COORDINATION POINT SERVER CONFIGURATION UTILITY

=======================================================

Select one of the following:

[1] Configure Coordination Point Server on single node VCS system

[2] Configure Coordination Point Server on SFHA cluster

[3] Unconfigure Coordination Point Server

Enter the option:

NOTE: For configuring CP server on SFHA cluster, the CP server
database should reside on shared storage. Please refer to
documentation for information on setting up of shared storage
for CP server database.
```

4 Depending upon your configuration, select either option 1 or option 2.

The configuration utility then runs the following preconfiguration checks:

- Checks to see if a single node VCS cluster or an SFHA cluster is running with the supported platform. (only Solaris and Linux platforms are supported)
- Checks to see if the CP server is already configured on the system.
  If the CP server is already configured, then the configuration utility informs the user and requests that the user unconfigure the server before trying to configure it.
- Checks to see if VCS is installed and configured on the system.
  The CP server requires VCS to be installed and configured before its configuration.

5 Enter the name of the CP server.

For example:

```
Enter the name of the CP Server: mycps1.symantecexample.com
```

6 Enter a valid Virtual IP address on which the CP server process should depend on.

For example:

```
Enter a valid Virtual IP address on which
the CP Server process should depend on:
10.209.83.85
```

7 Enter the CP server port number or press Enter to accept the default value (14250).

For example:

```
Enter a port number in range [49152 - 65535], or
press <enter> for default port (14250)
```

8 Choose if the communication between the VCS clusters and the CP server has to be made secure.

This requires Symantec Product Authentication Service to be configured on the CP server.

For example:

```
Veritas recommends secure communication between the CP server and
application clusters. Enabling security requires Symantec Product
Authentication Service to be installed and configured on the cluster.

Do you want to enable Security for the communications? (y/n)
(Default:y) :
```

The above note indicates that Symantec Product Authentication Service (AT) must be configured on the CP server cluster, if you want to enable security for communication between the VCS clusters and CP server.

If security is chosen but not already configured on the system, then the script immediately exits. You can configure security with VCS and later rerun the configuration script.

Symantec recommends enabling security for communication between CP server and the VCS clusters.

For information about configuring security on the CP server:

See "Configuring security on the CP server" on page 104.

9 Enter the absolute path of the CP server database or press Enter to accept the default value (/etc/VRTScps/db).

Depending upon your configuration, you are presented with one of the following examples.

For a single node VCS configuration for CP server example:

```
CP Server uses an internal database to store the client information.

Note: As the CP Server is being configured on a single node VCS,
the database can reside on local file system.

Enter absolute path of the database (Default:/etc/VRTScps/db):
```

For configuring CP server on an SFHA cluster example:

```
CP Server uses an internal database to store the client information.

Note: As the CP Server is being configured on SFHA cluster, the
database should reside on shared storage with vxfs file system.

Please refer to documentation for information on setting up of
shared storage for CP server database.

Enter absolute path of the database (Default:/etc/VRTScps/db):
```

10 Review the displayed CP server configuration information.

If you want to change the current configuration, press b. If you want to continue, press Enter.

For example:

```
Following is the CP Server configuration information:
-----------------------------------------------
(a)CP Server Name: mycps1.symantecexample.com
(b)CP Server Virtual IP: 10.209.83.85
(c)CP Server Port: 14250
(d)CP Server Security : 1
(e)CP Server Database Dir: /etc/VRTScps/db
-----------------------------------------------

Press b if you want to change the configuration, <enter> to continue :
```

11 The configuration utility proceeds with the configuration process. A vxcps.conf configuration file is created. Depending upon your configuration, one of the following messages appear.

For a single node VCS configuration for CP server example:

```
Successfully generated the /etc/vxcps.conf configuration file.
Successfully created directory /etc/VRTScps/db.

Configuring CP Server Service Group (CPSSG) for this cluster
-----------------------------------------------

NOTE: Please ensure that the supplied network interface is a
public NIC
```

For configuring CP server on an SFHA cluster example:

```
Successfully generated the /etc/vxcps.conf
configuration file.
Successfully created directory /etc/VRTScps/db.
Creating mount point /etc/VRTScps/db on
mycps1.symantecexample.com.
Copying configuration file /etc/vxcps.conf to
mycps1.symantecexample.com

Configuring CP Server Service Group (CPSSG) for this cluster
-----------------------------------------------
```

12 For configuring CP server on an SFHA cluster, you are prompted to use the same NIC name for the virtual IP on all the systems in the cluster. For example:

```
Is the name of NIC for virtual IP 10.209.83.85 same on all the systems?
[y/n] : y

NOTE: Please ensure that the supplied network interface is a
public NIC
```

13 Enter a valid interface for virtual IP address for the CP server process.

For a single node VCS configuration for CP server example:

```
Enter a valid network interface for virtual IP 10.209.83.85
on mycps1.symantecexample.com: bge0
```

For configuring CP server on an SFHA cluster example:

```
Enter a valid interface for virtual IP 10.209.83.85
on all the systems : bge0
```

14 Enter the netmask for the virtual IP address. For example:

```
Enter the netmask for virtual IP 10.209.83.85 :
255.255.252.0
```

15 For configuring CP server on an SFHA cluster, enter the name of the disk group for the CP server database. For example:

```
Enter the name of diskgroup for cps database :
cps_dg
```

16 For configuring CP server on an SFHA cluster, enter the name of the volume that is created on the above disk group. For example:

```
Enter the name of volume created on diskgroup cps_dg :
cps_volume
```

17 After the configuration process has completed, a success message appears. For example:

```
Successfully added the CPSSG service group to
VCS configuration. Bringing the CPSSG service
group online. Please wait...

The Veritas Coordination Point Server has been
configured on your system.
```

18 Run the `hagrp -state` command to ensure that the CPSSG service group has been added.

For example:

```
# hagrp -state CPSSG

#Group   Attribute   System                      Value
CPSSG     State      mycps1.symantecexample.com   |ONLINE|
```

It also generates the configuration file for CP server (/etc/vxcps.conf).

The configuration utility adds the vxcpserv process and other resources to the VCS configuration in the CP server service group (CPSSG).

For information about the CPSSG, refer to the *Veritas Cluster Server Administrator's Guide*.

In addition, the main.cf samples contain details about the vxcpserv resource and its dependencies:

See "Sample configuration files for CP server" on page 411.

Configuring the CP server manually

Perform the following steps to manually configure the CP server.

To manually configure the CP server

1 Ensure that the CP server preparation procedures have been performed:

2 Stop VCS on each node by using the following command:

```
# hastop -local
```

3 Edit the main.cf to add the CPSSG service group on any node. Use the CPSSG service group in the main.cf as an example:

See "Sample configuration files for CP server" on page 411.

Customize the resources under the CPSSG service group as per your configuration.

4 Verify the main.cf using the following command:

```
# hacf -verify /etc/VRTSvcs/conf/config
```

If successfully verified, proceed to copy this main.cf to all other cluster nodes.

5 Create the vxcps.conf file using the sample configuration file provided at /etc/vxcps/vxcps.conf.sample.

Confirm that security for communication has been established between the application clusters and the CP server. If security is to be disabled, set the security parameter to 0 in /etc/vxcps.conf file. If security parameter is set to 1 and security is not already configured, then CP server start-up fails. You can configure security and set security parameter to 1 in /etc/vxcps.conf file.

For more information about configuring security on the CP server:

See "Configuring security on the CP server" on page 104.

Symantec recommends enabling security for communication between CP server and the application clusters.

6 Start VCS on all the cluster nodes.

Enter the following command:

```
# hastart
```

7 Verify that the CP server service group (CPSSG) is online.

Enter the following command:

```
# hagrp -state CPSSG
```

Output similar to the following should appear:

```
# Group Attribute  System                      Value
  CPSSG State      mycps1.symantecexample.com  |ONLINE|
```

Verifying the CP server configuration

During the CP server configuration process, individual files are updated on the node or nodes hosting the CP server. After your configuration, you should check for the following files on your CP server node or nodes:

- /etc/vxcps.conf (CP server configuration file)
- /etc/VRTSvcs/conf/config/main.cf
- /etc/VRTScps/db (default location for CP server database)

Additionally, use the `cpsadm` command to check if the vxcpserv process is listening on the configured Virtual IP. For example, run the following command:

```
# cpsadm -s cp_server -a ping_cps
```

where *cp_server* is the virtual IP/ virtual hostname of the CP server.

Chapter 6

Configuring VCS

This chapter includes the following topics:

Overview of tasks for VCS configuration using installvcs program

Tasks involved in configuring VCS are as follows:

- Start the software configuration
  See "Starting the software configuration" on page 116.
- Specify the systems where you want to configure VCS

See "Specifying systems for configuration" on page 117.

- Configure the basic cluster
  See "Configuring the basic cluster" on page 117.
- Configure virtual IP address of the cluster (optional)
  See "Configuring the virtual IP of the cluster" on page 119.
- Configure the cluster in secure mode (optional)
  See "Configuring the cluster in secure mode" on page 121.
- Add VCS users (required if you did not configure the cluster in secure mode)
  See "Adding VCS users" on page 124.
- Configure SMTP email notification (optional)
  See "Configuring SMTP email notification" on page 124.
- Configure SNMP email notification (optional)
  See "Configuring SNMP trap notification" on page 126.
- Configure global clusters (optional)
  You must have enabled Global Cluster Option when you installed VCS.
  See "Configuring global clusters" on page 128.
- Complete the software configuration
  See "Completing the VCS configuration" on page 129.

Starting the software configuration

You can configure VCS using the Veritas product installer or the installvcs program.

To configure VCS using the product installer

1. Confirm that you are logged in as the superuser and that you have mounted the product disc.
2. Start the installer.

   ```
   # ./installer
   ```

   The installer starts the product installation program with a copyright message and specifies the directory where the logs are created.
3. From the opening Selection Menu, choose: C for "Configure an Installed Product."
4. From the displayed list of products to configure, choose: Veritas Cluster Server.

To configure VCS using the installvcs program

1 Confirm that you are logged in as the superuser.

2 Start the installvcs program.

```
# /opt/VRTS/install/installvcs -configure
```

The installer begins with a copyright message and specifies the directory where the logs are created.

Specifying systems for configuration

The installer prompts for the system names on which you want to configure VCS. The installer performs an initial check on the systems that you specify.

To specify system names for installation

1 Enter the names of the systems where you want to configure VCS.

```
Enter the system names separated by spaces:  [q,?]
(galaxy) galaxy nebula
```

2 Review the output as the installer verifies the systems you specify.

The installer does the following tasks:

- Checks that the local node running the installer can communicate with remote nodes
  If the installer finds ssh binaries, it confirms that ssh can operate without requests for passwords or passphrases.
- Makes sure the systems use the proper operating system
- Makes sure the systems install from the global zone
- Checks whether VCS is installed
- Exits if VCS 5.1 is not installed

Configuring the basic cluster

Enter the cluster information when the installer prompts you.

To configure the cluster

1. Review the configuration instructions that the installer presents.
2. Enter the unique cluster name and cluster ID.

```
Enter the unique cluster name: [q,?] clus1
Enter a unique Cluster ID number between 0-65535: [b,q,?] (0) 7
```

3. Review the NICs available on the first system as the installer discovers and reports them.

   The private heartbeats can either use NIC or aggregated interfaces. To use aggregated interfaces for private heartbeat, enter the name of the aggregated interface. To use a NIC for private heartbeat, enter a NIC which is not part of an aggregated interface.

4. Enter the network interface card details for the private heartbeat links.

   You must choose the network interface cards or the aggregated interfaces that the installer discovers and reports. To use any aggregated interfaces that the installer has not discovered, you must manually add the aggregated interfaces to use as private links after you configure VCS.

   See the *Veritas Cluster Server Administrator's Guide*.

   Answer the following prompts based on architecture:

   - For Solaris SPARC:
     You must not enter the network interface card that is used for the public network (typically hme0.)

```
Enter the NIC for the first private heartbeat NIC on galaxy:
[b,q,?] qfe0
Would you like to configure a second private heartbeat link?
[y,n,q,b,?] (y)
Enter the NIC for the second private heartbeat NIC on galaxy:
[b,q,?] qfe1
Would you like to configure a third private heartbeat link?
[y,n,q,b,?](n)
Do you want to configure an additional low priority heartbeat
link? [y,n,q,b,?] (n)
```

   - For Solaris x64:
     You must not enter the network interface card that is used for the public network (typically bge0.)

```
Enter the NIC for the first private heartbeat NIC on galaxy:
[b,q,?] e1000g0
Would you like to configure a second private heartbeat link?
[y,n,q,b,?] (y)
Enter the NIC for the second private heartbeat NIC on galaxy:
[b,q,?] e1000g1
Would you like to configure a third private heartbeat link?
[y,n,q,b,?](n)
Do you want to configure an additional low priority heartbeat
link? [y,n,q,b,?] (n)
```

5 Choose whether to use the same NIC details to configure private heartbeat links on other systems.

```
Are you using the same NICs for private heartbeat links on all
systems? [y,n,q,b,?] (y)
```

If you want to use the NIC details that you entered for galaxy, make sure the same NICs are available on each system. Then, enter **y** at the prompt.

If the NIC device names are different on some of the systems, enter **n**. Provide the NIC details for each system as the program prompts.

6 Verify and confirm the information that the installer summarizes.

Configuring the virtual IP of the cluster

You can configure the virtual IP of the cluster to use to connect to the Cluster Manager (Java Console) or to specify in the RemoteGroup resource.

See the *Veritas Cluster Server Administrator's Guide* for information on the Cluster Manager.

See the *Veritas Cluster Server Bundled Agents Reference Guide* for information on the RemoteGroup agent.

To configure the virtual IP of the cluster

1 Review the required information to configure the virtual IP of the cluster.

2 To configure virtual IP, enter `y` at the prompt.

3 Confirm whether you want to use the discovered public NIC on the first system.

Do one of the following:

- If the discovered NIC is the one to use, press `Enter`.

- If you want to use a different NIC, type the name of a NIC to use and press `Enter`.

```
Active NIC devices discovered on galaxy: hme0
Enter the NIC for Virtual IP of the Cluster to use on galaxy:
[b,q,?](hme0)
```

4 Confirm whether you want to use the same public NIC on all nodes.

Do one of the following:

- If all nodes use the same public NIC, enter `y`.
- If unique NICs are used, enter `n` and enter a NIC for each node.

```
Is hme0 to be the public NIC used by all systems
[y,n,q,b,?] (y)
```

5 Enter the virtual IP address for the cluster.

You can enter either an IPv4 address or an IPv6 address.

For IPv4:

- Enter the virtual IP address.

```
Enter the Virtual IP address for the Cluster:
[b,q,?] 192.168.1.16
```

- Confirm the default netmask or enter another one:

```
Enter the netmask for IP 192.168.1.16: [b,q,?]
(255.255.240.0)
```

- Verify and confirm the Cluster Virtual IP information.

```
Cluster Virtual IP verification:

      NIC: hme0
      IP: 192.168.1.16
      Netmask: 255.255.240.0

Is this information correct? [y,n,q] (y)
```

For IPv6

- Enter the virtual IP address.

```
Enter the Virtual IP address for the Cluster:
[b,q,?] 2001:454e:205a:110:203:baff:feee:10
```

- Enter the prefix for the virtual IPv6 address you provided. For example:

```
Enter the Prefix for IP
2001:454e:205a:110:203:baff:feee:10: [b,q,?] 64
```

- Verify and confirm the Cluster Virtual IP information.

```
Cluster Virtual IP verification:

      NIC: hme0
      IP: 2001:454e:205a:110:203:baff:feee:10
      Prefix: 64

Is this information correct? [y,n,q] (y)
```

Configuring the cluster in secure mode

If you want to configure the cluster in secure mode, make sure that you meet the prerequisites for secure cluster configuration.

The installvcs program provides different configuration modes to configure a secure cluster. Make sure that you completed the pre-configuration tasks for the configuration mode that you want to choose.

See "Preparing to configure the clusters in secure mode" on page 83.

To configure the cluster in secure mode

1 Choose whether to configure VCS to use Symantec Product Authentication Service.

```
Would you like to configure VCS to use Symantec Security
Services? [y,n,q] (n) y
```

- If you want to configure the cluster in secure mode, make sure you meet the prerequisites and enter **y**.
- If you do not want to configure the cluster in secure mode, enter **n**.
  You must add VCS users when the configuration program prompts.

See "Adding VCS users" on page 124.

2 Select one of the options to enable security.

Before you choose any of the options, make sure that all the nodes in the cluster can successfully ping the root broker system.

```
Select the Security option you would like to perform [1-3,b,q,?] (1)

Security Menu
     1)  Configure security completely automatically
     2)  Provide AB credentials using BLOBs
     3)  Provide AB credentials without using BLOBs
     b)  Back to previous menu
```

Review the following configuration modes. Based on the configuration that you want to use, enter one of the following values:

`Option 1.` Automatic configuration

Based on the root broker you want to use, do one of the following:

- To use an external root broker:
  Enter the name of the root broker system when prompted.
  Requires remote access to the root broker. Make sure that all the nodes in the cluster can successfully ping the root broker system.
  Review the output as the installer verifies communication with the root broker system, checks vxatd process and version, and checks security domain.
- To configure one of the nodes as root broker:
  - Press Enter at the following installer prompt:

    ```
    If you already have an external
    RB(Root Broker) installed and configured, enter
    the RB name, or press Enter to skip: [b]
    ```

  - Choose the node that the installer must configure as root and authentication broker. The installer configures the other nodes as authentication brokers.
    At the installer prompt, you can choose the first node in the cluster to configure as RAB, or you can enter n to configure another node as RAB. For example:

    ```
    Do you want to configure <galaxy> as RAB,
    and other nodes as AB? [y,n,q,b] (y) n
    Enter the node name which you want to
    configure as RAB: nebula
    ```

Option 2. Semiautomatic configuration

Enter the path of the encrypted file (BLOB file) for each node when prompted.

Option 3. Manual configuration

Enter the following Root Broker information as the installer prompts you:

```
Enter root broker name: [b]
east.symantecexample.com
Enter root broker FQDN:  [b]
(symantecexample.com)
symantecexample.com
Enter the root broker domain name for the
Authentication Broker's identity:  [b]
root@east.symantecexample.com
Enter root broker port:  [b] 2821
Enter path to the locally accessible root hash [b]
(/var/tmp/installvcs-200910221810ROA/root_hash)
/var/tmp/installvcs-200910221810ROA/root_hash
```

Enter the following Authentication Broker information as the installer prompts you for each node:

```
Enter Authentication broker's identity on
galaxy [b]
(galaxy.symantecexample.com)
galaxy.symantecexample.com
Enter the password for the Authentication broker's
identity on galaxy:
Enter Authentication broker's identity on
nebula [b]
(nebula.symantecexample.com)
nebula.symantecexample.com
Enter the password for the Authentication broker's
identity on nebula:
```

3 After you provide the required information to configure the cluster in secure mode, the program prompts you to configure SMTP email notification.

Note that the installer does not prompt you to add VCS users if you configured the cluster in secure mode. However, you must add VCS users later.

See the *Veritas Cluster Server Administrator's Guide* for more information.

Adding VCS users

If you have enabled Symantec Product Authentication Service, you do not need to add VCS users now. Otherwise, on systems operating under an English locale, you can add VCS users at this time.

To add VCS users

1. Review the required information to add VCS users.
2. Reset the password for the Admin user, if necessary.

```
Do you want to set the username and/or password for the Admin user
(default username = 'admin', password='password')? [y,n,q] (n) y
Enter the user name: [b,q,?] (admin)
Enter the password:
Enter again:
```

3. To add a user, enter **y** at the prompt.

```
Do you want to add another user to the cluster? [y,n,q] (y)
```

4. Enter the user's name, password, and level of privileges.

```
Enter the user name: [b,q,?] smith
Enter New Password:*******

Enter Again:*******
Enter the privilege for user smith (A=Administrator, O=Operator,
G=Guest): [?] a
```

5. Enter **n** at the prompt if you have finished adding users.

```
Would you like to add another user? [y,n,q] (n)
```

6. Review the summary of the newly added users and confirm the information.

Configuring SMTP email notification

You can choose to configure VCS to send event notifications to SMTP email services. You need to provide the SMTP server name and email addresses of people to be notified. Note that you can also configure the notification after installation.

Refer to the *Veritas Cluster Server Administrator's Guide* for more information.

To configure SMTP email notification

1 Review the required information to configure the SMTP email notification.

2 Specify whether you want to configure the SMTP notification.

```
Do you want to configure SMTP notification? [y,n,q] (n) y
```

If you do not want to configure the SMTP notification, you can skip to the next configuration option.

See "Configuring SNMP trap notification" on page 126.

3 Provide information to configure SMTP notification.

Provide the following information:

- Enter the NIC information.

```
Active NIC devices discovered on galaxy: hme0
Enter the NIC for the VCS Notifier to use on galaxy:
[b,q,?] (hme0)
Is hme0 to be the public NIC used by all systems?
[y,n,q,b,?] (y)
```

- Enter the SMTP server's host name.

```
Enter the domain-based hostname of the SMTP server
(example: smtp.yourcompany.com): [b,q,?] smtp.example.com
```

- Enter the email address of each recipient.

```
Enter the full email address of the SMTP recipient
(example: user@yourcompany.com): [b,q,?] ozzie@example.com
```

- Enter the minimum security level of messages to be sent to each recipient.

```
Enter the minimum severity of events for which mail should be
sent to ozzie@example.com  [I=Information, W=Warning,
E=Error, S=SevereError]: [b,q,?] w
```

4 Add more SMTP recipients, if necessary.

- If you want to add another SMTP recipient, enter `y` and provide the required information at the prompt.

```
Would you like to add another SMTP recipient? [y,n,q,b] (n) y

Enter the full email address of the SMTP recipient
```

```
(example: user@yourcompany.com): [b,q,?] harriet@example.com

Enter the minimum severity of events for which mail should be
sent to harriet@example.com  [I=Information, W=Warning,
E=Error, S=SevereError]: [b,q,?] E
```

- If you do not want to add, answer **n**.

```
Would you like to add another SMTP recipient? [y,n,q,b] (n)
```

5 Verify and confirm the SMTP notification information.

```
NIC: hme0

SMTP Address: smtp.example.com
Recipient: ozzie@example.com receives email for Warning or
higher events
Recipient: harriet@example.com receives email for Error or
higher events

Is this information correct? [y,n,q] (y)
```

Configuring SNMP trap notification

You can choose to configure VCS to send event notifications to SNMP management consoles. You need to provide the SNMP management console name to be notified and message severity levels.

Note that you can also configure the notification after installation.

Refer to the *Veritas Cluster Server Administrator's Guide* for more information.

To configure the SNMP trap notification

1 Review the required information to configure the SNMP notification feature of VCS.

2 Specify whether you want to configure the SNMP notification.

```
Do you want to configure SNMP notification? [y,n,q] (n) y
```

If you skip this option and if you had installed a valid HA/DR license, the installer presents you with an option to configure this cluster as global cluster. If you did not install an HA/DR license, the installer proceeds to configure VCS based on the configuration details you provided.

See "Configuring global clusters" on page 128.

3 Provide information to configure SNMP trap notification.

Provide the following information:

- Enter the NIC information.

```
Active NIC devices discovered on galaxy: hme0
Enter the NIC for the VCS Notifier to use on galaxy:
[b,q,?] (hme0)
Is hme0 to be the public NIC used by all systems?
[y,n,q,b,?] (y)
```

- Enter the SNMP trap daemon port.

```
Enter the SNMP trap daemon port: [b,q,?] (162)
```

- Enter the SNMP console system name.

```
Enter the SNMP console system name: [b,q,?] saturn
```

- Enter the minimum security level of messages to be sent to each console.

```
Enter the minimum severity of events for which SNMP traps
should be sent to saturn [I=Information, W=Warning, E=Error,
S=SevereError]: [b,q,?] E
```

4 Add more SNMP consoles, if necessary.

- If you want to add another SNMP console, enter `y` and provide the required information at the prompt.

```
Would you like to add another SNMP console? [y,n,q,b] (n) y
Enter the SNMP console system name: [b,q,?] jupiter
Enter the minimum severity of events for which SNMP traps
should be sent to jupiter [I=Information, W=Warning,
E=Error, S=SevereError]: [b,q,?] S
```

- If you do not want to add, answer `n`.

```
Would you like to add another SNMP console? [y,n,q,b] (n)
```

5 Verify and confirm the SNMP notification information.

```
NIC: hme0

SNMP Port: 162
Console: saturn receives SNMP traps for Error or
higher events
Console: jupiter receives SNMP traps for SevereError or
higher events

Is this information correct? [y,n,q] (y)
```

Configuring global clusters

If you had installed a valid HA/DR license, the installer provides you an option to configure this cluster as global cluster. If not, the installer proceeds to configure VCS based on the configuration details you provided. You can also run the gcoconfig utility in each cluster later to update the VCS configuration file for global cluster.

You can configure global clusters to link clusters at separate locations and enable wide-area failover and disaster recovery. The installer adds basic global cluster information to the VCS configuration file. You must perform additional configuration tasks to set up a global cluster.

See the *Veritas Cluster Server Administrator's Guide* for instructions to set up VCS global clusters.

Note: If you installed a HA/DR license to set up replicated data cluster or campus cluster, skip this installer option.

To configure the global cluster option

1 Review the required information to configure the global cluster option.

2 Specify whether you want to configure the global cluster option.

```
Do you want to configure the Global Cluster Option? [y,n,q] (n) y
```

If you skip this option, the installer proceeds to configure VCS based on the configuration details you provided.

3 Provide information to configure this cluster as global cluster.

The installer prompts you for a NIC, a virtual IP address, and value for the netmask.

If you had entered virtual IP address details, the installer discovers the values you entered. You can use the same virtual IP address for global cluster configuration or enter different values.

You can also enter an IPv6 address as a virtual IP address.

4 Verify and confirm the configuration of the global cluster.

```
Global Cluster Option configuration verification:

NIC: hme0
IP: 192.168.1.16
Netmask: 255.255.240.0

Is this information correct? [y,n,q] (y)
```

On Solaris x64, an example for the NIC's port is bge0.

Completing the VCS configuration

After you enter the VCS configuration information, the installer prompts to stop the VCS processes to complete the configuration process. The installer continues to create configuration files and copies them to each system. The installer also configures a cluster UUID value for the cluster at the end of the configuration. After the installer successfully configures VCS, it restarts VCS.

If you chose to configure the cluster in secure mode, the installer then does the following before it starts VCS in secure mode:

- Depending on the security mode you chose to set up Authentication Service, the installer does one of the following:
  - Creates the security principal
  - Executes the encrypted file to create security principal on each node in the cluster
- Creates the VxSS service group
- Creates the Authentication Server credentials on each node in the cluster
- Creates the Web credentials for VCS users
- Sets up trust with the root broker

To complete the VCS configuration

1 Press Enter at the following prompt.

```
Do you want to stop VCS processes now? [y,n,q,?] (y)
```

2 Review the output as the installer stops various processes and performs the configuration. The installer then restarts VCS.

3 Enter y at the prompt to send the installation information to Symantec.

```
Would you like to send the information about this installation
to Symantec to help improve installation in the future? [y,n,q,?] (y) y
```

4 After the installer configures VCS successfully, note the location of summary, log, and response files that installer creates.

The files provide the useful information that can assist you with the configuration and can also assist future configurations.

summary file	Describes the cluster and its configured resources.
log file	Details the entire configuration.
response file	Contains the configuration information that can be used to perform secure or unattended installations on other systems. See "Configuring VCS using response files" on page 171.

Verifying and updating licenses on the system

After you install VCS, you can verify the licensing information using the vxlicrep program. You can replace the demo licenses with a permanent license.

Checking licensing information on the system

You can use the vxlicrep program to display information about the licenses on a system.

To check licensing information

1 Navigate to the folder containing the `vxlicrep` program and enter:

```
# cd /opt/VRTS/bin
# ./vxlicrep
```

2 Review the following output to determine the following information:

- The license key
- The type of license
- The product for which it applies
- Its expiration date, if any. Demo keys have expiration dates. Permanent keys and site keys do not have expiration dates.

```
License Key                    = xxx-xxx-xxx-xxx-xxx
Product Name                   = Veritas Cluster Server
Serial Number                  = 1249
License Type                   = PERMANENT
OEM ID                         = 478

Features :=
Platform                       = Solaris
Version                        = 5.1
Tier                           = 0
Reserved                       = 0
Mode                           = VCS
```

Updating product licenses using vxlicinst

You can use the `vxlicinst` command to add the VCS license key on each node. If you have VCS already installed and configured and you use a demo license, you can replace the demo license.

See "Replacing a VCS demo license with a permanent license" on page 132.

To update product licenses

- On each node, enter the license key using the command:

```
# cd /opt/VRTS/bin
# ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
```

Replacing a VCS demo license with a permanent license

When a VCS demonstration key license expires, you can replace it with a permanent license using the `vxlicinst(1)` program.

To replace a demo key

1. Make sure you have permissions to log in as root on each of the nodes in the cluster.
2. Shut down VCS on all nodes in the cluster:

   ```
   # hastop -all -force
   ```

   This command does not shut down any running applications.
3. Enter the permanent license key using the following command on each node:

   ```
   # cd /opt/VRTS/bin
   # ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
   ```

4. Make sure demo licenses are replaced on all cluster nodes before starting VCS.

   ```
   # cd /opt/VRTS/bin
   # ./vxlicrep
   ```

5. Start VCS on each node:

   ```
   # hastart
   ```

Chapter 7

Configuring VCS clusters for data integrity

This chapter includes the following topics:

Setting up disk-based I/O fencing using installvcs program

You can configure I/O fencing using the `-fencing` option of the installvcs program.

Initializing disks as VxVM disks

Perform the following procedure to initialize disks as VxVM disks.

To initialize disks as VxVM disks

1. Make the new disks recognizable. On each node, enter:

   ```
   # devfsadm
   ```

2. To initialize the disks as VxVM disks, use one of the following methods:
   - Use the interactive vxdiskadm utility to initialize the disks as VxVM disks. For more information see the *Veritas Volume Managers Administrator's Guide*.
   - Use the `vxdisksetup` command to initialize a disk as a VxVM disk.

     ```
     vxdisksetup -i device_name
     ```

The example specifies the CDS format:

```
# vxdisksetup -i c2t13d0
```

Repeat this command for each disk you intend to use as a coordinator disk.

Configuring disk-based I/O fencing using installvcs program

Note: The installer stops and starts VCS to complete I/O fencing configuration. Make sure to unfreeze any frozen VCS service groups in the cluster for the installer to successfully stop VCS.

To set up disk-based I/O fencing using the installvcs program

1. Start the installvcs program with `-fencing` option.

   ```
   # /opt/VRTS/install/installvcs -fencing
   ```

   The installvcs program starts with a copyright message and verifies the cluster information.

2. Confirm that you want to proceed with the I/O fencing configuration at the prompt.

   The program checks that the local node running the script can communicate with remote nodes and checks whether VCS 5.1 is configured properly.

3. Review the I/O fencing configuration options that the program presents. Type **2** to configure disk-based I/O fencing.

   ```
   Select the fencing mechanism to be configured in this
   Application Cluster
   [1-3,b,q] 2
   ```

4. Review the output as the configuration program checks whether VxVM is already started and is running.

   - If the check fails, configure and enable VxVM before you repeat this procedure.
   - If the check passes, then the program prompts you for the coordinator disk group information.

5. Choose whether to use an existing disk group or create a new disk group to configure as the coordinator disk group.

The program lists the available disk group names and provides an option to create a new disk group. Perform one of the following:

- To use an existing disk group, enter the number corresponding to the disk group at the prompt.
  The program verifies whether the disk group you chose has an odd number of disks and that the disk group has a minimum of three disks.
- To create a new disk group, perform the following steps:
  - Enter the number corresponding to the **Create a new disk group** option.
    The program lists the available disks that are in the CDS disk format in the cluster and asks you to choose an odd number of disks with at least three disks to be used as coordinator disks.
    Symantec recommends to use three disks as coordination points for disk-based I/O fencing.
  - Enter the numbers corresponding to the disks that you want to use as coordinator disks.
  - Enter the disk group name.

6 Verify that the coordinator disks you chose meet the I/O fencing requirements.

You must verify that the disks are SCSI-3 PR compatible using the vxfentsthdw utility and then return to this configuration program.

See "Checking shared disks for I/O fencing" on page 136.

7 After you confirm the requirements, the program creates the coordinator disk group with the information you provided.

8 Enter the I/O fencing disk policy that you chose to use. For example:

```
Enter fencing mechanism name (raw/dmp): [b,q,?] raw
```

The program also does the following:

- Populates the /etc/vxfendg file with this disk group information
- Populates the /etc/vxfenmode file on each cluster node with the I/O fencing mode information and with the SCSI-3 disk policy information

9 Verify and confirm the I/O fencing configuration information that the installer summarizes.

10 Review the output as the configuration program does the following:

- Stops VCS and I/O fencing on each node.
- Configures disk-based I/O fencing and starts the I/O fencing process.
- Updates the VCS configuration file main.cf if necessary.

- Copies the /etc/vxfenmode file to a date and time suffixed file /etc/vxfenmode-*date-time*. This backup file is useful if any future fencing configuration fails.
- Starts VCS on each node to make sure that the VCS is cleanly configured to use the I/O fencing feature.

11 Review the output as the configuration program displays the location of the log files, the summary files, and the response files.

12 Configure the Coordination Point agent to monitor the coordinator disks.

See "Configuring Coordination Point agent to monitor coordination points" on page 227.

Checking shared disks for I/O fencing

Make sure that the shared storage you set up while preparing to configure VCS meets the I/O fencing requirements. You can test the shared disks using the vxfentsthdw utility. The two nodes must have `ssh` (default) or `rsh` communication. To confirm whether a disk (or LUN) supports SCSI-3 persistent reservations, two nodes must simultaneously have access to the same disks. Because a shared disk is likely to have a different name on each node, check the serial number to verify the identity of the disk. Use the `vxfenadm` command with the `-i` option. This command option verifies that the same serial number for the LUN is returned on all paths to the LUN.

Make sure to test the disks that serve as coordinator disks.

The vxfentsthdw utility has additional options suitable for testing many disks. Review the options for testing the disk groups (`-g`) and the disks that are listed in a file (`-f`). You can also test disks without destroying data using the `-r` option.

See the *Veritas Cluster Server Administrator's Guide*.

Checking that disks support SCSI-3 involves the following tasks:

- Verifying the Array Support Library (ASL)
  See "Verifying Array Support Library (ASL)" on page 137.
- Verifying that nodes have access to the same disk
  See "Verifying that the nodes have access to the same disk" on page 137.
- Testing the shared disks for SCSI-3
  See "Testing the disks using vxfentsthdw utility" on page 138.

Verifying Array Support Library (ASL)

Make sure that the Array Support Library (ASL) for the array that you add is installed.

To verify Array Support Library (ASL)

1 If the Array Support Library (ASL) for the array that you add is not installed, obtain and install it on each node before proceeding.

The ASL for the supported storage device that you add is available from the disk array vendor or Symantec technical support.

2 Verify that the ASL for the disk array is installed on each of the nodes. Run the following command on each node and examine the output to verify the installation of ASL.

The following output is a sample:

```
# vxddladm listsupport all


LIBNAME             VID                 PID
============================================================
libvx3par.so        3PARdata            VV
libvxCLARiiON.so    DGC                 All
libvxFJTSYe6k.so    FUJITSU             E6000
libvxFJTSYe8k.so    FUJITSU             All
libvxap.so          SUN                 All
libvxatf.so         VERITAS             ATFNODES
libvxcompellent.so  COMPELNT            Compellent Vol
libvxcopan.so       COPANSYS            8814, 8818
```

3 Scan all disk drives and their attributes, update the VxVM device list, and reconfigure DMP with the new devices. Type:

```
# vxdisk scandisks
```

See the Veritas Volume Manager documentation for details on how to add and configure disks.

Verifying that the nodes have access to the same disk

Before you test the disks that you plan to use as shared data storage or as coordinator disks using the vxfentsthdw utility, you must verify that the systems see the same disk.

To verify that the nodes have access to the same disk

1. Verify the connection of the shared storage for data to two of the nodes on which you installed VCS.
2. Ensure that both nodes are connected to the same disk during the testing. Use the vxfenadm command to verify the disk serial number.

   ```
   vxfenadm -i diskpath
   ```

   Refer to the `vxfenadm` (1M) manual page.

   For example, an EMC disk is accessible by the /dev/rdsk/c1t1d0s2 path on node A and the /dev/rdsk/c2t1d0s2 path on node B.

   From node A, enter:

   ```
   vxfenadm -i /dev/rdsk/c1t1d0s2

   Vendor id : EMC
   Product id : SYMMETRIX
   Revision : 5567
   Serial Number : 42031000a
   ```

   The same serial number information should appear when you enter the equivalent command on node B using the /dev/rdsk/c2t1d0s2 path.

   On a disk from another manufacturer, Hitachi Data Systems, the output is different and may resemble:

   ```
   # vxfenadm -i /dev/rdsk/c3t1d2s2

   Vendor id       : HITACHI
   Product id      : OPEN-3        -SUN
   Revision        : 0117
   Serial Number   : 0401EB6F0002
   ```

Testing the disks using vxfentsthdw utility

This procedure uses the /dev/rdsk/c1t1d0s2 disk in the steps.

If the utility does not show a message that states a disk is ready, the verification has failed. Failure of verification can be the result of an improperly configured disk array. The failure can also be due to a bad disk.

If the failure is due to a bad disk, remove and replace it. The vxfentsthdw utility indicates a disk can be used for I/O fencing with a message resembling:

```
The disk /dev/rdsk/c1t1d0s2 is ready to be configured for I/O Fencing on
node galaxy
```

For more information on how to replace coordinator disks, refer to the *Veritas Cluster Server Administrator's Guide*.

To test the disks using vxfentsthdw utility

1 Make sure system-to-system communication functions properly.

See "Setting up inter-system communication" on page 56.

2 From one node, start the utility.

Run the utility with the -n option if you use `rsh` for communication.

```
# vxfentsthdw [-n]
```

3 The script warns that the tests overwrite data on the disks. After you review the overview and the warning, confirm to continue the process and enter the node names.

Warning: The tests overwrite and destroy data on the disks unless you use the `-r` option.

```
******** WARNING!!!!!!!! ********
THIS UTILITY WILL DESTROY THE DATA ON THE DISK!!

Do you still want to continue : [y/n] (default: n) y
Enter the first node of the cluster: galaxy
Enter the second node of the cluster: nebula
```

4 Enter the names of the disks that you want to check. Each node may know the same disk by a different name:

```
Enter the disk name to be checked for SCSI-3 PGR on node
IP_adrs_of_galaxy in the format:
for dmp: /dev/vx/rdmp/cxtxdxsx
for raw: /dev/rdsk/cxtxdxsx
Make sure it's the same disk as seen by nodes
IP_adrs_ofgalaxy and IP_adrs_of_nebula
  /dev/rdsk/c2t13d0s2

Enter the disk name to be checked for SCSI-3 PGR on node
IP_adrs_of_nebula in the format:
for dmp: /dev/vx/rdmp/cxtxdxsx
for raw: /dev/rdsk/cxtxdxsx
Make sure it's the same disk as seen by nodes
IP_adrs_ofgalaxy and IP_adrs_of_nebula
  /dev/rdsk/c2t13d0s2
```

If the serial numbers of the disks are not identical. then the test terminates.

5 Review the output as the utility performs the checks and report its activities.

6 If a disk is ready for I/O fencing on each node, the utility reports success:

```
The disk is now ready to be configured for I/O Fencing on node
galaxy

ALL tests on the disk /dev/rdsk/c1t1d0s2 have PASSED
The disk is now ready to be configured for I/O Fencing on node
galaxy
```

7 Run the vxfentsthdw utility for each disk you intend to verify.

Setting up server-based I/O fencing using installvcs program

If VCS cluster is configured to run in secure mode, then verify that the configuration is correct before you configure CP server-based I/O fencing.

See "Verifying security configuration on VCS cluster to use CP server coordination point " on page 141.

See "Configuring server-based I/O fencing" on page 143.

Verifying security configuration on VCS cluster to use CP server coordination point

After configuring security using the `installvcs -security` command, follow the procedure below on each VCS cluster node to confirm that security is correctly configured.

To verify the security configuration on VCS cluster to use CP server coordination point

1 Run the following command:

```
# /opt/VRTScps/bin/cpsat listpd -t local

Domain(s) Found 1

****************************

Domain Name HA_SERVICES@galaxy.symantec.com

Expiry Interval 0

****************************
```

2 There should be a domain name entry with the following format:

HA_SERVICES@*hostname.domainname*

or

HA_SERVICES@*hostname*

3 There should not be duplicate entries for HA_SERVICES domain.

An example of incorrect configuration is given below.

```
showdomains

Domain(s) Found :       3

**************************************

Domain Name:    HA_SERVICES@galaxy.symantec.com

Domain Type:    vx

**************************************

Domain Name:    broker@galaxy.symantec.com

Domain Type:    vx

**************************************

Domain Name:    HA_SERVICES@galaxy

Domain Type:    vx

**************************************
```

Proceed to reconfigure security in case duplicate entries appear as shown in the above example.

Configuring server-based I/O fencing

This section describes how to configure server-based I/O fencing for the VCS cluster. With server-based I/O fencing, a combination of CP servers and SCSI-3 compliant coordinator disks can act as coordination points for I/O fencing.

To configure the VCS cluster with server-based I/O fencing

1. Ensure that the CP server(s) are configured and reachable from the cluster. If coordinator disks are to be used as coordination points, ensure that they are SCSI-3 compliant.
2. Run the `installvcs -fencing` command to configure fencing.

   For example:

   ```
   /opt/VRTS/install/installvcs -fencing
   ```

   The installer creates a vxfenmode file on each node. The file is located at /etc/vxfenmode.

The following procedure can be used as an example to configure server-based I/O fencing. In this procedure example, there is one CP server and two disks acting as the coordination points.

To configure fencing configuration using the installer - CP client-based fencing

1. After installing and configuring VCS on the VCS cluster, the user issues the following command for configuring fencing:

   ```
   /opt/VRTS/install/installvcs -fencing
   ```

2. After issuing the command, the installer displays Symantec copyright information and the location of log files for the configuration process.

   Access and review these log files if there is any problem with the installation process. The following is an example of the command output:

   ```
   Logs for installvcs are being created in /var/tmp/installvcs-LqwKwB.
   ```

3. Next, the installer displays the current cluster information for verification purposes. The following is an example of the command output:

   ```
   Cluster information verification:

   Cluster Name: clus1
   Cluster ID Number: 4445
   Systems: galaxy nebula
   ```

   The cluster name, systems, and ID number are all displayed.

   You are then asked whether you want to configure I/O fencing for the cluster. Enter "y" for yes. The rsh (or ssh) communication with the cluster nodes is then checked by the installer.

4 Next, you are prompted to select one of the following options for your fencing configuration:

```
Fencing configuration
     1)  Configure CP client based fencing
     2)  Configure disk based fencing
     3)  Configure fencing in disabled mode

Select the fencing mechanism to be configured in this
Application Cluster [1-3,q]
```

Select the first option for CP client-based fencing.

5 Enter the total number of coordination points including both servers and disks. This number should be at least 3.

For example:

```
Enter the total number of co-ordination points including both
CP servers and disks: [b] (3)
```

6 Enter the total number of coordinator disks among the coordination points. In this example, there are two coordinator disks.

For example:

```
Enter the total number of disks among these:
[b] (0) 2
```

7 Enter the Virtual IP addresses or host names of the virtual IP address for each of the Coordination Point servers.

Note: The installer assumes these values to be the identical as viewed from all the client cluster nodes.

For example:

```
Enter the Virtual IP address/fully qualified host name
for the Co-ordination Point Server #1::
[b] 10.209.80.197
```

8 Enter the port that the CP server would be listening on.

For example:

```
Enter the port in the range [49152, 65535] which the
Co-ordination Point Server 10.209.80.197
would be listening on or simply accept the default port suggested:
[b] (14250)
```

9 Enter the fencing mechanism for the disk or disks.

For example:

```
Enter fencing mechanism for the disk(s) (raw/dmp):
[b,q,?] raw
```

10 The installer then displays a list of available disks to choose from to set up as coordinator points.

```
Select disk number 1 for co-ordination point

1)  c3t0d0s2
2)  c3t1d0s3
3)  c3t2d0s4

Please enter a valid disk which is available from all the
cluster nodes for co-ordination point [1-3,q] 1
```

Select a disk from the displayed list.

Ensure that the selected disk is available from all the VCS cluster nodes.

11 Read the displayed recommendation from the installer to verify the disks prior to proceeding:

```
It is strongly recommended to run the 'VxFen Test Hardware' utility
located at '/opt/VRTSvcs/vxfen/bin/vxfentsthdw' in another window
before continuing. The utility verifies if the shared storage
you intend to use is configured to support I/O
fencing. Use the disk you just selected for this
verification. Come back here after you have completed
the above step to continue with the configuration.
```

Symantec recommends that you verify that the disks you are using as coordination points have been configured to support I/O fencing. Press Enter to continue.

You are then prompted to confirm your disk selection after performing a 'vxfentsthdw' test.

Press Enter to accept the default (y) and continue.

12 The installer then displays a list of available disks to choose from to set up as coordinator points.

Select a disk from the displayed list for the second coordinator point.

Ensure that the selected disk is available from all the VCS cluster nodes.

13 Proceed to read the displayed recommendation from the installer to verify the disks prior to proceeding.

Press Enter to continue.

14 You are then prompted to confirm your disk selection after performing a 'vxfentsthdw' test.

Press Enter to accept the default (y) and continue.

15 Proceed to enter a disk group name for the coordinator disks or accept the default.

```
Enter the disk group name for coordinating disk(s):
[b] (vxfencoorddg)
```

16 The installer now begins verification of the coordination points. At the end of the verification process, the following information is displayed:

- Total number of coordination points being used
- CP Server Virtual IP/hostname and port number
- SCSI-3 disks

- Disk Group name for the disks in customized fencing
- Disk mechanism used for customized fencing

For example:

```
Total number of coordination points being used: 3
CP Server (Port):
    1. 10.209.80.197 (14250)
SCSI-3 disks:
    1. c3t0d0s2
    2. c3t1d0s3
Disk Group name for the disks in customized fencing: vxfencoorddg
Disk mechanism used for customized fencing: raw
```

Your are then prompted to accept the above information. Press Enter to accept the default (y) and continue.

The disks and disk group are initialized and the disk group deported on the VCS cluster node.

17 The installer now automatically determines the security configuration of the CP server's side and takes the appropriate action:

- If the CP server's side is configured for security, then the VCS cluster's side will be configured for security.
- If the CP server's side is not configured for security, then the VCS cluster's side will not be configured for security.

For example:

```
While it is recommended to have secure communication
configured between CP Servers and CP client cluster, the client
cluster must be in the same mode (secure or non-secure) as the
CP servers are.

Since the CP servers are configured in secure mode, the installer
will configure the client cluster also as a secure cluster.

Press [Enter] to continue:

Trying to configure Security on the cluster:

All systems already have established trust within the
```

```
Symantec Product Authentication Service domain
root@galaxy.symantec.com
```

18 Enter whether you are using different root brokers for the CP servers and VCS clusters.

If you are using different root brokers, then the installer tries to establish trust between the authentication brokers of the CP servers and the VCS cluster nodes for their communication.

After entering "y" for yes or "n" for no, press Enter to continue.

19 If you entered "y" for yes in step 18, then you are also prompted for the following information:

- Hostname for the authentication broker for any one of the CP servers
- Port number where the authentication broker for the CP server is listening for establishing trust
- Hostname for the authentication broker for any one of the VCS cluster nodes
- Port number where the authentication broker for the VCS cluster is listening for establishing trust

Press Enter to continue.

20 The installer then displays your I/O fencing configuration and prompts you to indicate whether the displayed I/O fencing configuration information is correct.

If the information is correct, enter "y" for yes.

For example:

```
CPS Admin utility location: /opt/VRTScps/bin/cpsadm
Cluster ID: 2122
Cluster Name: clus1
UUID for the above cluster: {ae5e589a-1dd1-11b2-dd44-00144f79240c}
```

21 The installer then updates the VCS cluster information on each of the CP Servers to ensure connectivity between them.

The installer then populates the file /etc/vxfenmode with the above details in each of the CP VCS cluster nodes.

For example:

```
Updating client cluster information on CP Server 10.210.80.199


Adding the client cluster to the CP Server 10.210.80.199 ................... Done

Registering client node galaxy with CP Server 10.210.80.199.............. Done
Adding CPClient user for communicating to CP Server 10.210.80.199 ......... Done
Adding cluster clus1 to the CPClient user on CP Server 10.210.80.199 ... Done

Registering client node nebula with CP Server 10.210.80.199 ............. Done
Adding CPClient user for communicating to CP Server 10.210.80.199 ......... Done
Adding cluster clus1 to the CPClient user on CP Server 10.210.80.199 ... Done

Updating /etc/vxfenmode file on galaxy ................................. Done
Updating /etc/vxfenmode file on nebula ......... ........................ Done
```

For additional information about the vxfenmode file in mixed disk and CP server mode, or pure server-based mode:

See "About I/O fencing configuration files" on page 94.

22 You are then prompted to configure the CP agent on the client cluster.

```
Do you want to configure CP Agent on the client cluster? [y,n,q]
(y)

Enter a non-existing name for the service group for CP Agent:
[b] (vxfen)

Adding CP Agent via galaxy ........................ Done
```

23 The VCS and the fencing process are then stopped and restarted on each VCS cluster node, and the I/O configuration process then finished.

```
Stopping VCS on galaxy ............................ Done
Stopping Fencing on galaxy ........................ Done
Stopping VCS on nebula ............................ Done
Stopping Fencing on nebula ........................ Done
```

24 At the end of this process, the installer then displays the location of the configuration log files, summary files, and response files.

Section 4

Installation using the Web-based installer

Chapter 8

Installing VCS

This chapter includes the following topics:

Before using the Veritas Web-based installer

The Veritas Web-based installer requires the following configuration.

Table 8-1 Web-based installer requirements

System	Function	Requirements
Target system	The system(s) where the Veritas products will be installed.	Must be a supported platform for VCS 5.1
Installation server	The server from which to initiate the installation. The installation media is mounted and accessible from the installation server.	Must be the same OS as the system(s) on which to install.
Administrative system	The system on which you run the web browser to perform the installation.	Web browser

Starting the Veritas Web-based installer

This section describes starting the Veritas Web-based installer.

To start the Web-based installer

1. Start the Veritas XPortal Server process `xprtld`, on the installation server:

   ```
   # ./webinstaller start
   ```

   The webinstaller script displays a URL.
2. On the administrative server, start the Web browser.
3. Navigate to the URL displayed from step 1.
4. The browser may display the following message:

   ```
   Secure Connection Failed
   ```

   Obtain a security exception for your browser.
5. When prompted, enter `root` and root's password of the installation server.

Obtaining a security exception on Mozilla Firefox

You may need to get a security exception on Mozilla Firefox.

To obtain a security exception

1. Click **Or you can add an exception** link.
2. Click **Add Exception** button.
3. Click **Get Certificate** button.
4. Uncheck **Permanently Store this exception checkbox (recommended)**.
5. Click **Confirm Security Exception** button.
6. Enter root in User Name field and root password of the web server in the Password field.

Performing a pre-installation check with the Veritas Web-based installer

This section describes performing a pre-installation check with the Veritas Web-based installer.

To perform a pre-installation check

1 Start the Web-based installer.

See “Starting the Veritas Web-based installer” on page 156.

2 On the Select a task and a product page, select **Perform a Pre-installation check** from the **Task** drop-down list.

3 Select the product from the **Product** drop-down list, and click **Next**.

4 Indicate the systems on which to perform the precheck. Enter one or more system names, separated by spaces. Click **Validate**.

5 The installer performs the precheck and displays the results.

6 If the validation completes successfully, click **Next**. The installer prompts you to begin the installation. Click **Ok** to install VCS on the selected system. Click **Cancel** to install later.

7 Click **Finish**. The installer prompts you for another task.

Installing VCS with the Veritas Web-based installer

This section describes installing VCS with the Veritas Web-based installer.

To install VCS

1 Perform preliminary steps.

2 Start the Web-based installer.

See “Starting the Veritas Web-based installer” on page 156.

3 On the Select a task and a product page, select **Install a Product** from the **Task** drop-down list.

4 Select VCS from the Product drop-down list, and click Next.

5 On the License agreement page, select whether you accept the terms of the End User License Agreement (EULA). To continue, select **Yes, I agree** and click **Next**.

6 Choose minimal, recommended, or all packages. Click **Next**.

7 Indicate the systems on which to install. Enter one or more system names, separated by spaces. Click **Validate**.

8 After the validation completes successfully, click **Next** to install VCS on the selected system.

9 After the installation completes, you must choose your licensing method.

On the license page, select one of the following tabs:

- Keyless licensing

  Note: The keyless license option enables you to install without entering a key. However, in order to ensure compliance you must manage the systems with a management server.

  For more information, go to the following website:

  http://go.symantec.com/sfhakeyless

  Complete the following information:
  Choose whether you want to enable Global Cluster option.
  Click Register.

- Enter license key
  If you have a valid license key, select this tab. Enter the license key for each system. Click **Register**.

10 The installer prompts you to configure the cluster.

   If you select n, you can exit the installer. You must configure the product before you can use VCS.

   After the installation completes, the installer displays the location of the log and summary files. If required, view the files to confirm the installation status.

11 Select the checkbox to specify whether you want to send your installation information to Symantec.

   ```
   Would you like to send the information about this installation
   to Symantec to help improve installation in the future?
   ```

   Click **Finish**. The installer prompts you for another task.

Chapter 9

Configuring VCS

This chapter includes the following topics:

Configuring VCS using the web-based installer

This section describes the procedure to configure VCS using the web-based installer. Before you begin with the procedure, review the requirements for configuring VCS.

See "Getting your VCS installation and configuration information ready" on page 69.

To configure VCS on a cluster

1 Start the web-based installer.

2 Select the following on the **Select Product/Task** screen:

- From the list of tasks, select **Configure a product**.
- From the list of products, select **Veritas Cluster Server**.
- By default, the communication between the systems is selected as SSH. If SSH is used for communication between systems, the SSH commands execute without prompting for passwords or confirmations.
- Click **Next**.

Note: You can click **Quit** to quit the web-installer at any time during the configuration process.

---

3 Select the following on the **Select Systems** screen:

- Enter the system names on which VCS is to be configured, and then click **Validate**.
  Example: **galaxy nebula**
  The installer performs the initial system verification. It checks that communication between systems has been set up. It also checks for release compatibility, installed product version, platform version, and performs product prechecks.
- Click **Next** after the installer completes the system verification successfully.

4 Select the following on the **Set Cluster Name/ ID** screen.

- Enter the unique cluster name and Cluster ID number.
- Select the number of heartbeat links.
- Select **Low priority heartbeat** if you want to configure one heartbeat link as a low priority link.
- Select **Unique NICs per system** if you do not want to use the same NIC details to configure private heartbeat links on other systems.
- Click **Next**.

5 Select the following on the **Set Cluster Heartbeat** screen.

- If you are using the same NICs to configure private heartbeat links on all the systems, select the NIC for the first private heartbeat NIC on each system.
  Select the NIC for the second private heartbeat NIC on each system.
- If you have selected **Unique NICs per system** in the previous screen, provide the NIC details for each system.
- Click **Next**.

6 In the **VCS Optional Configure** screen, select the VCS options that you want to configure, namely Virtual IP, User, SMTP, SNMP, and GCO. Depending on the options that you select, you can enter the details regarding each option.

- To configure the virtual IP, do the following:
  - Select Configure Virtual IP.
  - If each system uses a separate NIC, select Configure NICs for every system separately.
  - Select the interface on which you want to configure the virtual IP.
  - Enter a virtual IP address and value for the netmask.
- To configure the VCS users, enter the following information:

- Reset the password for the Admin user, if necessary.
- Click **Add** to add a new user.
  Specify the user name, password, and user privileges for this user.

- To configure SMTP notification, enter the following information:
  - If all the systems use the same NIC, select the NIC for the VCS Notifier to be used on all systems. If not, select the NIC to be used by each system.
  - Enter the domain-based hostname of the SMTP server. Example: smtp.yourcompany.com
  - Enter the full email address of the SMTP recipient. Example: user@yourcompany.com.
  - Select the minimum security level of messages to be sent to each recipient.
  - Click **Add** to add more SMTP recipients, if necessary.
- To configure SNMP notification, enter the following information.
  - If all the systems use the same NIC, select the NIC for the VCS Notifier to be used on all systems. If not, select the NIC to be used by each system.
  - Enter the SNMP trap daemon port: (162).
  - Enter the SNMP console system name.
  - Select the minimum security level of messages to be sent to each console.
  - Click **Add** to add more SNMP consoles, if necessary.
- If you installed a valid HA/DR license, you can select the gco option to configure this cluster as a global cluster.
  See *Veritas Cluster Server Administrator's Guide* for instructions to set up VCS global clusters.
  - Select a NIC.
  - Enter a virtual IP address and value for the netmask.
  - Click **Next**.
    The installer proceeds to configure VCS based on the configuration details you provided.

7 In the **Starting Processes** screen, the installer completes the VCS configuration.

The installer starts VCS and its components on each system.

After the startup process is complete, click **Next** to move to the next screen.

8 Click **Next** to complete the process of configuring VCS.

View the summary file, log file, or response file, if needed, to confirm the configuration.

9 Select the checkbox to specify whether you want to send your installation information to Symantec.

```
Would you like to send the information about this installation
to Symantec to help improve installation in the future?
```

Click **Finish**. The installer prompts you for another task.

Section 5

Installation using response files

Chapter 10

Performing automated VCS installation

This chapter includes the following topics:

Installing VCS using response files

Typically, you can use the response file that the installer generates after you perform VCS installation on one cluster to install VCS on other clusters. You can also create a response file using the `-makeresponsefile` option of the installer.

To install VCS using response files

1. Make sure the systems where you want to install VCS meet the installation requirements.

   See "VCS installation requirements" on page 33.

2. Make sure the preinstallation tasks are completed.

   See "Performing preinstallation tasks" on page 51.

3. Copy the response file to one of the cluster systems where you want to install VCS.

   See "Sample response file for installing VCS" on page 168.

4. Edit the values of the response file variables as necessary.

   See "Response file variables to install VCS" on page 166.

5 Mount the product disc and navigate to the folder that contains the installation program.

6 Start the installation from the system to which you copied the response file. For example:

```
# ./installer -responsefile /tmp/response_file

# ./installvcs -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Response file variables to install VCS

Table 10-1 lists the response file variables that you can define to install VCS.

Table 10-1 Response file variables specific to installing VCS

Variable	List or Scalar	Description
CFG{opt}{install}	Scalar	Installs VCS packages. (Required)
CFG{accepteula}	Scalar	Specifies whether you agree with EULA.pdf on the media. (Required)
CFG{opt}{stopfail_allow}	Scalar	Decides whether or not to proceed if the installer fails while stopping the processes or while unloading the drivers. (Optional)
CFG{systems}	List	List of systems on which the product is to be installed. Required
CFG{prod}	Scalar	Defines the product to be installed. The value is VCS51 for VCS. (Required)

Table 10-1 Response file variables specific to installing VCS *(continued)*

Variable	List or Scalar	Description
CFG{opt}installallpkgs or CFG{opt}installrecpkgs or CFG{opt}installminpkgs	Scalar	Instructs the installer to install VCS packages based on the variable that has the value set to 1: ■ installallpkgs: Installs all packages ■ installrecpkgs: Installs recommended packages ■ installminpkgs: Installs minimum packages **Note:** The installer requires only one of these variable values to be set to 1. (Required)
CFG{opt}{rsh}	Scalar	Defines that *rsh* must be used instead of ssh as the communication method between systems. (Optional)
CFG{opt}{gco}	Scalar	Defines that the installer must enable the global cluster option. You must set this variable value to 1 if you want to configure global clusters. (Optional)
CFG{opt}{keyfile}	Scalar	Defines the location of an ssh keyfile that is used to communicate with all remote systems. (Optional)
CFG{opt}{patchpath}	Scalar	Defines a location, typically an NFS mount, from which all remote systems can install product patches. The location must be accessible from all target systems. (Optional)

Table 10-1 Response file variables specific to installing VCS *(continued)*

Variable	List or Scalar	Description
CFG{opt}{pkgpath}	Scalar	Defines a location, typically an NFS mount, from which all remote systems can install product packages. The location must be accessible from all target systems. (Optional)
CFG{opt}{tmppath}	Scalar	Defines the location where a working directory is created to store temporary files and the depots that are needed during the install. The default location is /var/tmp. (Optional)
CFG{opt}{logpath}	Scalar	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. **Note:** The installer copies the response files and summary files also to the specified *logpath* location. (Optional)
$CFG{opt}{vxkeyless}	Scalar	Installs the product with keyless license if the value is set to 1. If the value is set to 0, you must define the CFG{keys}{system} variable with the license keys. (Optional)
CFG{keys} {system}	Scalar	List of keys to be registered on the system if the variable $CFG{opt}{vxkeyless} is set to 0. (Optional)

Sample response file for installing VCS

Review the response file variables and their definitions.

See "Response file variables to install VCS" on page 166.

```
#
# Configuration Values:
#
our %CFG;

$CFG{accepteula}=1;
$CFG{opt}{install}=1;
$CFG{opt}{installrecpkgs}=1;
$CFG{prod}="VCS51";
$CFG{systems}=[ qw(galaxy nebula) ];
```

Chapter 11

Performing automated VCS configuration

This chapter includes the following topics:

Configuring VCS using response files

Typically, you can use the response file that the installer generates after you perform VCS configuration on one cluster to configure VCS on other clusters. You can also create a response file using the `-makeresponsefile` option of the installer.

To configure VCS using response files

1. Make sure the VCS packages are installed on the systems where you want to configure VCS.
2. Copy the response file to one of the cluster systems where you want to configure VCS.

   See "Sample response file for configuring VCS" on page 178.

3 Edit the values of the response file variables as necessary.

To configure optional features, you must define appropriate values for all the response file variables that are related to the optional feature.

See "Response file variables to configure VCS" on page 172.

4 Start the configuration from the system to which you copied the response file. For example:

```
# /opt/VRTS/install/installvcs -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Response file variables to configure VCS

Table 11-1 lists the response file variables that you can define to configure VCS.

Table 11-1 Response file variables specific to configuring VCS

Variable	List or Scalar	Description
CFG{opt}{configure}	Scalar	Performs the configuration if the packages are already installed. (Required)
CFG{accepteula}	Scalar	Specifies whether you agree with EULA.pdf on the media. (Required)
CFG{opt}{stopfail_allow}	Scalar	Decides whether or not to proceed if the installer fails while stopping the processes or while unloading the drivers. (Optional)
CFG{systems}	List	List of systems on which the product is to be configured. (Required)
CFG{prod}	Scalar	Defines the product to be configured. The value is VCS51 for VCS. (Required)

Table 11-1 Response file variables specific to configuring VCS *(continued)*

Variable	List or Scalar	Description
CFG{opt}{keyfile}	Scalar	Defines the location of an ssh keyfile that is used to communicate with all remote systems. (Optional)
CFG{opt}{rsh}	Scalar	Defines that *rsh* must be used instead of ssh as the communication method between systems. (Optional)
CFG{opt}{logpath}	Scalar	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. **Note:** The installer copies the response files and summary files also to the specified *logpath* location. (Optional)

Note that some optional variables make it necessary to define other optional variables. For example, all the variables that are related to the cluster service group (csgnic, csgvip, and csgnetmask) must be defined if any are defined. The same is true for the SMTP notification (smtpserver, smtprecp, and smtprsev), the SNMP trap notification (snmpport, snmpcons, and snmpcsev), and the Global Cluster Option (gconic, gcovip, and gconetmask).

Table 11-2 lists the response file variables that specify the required information to configure a basic VCS cluster.

Table 11-2 Response file variables specific to configuring a basic VCS cluster

Variable	List or Scalar	Description
CFG{vcs_clusterid}	Scalar	An integer between 0 and 65535 that uniquely identifies the cluster. (Required)
CFG{vcs_clustername}	Scalar	Defines the name of the cluster. (Required)

Table 11-2 Response file variables specific to configuring a basic VCS cluster *(continued)*

Variable	List or Scalar	Description
CFG{vcs_allowcomms}	Scalar	Indicates whether or not to start LLT and GAB when you set up a single-node cluster. The value can be 0 (do not start) or 1 (start). (Required)
CFG{vcs_lltlink#} {system}	Scalar	Defines the NIC to be used for a private heartbeat link on each system. Two LLT links are required per system (lltlink1 and lltlink2). You can configure up to four LLT links. (Required)
CFG{vcs_lltlinklowpri} {system}	Scalar	Defines a low priority heartbeat link. Typically, lltlinklowpri is used on a public network link to provide an additional layer of communication. (Optional)

Table 11-3 lists the response file variables that specify the required information to configure virtual IP for VCS cluster.

Table 11-3 Response file variables specific to configuring virtual IP for VCS cluster

Variable	List or Scalar	Description
CFG{vcs_csgnic} {system}	Scalar	Defines the NIC device to use on a system. You can enter 'all' as a system value if the same NIC is used on all systems. (Optional)
CFG{vcs_csgvip}	Scalar	Defines the virtual IP address for the cluster. (Optional)

Table 11-3 Response file variables specific to configuring virtual IP for VCS cluster *(continued)*

Variable	List or Scalar	Description
CFG{vcs_csgnetmask}	Scalar	Defines the Netmask of the virtual IP address for the cluster. (Optional)

Table 11-4 lists the response file variables that specify the required information to configure the VCS cluster in secure mode.

Table 11-4 Response file variables specific to configuring VCS cluster in secure mode

Variable	List or Scalar	Description
CFG{at_rootdomain}	Scalar	Defines the name of the system where the root broker is installed. (Optional)
CFG{vcs_securitymenuopt}	Scalar	Specifies the menu option to choose to configure the cluster in secure mode. ■ 1—Automatic ■ 2—Semi-automatic ■ 3—Manual (Optional)
CFG{vcs_vssdefport}	Scalar	Specifies the default port address of the root broker. (Optional)
CFG{vcs_roothashpath}	Scalar	Specifies the path of the root hash file. (Optional)
CFG{vcs_ab_prplname} {system}	Scalar	Specifies the authentication broker's principal name on system. (Optional)
CFG{vcs_ab_password} {system}	Scalar	Specifies the authentication broker's password on system. (Optional)

Table 11-4 Response file variables specific to configuring VCS cluster in secure mode *(continued)*

Variable	List or Scalar	Description
CFG{vcs_blobpath} {system}	Scalar	Specifies the path of the encrypted BLOB file for system. (Optional)

Table 11-5 lists the response file variables that specify the required information to configure VCS users.

Table 11-5 Response file variables specific to configuring VCS users

Variable	List or Scalar	Description
CFG{vcs_userenpw}	List	List of encoded passwords for VCS users The value in the list can be "Administrators Operators Guests" **Note:** The order of the values for the vcs_userenpw list must match the order of the values in the vcs_username list. (Optional)
CFG{vcs_username}	List	List of names of VCS users (Optional)
CFG{vcs_userpriv}	List	List of privileges for VCS users **Note:** The order of the values for the vcs_userpriv list must match the order of the values in the vcs_username list. (Optional)

Table 11-6 lists the response file variables that specify the required information to configure VCS notifications using SMTP.

Table 11-6 Response file variables specific to configuring VCS notifications using SMTP

Variable	List or Scalar	Description
CFG{vcs_smtpserver}	Scalar	Defines the domain-based hostname (example: smtp.symantecexample.com) of the SMTP server to be used for Web notification. (Optional)
CFG{vcs_smtprecp}	List	List of full email addresses (example: user@symantecexample.com) of SMTP recipients. (Optional)
CFG{vcs_smtprsev}	List	Defines the minimum severity level of messages (Information, Warning, Error, SevereError) that listed SMTP recipients are to receive. Note that the ordering of severity levels must match that of the addresses of SMTP recipients. (Optional)

Table 11-7 lists the response file variables that specify the required information to configure VCS notifications using SNMP.

Table 11-7 Response file variables specific to configuring VCS notifications using SNMP

Variable	List or Scalar	Description
CFG{vcs_snmpport}	Scalar	Defines the SNMP trap daemon port (default=162). (Optional)
CFG{vcs_snmpcons}	List	List of SNMP console system names (Optional)

Table 11-7 Response file variables specific to configuring VCS notifications using SNMP *(continued)*

Variable	List or Scalar	Description
CFG{vcs_snmpcsev}	List	Defines the minimum severity level of messages (Information, Warning, Error, SevereError) that listed SNMP consoles are to receive. Note that the ordering of severity levels must match that of the SNMP console system names. (Optional)

Table 11-8 lists the response file variables that specify the required information to configure VCS global clusters.

Table 11-8 Response file variables specific to configuring VCS global clusters

Variable	List or Scalar	Description
CFG{vcs_gconic} {system}	Scalar	Defines the NIC for the Virtual IP that the Global Cluster Option uses. You can enter 'all' as a system value if the same NIC is used on all systems. (Optional)
CFG{vcs_gcovip}	Scalar	Defines the virtual IP address to that the Global Cluster Option uses. (Optional)
CFG{vcs_gconetmask}	Scalar	Defines the Netmask of the virtual IP address that the Global Cluster Option uses. (Optional)

Sample response file for configuring VCS

Review the response file variables and their definitions.

See "Response file variables to configure VCS" on page 172.

Note: For Solaris x64 Platform Edition, the sample response file contains e1000g0, e1000g2, and e1000g3 instead of hme0, qfe0, qfe1.

```
#
# Configuration Values:
#
our %CFG;

$CFG{at_rootdomain}="root\@east.symantecexample.com";
$CFG{rootbroker}="east.symantecexample.com";
$CFG{opt}{configure}=1;
$CFG{opt}{gco}=1;
$CFG{opt}{ha}=1;
$CFG{prod}="VCS51";
$CFG{systems}=[ qw(galaxy nebula) ];
$CFG{vcs_allowcomms}=1;
$CFG{vcs_clusterid}=13221;
$CFG{vcs_clustername}="clus1";
$CFG{vcs_csgnetmask}="255.255.255.0";
$CFG{vcs_csgnic}{all}="hme0";
$CFG{vcs_csgvip}="10.10.12.1";
$CFG{vcs_gconetmask}="255.255.255.0";
$CFG{vcs_gcovip}="10.10.12.1";
$CFG{vcs_lltlink1}{galaxy}="qfe0";
$CFG{vcs_lltlink1}{nebula}="qfe0";
$CFG{vcs_lltlink2}{galaxy}="qfe1";
$CFG{vcs_lltlink2}{nebula}="qfe1";


$CFG{vcs_securitymenuopt}=1;
$CFG{vcs_smtprecp}=[ qw(earnie@symantecexample.com) ];
$CFG{vcs_smtprsev}=[ qw(SevereError) ];
$CFG{vcs_smtpserver}="smtp.symantecexample.com";
$CFG{vcs_snmpcons}=[ qw(neptune) ];
$CFG{vcs_snmpcsev}=[ qw(SevereError) ];
$CFG{vcs_snmpport}=162;
```

Chapter 12

Performing automated I/O fencing configuration for VCS

This chapter includes the following topics:

Configuring I/O fencing using response files

Typically, you can use the response file that the installer generates after you perform I/O fencing configuration to configure I/O fencing for VCS. You can also create a response file using the `-makeresponsefile` option of the installer.

To configure I/O fencing using response files

1. Make sure that VCS is configured.
2. Based on whether you want to configure disk-based or server-based I/O fencing, make sure you have completed the preparatory tasks.

   See "About planning to configure I/O fencing" on page 97.

3 Copy the response file to one of the cluster systems where you want to configure I/O fencing.

See "Sample response file for configuring disk-based I/O fencing" on page 183.

See "Sample response file for configuring server-based I/O fencing" on page 186.

4 Edit the values of the response file variables as necessary.

See "Response file variables to configure disk-based I/O fencing" on page 182.

See "Response file variables to configure server-based I/O fencing" on page 184.

5 Start the configuration from the system to which you copied the response file. For example:

```
# /opt/VRTS/install/installvcs -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Response file variables to configure disk-based I/O fencing

Table 12-1 lists the response file variables that specify the required information to configure disk-based I/O fencing for VCS.

Table 12-1 Response file variables specific to configuring disk-based I/O fencing

Variable	List or Scalar	Description
CFG{opt}{fencing}	Scalar	Performs the I/O fencing configuration. (Required)
CFG{vxfen_config_fencing_option}	Scalar	Specifies the I/O fencing configuration mode. ■ 1—Coordination Point Server-based I/O fencing ■ 2—Coordinator disk-based I/O fencing ■ 3—Disabled mode (Required)
CFG {vxfen_config _fencing_mechanism}	Scalar	Specifies the I/O fencing mechanism. (Optional)

Table 12-1 Response file variables specific to configuring disk-based I/O fencing *(continued)*

Variable	List or Scalar	Description
CFG{vxfen_config_fencing_dg}	Scalar	Specifies the disk group for I/O fencing. (Optional) **Note:** You must define either the vxfen_config_fencing_dg variable or the vxfen_config_fencing_newdg_disks variable.
CFG{vxfen_config _fencing_newdg_disks}	List	Specifies the disks to use to create a new disk group for I/O fencing. (Optional) **Note:** You must define either the vxfen_config_fencing_dg variable or the vxfen_config_fencing_newdg_disks variable.

Sample response file for configuring disk-based I/O fencing

Review the disk-based I/O fencing response file variables and their definitions.

See "Response file variables to configure disk-based I/O fencing" on page 182.

```
#
# Configuration Values:
#
our %CFG;

$CFG{opt}{configure}=1;
$CFG{opt}{fencing}=1;

$CFG{prod}="VCS51";

$CFG{systems}=[ qw(galaxy nebula) ];
$CFG{vcs_clusterid}=13221;
$CFG{vcs_clustername}="clus1";
$CFG{vxfen_config_fencing_dg}="fendg";
$CFG{vxfen_config_fencing_mechanism}="dmp";
$CFG{vxfen_config_fencing_newdg_disks}=
```

```
 [ qw(c1t1d0s2 c2t1d0s2 c3t1d0s2) ];
$CFG{vxfen_config_fencing_option}=2;
```

Response file variables to configure server-based I/O fencing

You can use a CP server response file to configure server-based customized I/O fencing. The installer uses the CP server response file for the following types of I/O fencing configurations:

- Client cluster fencing (server-based I/O fencing configuration itself)
  The installer configures server-based customized I/O fencing on the VCS cluster without prompting for user input.
- Disk-based fencing with the disk group already created
  The installer configures fencing in disk-based mode on the VCS cluster without prompting for user input.
  Disk-based fencing configuration is one in which SCSI-3 disks are used as the only coordination points.
  Disk-based fencing with the disk group already created means that the disk group consisting of the coordinating disks already exists on the VCS cluster nodes.
- Disk-based fencing with the disk group to be created
  The installer creates the disk group and configures fencing properly on all the nodes in the VCS cluster without user intervention.
  Disk-based fencing with the disk group to be created means that the disk group does not exist yet, but will be created with the disks mentioned as coordination point.

Table 12-2 lists the fields in the response file that are relevant for server-based customized I/O fencing.

Table 12-2 CP server response file definitions

Response file field	Definition
fencing_cpc_config_cpagent	Enter '1' or '0' depending upon whether you want to configure the Coordination Point agent using the installer or not. Enter "0" if you do not want to configure the Coordination Point agent using the installer. Enter "1" if you want to use the installer to configure the Coordination Point agent.

Table 12-2 CP server response file definitions *(continued)*

Response file field	Definition
fencing_cpc_cpagentgrp	Name of the service group which will have the Coordination Point agent resource as part of it. **Note:** This field is obsolete if the `fencing_cpc_config_cpagent` field is given a value of '0'.
fencing_cpc_cps	Virtual IP address or Virtual hostname of the CP servers.
fencing_cpc_reusedg	This response file field indicates whether to reuse an existing DG name for the fencing configuration in customized fencing (CP server and coordinator disks). Enter either a "1" or "0". Entering a "1" indicates reuse, and entering a "0" indicates do not reuse. When reusing an existing DG name for the mixed mode fencing configuration. you need to manually add a line of text , such as "$CFG{fencing_cpc_reusedg}=0" or "$CFG{fencing_cpc_reusedg}=1" before proceeding with a silent installation.
fencing_cpc_dgname	The name of the disk group to be used in the customized fencing, where at least one disk is being used.
fencing_cpc_diffab	This response field indicates whether the CP servers and VCS clusters use different root brokers. Entering a "1" indicates that they are using different root brokers. Entering a "0" indicates that they are not using different root brokers.
fencing_cpc_disks	The disks being used as coordination points if any.
fencing_cpc_ncps	Total number of coordination points being used, including both CP servers and disks.
fencing_cpc_ndisks	The number of disks being used.
fencing_cpc_ports	The port of the CP server that is denoted by *cps* .

Table 12-2 CP server response file definitions *(continued)*

Response file field	Definition
fencing_cpc_ccab	The name of the authentication broker (AB) for any one of the VCS cluster nodes.
fencing_cpc_cpsabport	The port at which the authentication broker (AB) mentioned above listens for authentication..
fencing_cpc_ccabport	The port at which the authentication broker (AB) mentioned above listens for authentication.
fencing_cpc_mechanism	The disk mechanism that is used by customized fencing. The value for this field is either "raw" or "dmp"
fencing_cpc_cpsab	The name of the authentication broker (AB) for any one of the CP servers.
fencing_cpc_security	This field indicates whether security is enabled or not Entering a "1" indicates that security is enabled. Entering a "0" indicates that security has not been enabled.

Sample response file for configuring server-based I/O fencing

The following is a sample response file used for server-based I/O fencing :

```
$CFG{fencing_cpc_config_cpagent}=0;
$CFG{fencing_cpc_cps}=[ qw(10.200.117.145) ];
$CFG{fencing_cpc_dgname}="vxfencoorddg";
$CFG{fencing_cpc_diffab}=0;
$CFG{fencing_cpc_disks}=[ qw(emc_clariion0_37 emc_clariion0_13) ];
$CFG{fencing_cpc_mechanism}="raw";
$CFG{fencing_cpc_ncps}=3;
$CFG{fencing_cpc_ndisks}=2;
$CFG{fencing_cpc_ports}{"10.200.117.145"}=14250;
$CFG{fencing_cpc_reusedg}=1;
$CFG{fencing_cpc_security}=1;
$CFG{opt}{configure}=1;
$CFG{opt}{fencing}=1;
$CFG{prod}="VCS51";
```

```
$CFG{systems}=[ qw(galaxy nebula) ];
$CFG{vcs_clusterid}=1256;
$CFG{vcs_clustername}="clus1";
$CFG{vxfen_config_fencing_option}=1;
```

Section 6

Manual installation

Chapter 13

Performing preinstallation tasks

This chapter includes the following topics:

Preparing for a manual installation

Before you start installation, log in as the superuser. Mount the disc, copy the files to a temporary location locally for your convenience. Each operating system occupies an entire disc. Each disc has an identical directory structure.

To prepare for installation

1. Log in as the superuser.
2. Mount the appropriate disc.

   See "Mounting the product disc" on page 67.
3. Copy the files to a temporary location on the system.

   ```
   # cp -r pkgs/* /tmp/install
   ```

Requirements for installing VCS

Review requirements before you install.

See "VCS installation requirements" on page 33.

Chapter 14

Manually installing VCS

This chapter includes the following topics:

About VCS manual installation

You can manually install and configure VCS instead of using the installvcs program.

A manual installation takes a lot of time, patience, and care. Symantec recommends that you use the installvcs program instead of the manual installation when possible.

Installing VCS software manually

If you manually install VCS software to upgrade your cluster, make sure to back up the previous VCS configuration files before you start the installation. These files follow:

- /etc/VRTSvcs/conf/config
- /etc/llttab
- /etc/gabtab
- /etc/llthosts

Table 14-1 lists the tasks that you must perform when you manually install and configure VCS 5.1.

Table 14-1 Manual installation tasks for VCS 5.1

Task	Reference
Install VCS software manually on each node in the cluster.	See "Installing VCS packages for a manual installation" on page 195.
Install VCS language pack software manually on each node in the cluster.	See "Installing language packages in a manual installation" on page 196.
Add a license key.	See "Adding a license key for a manual installation" on page 197.
Copy the installation guide to each node.	See "Copying the installation guide to each node" on page 199.
Configure LLT and GAB.	■ See "Configuring LLT for a manual installation" on page 205. ■ See "Configuring GAB for a manual installation" on page 208.
Configure VCS.	See "Configuring VCS" on page 209.
Start LLT, GAB, and VCS services.	See "Starting LLT, GAB, and VCS for a manual installation" on page 210.
Modify the VCS configuration.	See "Modifying the VCS configuration" on page 212.
Replace demo license with a permanent license.	See "Replacing a VCS demo license with a permanent license for manual installations" on page 199.

Viewing the list of VCS packages

During the VCS installation, the installer prompts you with an option to choose the VCS packages to install. You can view the list of packages that each of these options would install using the installer command-line option.

Manual installation or upgrade of the product requires you to install the packages in a specified order. For example, you must install some packages before other packages because of various product dependencies. The following installer command options list the packages in the order in which you must install these packages.

Table 14-2 describes the VCS package installation options and the corresponding command to view the list of packages.

Table 14-2 Installer command options to view VCS packages

Option	Description	Command option to view the list of packages
1	Installs only the minimal required VCS packages that provide basic functionality of the product.	`installvcs -minpkgs`
2	Installs the recommended VCS packages that provide complete functionality of the product. This option does not install the optional VCS packages.	`installvcs -recpkgs`
3	Installs all the VCS packages. You must choose this option to configure any optional VCS feature.	`installvcs -allpkgs`

To view the list of VCS packages

1 Navigate to the directory where you can start the installvcs program.

```
# cd cluster_server
```

2 Run the following command to view the list of packages. Based on what packages you want to install, enter the appropriate command option:

```
# ./installvcs -minpkgs
```

Or

```
# ./installvcs -recpkgs
```

Or

```
# ./installvcs -allpkgs
```

Installing VCS packages for a manual installation

All packages are installed into the /opt directory.

You can create lists of the packages to install.

See "Viewing the list of VCS packages" on page 194.

If you copied these files to /tmp/install, navigate to the directory and perform the following on each system:

To install VCS packages on a node

- Install the following required packages in the order shown:

```
# pkgadd -d VRTSvlic.pkg
# pkgadd -d VRTSperl.pkg
# pkgadd -d VRTSspt.pkg
# pkgadd -d VRTSllt.pkg
# pkgadd -d VRTSgab.pkg
# pkgadd -d VRTSvxfen.pkg
# pkgadd -d VRTSvcs.pkg
# pkgadd -d VRTScps.pkg
# pkgadd -d VRTSvcsag.pkg
# pkgadd -d VRTScutil.pkg
# pkgadd -d VRTSat.pkg
# pkgadd -d VRTSvcsea.pkg
```

See "Veritas Cluster Server installation packages" on page 383.

Installing language packages in a manual installation

Install the language packages that VCS requires after you install the base VCS packages.

See "Veritas Cluster Server installation packages" on page 383.

Before you install, make sure that you are logged on as superuser and that you have mounted the language disc.

See "Mounting the product disc" on page 67.

Perform the steps on each node in the cluster to install the language packages.

To install the language packages on a node

1. Copy the package files from the software disc to the temporary directory.

```
# cp -r pkgs/* /tmp
```

2. Install the following required and optional VCS packages from the compressed files:

   - Install the following required packages in the order shown for Chinese language support:

```
# pkgadd -d VRTSmulic.pkg
# pkgadd -d VRTSatZH.pkg
# pkgadd -d VRTSzhvm.pkg
```

- Install the following required packages in the order shown for Japanese language support:

```
# pkgadd -d VRTSmulic.pkg
# pkgadd -d VRTSatJA.pkg
# pkgadd -d VRTSjacav.pkg
# pkgadd -d VRTSjacse.pkg
# pkgadd -d VRTSjacs.pkg
# pkgadd -d VRTSjacsu.pkg
# pkgadd -d VRTSjadba.pkg
# pkgadd -d VRTSjadbe.pkg
# pkgadd -d VRTSjafs.pkg
# pkgadd -d VRTSjaodm.pkg
# pkgadd -d VRTSjavm.pkg
```

Adding a license key for a manual installation

You can either add the VCS license keys or use keyless licensing for VCS.

See "Setting or changing the product level for keyless licensing" on page 197.

After you have installed all packages on each cluster node, use the `vxlicinst` command to add the VCS license key on each system:

```
# cd /opt/VRTS/bin
# ./vxlicinst -k XXXX-XXXX-XXXX-XXXX-XXXX-XXX
```

Setting or changing the product level for keyless licensing

The keyless licensing method uses product levels to determine the Veritas products and functionality that are licensed. In order to use keyless licensing, you must set up a Management Server to manage your systems.

For more information and to download the management server, see the following URL:

http://go.symantec.com/vom

When you set the product license level for the first time, you enable keyless licensing for that system. If you install with the product installer and select the keyless option, you are prompted to select the product and feature level that you want to license.

After you install, you can change product license levels at any time to reflect the products and functionality that you want to license. When you set a product level, you agree that you have the license for that functionality.

To set or change the product level

1 View the current setting for the product level.

```
# vxkeyless [-v] display
```

2 View the possible settings for the product level.

```
# vxkeyless displayall
```

3 Set the desired product level.

```
# vxkeyless [-q] set prod_levels
```

where *prod_levels* is a comma-separated list of keywords, as shown in step 2

If you want to remove keyless licensing and enter a key, you must clear the keyless licenses. Use the NONE keyword to clear all keys from the system.

Warning: Clearing the keys disables the Veritas products until you install a new key or set a new product level.

To clear the product license level

1 View the current setting for the product license level.

```
# vxkeyless [-v] display
```

2 If there are keyless licenses installed, remove all keyless licenses:

```
# vxkeyless [-q] set NONE
```

For more details on using the `vxkeyless` utility, see the `vxkeyless(1m)` manual page.

Checking licensing information on the system for a manual installation

Use the `vxlicrep` utility to display information about all Veritas licenses on a system. For example, enter:

```
# cd /opt/VRTS/bin
# ./vxlicrep
```

From the output, you can determine the following:

- The license key

- The type of license
- The product for which it applies
- Its expiration date, if one exists
  Demo keys have expiration dates, while permanent keys and site keys do not.

Replacing a VCS demo license with a permanent license for manual installations

When a VCS demo key license expires, you can replace it with a permanent license using the `vxlicinst` program.

See "Checking licensing information on the system" on page 130.

Copying the installation guide to each node

After you install VCS, Symantec recommends that you copy the PDF version of this guide from the installation disc (cluster_server/docs/vcs_install.pdf) to the directory /opt/VRTS/docs on each node to make it available for reference.

Installing with JumpStart

These JumpStart instructions assume a working knowledge of JumpStart. See the JumpStart documentation that came with your operating system for details on using JumpStart. Only fresh installations of VCS are supported using JumpStart. Upgrading is not supported. The following procedure assumes a stand-alone configuration.

For the language pack, you can use JumpStart to install packages. You add the language packages in the script, and put those files in the JumpStart server directory.

Overview of JumpStart installation tasks

Review the summary of tasks before you perform the JumpStart installation.

1. Add a client (register to the JumpStart server). See the JumpStart documentation that came with your operating system for details.
2. Read the JumpStart installation instructions.
3. Generate the finish scripts.

   See "Generating the finish scripts" on page 200.

4 Prepare shared storage installation resources.

See "Preparing installation resources" on page 202.

5 Modify the rules file for JumpStart.

See the JumpStart documentation that came with your operating system for details.

6 Run JumpStart to install the Veritas product. Note that JumpStart may reboot systems after product installation.

7 Run the installer command from the disc or from directory /opt/VRTS/install directory to configure the Veritas software.

```
# /opt/VRTS/install/installer -configure
```

Generating the finish scripts

Perform these steps to generate the finish script to install VCS.

To generate the script

1 Run the installer program.

```
installprod -jumpstart directory_to_generate_scripts
```

Where *installprod* is the product's installation command, and *directory_to_generate_scripts* is where you want to put the scripts. The following is an example:

```
# ./installvcs -jumpstart /js_scripts
```

2 When you are prompted to encapsulate the root disk automatically, choose **yes** to do so. If you do not want to encapsulate it automatically, choose **no** and go to step 6.

3 Specify a disk group name for the root disk.

```
Specify the disk group name of the root disk to be encapsulated:
rootdg
```

4 Specify private region length.

```
Specify the private region length of the root disk to be
encapsulated: (65536)
```

5 Specify the disk's media name of the root disk to encapsulate.

```
Specify the disk media name of the root disk to be encapsulated:
(rootdg_01)
```

6 JumpStart finish scripts, installer scripts, and encapsulation scripts are generated in the directory you specified in step 1. Output resembles:

```
The finish scripts for VCS51 is generated at
/js_scripts/jumpstart_vcs51.fin
The installer script to configure VCS is generated at
/js_scripts/installvcs
The installer script to uninstall VCS is generated at
/js_scripts/uninstallvcs
The encapsulation boot disk script for VM is generated at
/js_scripts/encap_bootdisk_vm51.fin
```

List the js_scripts directory.

```
# ls /js_scripts
```

Output resembles:

```
encap_bootdisk_vm51.fin jumpstart_vcs51.fin installvcs uninstallvcs
```

7 Modify the JumpStart script according to your requirements. You must modify the BUILDSRC and ENCAPSRC values. Keep the values aligned with the resource location values.

See "Preparing installation resources" on page 202.

```
BUILDSRC="hostname_or_ip:/path_to_pkgs_patches_scripts"
// If you don't want to encapsulate the root disk automatically
// comment out the following line.
ENCAPSRC="hostname_or_ip:/path_to_encap_script"
```

8 If you want to install different products, use the following command to get the sequence for the product. In the following commands, replace the variable *prod* with the product's acronym. See the product documentation for more information.

- For the minimum set of packages, use:

  ```
  # installprod -minpkgs
  ```

- For the recommended set of packages, use:

```
# installprod -recpkgs
```

An example of this command is:

```
# ./installvcs -minpkgs
VCS: PKGS: VRTSvlic VRTSperl VRTSllt VRTSgab VRTSvxfen VRTSvcs
VRTSvcsag VRTSat
```

Use the list of packages that is generated to replace the package list in the finish scripts.

Preparing installation resources

Prepare resources for the JumpStart installation.

To prepare the resources

1. Copy the contents of the installation disc to the shared storage.

```
# cd /cdrom/cdrom0
# cp -r * BUILDSRC
```

2. Generate the response file for the package list that you found in Generating the finish scripts step 8. In this example the packages are: VRTSvlic VRTSperl VRTSllt VRTSgab VRTSvxfen VRTSvcs VRTSvcsag VRTSat.

```
# cd BUILDSRC/pkgs/
# pkgask -r package_name.response -d /BUILDSRC/pkgs/packages_name.pkg
```

3. Create the adminfile file under *BUILDSRC*/pkgs/ directory. The adminfile file's contents follow:

```
mail=
instance=overwrite
partial=nocheck
runlevel=quit
idepend=quit
rdepend=nocheck
space=quit
setuid=nocheck
conflict=nocheck
action=nocheck
basedir=default
```

4 Copy the install and uninstall scripts that you generated in Generating the finish scripts step 6 to *BUILDSRC* if you want to configure or uninstall from /opt/VRTS/install. You need to configure and uninstall from disc otherwise.

5 If you want to encapsulate the root disk automatically when perform the JumpStart installation, copy the scripts encap_bootdisk_vm51.fin generated in Generating the finish scripts step 6 to *ENCAPSRC*

Adding language pack information to the finish file

For the language pack, copy the language packages from the language pack installation disc to the shared storage.

```
# cd /cdrom/cdrom0/pkgs
# cp -r * BUILDSRC/pkgs
```

Add lines for the language packages in the finish script. If the finish file resembles:

```
. . .
for PKG in VRTSperl VRTSvlic VRTSicsco . . .

do
.
.
.
done
```

Add the following lines for the language pack after the patch information for VCS. Copy the command syntax between the "do" and "done" lines and add that for the language pack lines as well. Note that the line that starts "for PKG" is on three lines in this guide, but should be on a single line in the file.

```
. . .
for PKG in VRTSmulic VRTSatJA VRTSjacav VRTSjacs VRTSjacse
VRTSjacsu VRTSjadba VRTSjafs VRTSjavm VRTSjadbe VRTSjaodm
VRTSatZH VRTSzhvm

do
.
.
.
done
```

Chapter 15

Manually configuring VCS

This chapter includes the following topics:

Configuring LLT for a manual installation

VCS uses the Low Latency Transport (LLT) protocol for all cluster communications as a high-performance, low-latency replacement for the IP stack. LLT has two major functions.

It handles the following tasks:

- Traffic distribution
- Heartbeat traffic

To configure LLT, perform the following steps on each node in the cluster:

- Set up the file /etc/llthosts.
  See "Setting up /etc/llthosts for a manual installation" on page 206.
- Set up the file /etc/llttab.
  See "Setting up /etc/llttab for a manual installation" on page 206.
- Edit the following file on each node in the cluster to change the values of the LLT_START and the LLT_STOP environment variables to 1:
  /etc/default/llt

Setting up /etc/llthosts for a manual installation

The file llthosts(4) is a database. It contains one entry per system that links the LLT system ID (in the first column) with the LLT host name. You must ensure that contents of this file are identical on all the nodes in the cluster. A mismatch of the contents of the file can cause indeterminate behavior in the cluster.

Use vi or another editor, to create the file /etc/llthosts that contains the entries that resemble:

```
0 galaxy
1 nebula
```

Setting up /etc/lltab for a manual installation

The /etc/lltab file must specify the system's ID number (or its node name), its cluster ID, and the network links that correspond to the system. In addition, the file can contain other directives. Refer also to the sample lltab file in /opt/VRTSllt.

See "LLT directives for a manual installation" on page 207.

Run the `dladm show-dev` command to query all NICs.

Use vi or another editor to create the file /etc/lltab that contains the entries that resemble the following:

- For SPARC:

```
set-node galaxy
set-cluster 2
link qfe0 qfe:0 - ether - -
link qfe1 qfe:1 - ether - -
```

- For x64:

```
set-node galaxy
set-cluster 2
link e1000g0 /dev/e1000g:0 - ether - -
link e1000g1 /dev/e1000g:1 - ether - -
```

The first line must identify the system where the file exists. In the example, the value for `set-node` can be: galaxy, 0, or the file name /etc/nodename. The file needs to contain the name of the system (galaxy in this example). The next two lines, beginning with the link command, identify the two private network cards that the LLT protocol uses. The order of directives must be the same as in the sample lltab file in /opt/VRTSllt.

LLT directives for a manual installation

For more information about LLT directives, refer to the `lltab`(4) manual page.

Table 15-1 contains the LLT directives for a manual installation.

Table 15-1 LLT directives

Directive	Description
`set-node`	Assigns the system ID or symbolic name. The system ID number must be unique for each system in the cluster, and must be in the range 0-31. The symbolic name corresponds to the system ID, which is in /etc/llthosts file. Note that LLT fails to operate if any systems share the same ID.
`link`	Attaches LLT to a network interface. At least one link is required, and up to eight are supported. The first argument to link is a user-defined tag shown in the `lltstat(1M)` output to identify the link. It may also be used in `lltab` to set optional static MAC addresses. The second argument to link is the device name of the network interface. Its format is device_name:device_instance_number. The remaining four arguments to link are defaults; these arguments should be modified only in advanced configurations. There should be one link directive for each network interface. LLT uses an unregistered Ethernet SAP of 0xCAFE. If the SAP is unacceptable, refer to the `lltab(4)` manual page for information on how to customize SAP. Note that IP addresses do not need to be assigned to the network device; LLT does not use IP addresses.
`set-cluster`	Assigns a unique cluster number. Use this directive when more than one cluster is configured on the same physical network connection. LLT uses a default cluster number of zero.
`link-lowpri`	Use this directive in place of `link` for public network interfaces. This directive prevents VCS communication on the public network until the network is the last link, and reduces the rate of heartbeat broadcasts. Note that LLT distributes network traffic evenly across all available network connections. In addition to enabling VCS communication, it broadcasts heartbeats to monitor each network connection.

For more information about LLT directives, refer to the `lltab`(4) manual page.

Additional considerations for LLT for a manual installation

You must attach each network interface that is configured for LLT to a separate and distinct physical network.

By default, Sun systems assign the same MAC address to all interfaces. Thus, connecting two or more interfaces to a network switch can cause problems. Consider the following example. You configure an IP on one public interface and LLT on another. Both interfaces are connected to a switch. The duplicate MAC address on the two switch ports can cause the switch to incorrectly redirect IP traffic to the LLT interface and vice versa. To avoid this issue, configure the system to assign unique MAC addresses by setting the eeprom(1M) parameter local-mac-address? to true.

Configuring GAB for a manual installation

VCS uses the Group Membership Services/Atomic Broadcast (GAB) protocol for cluster membership and reliable cluster communications. GAB has two major functions.

It handles the following tasks:

- Cluster membership
- Cluster communications

To configure GAB

1 Set up an /etc/gabtab configuration file on each node in the cluster using vi or another editor. The following example shows an /etc/gabtab file:

```
/sbin/gabconfig -c -nN
```

Where the `-c` option configures the driver for use. The `-n`N option specifies that the cluster is not formed until at least N systems are ready to form the cluster. Symantec recommends that you set N to be the total number of systems in the cluster.

Warning: Symantec does not recommend the use of the `-c -x` option for `/sbin/gabconfig`. Using `-c -x` can lead to a split-brain condition.

---

2 Edit the following file on each node in the cluster to change the values of the GAB_START and the GAB_STOP environment variables to 1:

/etc/default/gab

Configuring VCS

VCS configuration requires the types.cf and main.cf files on each system in the cluster. Both of the files are in the /etc/VRTSvcs/conf/config directory.

main.cf file — The main.cf configuration file requires the following minimum essential elements:

- An "include" statement that specifies the file, types.cf, which defines the VCS bundled agent resources.
- The name of the cluster.
- The name of the systems that make up the cluster.

types.cf file — Note that the "include" statement in main.cf refers to the types.cf file. This text file describes the VCS bundled agent resources. During new installations, the types.cf file is automatically copied in to the /etc/VRTSvcs/conf/config directory.

When you manually install VCS, the file /etc/VRTSvcs/conf/config/main.cf contains only the line:

```
include "types.cf"
```

For a full description of the main.cf file, and how to edit and verify it, refer to the *Veritas Cluster Server Administrator's Guide*.

To configure VCS manually

1 Log on as superuser, and move to the directory that contains the configuration file:

```
# cd /etc/VRTSvcs/conf/config
```

2 Use vi or another text editor to edit the main.cf file, defining your cluster name and system names. Refer to the following example.

An example main.cf for a two-node cluster:

```
include "types.cf"
cluster VCSCluster2 ( )
system galaxy ( )
system nebula ( )
```

An example main.cf for a single-node cluster:

```
include "types.cf"
cluster VCSCluster1 ( )
system sn1
```

3 Save and close the main.cf file.

4 Edit the following file on each node in the cluster to change the values of the VCS_START and the VCS_STOP environment variables to 1:

/etc/default/vcs

Configuring the cluster UUID when creating a cluster manually

You need to configure the cluster UUID when you manually create a cluster.

To configure the cluster UUID when you create a cluster manually

- On one node in the cluster, perform the following command to populate the cluster UUID on each node in the cluster.

```
# /opt/VRTSvcs/bin/uuidconfig.pl -clus -configure nodeA
      nodeB ... nodeN
```

Where *nodeA*, *nodeB*, through *nodeN* are the names of the cluster nodes.

Starting LLT, GAB, and VCS for a manual installation

Start LLT, GAB, and VCS.

To start LLT

- On each node, type:
  - For Solaris 9:

```
# /etc/rc2.d/S70llt start
```

- For Solaris 10:

```
# svcadm enable system/llt
```

If LLT is configured correctly on each node, the console output resembles:

```
Sep  1 19:12:57 galaxy kernel: LLT INFO V-14-1-10009
LLT 5.1.00.00 Protocol available
```

See "Verifying LLT" on page 317.

To start GAB

- On each node, type:
  - Solaris 9:

```
# /etc/rc2.d/S92gab start
```

  - Solaris 10:

```
# svcadm enable system/gab
```

If GAB is configured correctly on each node, the console output resembles:

```
Sep  1 19:13:35 galaxy kernel: GAB INFO V-15-1-20021
GAB 5.1.00.00 available
```

See "Verifying GAB" on page 320.

To start VCS

- On each node, type:
  - Solaris 9:

```
# /etc/rc3.d/S99vcs start
```

  - Solaris 10:

```
# svcadm enable system/vcs
```

If VCS is configured correctly on each node, the console output resembles:

```
Apr  5 14:52:02 galaxy gab: GAB:20036: Port h gen 3972a201
      membership 01
```

See "Verifying the cluster" on page 322.

Modifying the VCS configuration

After the successful installation of VCS, you can modify the configuration of VCS using several methods. You can dynamically modify the configuration from the command line, Veritas Cluster Server Management Console, or the Cluster Manager (Java Console). For information on management tools, refer to the *Veritas Cluster Server Administrator's Guide*.

You can also edit the main.cf file directly. For information on the structure of the main.cf file, refer to the *Veritas Cluster Server Administrator's Guide*.

Configuring the ClusterService group

When you have installed VCS, and verified that LLT, GAB, and VCS work, you can create a service group to include the optional features. These features include the VCS notification components, and the Global Cluster option. If you manually added VCS to your cluster systems, you must manually create the ClusterService group. Presented in this guide is a reference configuration example of a system with a ClusterService group.

See "Sample main.cf file for VCS clusters" on page 311.

Chapter 16

Manually configuring the clusters for data integrity

This chapter includes the following topics:

Setting up disk-based I/O fencing manually

Tasks that are involved in setting up I/O fencing include:

Table 16-1 Tasks to set up I/O fencing manually

Action	Description
Initializing disks as VxVM disks	See "Initializing disks as VxVM disks" on page 133.
Identifying disks to use as coordinator disks	See "Identifying disks to use as coordinator disks" on page 214.
Checking shared disks for I/O fencing	See "Checking shared disks for I/O fencing" on page 136.
Setting up coordinator disk groups	See "Setting up coordinator disk groups" on page 214.
Creating I/O fencing configuration files	See "Creating I/O fencing configuration files" on page 215.
Modifying VCS configuration to use I/O fencing	See "Modifying VCS configuration to use I/O fencing" on page 216.

Table 16-1 Tasks to set up I/O fencing manually *(continued)*

Action	Description
Configuring Coordination Point agent to monitor coordination points	See "Configuring Coordination Point agent to monitor coordination points" on page 227.
Verifying I/O fencing configuration	See "Verifying I/O fencing configuration" on page 218.

Identifying disks to use as coordinator disks

After you add and initialize disks, identify disks to use as coordinator disks.

See "Initializing disks as VxVM disks" on page 133.

To identify the coordinator disks

1 List the disks on each node.

For example, execute the following commands to list the disks:

```
# vxdisk -o alldgs list
```

2 Pick three SCSI-3 PR compliant shared disks as coordinator disks.

See "Checking shared disks for I/O fencing" on page 136.

Setting up coordinator disk groups

From one node, create a disk group named vxfencoorddg. This group must contain three disks or LUNs. You must also set the coordinator attribute for the coordinator disk group. VxVM uses this attribute to prevent the reassignment of coordinator disks to other disk groups.

Note that if you create a coordinator disk group as a regular disk group, you can turn on the coordinator attribute in Volume Manager.

Refer to the *Veritas Volume Manager Administrator's Guide* for details on how to create disk groups.

The following example procedure assumes that the disks have the device names c1t1d0s2, c2t1d0s2, and c3t1d0s2.

To create the vxfencoorddg disk group

1 On any node, create the disk group by specifying the device names:

```
# vxdg init vxfencoorddg c1t1d0s2 c2t1d0s2 c3t1d0s2
```

2 Set the coordinator attribute value as "on" for the coordinator disk group.

```
# vxdg -g vxfencoorddg set coordinator=on
```

3 Deport the coordinator disk group:

```
# vxdg deport vxfencoorddg
```

4 Import the disk group with the `-t` option to avoid automatically importing it when the nodes restart:

```
# vxdg -t import vxfencoorddg
```

5 Deport the disk group. Deporting the disk group prevents the coordinator disks from serving other purposes:

```
# vxdg deport vxfencoorddg
```

Creating I/O fencing configuration files

After you set up the coordinator disk group, you must do the following to configure I/O fencing:

- Create the I/O fencing configuration file /etc/vxfendg
- Update the I/O fencing configuration file /etc/vxfenmode

To update the I/O fencing files and start I/O fencing

1 On each nodes, type:

```
# echo "vxfencoorddg" > /etc/vxfendg
```

Do not use spaces between the quotes in the "vxfencoorddg" text.

This command creates the /etc/vxfendg file, which includes the name of the coordinator disk group.

2 On all cluster nodes depending on the SCSI-3 mechanism, type one of the following selections:

- For DMP configuration:

```
# cp /etc/vxfen.d/vxfenmode_scsi3_dmp /etc/vxfenmode
```

- For raw device configuration:

```
# cp /etc/vxfen.d/vxfenmode_scsi3_raw /etc/vxfenmode
```

3 To check the updated /etc/vxfenmode configuration, enter the following command on one of the nodes. For example:

```
# more /etc/vxfenmode
```

4 Edit the following file on each node in the cluster to change the values of the VXFEN_START and the VXFEN_STOP environment variables to 1:

/etc/default/vxfen

Modifying VCS configuration to use I/O fencing

After you add coordinator disks and configure I/O fencing, add the UseFence = SCSI3 cluster attribute to the VCS configuration file /etc/VRTSvcs/conf/config/main.cf. If you reset this attribute to UseFence = None, VCS does not make use of I/O fencing abilities while failing over service groups. However, I/O fencing needs to be disabled separately.

To modify VCS configuration to enable I/O fencing

1 Save the existing configuration:

```
# haconf -dump -makero
```

2 Stop VCS on all nodes:

```
# hastop -all
```

3 If the I/O fencing driver vxfen is already running, stop the I/O fencing driver.

Depending on the Solaris version on the cluster nodes, run the following command:

- Solaris 9:

```
# /etc/init.d/vxfen stop
```

- Solaris 10:

```
# svcadm disable vxfen
```

4 Make a backup copy of the main.cf file:

```
# cd /etc/VRTSvcs/conf/config
# cp main.cf main.orig
```

5 On one node, use vi or another text editor to edit the main.cf file. To modify the list of cluster attributes, add the UseFence attribute and assign its value as SCSI3.

```
cluster clus1(
UserNames = { admin = "cDRpdxPmHpzS." }
Administrators = { admin }
HacliUserLevel = COMMANDROOT
CounterInterval = 5
UseFence = SCSI3
)
```

6 Save and close the file.

7 Verify the syntax of the file /etc/VRTSvcs/conf/config/main.cf:

```
# hacf -verify /etc/VRTSvcs/conf/config
```

8 Using rcp or another utility, copy the VCS configuration file from a node (for example, galaxy) to the remaining cluster nodes.

For example, on each remaining node, enter:

```
# rcp galaxy:/etc/VRTSvcs/conf/config/main.cf \
/etc/VRTSvcs/conf/config
```

9 Start the I/O fencing driver and VCS. Perform the following steps on each node:

- Start the I/O fencing driver.
  The vxfen startup script also invokes the `vxfenconfig` command, which configures the vxfen driver to start and use the coordinator disks that are listed in /etc/vxfentab.

  Depending on the Solaris version on the cluster nodes, run the following command:

  - Solaris 9:

    ```
    # /etc/init.d/vxfen start
    ```

  - Solaris 10:

```
# svcadm enable vxfen
```

- Start VCS.

```
# /opt/VRTS/bin/hastart
```

Verifying I/O fencing configuration

Verify from the vxfenadm output that the SCSI-3 disk policy reflects the configuration in the /etc/vxfenmode file.

To verify I/O fencing configuration

- On one of the nodes, type:

```
# vxfenadm -d

I/O Fencing Cluster Information:
================================

Fencing Protocol Version: 201
Fencing Mode: SCSI3
Fencing SCSI3 Disk Policy: dmp
Cluster Members:

   * 0 (galaxy)
   1 (nebula)

RFSM State Information:
   node 0 in state 8 (running)
   node 1 in state 8 (running)
```

Setting up server-based I/O fencing manually

Tasks that are involved in setting up server-based I/O fencing manually include:

Table 16-2 Tasks to set up server-based I/O fencing manually

Action	Description
Preparing the CP servers for use by the VCS cluster	See "Preparing the CP servers manually for use by the VCS cluster" on page 219.

Table 16-2 Tasks to set up server-based I/O fencing manually *(continued)*

Action	Description
Modifying I/O fencing configuration files to configure server-based I/O fencing	See "Configuring server-based fencing on the VCS cluster manually" on page 223.
Configuring Coordination Point agent to monitor coordination points	See "Configuring Coordination Point agent to monitor coordination points" on page 227.
Verifying the server-based I/O fencing configuration	See "Verifying server-based I/O fencing configuration" on page 229.

Preparing the CP servers manually for use by the VCS cluster

Use this procedure to manually prepare the CP server for use by the VCS cluster or clusters.

Table 16-3 displays the sample values used in this procedure.

Table 16-3 Sample values in procedure

CP server configuration component	Sample name
CP server	mycps1.symantecexample.com
Node #1 - VCS cluster	galaxy
Node #2 - VCS cluster	nebula
Cluster name	clus1
Cluster UUID	{f0735332-1dd1-11b2}

To manually configure CP servers for use by the VCS cluster

1 Determine the cluster name and uuid on the VCS cluster.

For example, issue the following commands on one of the VCS cluster nodes (galaxy):

```
# grep cluster /etc/VRTSvcs/conf/config/main.cf

cluster clus1

# cat /etc/vx/.uuids/clusuuid

{f0735332-1dd1-11b2}
```

2 Check whether the VCS cluster and nodes are present in the CP server.

```
# cpsadm -s mycps1.symantecexample.com -a list_nodes

ClusName  UUID                 Hostname(Node ID) Registered
clus1  {f0735332-1dd1-11b2} galaxy(0)         0
clus1  {f0735332-1dd1-11b2} nebula(1)         0
```

If the output does not show the cluster and nodes, then add them as described in the next step.

3 Add the VCS cluster and nodes to each CP server.

For example, issue the following command on the CP server (mycps1.symantecexample.com) to add the cluster:

```
# cpsadm -s mycps1.symantecexample.com -a add_clus\
 -c clus1  -u {f0735332-1dd1-11b2}

Cluster clus1 added successfully
```

Issue the following command on the CP server (mycps1.symantecexample.com) to add the first node:

```
# cpsadm -s mycps1.symantecexample.com -a add_node\
 -c clus1 -u {f0735332-1dd1-11b2} -h galaxy -n0

Node 0 (galaxy) successfully added
```

Issue the following command on the CP server (mycps1.symantecexample.com) to add the second node:

```
# cpsadm -s mycps1.symantecexample.com -a add_node\
 -c clus1 -u {f0735332-1dd1-11b2} -h nebula -n1

Node 1 (nebula) successfully added
```

4 If security is to be enabled, check whether the _HA_VCS_ users are created in the CP server.

If the output below does not show the users, then add them as described in the next step.

```
# cpsadm -s mycps1.symantecexample.com -a list_users

Username/Domain Type                             Cluster Name / UUID             Role

_HA_VCS_galaxy@HA_SERVICES@galaxy.symantec.com/vx clus1/{f0735332-1dd1-11b2} Operator

_HA_VCS_nebula@HA_SERVICES@nebula.symantec.com/vx clus1/{f0735332-1dd1-11b2} Operator
```

If security is to be disabled, then add the user name "cpsclient@hostname" to the server instead of the _HA_VCS_ users (for example, cpsclient@galaxy).

The CP server can only run in either secure mode or non-secure mode, both connections are not accepted at the same time.

5 Add the users to the CP server.

First, determine the user@domain to be added.

The user for fencing should be of the form _HA_VCS_*short-hostname* and domain name is that of HA_SERVICES user in the output of command:

```
# /opt/VRTScps/bin/cpsat listpd -t local
```

Next, issue the following commands on the CP server (mycps1.symantecexample.com):

```
# cpsadm -s mycps1.symantecexample.com -a add_user -e\
 _HA_VCS_galaxy@HA_SERVICES@galaxy.symantec.com\
 -f cps_operator -g vx

User _HA_VCS_galaxy@HA_SERVICES@galaxy.symantec.com
successfully added

# cpsadm -s mycps1.symantecexample.com -a add_user -e\
 _HA_VCS_nebula@HA_SERVICES@nebula.symantec.com\
 -f cps_operator -g vx

User _HA_VCS_nebula@HA_SERVICES@nebula.symantec.com
successfully added
```

6 Authorize the CP server user to administer the VCS cluster. You must perform this task for the CP server users corresponding to each node in the VCS cluster.

For example, issue the following command on the CP server (mycps1.symantecexample.com) for VCS cluster clus1 with two nodes galaxy and nebula:

```
# cpsadm -s mycps1.symantecexample.com -a\
add_clus_to_user -c clus1\
 -u {f0735332-1dd1-11b2}\
 -e _HA_VCS_galaxy@HA_SERVICES@galaxy.symantec.com\
 -f cps_operator -g vx


Cluster successfully added to user
 _HA_VCS_galaxy@HA_SERVICES@galaxy.symantec.com privileges.

# cpsadm -s mycps1.symantecexample.com -a\
add_clus_to_user -c clus1\
 -u {f0735332-1dd1-11b2}\
 -e _HA_VCS_nebula@HA_SERVICES@nebula.symantec.com\
 -f cps_operator -g vx


Cluster successfully added to user
 _HA_VCS_nebula@HA_SERVICES@nebula.symantec.com privileges.
```

Configuring server-based fencing on the VCS cluster manually

The configuration process for the client or VCS cluster to use CP server as a coordination point requires editing the /etc/vxfenmode file. You need to edit this file to specify the following information for your configuration:

- Fencing mode
- Fencing mechanism
- Fencing disk policy (if applicable to your I/O fencing configuration)
- Appropriate value for the security configuration
- CP server or CP servers
- Coordinator disk group (if applicable to your I/O fencing configuration)

Whenever coordinator disks are used as coordination points in your I/O fencing configuration, a disk group (vxfendg) has to be created. This disk group has to be

specified in the /etc/vxfenmode file. For information about creating the disk group, see the *Veritas™ Cluster Server Installation Guide*.

The customized fencing framework also generates the /etc/vxfentab file which has security setting and the coordination points (all the CP servers and disks from disk group specified in /etc/vxfenmode file).

Edit the following file on each node in the cluster to change the values of the VXFEN_START and the VXFEN_STOP environment variables to 1:

/etc/default/vxfen

Use a text editor to edit the /etc/vxfenmode file values to meet your configuration specifications.

The following file output provides an example of what the /etc/vxfenmode file contains:

```
#
# vxfen_mode determines in what mode VCS I/O Fencing should work.
#
# available options:
# scsi3      - use scsi3 persistent reservation disks
# customized - use script based customized fencing
# disabled   - run the driver but don't do any actual fencing
#
vxfen_mode=customized

# vxfen_mechanism determines the mechanism for customized I/O
# fencing that should be used.
#
# available options:
# cps      - use a coordination point server with optional script
#            controlled scsi3 disks
#
vxfen_mechanism=cps

#
# scsi3_disk_policy determines the way in which I/O Fencing
# communicates with the coordination disks. This field is
# required only if customized coordinator disks are being used.
#
# available options:
# dmp - use dynamic multipathing
# raw - connect to disks using the native interface
#
```

```
scsi3_disk_policy=dmp

# security when enabled uses secure communication to the cp server
# using VxAT (Veritas Authentication Service)
# available options:
# 0 - don't use Veritas Authentication Service for cp server
#   communication
# 1  - use Veritas Authentication Service for cp server
#   communication
security=1

#
# Specify 3 or more odd number of coordination points in this file,
# one in each row. They can be all-CP servers, all-SCSI-3 compliant
# coordinator disks, or a combination of CP servers and SCSI-3
# compliant coordinator disks. Please ensure that the CP server
# coordination points are numbered sequentially and in the same
# order on all the cluster nodes.
#
# Coordination Point Server(CPS) is specified as:
#
#  cps<number>=<Virtual IP/ Virtual hostname of cp server> in
# square brackets ([]), followed by ":" and CPS port number.
#
# Examples:
# cps1=[192.168.0.23]:14250
# cps2=[mycps.company.com]:14250
#
# SCSI-3 compliant coordinator disks are specified as:
#
#  vxfendg=<coordinator disk group name>
# Example:
#  vxfendg=vxfencoorddg
#
# Examples of different configurations:
#  1. All CP server coordination points
# cps1=
# cps2=
# cps3=
#
# 2. A combination of CP server and a disk group having two SCSI-3
# coordinator disks
# cps1=
```

```
# vxfendg=
# Note: The disk group specified in this case should have two disks
#
# 3. All SCSI-3 coordinator disks
# vxfendg=
# Note: The disk group specified in case should have three disks
#
```

Table 16-4 defines the vxfenmode parameters that must be edited.

Table 16-4 vxfenmode file parameters

vxfenmode File Parameter	Description
vxfen_mode	Fencing mode of operation. This parameter must be set to “customized”.
vxfen_mechanism	Fencing mechanism. This parameter defines the mechanism that is used for fencing. If one of the three coordination points is a CP server, then this parameter must be set to “cps”.
scsi3_disk_policy	Configure the vxfen module to use either DMP devices, "dmp" or the underlying raw character devices, "raw". **Note:** The configured disk policy is applied on all the nodes.
security	Security parameter 1 indicates that Symantec Product Authentication Service is used for CP server communications. Security parameter 0 indicates that communication with the CP server is made in non-secure mode. The default security value is 1. **Note:** Symantec only supports a configuration where both the CP server and client sides have the same security setting. The security setting on both sides must be either enabled or disabled.

Table 16-4 vxfenmode file parameters *(continued)*

vxfenmode File Parameter	Description
cps1, cps2, cps3, or vxfendg	Coordination point parameters. Enter either the Virtual IP address or FQHN (whichever is accessible) of the CP server. **Note:** Whenever coordinator disks are used in an I/O fencing configuration, a disk group has to be created (vxfendg) and specified in the /etc/vxfenmode file. Additionally, the customized fencing framework also generates the /etc/vxfentab file which specifies the security setting and the coordination points (all the CP servers and the disks from disk group specified in /etc/vxfenmode file).

After editing the /etc/vxfenmode file, run the vxfen init script to start fencing.

For example:

On Solaris 9 systems:

```
# /etc/init.d/vxfen start
```

On Solaris 10 systems:

```
# svcadm enable vxfen
```

Configuring Coordination Point agent to monitor coordination points

The following procedure describes how to manually configure the Coordination Point agent to monitor coordination points (CP server or SCSI-3 disks).

See the *Veritas Cluster Server Bundled Agents Reference Guide* for more information on the agent.

To configure Configuration Point agent to monitor coordination points

1. Ensure that your VCS cluster has been properly installed and configured with fencing enabled.
2. Create a parallel service group vxfen and add a coordpoint resource to the vxfen service group as follows:

```
# haconf -makerw
# hagrp -add vxfen
# hagrp -modify vxfen SystemList system1 0 system2 1
# hagrp -modify vxfen AutoFailOver 0
# hagrp -modify vxfen Parallel 1
# hagrp -modify vxfen SourceFile "./main.cf"
# hares -add coordpoint CoordPoint vxfen
# hares -modify coordpoint FaultTolerance 1
# hares -modify coordpoint Enabled 1
# haconf -dump -makero
```

3. Verify the status of the agent on the VCS cluster using the `hares` commands.

   For example:

```
# hares -state coordpoint
```

   The following is an example of the command and output::

```
# hares -state

# Resource    Attribute   System   Value
coordpoint   State        galaxy   ONLINE
```

4. Access the engine log to view the agent log. The agent log is written to the engine log.

   The agent log contains detailed Coordination Point agent monitoring information; including information about whether the Coordination Point agent is able to access all the coordination points, information to check on which coordination points the Coordination Point agent is reporting missing keys, etc.

   To view all such information in the engine log, change the dbg level for that node using the following command:

```
# hatype -modify coordpoint LogDbg 10
```

   The agent log can now be viewed at the following location:

   /var/VRTSvcs/log/engine_A.log

Verifying server-based I/O fencing configuration

During the VCS cluster installation, the installer populates the following files based on inputs that are received during the configuration phase:

- /etc/vxfenmode (edited for CP server)
- /etc/vxfentab (edited for CP server)

Verify that the I/O fencing configuration was successful by running the `vxfenadm` command. For example, run the following command:

```
# vxfenadm -d
```

For troubleshooting server-based I/O fencing configuration issues, refer to the *Veritas Cluster Server Administrator's Guide*.

Verify that I/O fencing is using the specified coordination points by running the `vxfenconfig` command. For example, run the following command:

```
# vxfenconfig -l
```

Section 7

Upgrading VCS

Chapter 17

Planning to upgrade VCS

This chapter includes the following topics:

About upgrading to VCS 5.1

You can upgrade VCS using one of the following methods:

- Typical upgrade using Veritas product installer or the installvcs program
  See "VCS supported upgrade paths" on page 234.
  See "Upgrading VCS using the script-based installer" on page 240.
- Typical upgrade Veritas Web installer
  See "VCS supported upgrade paths" on page 234.
  See "Upgrading VCS with the Veritas Web-based installer" on page 241.
- Phased upgrade to reduce downtime
  See "Performing a phased upgrade from VCS 5.0 MP3" on page 243.
- Automated upgrade using response files
  See "VCS supported upgrade paths" on page 234.
  See "Upgrading VCS using response files" on page 261.
- Upgrade using supported native operating system utility
  Live Upgrade
  See "About Live Upgrade" on page 265.

You can upgrade VCS 5.1 to Storage Foundation High Availability 5.1 using Veritas product installer or response files.

See the *Veritas Storage Foundation and High Availability Installation Guide*.

VCS supported upgrade paths

Table 17-1 lists the supported upgrade paths for Solaris SPARC.

Table 17-1 Supported upgrade paths for Solaris SPARC

Current version of VCS	Solaris 2.6, 7	Solaris 8	Solaris 9	Solaris 10
3.5 3.5 MP4 4.0 4.0 MP1 4.0 MP2	No upgrade path exists. Uninstall VCS. Upgrade the operating system to at least Solaris 9. Use the installer to perform a full installation of VCS to 5.1.	No upgrade path exists. Uninstall VCS. Upgrade the operating system to at least Solaris 9. Use the installer to perform a full installation of VCS to 5.1.	No upgrade path exists. Uninstall VCS. Use the installer to perform a full installation of VCS to 5.1.	n/a
4.1 4.1 MP1 4.1 MP2	n/a	No upgrade path exists. Uninstall VCS. Upgrade the operating system to at least Solaris 9. Use the installer to perform a full installation of VCS to 5.1.	Upgrade VCS to 4.1 MP2. Use the installer to upgrade VCS to 5.1.	Upgrade VCS to 4.1 MP2. Use the installer to upgrade VCS to 5.1.

Table 17-1 Supported upgrade paths for Solaris SPARC *(continued)*

Current version of VCS	Solaris 2.6, 7	Solaris 8	Solaris 9	Solaris 10
5.0 5.0 MP1 5.0 MP3	n/a	No upgrade path exists. Uninstall VCS. Upgrade the operating system to at least Solaris 9. Use the installer to perform a full installation of VCS to 5.1.	Use the installer to upgrade VCS to 5.1.	Use the installer to upgrade VCS to 5.1.

Table 17-2 lists the supported upgrade paths for the Solaris x64 Platform Edition.

Table 17-2 Supported upgrade paths for Solaris x64 Platform Edition

Current version of VCS	Solaris 10
4.1, 4.1 Phase 2	No upgrade path exists. Uninstall VCS. Use the installer to perform a full installation of VCS to 5.1.
5.0 5.0 MP3	Use the installer to upgrade VCS to 5.1.

Upgrading VCS in secure enterprise environments

In secure enterprise environments, ssh or rsh communication is not allowed between systems. In such cases, the installvcs program can upgrade VCS only on systems with which it can communicate (most often the local system only).

Run the installvcs program on each node to upgrade the cluster to VCS 5.1. On each node, the installvcs program updates the configuration, stops the cluster, and then upgrades VCS on the node. After the last node is upgraded and started, the upgrade is complete.

Warning: If you are running the cluster in secure mode, make sure to remove the file /tmp/disable_selfcont from the cluster before upgrading to VCS 5.1.

About phased upgrade

Perform a phased upgrade to minimize the downtime for the cluster. Depending on the situation, you can calculate the approximate downtime as follows:

You can fail over all your service groups to the nodes that are up.	Downtime equals the time that is taken to offline and online the service groups.
You have a service group that you cannot fail over to a node that runs during upgrade.	Downtime for that service group equals the time that is taken to perform an upgrade and restart the node.

Prerequisites for a phased upgrade

Before you start the upgrade, confirm that you have licenses for all the nodes that you plan to upgrade.

Planning for a phased upgrade

Plan out the movement of the service groups from node-to-node to minimize the downtime for any particular service group.

Some rough guidelines follow:

- Split the cluster in half. If the cluster has an odd number of nodes, calculate (n+1)/2, and start the upgrade with the even number of nodes.
- Split the cluster so that your high priority service groups remain online during the upgrade of the first subcluster.

Phased upgrade limitations

The following limitations primarily describe not to tamper with configurations or service groups during the phased upgrade:

- While you perform the upgrades, do not start any modules.
- When you start the installer, only select VCS.
- While you perform the upgrades, do not add or remove service groups to any of the nodes.
- Depending on your configuration, you may find that you cannot upgrade multiple nodes at the same time. You may only be able to upgrade one node at a time.

- For very large clusters, you might have to repeat these steps multiple times to upgrade your cluster.

Phased upgrade example

In this example, you have four nodes: node01, node02, node03, and node04. You also have four service groups: sg1, sg2, sg3, and sg4. For the purposes of this example, the cluster is split into two subclusters. The nodes node01 and node02 are in the first subcluster, which you first upgrade. The nodes node03 and node04 are in the second subcluster, which you upgrade last.

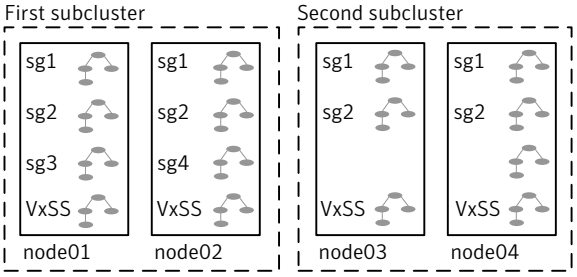
Each service group is running on the nodes as follows:

- sg1 and sg2 are parallel service groups and run on all the nodes.
- sg3 and sg4 are failover service groups. sg3 runs on node01 and sg4 runs on node02.
- VxSS service group runs on all nodes (secure mode is enabled)

In your system list, you have each service group that fails over to other nodes as follows:

- sg1 and sg2 are running on all the nodes.
- sg3 and sg4 can fail over to any of the nodes in the cluster.
- VxSS service group runs on all nodes

Figure 17-1 Example of phased upgrade set up



Phased upgrade example overview

This example's upgrade path follows:

- Move all the service groups from the first subcluster to the second subcluster.
- Upgrade the operating system on the first subcluster's nodes, if required.
- On the first subcluster, start the upgrade using the installation program.

- Get the second subcluster ready.
- Activate the first subcluster.
- Upgrade the operating system on the second subcluster's nodes, if required.
- On the second subcluster, start the upgrade using the installation program.
- Activate the second subcluster.

See "Performing a phased upgrade from VCS 5.0 MP3" on page 243.

Chapter 18

Performing a typical VCS upgrade using the installer

This chapter includes the following topics:

Before upgrading from 4.x using the script-based or Web-based installer

Before you upgrade VCS, perform the following steps if you are upgrading from VCS 4.x. You first need to remove deprecated resource types and modify changed values.

To prepare to upgrade to VCS 5.1 from VCS 4.x

1. Remove deprecated resources and modify attributes. The installer program can erase obsolete types and resources can be erased from the system or you can manually remove them.

   See "Manually removing deprecated resource types and modifying attributes" on page 407.

2. Stop the application agents that are installed on the VxVM disk (for example the NBU agent).

   Perform the following steps to stop the application agents:

   - Take the resources offline on all systems that you want to upgrade.

     ```
     # hares -offline resname -sys sysname
     ```

- Stop the application agents that are installed on VxVM disk on all the systems.

  ```
  # haagent -stop agentname -sys sysname
  ```

- Ensure that the agent processes are not running.

  ```
  # ps -ef | grep Agent
  ```

  This command does not list any processes in the VxVM installation directory.

3 Make sure that LLT, GAB, and VCS are running on all of the nodes in the cluster. The installer program cannot proceed unless these processes are running.

```
# lltconfig
```

LLT is running

```
# gabconfig -a

=======================================================
Port a gen cc701 membership 01
Port h gen cc704 membership 01
```

Upgrading VCS using the script-based installer

You can use the product installer to upgrade VCS.

To upgrade VCS using the product installer

1 Log in as superuser and mount the product disc.

2 Start the installer.

```
# ./installer
```

The installer starts the product installation program with a copyright message. It then specifies where it creates the logs. Note the log's directory and name.

3 From the opening Selection Menu, choose: **G** for "Upgrade a Product."

4 Enter the names of the nodes that you want to upgrade. Use spaces to separate node names. Press the Enter key to proceed.

The installer runs some verification checks on the nodes.

5 When the verification checks are complete, press the Enter key to continue.

The installer lists the packages to upgrade.

6 The installer asks if you want to stop VCS processes. Press the Enter key to continue.

The installer stops VCS processes, uninstalls packages, installs, upgrades, and configures VCS.

7 The installer lists the nodes that Symantec recommends you restart.

If you are upgrading from 4.x, you may need to create new VCS accounts if you used native OS accounts.

See "Creating new VCS accounts if you used native operating system accounts" on page 408.

Upgrading VCS with the Veritas Web-based installer

This section describes upgrading VCS with the Veritas Web-based installer. The installer detects and upgrades the product that is currently installed on the specified system or systems. If you want to upgrade to a different product, you may need to perform additional steps.

To upgrade VCS

1 Perform the required steps to save any data that you wish to preserve. For example, take back-ups of configuration files.

2 Start the Web-based installer.

See "Starting the Veritas Web-based installer" on page 156.

3 Select **Upgrade**.

The installer detects the product that is installed on the specified system.

4 On the License agreement page, select whether you accept the terms of the End User License Agreement (EULA). To continue, select **Yes I agree** and click **Next**.

5 Indicate the systems on which to upgrade. Enter one or more system names, separated by spaces. Click **Validate**.

6 Click **Next** to complete the upgrade.

After the upgrade completes, the installer displays the location of the log and summary files. If required, view the files to confirm the installation status.

7 Click **Finish**. The installer prompts you for another task.

If you are upgrading from 4.x, you may need to create new VCS accounts if you used native operating system accounts.

See "Creating new VCS accounts if you used native operating system accounts" on page 408.

Chapter 19

Performing a phased upgrade

This chapter includes the following topics:

Performing a phased upgrade from VCS 5.0 MP3

This section explains how to perform a phased upgrade of VCS on four nodes with four service groups. Note that in this scenario, the service groups cannot stay online during the upgrade of the second subcluster. Do not add, remove, or change resources or service groups on any nodes during the upgrade. These changes are likely to get lost after the upgrade. The following example illustrates the steps to perform a phased upgrade. The phased upgrade is from VCS 5.0 MP3 in a secure cluster to VCS 5.1 in a secure cluster.

See "About phased upgrade" on page 236.

Moving the service groups to the second subcluster

Perform the following steps to establish the service group's status and to switch the service groups.

To move service groups to the second subcluster

1 On the first subcluster, determine where the service groups are online.

```
# hagrp -state
```

The output resembles:

```
#Group   Attribute System Value
sg1      State     node01 |ONLINE|
sg1      State     node02 |ONLINE|
sg1      State     node03 |ONLINE|
sg1      State     node04 |ONLINE|
sg2      State     node01 |ONLINE|
sg2      State     node02 |ONLINE|
sg2      State     node03 |ONLINE|
sg2      State     node04 |ONLINE|
sg3      State     node01 |ONLINE|
sg3      State     node02 |OFFLINE|
sg3      State     node03 |OFFLINE|
sg3      State     node04 |OFFLINE|
sg4      State     node01 |OFFLINE|
sg4      State     node02 |ONLINE|
sg4      State     node03 |OFFLINE|
sg4      State     node04 |OFFLINE|
VxSS     State     node01 |ONLINE|
VxSS     State     node02 |ONLINE|
VxSS     State     node03 |ONLINE|
VxSS     State     node04 |ONLINE|
```

2 Offline the parallel service groups (sg1 and sg2) and the VXSS group from the first subcluster. Switch the failover service groups (sg3 and sg4) from the first subcluster (node01 and node02) to the nodes on the second subcluster (node03 and node04).

```
# hagrp -offline sg1 -sys node01
# hagrp -offline sg2 -sys node01
# hagrp -offline sg1 -sys node02
# hagrp -offline sg2 -sys node02
# hagrp -offline VxSS -sys node01
# hagrp -offline VxSS -sys node02
# hagrp -switch sg3 -to node03
# hagrp -switch sg4 -to node04
```

3 On the nodes in the first subcluster, unmount all the VxFS file systems that VCS does not manage, for example:

```
# df -k
```

```
Filesystem          kbytes    used   avail capacity  Mounted on
/dev/dsk/c1t0d0s0   66440242 10114415 55661425  16%  /
/devices                0       0       0     0%  /devices
ctfs                    0       0       0     0%  /system/contract
proc                    0       0       0     0%  /proc
mnttab                  0       0       0     0%  /etc/mnttab
swap                 5287408    1400 5286008     1%  /etc/svc/volatile
objfs                   0       0       0     0%  /system/object
sharefs                 0       0       0     0%  /etc/dfs/sharetab
/platform/sun4u-us3/lib/libc_psr/libc_psr_hwcap1.so.1
                   66440242 10114415 55661425    16%  /platform/sun4u-us3/lib/
libc_psr.so.1
/platform/sun4u-us3/lib/sparcv9/libc_psr/libc_psr_hwcap1.so.1
                     66440242 10114415 55661425    16%    /platform/sun4u-us3/lib/
sparcv9/libc_psr.so.1
fd                      0       0       0     0%    /dev/fd
swap                 5286064      56 5286008     1%    /tmp
swap                 5286056      48 5286008     1%    /var/run
swap                 5286008       0 5286008     0%    /dev/vx/dmp
swap                 5286008       0 5286008     0%    /dev/vx/rdmp
                      3.0G   18M  2.8G   1% /mnt/dg2/dg2vol1
/dev/vx/dsk/dg2/dg2vol2
                      1.0G   18M  944M   2% /mnt/dg2/dg2vol2
/dev/vx/dsk/dg2/dg2vol3
                       10G   20M  9.4G   1% /mnt/dg2/dg2vol3
```

```
# umount /mnt/dg2/dg2vol1
# umount /mnt/dg2/dg2vol2
# umount /mnt/dg2/dg2vol3
```

4 On the nodes in the first subcluster, stop all VxVM volumes (for each disk group) that VCS does not manage.

5 Make the configuration writable on the first subcluster.

```
# haconf -makerw
```

6 Freeze the nodes in the first subcluster.

```
# hasys -freeze -persistent node01
# hasys -freeze -persistent node02
```

7 Dump the configuration and make it read-only.

```
# haconf -dump -makero
```

8 Verify that the service groups are offline on the first subcluster that you want to upgrade.

```
# hagrp -state
```

Output resembles:

```
#Group Attribute System Value
sg1  State node01 |OFFLINE|
sg1  State node02 |OFFLINE|
sg1  State node03 |ONLINE|
sg1  State node04 |ONLINE|
sg2  State node01 |OFFLINE|
sg2  State node02 |OFFLINE|
sg2  State node03 |ONLINE|
sg2  State node04 |ONLINE|
sg3  State node01 |OFFLINE|
sg3  State node02 |OFFLINE|
sg3  State node03 |ONLINE|
sg3  State node04 |OFFLINE|
sg4  State node01 |OFFLINE|
sg4  State node02 |OFFLINE|
sg4  State node03 |OFFLINE|
sg4  State node04 |ONLINE|
VxSS State node01 |OFFLINE|
VxSS State node02 |OFFLINE|
VxSS State node03 |ONLINE|
VxSS State node04 |ONLINE|
```

9 Perform this step on the nodes (node01 and node02) in the first subcluster if the cluster uses I/O Fencing. Use an editor of your choice and change the following:

- In the `/etc/vxfenmode` file, change the value of the vxfen_mode variable from scsi3 to disabled. You want the line in the `vxfenmode` file to resemble:

```
vxfen_mode=disabled
```

- In the `/etc/VRTSvcs/conf/config/main.cf` file, change the value of the UseFence attribute from SCSI3 to NONE. You want the line in the `main.cf` file to resemble:

```
UseFence = NONE
```

10 Back up the llttab, llthosts, gabtab, types.cf, main.cf and AT configuration files on the first subcluster.

```
# cp /etc/llttab /etc/llttab.bkp
# cp /etc/llthosts /etc/llthosts.bkp
# cp /etc/gabtab /etc/gabtab.bkp
# cp /etc/VRTSvcs/conf/config/main.cf \
     /etc/VRTSvcs/conf/config/main.cf.bkp
# cp /etc/VRTSvcs/conf/config/types.cf \
     /etc/VRTSvcs/conf/config/types.cf.bkp
# /opt/VRTSat/bin/vssat showbackuplist
B|/var/VRTSat/.VRTSat/profile/VRTSatlocal.conf
B|/var/VRTSat/.VRTSat/profile/certstore
B|/var/VRTSat/ABAuthSource
B|/etc/vx/vss/VRTSat.conf
Quiescing ...
Snapshot Directory :/var/VRTSatSnapShot
```

Upgrading the operating system on the first subcluster

You can perform the operating system upgrade on the first subcluster, if required. Refer to the operating system's documentation for more information.

Upgrading the first subcluster

You now navigate to the installer program and start it.

To start the installer for the phased upgrade

1 Confirm that you are logged on as the superuser and you mounted the product disc.

2 Navigate to the folder that contains installvcs.

```
# cd /cluster_server
```

3 Make sure that VCS is running. Start the installvcs program, specify the nodes in the first subcluster (node1 and node2).

```
# ./installvcs node1 node2
```

The program starts with a copyright message and specifies the directory where it creates the logs.

4 Enter **y** to agree to the End User License Agreement (EULA).

```
Do you agree with the terms of the End User License Agreement
as specified in the EULA.pdf file present on media? [y,n,q,?] y
```

5 Review the available installation options.

See "Veritas Cluster Server installation packages" on page 383.

1 Installs only the minimal required VCS packages that provides basic functionality of the product.

2 Installs the recommended VCS packages that provides complete functionality of the product. This option does not install the optional VCS packages.

Note that this option is the default.

3 Installs all the VCS packages.

You must choose this option to configure any optional VCS feature.

4 Displays the VCS packages for each option.

For this example, select **3** for all packages.

```
Select the packages to be installed on all systems? [1-4,q,?]
(2) 3
```

6 The installer performs a series of checks and tests to ensure communications, licensing, and compatibility.

7 When you are prompted, reply **y** to continue with the upgrade.

```
Do you want to continue? [y,n,q] (y)
```

8 When you are prompted, reply **y** to stop appropriate processes.

```
Do you want to stop VCS processes? [y,n,q] (y)
```

9 The installer ends for the first subcluster with the following output:

```
    Configuring VCS: 100%

    Estimated time remaining: 0:00

    Performing VCS upgrade configuration ..................... Done

Veritas Cluster Server Configure completed successfully


You are performing phased upgrade (Phased 1) on the systems.
Follow  the steps in install guide to upgrade the remaining
systems.

Would you like to send the information about this installation to
Symantec to help improve installation in the future? [y,n,q,?] (y)
```

The upgrade is finished on the first subcluster. Do not reboot the nodes in the first subcluster until you complete the Preparing the second subcluster procedure.

Preparing the second subcluster

Perform the following steps on the second subcluster before rebooting nodes in the first subcluster.

To prepare to upgrade the second subcluster

1 Get the summary of the status of your resources.

```
# hastatus -summ
-- SYSTEM STATE
-- System               State                Frozen

A  node01               EXITED                1
A  node02               EXITED                1
A  node03               RUNNING               0
A  node04               RUNNING               0

-- GROUP STATE
-- Group           System  Probed     AutoDisabled    State

B  SG1             node01   Y          N               OFFLINE
B  SG1             node02   Y          N               OFFLINE
B  SG1             node03   Y          N               ONLINE
B  SG1             node04   Y          N               ONLINE
B  SG2             node01   Y          N               OFFLINE
B  SG2             node02   Y          N               OFFLINE
B  SG2             node03   Y          N               ONLINE
B  SG2             node04   Y          N               ONLINE
B  SG3             node01   Y          N               OFFLINE
B  SG3             node02   Y          N               OFFLINE
B  SG3             node03   Y          N               ONLINE
B  SG3             node04   Y          N               OFFLINE
B  SG4             node01   Y          N               OFFLINE
B  SG4             node02   Y          N               OFFLINE
B  SG4             node03   Y          N               OFFLINE
B  SG4             node04   Y          N               ONLINE
B  VxSS            node01   Y          N               OFFLINE
B  VxSS            node02   Y          N               OFFLINE
B  VxSS            node03   Y          N               ONLINE
B  VxSS            node04   Y          N               ONLINE
```

2 Unmount all the VxFS file systems that VCS does not manage, for example:

```
# df -k
```

```
Filesystem            kbytes    used   avail capacity  Mounted on
/dev/dsk/c1t0d0s0    66440242 10114415 55661425    16%    /
/devices                   0       0       0     0%    /devices
ctfs                       0       0       0     0%    /system/contract
proc                       0       0       0     0%    /proc
mnttab                     0       0       0     0%    /etc/mnttab
swap                 5287408    1400 5286008     1%    /etc/svc/volatile
objfs                      0       0       0     0%    /system/object
sharefs                    0       0       0     0%    /etc/dfs/sharetab
/platform/sun4u-us3/lib/libc_psr/libc_psr_hwcap1.so.1
                     66440242 10114415 55661425    16%    /platform/sun4u-us3/
lib/libc_psr.so.1
/platform/sun4u-us3/lib/sparcv9/libc_psr/libc_psr_hwcap1.so.1
                     66440242 10114415 55661425    16%    /platform/sun4u-us3/
lib/sparcv9/libc_psr.so.1
fd                         0       0       0     0%    /dev/fd
swap                 5286064      56 5286008     1%    /tmp
swap                 5286056      48 5286008     1%    /var/run
swap                 5286008       0 5286008     0%    /dev/vx/dmp
swap                 5286008       0 5286008     0%    /dev/vx/rdmp
                      3.0G   18M  2.8G   1% /mnt/dg2/dg2vol1
/dev/vx/dsk/dg2/dg2vol2
                      1.0G   18M  944M   2% /mnt/dg2/dg2vol2
/dev/vx/dsk/dg2/dg2vol3
                       10G   20M  9.4G   1% /mnt/dg2/dg2vol3
```

```
# umount /mnt/dg2/dg2vol1
# umount /mnt/dg2/dg2vol2
# umount /mnt/dg2/dg2vol3
```

3 Stop all VxVM volumes (for each disk group) that VCS does not manage.

4 Make the configuration writable on the second subcluster.

```
# haconf -makerw
```

5 Unfreeze the service groups.

```
# hagrp -unfreeze sg1 -persistent
# hagrp -unfreeze sg2 -persistent
# hagrp -unfreeze sg3 -persistent
# hagrp -unfreeze sg4 -persistent
# hagrp -unfreeze VxSS -persistent
```

6 Dump the configuration and make it read-only.

```
# haconf -dump -makero
```

7 Take the service groups offline on node03 and node04.

```
# hagrp -offline sg1 -sys node03
# hagrp -offline sg1 -sys node04
# hagrp -offline sg2 -sys node03
# hagrp -offline sg2 -sys node04
# hagrp -offline sg3 -sys node03
# hagrp -offline sg4 -sys node04
# hagrp -offline VxSS -sys node03
# hagrp -offline VxSS -sys node04
```

8 Verify the state of the service groups.

```
# hagrp -state
#Group       Attribute    System     Value
SG1             State      node01    |OFFLINE|
SG1             State      node02    |OFFLINE|
SG1             State      node03    |OFFLINE|
SG1             State      node04    |OFFLINE|
SG2             State      node01    |OFFLINE|
SG2             State      node02    |OFFLINE|
SG2             State      node03    |OFFLINE|
SG2             State      node04    |OFFLINE|
SG3             State      node01    |OFFLINE|
SG3             State      node02    |OFFLINE|
SG3             State      node03    |OFFLINE|
SG3             State      node04    |OFFLINE|
VxSS            State      node01    |OFFLINE|
VxSS            State      node02    |OFFLINE|
VxSS            State      node03    |OFFLINE|
VxSS            State      node04    |OFFLINE|
```

9 Perform this step on node03 and node04 if the cluster uses I/O Fencing. Use an editor of your choice and change the following:

- In the `/etc/vxfenmode` file, change the value of the vxfen_mode variable from scsi3 to disabled. You want the line in the `vxfenmode` file to resemble:

```
vxfen_mode=disabled
```

- In the `/etc/VRTSvcs/conf/config/main.cf` file, change the value of the UseFence attribute from SCSI3 to NONE. You want the line in the `main.cf` file to resemble:

```
UseFence = NONE
```

10 Stop VCS, I/O Fencing, GAB, and LLT on node03 and node04.

- Solaris 9:

```
# /opt/VRTSvcs/bin/hastop -local
# /etc/init.d/vxfen stop
# /etc/init.d/gab stop
# /etc/init.d/llt stop
```

- Solaris 10:

```
# /opt/VRTSvcs/bin/hastop -local
# svcadm disable /system/vxfen
# svcadm disable /system/gab
# svcadm disable /system/llt
```

11 Make sure that the VXFEN, GAB, and LLT modules on node03 and node04 not loaded.

- Solaris 9:

```
# /etc/init.d/vxfen status
VXFEN module is not loaded

# /etc/init.d/gab status
GAB module is not loaded

# /etc/init.d/llt status
LLT module is not loaded
```

- Solaris 10:

```
# /lib/svc/method/vxfen status
VXFEN module is not loaded

# /lib/svc/method/gab status
GAB module is not loaded

# /lib/svc/method/llt status
LLT module is not loaded
```

Activating the first subcluster

Get the first subcluster ready for the service groups.

Note: These steps fulfill part of the installer's output instructions, see Upgrading the first subcluster step 9.

To activate the first subcluster

1. Perform this step on node01 and node02 if the cluster uses I/O Fencing. Use an editor of your choice and revert the following to an enabled state before you reboot the first subcluster's nodes:

   - In the `/etc/VRTSvcs/conf/config/main.cf` file, change the value of the UseFence attribute from NONE to SCSI3. You want the line in the `main.cf` file to resemble:

     ```
     UseFence = SCSI3
     ```

   - In the `/etc/vxfenmode` file, change the value of the vxfen_mode variable from disabled to scsi3. You want the line in the `vxfenmode` file to resemble:

     ```
     vxfen_mode=scsi3
     ```

2. Reboot the node01 and node02 in the first subcluster.

   ```
   # /usr/sbin/shutdown -y -i6 -g0
   ```

3. Seed node01 and node02 in the first subcluster.

   ```
   # gabconfig -xc
   ```

4. Make the configuration writable on the first subcluster.

   ```
   # haconf -makerw
   ```

5 Unfreeze the nodes in the first subcluster.

```
# hasys -unfreeze -persistent node01
# hasys -unfreeze -persistent node02
```

6 Dump the configuration and make it read-only.

```
# haconf -dump -makero
```

7 Bring the service groups online on node01 and node02.

```
# hagrp -online sg1 -sys node01
# hagrp -online sg1 -sys node02
# hagrp -online sg2 -sys node01
# hagrp -online sg2 -sys node02
# hagrp -online sg3 -sys node01
# hagrp -online sg4 -sys node02
# hagrp -online VxSS -sys node01
# hagrp -online VxSS -sys node02
```

Upgrading the operating system on the second subcluster

You can perform the operating system upgrade on the second subcluster, if required. Refer to the operating system's documentation for more information.

Before you perform the operating system upgrade, make sure to disable VCS, VXFEN, GAB, and LLT.

To disable VCS, VXFEN, GAB, and LLT

1 On the second subcluster, disable VCS so that it does not start after reboot. Edit the `vcs` file in `/etc/default`. Open the `vcs` file in an editor, and change the line that reads VCS_START=1 to VCS_START=**0**. Save and close the file.

2 On the second subcluster, disable VXFEN so that it does not start after reboot. Edit the `vxfen` file in `/etc/default`. Open the `vxfen` file in an editor, and change the line that reads VXFEN_START=1 to VXFEN_START=**0**. Save and close the file.

3 On the second subcluster, disable GAB so that it does not start after reboot. Edit the `gab` file in `/etc/default`. Open the `gab` file in an editor, and change the line that reads GAB_START=1 to GAB_START=**0**. Save and close the file.

4 On the second subcluster, disable LLT so that it does not start after reboot. Edit the `llt` file in `/etc/default`. Open the `llt` file in an editor, and change the line that reads LLT_START=1 to LLT_START=**0**. Save and close the file.

Perform the operating system upgrade. After you finish the operating system, enable VCS, VXFEN, GAB and LLT.

To enable VCS, VXFEN, GAB and LLT

- On second subcluster, perform following commands:
  - Solaris 9:

```
# /etc/init.d/llt start
# /etc/init.d/gab start
# /etc/init.d/vxfen start
# /etc/init.d/vcs start
```

  - Solaris 10:

```
# svcadm enable /system/llt
# svcadm enable /system/gab
# svcadm enable /system/vxfen
# svcadm enable /system/vcs
```

Upgrading the second subcluster

Perform the following procedure to upgrade the second subcluster (node03 and node04).

To start the installer to upgrade the second subcluster

1. Confirm that you are logged on as the superuser and you mounted the product disc.
2. Navigate to the folder that contains installvcs.

```
# cd /cluster_server
```

3. Confirm that VCS is stopped on node03 and node04. Start the installvcs program, specify the nodes in the second subcluster (node3 and node4).

```
# ./installvcs node3 node4
```

   The program starts with a copyright message and specifies the directory where it creates the logs.

4. Enter **y** to agree to the End User License Agreement (EULA).

```
Do you agree with the terms of the End User License Agreement
as specified in the EULA.pdf file present on media? [y,n,q,?] y
```

5 Review the available installation options.

See "Veritas Cluster Server installation packages" on page 383.

1 Installs only the minimal required VCS packages that provides basic functionality of the product.

2 Installs the recommended VCS packages that provides complete functionality of the product. This option does not install the optional VCS packages.

Note that this option is the default.

3 Installs all the VCS packages.

You must choose this option to configure any optional VCS feature.

4 Displays the VCS packages for each option.

For this example, select **3** for all packages.

```
Select the packages to be installed on all systems? [1-4,q,?]
(2) 3
```

6 The installer performs a series of checks and tests to ensure communications, licensing, and compatibility.

7 When you are prompted, reply **y** to continue with the upgrade.

```
Do you want to continue? [y,n,q] (y)
```

8 When you are prompted, reply **y** to stop VCS processes.

```
Do you want to stop VCS processes? [y,n,q] (y)
```

9 Monitor the installer program answering questions as appropriate until the upgrade completes.

Finishing the phased upgrade

You now have to reboot the nodes in the second subcluster.

To finish the upgrade

1 Verify that the cluster UUID is the same on the nodes in the second subcluster and the first subcluster. Run the following command to display the cluster UUID:

```
# /opt/VRTSvcs/bin/uuidconfig.pl [-rsh]
-clus -display node1 [node2 ...]
```

If the cluster UUID differs, manually copy the cluster UUID from a node in the first subcluster to the nodes in the second subcluster. For example:

```
# /opt/VRTSvcs/bin/uuidconfig.pl [-rsh] -clus
-copy -from_sys node01 -to_sys node03 node04
```

2 Perform this step on node03 and node04 if the cluster uses I/O Fencing. Use an editor of your choice and revert the following to an enabled state before you reboot the second subcluster's nodes:

- In the `/etc/vxfenmode` file, change the value of the vxfen_mode variable from disabled to scsi3. You want the line in the `vxfenmode` file to resemble:

```
vxfen_mode=scsi3
```

3 Reboot the node03 and node04 in the second subcluster.

```
# /usr/sbin/shutdown -y -i6 -g0
```

The nodes in the second subcluster join the nodes in the first subcluster.

4 Check to see if VCS and its components are up.

```
# gabconfig -a
GAB Port Memberships
===============================================================
Port a gen   nxxxnn membership 0123
Port b gen   nxxxnn membership 0123
Port h gen   nxxxnn membership 0123
```

5 Run an `hastatus -sum` command to determine the status of the nodes, service groups, and cluster.

```
# hastatus -sum

-- SYSTEM STATE
-- System          State           Frozen

A  node01          RUNNING         0
A  node02          RUNNING         0
A  node03          RUNNING         0
A  node04          RUNNING         0

-- GROUP STATE
-- Group    System    Probed   AutoDisabled   State

B  VxSS     node01    Y        N              ONLINE
B  VxSS     node02    Y        N              ONLINE
B  VxSS     node03    Y        N              ONLINE
B  VxSS     node04    Y        N              ONLINE
B  sg1      node01    Y        N              ONLINE
B  sg1      node02    Y        N              ONLINE
B  sg1      node03    Y        N              ONLINE
B  sg1      node04    Y        N              ONLINE
B  sg2      node01    Y        N              ONLINE
B  sg2      node02    Y        N              ONLINE
B  sg2      node03    Y        N              ONLINE
B  sg2      node04    Y        N              ONLINE
B  sg3      node01    Y        N              ONLINE
B  sg3      node02    Y        N              OFFLINE
B  sg3      node03    Y        N              OFFLINE
B  sg3      node04    Y        N              OFFLINE
B  sg4      node01    Y        N              OFFLINE
B  sg4      node02    Y        N              ONLINE
B  sg4      node03    Y        N              OFFLINE
B  sg4      node04    Y        N              OFFLINE
```

6 After the upgrade is complete, mount the VxFS file systems and start the VxVM volumes (for each disk group) that VCS does not manage.

In this example, you have performed a phased upgrade of VCS. The service groups were down when you took them offline on node03 and node04, to the time VCS brought them online on node01 or node02.

Chapter 20

Performing an automated VCS upgrade using response files

This chapter includes the following topics:

Upgrading VCS using response files

Typically, you can use the response file that the installer generates after you perform VCS upgrade on one cluster to upgrade VCS on other clusters. You can also create a response file using the `-makeresponsefile` option of the installer.

To perform automated VCS upgrade

1. Make sure the systems where you want to upgrade VCS meet the upgrade requirements.
2. Make sure the pre-upgrade tasks are completed.
3. Copy the response file to one of the cluster systems where you want to upgrade VCS.

   See "Sample response file for upgrading VCS" on page 264.
4. Edit the values of the response file variables as necessary.

   See "Response file variables to upgrade VCS" on page 262.

5 Mount the product disc and navigate to the folder that contains the installation program.

6 Start the upgrade from the system to which you copied the response file. For example:

```
# ./installer -responsefile /tmp/response_file

# ./installvcs -responsefile /tmp/response_file
```

Where /tmp/*response_file* is the response file's full path name.

Response file variables to upgrade VCS

Table 20-1 lists the response file variables that you can define to upgrade VCS.

Table 20-1 Response file variables specific to upgrading VCS

Variable	List or Scalar	Description
CFG{opt}{upgrade}	Scalar	Upgrades VCS packages. (Required)
CFG{accepteula}	Scalar	Specifies whether you agree with EULA.pdf on the media. (Required)
CFG{opt}{stopfail_allow}	Scalar	Decides whether or not to proceed if the installer fails while stopping the processes or while unloading the drivers. (Optional)
CFG{opt}{systems}	List	List of systems on which the product is to be upgraded. (Optional)
CFG{prod}	Scalar	Defines the product to be upgraded. The value is VCS51 for VCS. (Required)

Table 20-1 Response file variables specific to upgrading VCS *(continued)*

Variable	List or Scalar	Description
CFG{vcs_allowcomms}	Scalar	Indicates whether or not to start LLT and GAB when you set up a single-node cluster. The value can be 0 (do not start) or 1 (start). (Required)
CFG{opt}{keyfile}	Scalar	Defines the location of an ssh keyfile that is used to communicate with all remote systems. (Optional)
CFG{opt}{patchpath}	Scalar	Defines a location, typically an NFS mount, from which all remote systems can install product patches. The location must be accessible from all target systems. (Optional)
CFG{opt}{pkgpath}	Scalar	Defines a location, typically an NFS mount, from which all remote systems can install product packages. The location must be accessible from all target systems. (Optional)
CFG{opt}{tmppath}	Scalar	Defines the location where a working directory is created to store temporary files and the depots that are needed during the install. The default location is /var/tmp. (Optional)

Table 20-1 Response file variables specific to upgrading VCS *(continued)*

Variable	List or Scalar	Description
CFG{opt}{logpath}	Scalar	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. **Note:** The installer copies the response files and summary files also to the specified *logpath* location. (Optional)
CFG{opt}{rsh}	Scalar	Defines that *rsh* must be used instead of ssh as the communication method between systems. (Optional)

Sample response file for upgrading VCS

Review the response file variables and their definitions.

See "Response file variables to upgrade VCS" on page 262.

```
#
# Configuration Values:
#
our %CFG;

$CFG{accepteula}=1;
$CFG{vcs_allowcomms}=1;
$CFG{opt}{upgrade}=1;
$CFG{prod}="VCS51";
$CFG{systems}=[ qw( galaxy nebula) ];
```

Chapter 21

Upgrading using Live Upgrade

This chapter includes the following topics:

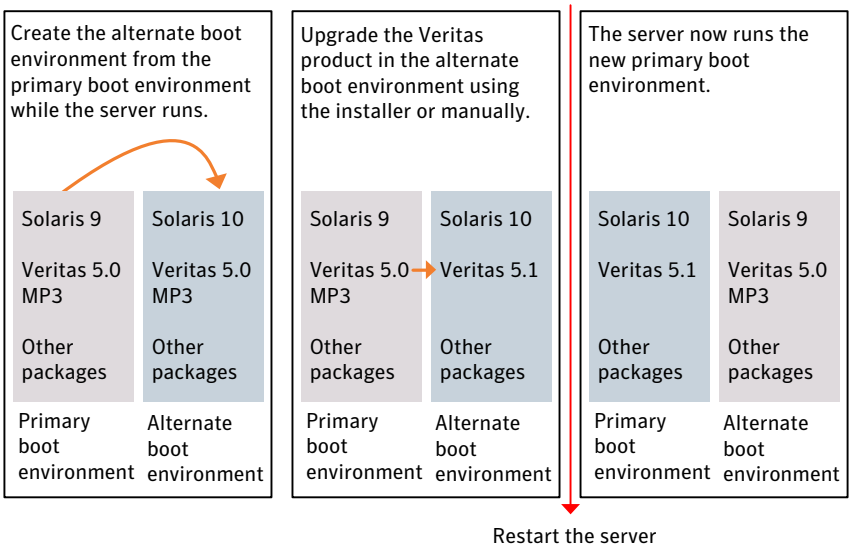
About Live Upgrade

You can use Live Upgrade to perform the following types of upgrade:

- Upgrade the operating system and VCS.
  See "Upgrading VCS and Solaris using Live Upgrade" on page 270.
- Upgrade the operating system.
  See "Upgrading Solaris using Live Upgrade" on page 276.
- Upgrade VCS.
  See "Upgrading VCS using Live Upgrade" on page 278.

Figure 21-1 illustrates an example of an upgrade of Veritas products from 5.0MP3 to 5.1, and the operating system from Solaris 9 to Solaris 10.

Figure 21-1 Live Upgrade process



Veritas Cluster Server exceptions for Live Upgrade

If you have configured I/O Fencing or Veritas File System or Veritas Volume Manager, use the Live Upgrade instructions in the *Storage Foundation and High Availability Installation Guide*.

Supported upgrade paths for Live Upgrade

The systems where you plan to use Live Upgrade must run Solaris 9 or Solaris 10.

VCS version must be at least 4.x.

Symantec requires that both global and non-global zones run the same version of Veritas products.

You can use Live Upgrade in the following virtualized environments:

Table 21-1 Live Upgrade support in virtualized environments

Environment	Procedure
Solaris native zones	Perform Live Upgrade to upgrade both global and local zones. See "Upgrading VCS and Solaris using Live Upgrade" on page 270.

Table 21-1 Live Upgrade support in virtualized environments *(continued)*

Environment	Procedure
Solaris branded zones (BrandZ)	Perform Live Upgrade to upgrade the global zone. See "Upgrading VCS and Solaris using Live Upgrade" on page 270. Manually upgrade the branded zone separately. Note that while you can perform a Live Upgrade in the presence of branded zones, the branded zones are not upgraded.
Logical domains (LDOM)	Perform Live Upgrade on the Domain controller only. Perform Live Upgrade on the Guest domain only. Use the standard Live Upgrade procedure for both types of LDOMs. See "Upgrading VCS and Solaris using Live Upgrade" on page 270.

Before you upgrade VCS using Solaris Live Upgrade

Before you upgrade, perform the following procedure.

To prepare for the Live Upgrade

1. Make sure that the VCS installation media and the operating system installation images are available and on hand.
2. On the nodes to be upgraded, select an alternate boot disk that is at least the same size as the root partition of the primary boot disk.

   If the primary boot disk is mirrored, you need to break off the mirror for the alternate boot disk.
3. Before you perform the Live Upgrade, take offline any services that involve non-root file systems. This prevents file sytems from being copied to the alternate boot environment that could potentially cause a root file system to run out of space.
4. Patch the operating system for Live Upgrade. Visit the following site for information on the required patches.

   http://sunsolve.sun.com/search/document.do?assetkey=1-61-72099-1

5 The version of the Live Upgrade packages must match the version of the operating system to which you want to upgrade on the alternate boot disk. If you are upgrading the Solaris operating system, do the following steps:

- Remove the installed Live Upgrade packages for the current operating system version:
  All Solaris versions: SUNWluu, SUNWlur packages.
  Solaris 10 update 5 or later also requires: SUNWlucfg package.
  Solaris 10 zones or Branded zones also requires: SUNWluzone package.

  Note: While you can perform Live Upgrade in the presence of branded zones, the branded zones themselves are not upgraded.

- From the new Solaris installation image, install the new versions of the Live Upgrade packages:
  All Solaris versions: SUNWluu, SUNWlur packages.
  Solaris 10 update 5 or later also requires: SUNWlucfg package.
  Solaris 10 zones or Branded zones also requires: SUNWluzone package.

  Note: While you can perform Live Upgrade in the presence of branded zones, the branded zones themselves are not upgraded.

6 Symantec provides the `vcslustart` script that runs a series of commands to create the alternate boot disk for the upgrade.

To preview the commands, specify the `vcslustart` script with the `-V` option.

Symantec recommends that you preview the commands to ensure there are no problems before beginning the Live Upgrade process.

The `vcslustart` script is located on the distribution media, in the scripts directory.

```
# cd /cdrom/scripts
```

```
# ./vcslustart -V -u targetos_version -s osimage_path -d diskname
```

-V Lists the commands to be executed during the upgrade process.

The `-V` option is a preview option without execution. The `-v` option displays the commands as the script executes them.

-u Specifies the operating system version for the upgrade on the alternate boot disk. For example, use `5.9` for Solaris 9 and `5.10` for Solaris 10.

-s Indicates the path to the operating system image to be installed on the alternate boot disk. If you are upgrading the operating system, specify the path to the new operating system version.

If you are not upgrading the operating system, and you specify the `-s` option, the `vcslustart -V` command can compare the patches that are installed on the specified image with the patches installed on the primary boot disk.

If you are not upgrading the operating system, you can omit the -s option; the operating system is cloned from the primary boot disk.

-d Indicates the name of the alternate boot disk on which you intend to upgrade. If you do not specify this option with the script, you are prompted for the disk information.

-v Indicates verbose, the executing commands display before they run.

-Y Indicates a default yes with no questions asked.

-D Prints with debug option on, and is for debugging.

-F Specifies the rootdisk's file system, where the default is `ufs`.

-t Specifies the number of CDs involved in upgrade.

-r Specifies that if the machine crashes or reboots before remounting the alternate disk using this option.

For example, to preview the commands to upgrade the Veritas products only:

```
# ./vcslustart -V -u 5.10 -d disk_name
```

For example, to upgrade to Solaris 10 update 6:

```
# ./vcslustart -v -u 5.10 -s /mnt/Solaris_10u6
```

For example, to preview the commands for an upgrade to Solaris 10 update 6:

```
# ./vcslustart -V -u 5.10 -s /mnt/Solaris_10u6
```

7 If the specified image is missing patches that are installed on the primary boot disk, note the patch numbers. To ensure that the alternate boot disk is the same as the primary boot disk, you need to install any missing patches on the alternate boot disk.

In the procedure examples, the primary or current boot environment resides on Disk0 (c0t0d0) and the alternate or inactive boot environment resides on Disk1 (c0t1d0).

Upgrading VCS and Solaris using Live Upgrade

Perform the Live Upgrade manually or use the installer. The nodes do not form a cluster until all of the nodes are upgraded to VCS 5.1. At the end of the Live Upgrade of the last node, all the nodes must boot from the alternate boot environment and join the cluster.

Upgrading VCS using Live Upgrade involves the following steps:

- Prepare to upgrade using Solaris Live Upgrade.
  See "Before you upgrade VCS using Solaris Live Upgrade" on page 267.
- Create a new boot environment on the alternate boot disk.
  See "Creating a new boot environment on the alternate boot disk" on page 271.
- Upgrade to VCS 5.1 on the alternate boot environment manually or using the installer. Refer to one of the following:

  To upgrade VCS manually:

  - See "Upgrading VCS manually" on page 273.

  To upgrade VCS using the installer:

  - See "Upgrading VCS using the installer" on page 272.
- Switch the alternate boot environment to be the new primary.
  See "Completing the Live Upgrade " on page 274.

- Verify Live Upgrade of VCS.
  See "Verifying Live Upgrade of VCS" on page 275.

Creating a new boot environment on the alternate boot disk

Run the `vcslustart` command on each node in the cluster to create a new boot environment on the alternate boot disk.

Note: This step can take several hours to complete. Do not interrupt the session as it may leave the boot environment unstable.

At the end of the process:

- The Solaris operating system on the alternate boot disk is upgraded, if you have chosen to upgrade the operating system.
- A new boot environment is created on the alternate boot disk by cloning the primary boot environment.

To create a new boot environment on the alternate boot disk

1 Navigate to the install media for the Symantec products:

```
# cd /cdrom/scripts
```

2 On each node, run one of the following commands:

To upgrade the operating system, by itself or together with upgrading the Veritas products:

```
# ./vcslustart -v -u targetos_version \
-s osimage_path -d disk_name
```

To upgrade the Veritas products only:

```
# ./vcslustart -v -u 5.10 -d disk_name
```

See Before you upgrade VCS using Solaris Live Upgrade step 6 for command options.

For example, to upgrade to Solaris 10 update 6:

```
# ./vcslustart -v -u 5.10 -s /mnt/Solaris_10u6
```

For example, to upgrade the Veritas products only:

```
# ./vcslustart -v -u 5.10
```

3 Review the output and note the new mount points. If the system is rebooted before completion of the upgrade or if the mounts become unmounted, you may need to remount the disks.

If you need to remount, run the command:

```
# vcslustart -r -u targetos_version -d disk_name
```

4 After the alternate boot disk is created, install any operating system patches that are required for the Veritas product installation.

Upgrading VCS using the installer

You can use the Veritas product installer to upgrade VCS as part of the Live Upgrade.

On a node in the cluster, run the installer on the alternate boot disk to upgrade VCS on all the nodes in the cluster. The program uninstalls the existing version of VCS on the alternate boot disk during the process.

At the end of the process the following occurs:

- VCS 5.1 is installed on the alternate boot disk.

To perform Live Upgrade of VCS using the installer

1 Insert the product disc with VCS 5.1 or access your copy of the software on the network.

2 Run the installer script specifying the root path as the alternate boot disk:

```
# ./installer -upgrade -rootpath /altroot.5.10
```

3 Enter the names of the nodes that you want to upgrade to VCS 5.1.

The installer displays the list of packages to be installed or upgraded on the nodes.

4 Press **Return** to continue with the installation.

5 Verify that the version of the Veritas packages on the alternate boot disk is 5.1.

```
# pkginfo -R /altroot.5.10 -l VRTSpkgname
```

For example:

```
# pkginfo -R /altroot.5.10 -l VRTSvcs
```

Review the installation logs at `/altroot.5.10/opt/VRTS/install/log`.

Upgrading VCS manually

You can perform a manual upgrade of VCS using Live Upgrade. On each node, remove and install the appropriate VCS packages.

At the end of the process the following occurs:

- VCS 5.1 is installed on the alternate boot disk.
- The boot environment on the alternate disk is activated.

To perform Live Upgrade of VCS manually

1. Confirm that the vcslustart script has mounted the secondary (alternate) disk to /altroot.5.10.

   ```
   # mount
   ```

   Or

   ```
   # df -k
   ```

2. Remove VCS packages on the alternate boot disk in the following order:

   ```
   # pkgrm   -R  /altroot.5.10 \
   VRTScmcc VRTScmcs VRTScssim VRTScscm \
   VRTSvcsmn VRTSacclib VRTSweb VRTScscw \
   VRTScutil VRTSjre15 VRTSvcsag VRTSvcsmg \
   VRTSvcs VRTSvxfen VRTSgab VRTSllt \
   VRTSspt VRTSat VRTSpbx VRTSicsco \
   VRTSvlic VRTSperl
   ```

   The `-R` option removes the packages from the root path `/altroot.5.10`.

3. Install VCS 5.1 packages in the following order one at a time to the alternate boot disk using the `pkgadd` command:

   ```
   VRTSvlic.pkg VRTSperl.pkg VRTSat.pkg VRTSspt.pkg
   VRTSllt.pkg VRTSgab.pkg VRTSvxfen.pkg VRTSvcs.pkg
   VRTScps.pkg VRTSvcsag.pkg VRTScutil.pkg
   ```

   For example:

   ```
   # pkgadd -R /altroot.5.10 -d package_name.pkg
   ```

   Where you replace *`package_name.pkg`* with a package's name, for example `VRTSvcs.pkg`.

   ```
   # pkgadd -R /altroot.5.10 -d VRTSvcs.pkg
   ```

4 Verify that the version of the packages on the alternate boot disk is 5.1.

```
# pkginfo -R /altroot.5.10 -l VRTSvcs
```

5 Switch the boot environment, perform one of the following:

- See "Switching the boot environment for Solaris SPARC" on page 279.
- See "Switching the boot environment for Solaris x64" on page 280.

6 Run the following command on the alternate root path of any one node in the cluster to configure a VCS cluster UUID:

```
# /altroot.5.10/opt/VRTSvcs/bin/uuidconfig.pl -clus -configure \
-use_llthost
```

The `-use_llthost` option indicates that the `/etc/llthost` file is used to determine the names of the nodes in the cluster. Alternatively, you can specify the node names instead of the file name.

7 Confirm that you have created the Universal Unique Identifier:

```
# /altroot.5.10/opt/VRTSvcs/bin/uuidconfig.pl -clus -display \
-use_llthost
```

8 Run the following command to export the root path installation environment variable.

```
# export INSTALL_ROOT_PATH=/altroot.5.10
```

Completing the Live Upgrade

At the end of the process:

- The alternate boot environment is activated.
- The system is booted from the alternate boot disk.

To complete the Live Upgrade

1 Complete the Live upgrade process:

```
# ./vcslufinish -u targetos_version
Live Upgrade finish on the Solaris release <5.10>
```

2 If the system crashes or reboots before Live Upgrade completes successfully, you can remount the alternate disk using the following command:

```
# ./vcslustart -r -u targetos_version
```

Then, rerun the `vcslufinish` command from step 1

```
# ./vcslufinish -u targetos_version
```

3 Reboot all the nodes in the cluster. The boot environment on the alternate disk is activated when you restart the nodes.

Note: Do not use the `reboot`, `halt`, or `uadmin` commands to reboot the system. Use either the `init` or the `shutdown` commands to enable the system to boot using the alternate boot environment.

```
# shutdown -g0 -y -i6
```

Verifying Live Upgrade of VCS

To ensure that Live Upgrade has completed successfully, verify that all the nodes have booted from the alternate boot environment and joined the cluster.

To verify that Live Upgrade completed successfully

1 Verify that the alternate boot environment is active.

```
# lustatus
```

If the alternate boot environment is not active, you can revert to the primary boot environment.

See "Reverting to the primary boot environment" on page 278.

2 Make sure that GAB ports a and h are up.

```
# gabconfig -a
Port a gen   39d901 membership 01
Port h gen   39d909 membership 01
```

3 Perform other verification as required to ensure that the new boot environment is configured correctly.

4 In a zone environment, verify the zone configuration.

Upgrading Solaris using Live Upgrade

If you are upgrading Solaris only, you must remove and reinstall VCS from the alternate boot environment prior to completing the Live Upgrade even if VCS has version 5.1 on the primary. You must remove and reinstall because VCS has kernel components that are specific to Solaris operating system versions. The correct version of the VCS packages must be installed.

Upgrading Solaris using Live Upgrade involves the following steps:

- Preparing to upgrade using Solaris Live Upgrade.
  See "Before you upgrade VCS using Solaris Live Upgrade" on page 267.
- Creating a new boot environment on the alternate boot disk
  See "Creating a new boot environment on the alternate boot disk" on page 271.
- Removing and reinstalling VCS 5.1 on the alternate boot environment, in one of the following ways:
  Using manual steps:
  See "Upgrading VCS manually" on page 273.
  Using the installer:

  Note: Do NOT configure the VCS 5.1

- Switching the alternate boot environment to be the new primary
  See "Completing the Live Upgrade " on page 274.
- Verifying Live Upgrade of VCS.
  See "Verifying Live Upgrade of VCS" on page 275.

Removing and reinstalling VCS using the installer

VCS has kernel components that are specific for Solaris operating system versions. When you use Solaris Live Upgrade to upgrade the Solaris operating system, you must complete these steps to ensure the correct version of VCS components are installed.

On a node in the cluster, run the installer on the alternate boot disk to remove and reinstall VCS 5.1 on all the nodes in the cluster.

At the end of the process the following occurs:

- VCS 5.1 is installed on the alternate boot disk, with the correct binaries for the new operating system version

To perform Live Upgrade of VCS using the installer

1. Insert the product disc with VCS 5.1 or access your copy of the software on the network.
2. Uninstall using the installer script, specifying the alternate boot disk as the root path:

   ```
   # /opt/VRTS/install/uninstallvcs -rootpath altrootpath
   ```

   For example:

   ```
   # /opt/VRTS/install/uninstallvcs -rootpath /altroot.5.10
   ```

3. Enter the names of the nodes that you want to uninstall.

   The installer displays the list of packages that will be uninstalled.
4. Press **Return** to continue.
5. Insert the product disc and run the following commands:

   ```
   # ./installvcs -install -rootpath altrootpath
   ```

   For example:

   ```
   # cd /cdrom/cluster_server
   # ./installvcs -install -rootpath /altroot.5.10
   ```

   The installer displays the list of packages that will be installed.
6. Press **Return** to continue with the installation.
7. Verify that the version of the Veritas packages on the alternate boot disk is 5.1.

   ```
   # pkginfo -R /altroot.5.10 -l VRTSpkgname
   ```

   For example:

   ```
   # pkginfo -R /altroot.5.10 -l VRTSvcs
   ```

   Review the installation logs at `/altroot.5.10/opt/VRTS/install/log`.

Upgrading VCS using Live Upgrade

Perform the Live Upgrade manually or use the installer. The nodes will not form a cluster until all of the nodes are upgraded to VCS 5.1. At the end of the Live Upgrade of the last node, all the nodes must boot from the alternate boot environment and join the cluster.

Upgrading VCS using Live Upgrade involves the following steps:

- Prepare to upgrade using Solaris Live Upgrade.
  See "Before you upgrade VCS using Solaris Live Upgrade" on page 267.
- Create a new boot environment on the alternate boot disk.
  See "Creating a new boot environment on the alternate boot disk" on page 271.
- Upgrade to VCS 5.1 on the alternate boot environment manually or using the installer. Refer to one of the following:

  To upgrade VCS manually:

  - See "Upgrading VCS manually" on page 273.

  To upgrade VCS using the installer:

  - See "Upgrading VCS using the installer" on page 272.
- Switch the alternate boot environment to be the new primary.
  See "Completing the Live Upgrade " on page 274.
- Verify Live Upgrade of VCS.
  See "Verifying Live Upgrade of VCS" on page 275.

Administering boot environments

Use the following procedures to perform relevant administrative tasks for boot environments.

Reverting to the primary boot environment

If the alternate boot environment fails to start, you can revert to the primary boot environment.

On each node, start the system from the primary boot environment in the PROM monitor mode.

```
ok> setenv boot-device disk_0
ok> boot
```

Failure to perform this step can result in the operating system booting from the alternate boot environment after the reboot.

The `vcslufinish` script displays the way to revert to primary boot environment. Here is a sample output.

```
Notes:
 ****************************************************************
 In case of a failure while booting to the target BE, the following
 process needs to be followed to fallback to the currently working
 boot environment:
 1. Enter the PROM monitor (ok prompt).
 2. Change the boot device back to the original boot environment
 by typing:
 setenv boot-device /pci@1c,600000/scsi@2/disk@0,0:a
 3. Boot to the original boot environment by typing:
 boot
 ****************************************************************
```

Switching the boot environment for Solaris SPARC

You do not have to perform the following procedures to switch the boot environment when you use the `vcslustart` and `vcslufinish` scripts to process Live Upgrade. You must perform the following procedures when you perform a manual Live Upgrade.

To switch the boot environment

1 Display the status of live-upgrade boot environments

```
# lustatus

Boot Environment  Is       Active Active    Can    Copy
Name              Complete Now    On Reboot Delete Status
----------------  -------- ------ --------- ------ ------
source.2657       yes      yes    yes       no     -
dest.2657         yes      no     no        yes    -
```

In this example, the primary boot disk is currently (source.2657). You want to activate the alternate boot disk (dest.2657)

2 Unmount any file systems that are mounted on the alternate root disk (dest.2657).

```
# lufslist dest.2657

               boot environment name: dest.2657

Filesystem        fstype device size  Mounted on Mount Options
----------------- ------ ------------ ---------- -------------
/dev/dsk/c0t0d0s1 swap     4298342400 -          -
/dev/dsk/c0t0d0s0 ufs     15729328128 /          -
/dev/dsk/c0t0d0s5 ufs      8591474688 /var       -
/dev/dsk/c0t0d0s3 ufs      5371625472 /vxfs      -

# luumount dest.2657
```

3 Activate the live-upgrade boot environment.

```
# luactivate dest.2657
```

4 Reboot the system.

```
# shutdown -g0 -i6 -y
```

The system automatically selects the boot environment entry that was activated.

Switching the boot environment for Solaris x64

You do not have to perform the following procedures to switch the boot environment when you use the `vcslustart` and `vcslufinish` scripts to process

Live Upgrade. You must perform the following procedures when you perform a manual Live Upgrade.

To switch the boot environment

1 Display the status of live-upgrade boot environments

```
# lustatus

Boot Environment Is       Active Active    Can    Copy
Name             Complete Now    On Reboot Delete Status
---------------- -------- ------ --------- ------ ------
source.2657      yes      yes    yes       no     -
dest.2657        yes      no     no        yes    -
```

In this example, the primary boot disk is currently (source.2657). You want to activate the alternate boot disk (dest.2657)

2 Unmount any file systems that are mounted on the alternate root disk (dest.2657).

```
# lufslist dest.2657

               boot environment name: dest.2657

Filesystem        fstype device size  Mounted on Mount Options
----------------- ------ ------------ ---------- --------------
/dev/dsk/c0t0d0s1 swap    4298342400  -          -
/dev/dsk/c0t0d0s0 ufs    15729328128  /          -
/dev/dsk/c0t0d0s5 ufs     8591474688  /var       -
/dev/dsk/c0t0d0s3 ufs     5371625472  /vxfs      -

# luumount dest.2657
```

3 Activate the live-upgrade boot environment.

```
# luactivate dest.2657
```

4 Reboot the system.

```
# shutdown -g0 -i6 -y
```

When the system boots up, the GRUB menu displays the following entries for the live-upgrade boot environments:

```
source.2657
dest.2657
```

The system automatically selects the boot environment entry that was activated.

Chapter 22

Upgrading the Solaris operating system

This chapter includes the following topics:

Upgrading Solaris versions

An operating system upgrade can take hours to finish. When you upgrade, you typically upgrade one node at a time. Coordinate with your system administrator to plan for the down time of each system. Plan ahead to move service groups to running nodes, while the nodes that you upgrade are down. Planning ahead reduces downtime and ensures availability of services for your customers.

When you upgrade the operating system, you must remove the GAB, LLT, and fencing packages and patches before you upgrade the operating system. Reinstall fencing, GAB, and LLT after upgrading the operating system.

Note: Be sure that you have the Symantec software disc with the VCS software on hand before you begin.

You must upgrade the operating system on each node in the cluster to completely upgrade the Solaris versions in the cluster.

Upgrading Solaris on a node

The tasks that you need to perform when upgrading the Solaris operating system include the following:

- Stopping VCS
- Stopping fencing, GAB, LLT, and unloading the kernel modules
- Removing packages and patches
- Upgrading Solaris operating system
- Reinstalling fencing, GAB, and LLT from the software disc
- Restarting VCS

To stop VCS

1. Make the VCS configuration writable. On the first system, type:

   ```
   # haconf -makerw
   ```

2. Move all service groups from the node you are plan to upgrade to another system. Keep services from failing over to this server. On the system where you plan to upgrade, type:

   ```
   # hasys -freeze -persistent -evacuate upgrade_server
   ```

3. Check if all service groups and resources are offline on the system and online on the other system. Type:

   ```
   # hastatus -summary
   ```

4. Close the configuration and unload the VCS services on the system that you plan to upgrade. On the system that you plan to upgrade, type:

   ```
   # haconf -dump -makero
   # hastop -local
   ```

5. Confirm that VCS has stopped. On the upgrading system, type:

   ```
   # gabconfig -a
   ```

   Output resembles:

   ```
   GAB Port Memberships
   ===================================
   Port a gen 23dc0001 membership 01
   ```

   Note that the output shows no membership for port h.

To stop fencing, GAB, LLT, and unload the kernel modules

1 Unconfigure fencing.

```
# vxfenconfig -U
```

2 Unload the FENCING module from the kernel. Perform the following:

- Determine the kernel module ID.

```
# modinfo | grep vxfen
```

- Unload the module from the kernel.

```
# modunload -i vxfen_id
```

3 Unconfigure GAB.

```
# gabconfig -U
```

4 Unload the GAB module from the kernel:

- Determine the kernel module ID:

```
# modinfo | grep gab
```

- Unload the module from the kernel:

```
# modunload -i gab_id
```

5 Unconfigure LLT. On each system, type:

```
# lltconfig -U
```

The following message is displayed on the console:

```
lltconfig: this will attempt to stop and reset LLT.
Confirm (y/n)?
```

6 Type `Y` on each system in response to the message.

7 Unload the LLT module from the kernel:

- Determine the kernel module ID:

```
# modinfo | grep llt
```

The module IDs are in the left-hand column of the output.

- Unload the module from the kernel:

  ```
  # modunload -i llt_id
  ```

To remove the fencing, GAB, and LLT packages and patches

- On each node, use the `pkgrm` command to remove the fencing, GAB, and LLT packages.

  ```
  # pkgrm VRTSvxfen VRTSgab VRTSllt
  ```

To upgrade the operating system

1. Follow the Sun installation guide to upgrade the operating system kernel to the new version of Solaris.
2. As the system comes up, enter single-user mode.

To reinstall fencing, GAB, and LLT from the software disc and restart

1. In single-user mode, log on as superuser on the system that you have upgraded.
2. Check whether the /tmp directory is mounted.

   ```
   # mount
   ```

3. If the /tmp directory is not mounted, then enter:

   ```
   # mount /tmp
   ```

4. Create a directory for installation:

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

5. Insert the software disc with the VCS software into a system drive where you have upgraded. The Solaris volume-management software automatically mounts the disc as /cdrom/cdrom0. Type the command:

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

6. Copy the package files from the software disc to the temporary directory:

   ```
   # cp -r pkgs/VRTSllt.pkg /tmp/install
   # cp -r pkgs/VRTSgab.pkg /tmp/install
   # cp -r pkgs/VRTSvxfen.pkg /tmp/install
   ```

7 Install the LLT, GAB, and fencing packages and patches. As you enter the command, be sure to install the packages and patches in the order shown:

- Install the packages.

```
# cd /tmp/install
# pkgadd -d VRTSllt.pkg
# pkgadd -d VRTSgab.pkg
# pkgadd -d VRTSvxfen.pkg
```

8 Bring up the system in multi-user mode:

```
# cd /
# init 3
```

To restart VCS

1 Verify that VCS services are running on the upgraded server. On the upgraded server, type:

```
# ps -ef | grep ha
root   576   1  0 16:54:12 ?    0:02 /opt/VRTSvcs/bin/had
root   578   1  0 16:54:13 ?    0:00 /opt/VRTSvcs/bin/hashadow
```

2 If the VCS services are not running, reload the VCS services. Type:

```
# hastart
```

3 Make the configuration writable.

```
# haconf -makerw
```

4 Unfreeze the upgraded server and save the configuration. On the upgraded server, type:

```
# hasys -unfreeze -persistent upgraded_server
# haconf -dump -makero
```

Section 8

Post-installation tasks

Chapter 23

Performing post-installation tasks

This chapter includes the following topics:

About enabling LDAP authentication for clusters that run in secure mode

Symantec Product Authentication Service (AT) supports LDAP (Lightweight Directory Access Protocol) user authentication through a plug-in for the authentication broker. AT supports all common LDAP distributions such as Sun Directory Server, Netscape, OpenLDAP, and Windows Active Directory.

For a cluster that runs in secure mode, you must enable the LDAP authentication plug-in if the VCS users belong to an LDAP domain.

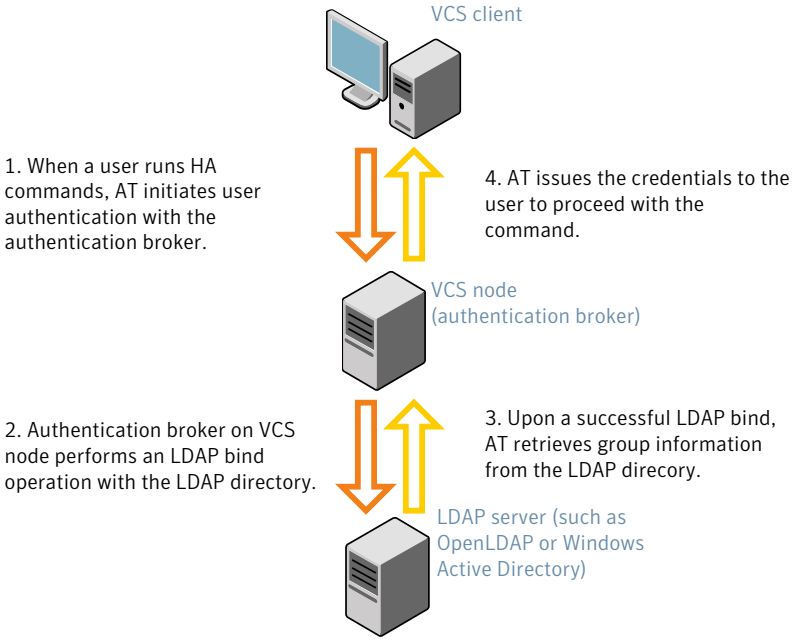
See "Enabling LDAP authentication for clusters that run in secure mode" on page 293.

If you have not already added VCS users during installation, you can add the users later.

See the *Veritas Cluster Server Administrator's Guide* for instructions to add VCS users.

Figure 23-1 depicts the VCS cluster communication with the LDAP servers when clusters run in secure mode.

Figure 23-1 Client communication with LDAP servers



See the *Symantec Product Authentication Service Administrator's Guide.*

The LDAP schema and syntax for LDAP commands (such as, ldapadd, ldapmodify, and ldapsearch) vary based on your LDAP implementation.

Before adding the LDAP domain in Symantec Product Authentication Service, note the following information about your LDAP environment:

- The type of LDAP schema used (the default is RFC 2307)
  - UserObjectClass (the default is posixAccount)
  - UserObject Attribute (the default is uid)
  - User Group Attribute (the default is gidNumber)
  - Group Object Class (the default is posixGroup)
  - GroupObject Attribute (the default is cn)
  - Group GID Attribute (the default is gidNumber)
  - Group Membership Attribute (the default is memberUid)
- URL to the LDAP Directory

- Distinguished name for the user container (for example, UserBaseDN=ou=people,dc=comp,dc=com)
- Distinguished name for the group container (for example, GroupBaseDN=ou=group,dc=comp,dc=com)

Enabling LDAP authentication for clusters that run in secure mode

The following procedure shows how to enable the plug-in module for LDAP authentication. This section provides examples for OpenLDAP and Windows Active Directory LDAP distributions.

Before you enable the LDAP authentication, complete the following steps:

- Make sure that the cluster runs in secure mode.

```
# haclus -value SecureClus
```

  The output must return the value as 1.

- Make sure that the AT version is 5.0.32.0 or later.

```
# /opt/VRTSat/bin/vssat showversion
vssat version: 5.0.32.0
```

See the `vssat.1m` and the `atldapconf.1m` manual pages.

To enable OpenLDAP authentication for clusters that run in secure mode

1 Add the LDAP domain to the AT configuration using the `vssat` command.

The following example adds the LDAP domain, MYENTERPRISE:

```
# /opt/VRTSat/bin/vssat addldapdomain \
--domainname "MYENTERPRISE.symantecdomain.com"\
--server_url "ldap://my_openldap_host.symantecexample.com"\
--user_base_dn "ou=people,dc=symantecdomain,dc=myenterprise,dc=com"\
--user_attribute "cn" --user_object_class "account"\
--user_gid_attribute "gidNumber"\
--group_base_dn "ou=group,dc=symantecdomain,dc=myenterprise,dc=com"\
--group_attribute "cn" --group_object_class "posixGroup"\
--group_gid_attribute "member"\
--admin_user "cn=manager,dc=symantecdomain,dc=myenterprise,dc=com"\
--admin_user_password "password" --auth_type "FLAT"
```

2 Verify that you can successfully authenticate an LDAP user on the VCS nodes.

You must have a valid LDAP user ID and password to run the command. In the following example, authentication is verified for the MYENTERPRISE domain for the LDAP user, vcsadmin1.

```
galaxy# /opt/VRTSat/bin/vssat authenticate
--domain ldap:MYENTERPRISE.symantecdomain.com
--prplname vcsadmin1 --broker galaxy:2821

Enter password for vcsadmin1: ##########

authenticate
----------------------
----------------------

Authenticated User vcsadmin1
----------------------
```

3 Add the LDAP user to the main.cf file.

```
# haconf makerw
# hauser -add "CN=vcsadmin1/CN=people/\
DC=symantecdomain/DC=myenterprise/\
DC=com@myenterprise.symantecdomain.com" -priv Administrator
# haconf -dump -makero
```

If you want to enable group-level authentication, you must run the following command:

```
# hauser -addpriv \
ldap_group@ldap_domain AdministratorGroup
```

4 Verify that the main.cf file has the following lines:

```
# cat /etc/VRTSvcs/conf/config/main.cf
...
...
cluster clus1 (
  SecureClus = 1
  Administrators = {
    "CN=vcsadmin1/CN=people/DC=symantecdomain/DC=myenterprise/
    DC=com@myenterprise.symantecdomain.com" }
  AdministratorGroups = {
    "CN=symantecusergroups/DC=symantecdomain/DC=myenterprise/
    DC=com@myenterprise.symantecdomain.com " }
  )
...
...
```

5 Set the VCS_DOMAIN and VCS_DOMAINTYPE environment variables as follows:

- VCS_DOMAIN=myenterprise.symantecdomain.com
- VCS_DOMAINTYPE=ldap

For example, for the Bourne Shell (sh or ksh), run the following commands:

```
# export VCS_DOMAIN=myenterprise.symantecdomain.com
# export VCS_DOMAINTYPE=ldap
```

6 Verify that you can log on to VCS. For example

```
# halogin vcsadmin1 password
# hasys -state
VCS NOTICE V-16-1-52563 VCS Login:vcsadmin1
#System    Attribute    Value
galaxy     Attribute  RUNNING
nebula     Attribute  RUNNING
```

Similarly, you can use the same LDAP user credentials to log on to the VCS node using the VCS Cluster Manager (Java Console).

7 To enable LDAP authentication on other nodes in the cluster, perform the procedure on each of the nodes in the cluster.

To enable Windows Active Directory authentication for clusters that run in secure mode

1 Run the LDAP configuration tool atldapconf using the -d option. The -d option discovers and retrieves an LDAP properties file which is a prioritized attribute list.

```
# /opt/VRTSat/bin/atldapconf -d
-s domain_controller_name_or_ipaddress
-u domain_user -g domain_group
```

For example:

```
# /opt/VRTSat/bin/atldapconf -d -s 192.168.20.32 \
-u Administrator -g "Domain Admins"
Search User provided is invalid or Authentication is required to
proceed further.
Please provide authentication information for LDAP server.

Username/Common Name: symantecdomain\administrator
Password:

Attribute file created.
```

2 Run the LDAP configuration tool atldapconf using the -c option. The -c option creates a CLI file to add the LDAP domain.

```
# /opt/VRTSat/bin/atldapconf -c -d windows_domain_name
```

For example:

```
# /opt/VRTSat/bin/atldapconf -c -d symantecdomain.com
Attribute list file not provided, using default AttributeList.txt.
CLI file name not provided, using default CLI.txt.

CLI for addldapdomain generated.
```

3 Run the LDAP configuration tool atldapconf using the -x option. The -x option reads the CLI file and executes the commands to add a domain to the AT.

```
# /opt/VRTSat/bin/atldapconf -x
```

4 List the LDAP domains to verify that the Windows Active Directory server integration is complete.

```
# /opt/VRTSat/bin/vssat listldapdomains

Domain Name :          symantecdomain.com
Server URL :           ldap://192.168.20.32:389
SSL Enabled :          No
User Base DN :         CN=people,DC=symantecdomain,DC=com
User Object Class :    account
User Attribute :       cn
User GID Attribute :   gidNumber
Group Base DN :        CN=group,DC=symantecdomain,DC=com
Group Object Class :   group
Group Attribute :      cn
Group GID Attribute :  cn
Auth Type :            FLAT
Admin User :
Admin User Password :
Search Scope :         SUB
```

5 Set the VCS_DOMAIN and VCS_DOMAINTYPE environment variables as follows:

- VCS_DOMAIN=symantecdomain.com
- VCS_DOMAINTYPE=ldap

For example, for the Bourne Shell (sh or ksh), run the following commands:

```
# export VCS_DOMAIN=symantecdomain.com
# export VCS_DOMAINTYPE=ldap
```

6 Verify that you can log on to VCS. For example

```
# halogin vcsadmin1 password
# hasys -state
VCS NOTICE V-16-1-52563 VCS Login:vcsadmin1
#System    Attribute    Value
galaxy     Attribute  RUNNING
nebula     Attribute  RUNNING
```

Similarly, you can use the same LDAP user credentials to log on to the VCS node using the VCS Cluster Manager (Java Console).

7 To enable LDAP authentication on other nodes in the cluster, perform the procedure on each of the nodes in the cluster.

Accessing the VCS documentation

The software disc contains the documentation for VCS in Portable Document Format (PDF) in the cluster_server/docs directory. After you install VCS, Symantec recommends that you copy the PDF version of the documents to the /opt/VRTS/docs directory on each node to make it available for reference.

To access the VCS documentation

- Copy the PDF from the software disc (cluster_server/docs/) to the directory /opt/VRTS/docs.

Removing permissions for communication

Make sure you completed the installation of VCS and the verification of disk support for I/O fencing. If you used `rsh`, remove the temporary `rsh` access permissions that you set for the nodes and restore the connections to the public network.

If the nodes use `ssh` for secure communications, and you temporarily removed the connections to the public network, restore the connections.

Chapter 24

Installing or upgrading VCS components

This chapter includes the following topics:

Installing the Java Console

You can administer VCS using the VCS Java-based graphical user interface, Java Console. After VCS has been installed, install the Java Console on a Windows system or Solaris system with X-Windows. Review the software requirements for Java Console.

The system from which you run the Java Console can be a system in the cluster or a remote workstation. A remote workstation enables each system in the cluster to be administered remotely.

When you install the Java Console on the Solaris system, make sure a printer is configured to that system. If you print the online JavaHelp on a system that does not have a printer that is configured, the Java Console might hang.

Review the information about using the Java Console. For more information, refer to the *Veritas Cluster Server Administrator's Guide*.

Software requirements for the Java Console

Cluster Manager (Java Console) is supported on:

- Solaris SPARC 2.8, 2.9, and 2.10
- Windows XP and Windows 2003

Note: Make sure that you are using an operating system version that supports JRE 1.5.

Hardware requirements for the Java Console

The minimum hardware requirements for the Java Console follow:

- Pentium II 300 megahertz
- 256 megabytes of RAM
- 800x600 display resolution
- 8-bit color depth of the monitor
- A graphics card that is capable of 2D images

Note: Symantec recommends using Pentium III, 400MHz, 256MB RAM, and 800x600 display resolution.

The version of the Java™ 2 Runtime Environment (JRE) requires 32 megabytes of RAM. This version is supported on the Intel Pentium platforms that run the Linux kernel v 2.2.12 and glibc v2.1.2-11 (or later).

Symantec recommends using the following hardware:

- 48 megabytes of RAM
- 16-bit color mode
- The KDE and the KWM window managers that are used with displays set to local hosts

Installing the Java Console on Solaris

Review the procedure to install the Java console. Before you begin with the procedure, ensure that you have the `gunzip` utility installed on your system.

To install Java console on Solaris

1 Create a directory for installation of the Java Console:

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

2 Download the Java GUI utility from http://go.symantec.com/vcsmc to a temporary directory.

3 Go to the temporary directory and unzip the compressed package file using the gunzip utility:

```
# cd /tmp/install
# gunzip VRTScscm.tar.gz
```

The file VRTScscm.tar is now present in the temporary directory.

4 Extract the compressed file from the tar file:

```
# tar -xvf VRTScscm.tar
```

5 Install the software:

```
# pkgadd -d . VRTScscm
```

6 Answer `Yes` if prompted.

Installing the Java Console on a Windows system

Review the procedure to install the Java console on a Windows system.

To install the Java Console on a Windows system

1 Download the Java GUI utility from http://go.symantec.com/vcsmc to a temporary directory.

2 Extract the zipped file to a temporary folder.

3 From this extracted folder, double-click setup.exe.

4 The Veritas Cluster Manager Install Wizard guides you through the installation process.

Upgrading the Java Console

Use one of the following applicable procedures to upgrade Java Console.

To upgrade Java console on Solaris

1. Log in as superuser on the node where you intend to install the package.
2. Remove the GUI from the previous installation.

```
# pkgrm VRTScscm
```

3. Install the VCS Java console.

   See "Installing the Java Console on Solaris" on page 302.

To upgrade the Java Console on a Windows client

1. Stop Cluster Manager (Java Console) if it is running.
2. Remove Cluster Manager from the system.
   - From the Control Panel, double-click **Add/Remove Programs**
   - Select **Veritas Cluster Manager**.
   - Click **Add/Remove**.
   - Follow the uninstall wizard instructions.
3. Install the new Cluster Manager.

   See "Installing the Java Console on a Windows system" on page 303.

Installing VCS Simulator

You can administer VCS Simulator from the Java Console or from the command line. Review the software requirements for VCS Simulator.

Software requirements for VCS Simulator

VCS Simulator is supported on:

- Windows XP and Windows 2003

Note: Make sure that you are using an operating system version that supports JRE 1.5.

Installing VCS Simulator on Windows systems

This section describes the procedure to install VCS Simulator on Windows systems.

To install VCS Simulator on Windows systems

1. Download VCS Simulator from the following location to a temporary directory.

   http://www.symantec.com/business/cluster-server and click **Utilities**.
2. Extract the compressed files to another directory.
3. Navigate to the path of the Simulator installer file:

   \cluster_server\windows\VCSWindowsInstallers\Simulator
4. Double-click the installer file.
5. Read the information in the Welcome screen and click **Next**.
6. In the Destination Folders dialog box, click **Next** to accepted the suggested installation path or click **Change** to choose a different location.
7. In the Ready to Install the Program dialog box, click **Back** to make changes to your selections or click **Install** to proceed with the installation.
8. In the Installshield Wizard Completed dialog box, click **Finish**.

Reviewing the installation

VCS Simulator installs Cluster Manager (Java Console) and Simulator binaries on the system. The Simulator installation creates the following directories:

Directory	Content
attrpool	Information about attributes associated with VCS objects
bin	VCS Simulator binaries
default_clus	Files for the default cluster configuration
sample_clus	A sample cluster configuration, which serves as a template for each new cluster configuration
templates	Various templates that are used by the Java Console
types	The types.cf files for all supported platforms
conf	Contains another directory called types. This directory contains assorted resource type definitions that are useful for the Simulator. The type definition files are present in platform-specific sub directories.

Additionally, VCS Simulator installs directories for various cluster configurations.

VCS Simulator creates a directory for every new simulated cluster and copies the contents of the sample_clus directory. Simulator also creates a log directory within each cluster directory for logs that are associated with the cluster.

Upgrading VCS Simulator

Use the following procedure to upgrade VCS Simulator.

To upgrade VCS Simulator on a Windows client

1. Stop all instances of VCS Simulator.
2. Stop VCS Simulator, if it is running.
3. RemoveVCS Simulator from the system.
   - From the Control Panel, double-click **Add/Remove Programs**
   - Select **VCS Simulator**.
   - Click **Add/Remove**.
   - Follow the uninstall wizard instructions.
4. Install the new Simulator.

   See "Installing VCS Simulator on Windows systems" on page 304.

Chapter 25

Verifying the VCS installation

This chapter includes the following topics:

About verifying the VCS installation

After you install and configure VCS, you can inspect the contents of the key VCS configuration files that you have installed and modified during the process. These files reflect the configuration that is based on the information you supplied. You can also run VCS commands to verify the status of LLT, GAB, and the cluster.

About the LLT and GAB configuration files

Low Latency Transport (LLT) and Group Membership and Atomic Broadcast (GAB) are VCS communication services. LLT requires /etc/llthosts and /etc/lltttab files. GAB requires /etc/gabtab file.

LLT and GAB also require the initialization configuration files:

- /etc/default/llt

- /etc/default/gab

The information that these LLT and GAB configuration files contain is as follows:

- The /etc/default/llt file

  This file stores the start and stop environment variables for LLT:

  - LLT_START—Defines the startup behavior for the LLT module after a system reboot. Valid values include:
    1—Indicates that LLT is enabled to start up.
    0—Indicates that LLT is disabled to start up.
  - LLT_STOP—Defines the shutdown behavior for the LLT module during a system shutdown. Valid values include:
    1—Indicates that LLT is enabled to shut down.
    0—Indicates that LLT is disabled to shut down.

  The installer sets the value of these variables to 1 at the end of VCS configuration.
  If you manually configured VCS, make sure you set the values of these environment variables to 1.

- The /etc/llthosts file

  The file `llthosts` is a database that contains one entry per system. This file links the LLT system ID (in the first column) with the LLT host name. This file must be identical on each node in the cluster. A mismatch of the contents of the file can cause indeterminate behavior in the cluster.
  For example, the file /etc/llthosts contains the entries that resemble:

  ```
  0       galaxy
  1       nebula
  ```

- The /etc/lltab file

  The file `lltab` contains the information that is derived during installation and used by the utility `lltconfig(1M)`. After installation, this file lists the private network links that correspond to the specific system. For example, the file /etc/lltab contains the entries that resemble the following:

  - For Solaris SPARC:

    ```
    set-node galaxy
    set-cluster 2
    link qfe0 /dev/qfe:0 - ether - -
    link qfe1 /dev/qfe:1 - ether - -
    ```

  - For Solaris x64:

```
set-node galaxy
set-cluster 2
link e1000g0 /dev/e1000g:0 - ether - -
link e1000g1 /dev/e1000g:1 - ether - -
```

The first line identifies the system. The second line identifies the cluster (that is, the cluster ID you entered during installation). The next two lines begin with the `link` command. These lines identify the two network cards that the LLT protocol uses.
If you configured a low priority link under LLT, the file also includes a "link-lopri" line.
Refer to the `lltab(4)` manual page for details about how the LLT configuration may be modified. The manual page describes the ordering of the directives in the `lltab` file.

- The /etc/default/gab file

  This file stores the start and stop environment variables for GAB:

  - GAB_START—Defines the startup behavior for the GAB module after a system reboot. Valid values include:
    1—Indicates that GAB is enabled to start up.
    0—Indicates that GAB is disabled to start up.
  - GAB_STOP—Defines the shutdown behavior for the GAB module during a system shutdown. Valid values include:
    1—Indicates that GAB is enabled to shut down.
    0—Indicates that GAB is disabled to shut down.

  The installer sets the value of these variables to 1 at the end of VCS configuration.
  If you manually configured VCS, make sure you set the values of these environment variables to 1.

- The /etc/gabtab file

  After you install VCS, the file /etc/gabtab contains a `gabconfig(1)` command that configures the GAB driver for use.
  The file /etc/gabtab contains a line that resembles:

  ```
  /sbin/gabconfig -c -nN
  ```

  The `-c` option configures the driver for use. The *`-nN`* specifies that the cluster is not formed until at least *`N`* nodes are ready to form the cluster. Symantec recommends that you set N to be the total number of nodes in the cluster.

Note: Symantec does not recommend the use of the `-c -x` option for `/sbin/gabconfig`. Using `-c -x` can lead to a split-brain condition.

About the cluster UUID

You can verify the existence of the cluster UUID.

To verify the cluster UUID exists

- From the prompt, run a more command.

```
more /etc/vx/.uuids/clusuuid
```

About the VCS configuration files

VCS configuration files include the following:

- main.cf
  The installer creates the VCS configuration file in the /etc/VRTSvcs/conf/config folder by default during the VCS configuration. The main.cf file contains the minimum information that defines the cluster and its nodes.
  See "Sample main.cf file for VCS clusters" on page 311.
  See "Sample main.cf file for global clusters" on page 313.
- types.cf
  The file types.cf, which is listed in the include statement in the main.cf file, defines the VCS bundled types for VCS resources. The file types.cf is also located in the folder /etc/VRTSvcs/conf/config.
  Additional files similar to types.cf may be present if agents have been added, such as Oracletypes.cf.
- /etc/default/vcs

  This file stores the start and stop environment variables for VCS engine:

  - VCS_START—Defines the startup behavior for VCS engine after a system reboot. Valid values include:
    1—Indicates that VCS engine is enabled to start up.
    0—Indicates that VCS engine is disabled to start up.
  - VCS_STOP—Defines the shutdown behavior for VCS engine during a system shutdown. Valid values include:
    1—Indicates that VCS engine is enabled to shut down.
    0—Indicates that VCS engine is disabled to shut down.

The installer sets the value of these variables to 1 at the end of VCS configuration.

If you manually configured VCS, make sure you set the values of these environment variables to 1.

Note the following information about the VCS configuration file after installing and configuring VCS:

- The cluster definition includes the cluster information that you provided during the configuration. This definition includes the cluster name, cluster address, and the names of users and administrators of the cluster.

  Notice that the cluster has an attribute UserNames. The installvcs program creates a user "admin" whose password is encrypted; the word "password" is the default password.
- If you set up the optional I/O fencing feature for VCS, then the UseFence = SCSI3 attribute is present.
- If you configured the cluster in secure mode, the main.cf includes the VxSS service group and "SecureClus = 1" cluster attribute.
- The installvcs program creates the ClusterService service group if you configured the virtual IP, SMTP, SNMP, or global cluster options.

  The service group also has the following characteristics:

  - The group includes the IP and NIC resources.
  - The service group also includes the notifier resource configuration, which is based on your input to installvcs program prompts about notification.
  - The installvcs program also creates a resource dependency tree.
  - If you set up global clusters, the ClusterService service group contains an Application resource, wac (wide-area connector). This resource's attributes contain definitions for controlling the cluster in a global cluster environment.

    Refer to the *Veritas Cluster Server Administrator's Guide* for information about managing VCS global clusters.

Refer to the *Veritas Cluster Server Administrator's Guide* to review the configuration concepts, and descriptions of main.cf and types.cf files for Solaris systems.

Sample main.cf file for VCS clusters

The following sample main.cf file is for a three-node cluster in secure mode.

```
include "types.cf"
include "OracleTypes.cf"
include "OracleASMTypes.cf"
include "Db2udbTypes.cf"
include "SybaseTypes.cf"


cluster vcs02 (
    SecureClus = 1
    )

system sysA (
    )

system sysB (
    )

system sysC (
    )

group ClusterService (
    SystemList = { sysA = 0, sysB = 1, sysC = 2 }
    AutoStartList = { sysA, sysB, sysC }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

NIC csgnic (
    Device = hme0
    )

NotifierMngr ntfr (
    SnmpConsoles = { vcslab4079 = SevereError }
    SmtpServer = "smtp.veritas.com"
    SmtpRecipients = { "johndoe@veritas.com" = SevereError }
    )

ntfr requires csgnic

// resource dependency tree
//
//     group ClusterService
//     {
```

```
//     NotifierMngr ntfr
//          {
//          NIC csgnic
//          }
// }

group VxSS (
    SystemList = { sysA = 0, sysB = 1, sysC = 2 }
    Parallel = 1
    AutoStartList = { sysA, sysB, sysC }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

Phantom phantom_vxss (
    )

ProcessOnOnly vxatd (
    IgnoreArgs = 1
    PathName = "/opt/VRTSat/bin/vxatd"
    )

// resource dependency tree
//
//     group VxSS
//     {
//     Phantom phantom_vxss
//     ProcessOnOnly vxatd
//     }
```

Sample main.cf file for global clusters

If you installed VCS with the Global Cluster option, note that the ClusterService group also contains the Application resource, wac. The wac resource is required to control the cluster in a global cluster environment.

In the following main.cf file example, bold text highlights global cluster specific entries.

```
include "types.cf"

cluster vcs03 (
    ClusterAddress = "10.182.13.50"
    SecureClus = 1
```

```
    )

system sysA (
    )

system sysB (
    )

system sysC (
    )

group ClusterService (
    SystemList = { sysA = 0, sysB = 1, sysC = 2 }
    AutoStartList = { sysA, sysB, sysC }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

Application wac (
    StartProgram = "/opt/VRTSvcs/bin/wacstart"
    StopProgram = "/opt/VRTSvcs/bin/wacstop"
    MonitorProcesses = { "/opt/VRTSvcs/bin/wac" }
    RestartLimit = 3
    )

IP gcoip (
    Device = hme0
    Address = "10.182.13.50"
    NetMask = "255.255.240.0"
    )

NIC csgnic (
    Device = hme0
    )

NotifierMngr ntfr (
    SnmpConsoles = { vcslab4079 = SevereError }
    SmtpServer = "smtp.veritas.com"
    SmtpRecipients = { "johndoe@veritas.com" = SevereError }
    )

gcoip requires csgnic
ntfr requires csgnic
```

```
wac requires gcoip

// resource dependency tree
//
//     group ClusterService
//     {
//     NotifierMngr ntfr
//         {
//         NIC csgnic
//         }
//     Application wac
//         {
//         IP gcoip
//             {
//             NIC csgnic
//             }
//         }
//     }

group VxSS (
    SystemList = { sysA = 0, sysB = 1, sysC = 2 }
    Parallel = 1
    AutoStartList = { sysA, sysB, sysC }
    OnlineRetryLimit = 3
    OnlineRetryInterval = 120
    )

Phantom phantom_vxss (
    )

ProcessOnOnly vxatd (
    IgnoreArgs = 1
    PathName = "/opt/VRTSat/bin/vxatd"
    )

// resource dependency tree
//
//     group VxSS
//     {
//     Phantom phantom_vxss
//     ProcessOnOnly vxatd
//     }
```

Verifying the LLT, GAB, and VCS configuration files

Make sure that the LLT, GAB, and VCS configuration files contain the information you provided during VCS installation and configuration.

To verify the LLT, GAB, and VCS configuration files

1. Navigate to the location of the configuration files:
   - LLT
     /etc/llthosts
     /etc/llttab
   - GAB
     /etc/gabtab
   - VCS
     /etc/VRTSvcs/conf/config/main.cf
2. Verify the content of the configuration files.

   See "About the LLT and GAB configuration files" on page 307.

   See "About the VCS configuration files" on page 310.

Verifying LLT, GAB, and cluster operation

Verify the operation of LLT, GAB, and the cluster using the VCS commands.

To verify LLT, GAB, and cluster operation

1. Log in to any node in the cluster as superuser.
2. Make sure that the PATH environment variable is set to run the VCS commands.

   See "Setting the PATH variable" on page 64.

3. On Solaris 9, if you use Sun SCI adapters for your private network, move the scripts `S70llt` and `S92gab` from the directory /etc/rc2.d to directory /etc/rc3.d. so that they are run after the `S19sci` and `S23scid` scripts.
4. Verify LLT operation.

   See "Verifying LLT" on page 317.

5. Verify GAB operation.

   See "Verifying GAB" on page 320.

6 Verify the cluster operation.

See "Verifying the cluster" on page 322.

Verifying LLT

Use the `lltstat` command to verify that links are active for LLT. If LLT is configured correctly, this command shows all the nodes in the cluster. The command also returns information about the links for LLT for the node on which you typed the command.

Refer to the `lltstat(1M)` manual page for more information.

To verify LLT

1 Log in as superuser on the node galaxy.

2 Run the `lltstat` command on the node galaxy to view the status of LLT.

```
lltstat -n
```

The output on galaxy resembles:

```
LLT node information:
    Node             State            Links
    *0 galaxy          OPEN            2
     1 nebula          OPEN            2
```

Each node has two links and each node is in the OPEN state. The asterisk (*) denotes the node on which you typed the command.

If LLT does not operate, the command does not return any LLT links information: If only one network is connected, the command returns the following LLT statistics information:

```
LLT node information:
    Node                State    Links
   * 0 galaxy           OPEN        2
     1 nebula           OPEN        2
     2 saturn           OPEN        1
```

3 Log in as superuser on the node nebula.

4 Run the `lltstat` command on the node nebula to view the status of LLT.

```
lltstat -n
```

The output on nebula resembles:

```
LLT node information:
    Node             State           Links
     0 galaxy          OPEN            2
    *1 nebula          OPEN            2
```

5 To view additional information about LLT, run the `lltstat -nvv` command on each node.

For example, run the following command on the node galaxy in a two-node cluster:

```
lltstat -nvv | more
```

The output on galaxy resembles the following:

- For Solaris SPARC:

```
Node          State      Link    Status      Address
*0 galaxy      OPEN
                         qfe:0 UP     08:00:20:93:0E:34
                         qfe:1 UP     08:00:20:93:0E:34
1 nebula       OPEN
                         qfe:0 UP     08:00:20:8F:D1:F2
                         qfe:1 DOWN
2              CONNWAIT
                         qfe:0 DOWN
                         qfe:1 DOWN
3              CONNWAIT
                         qfe:0 DOWN
                         qfe:1 DOWN
.
.
.

31             CONNWAIT
                         qfe:0 DOWN
                         /dev/qfe:1 DOWN
```

- For Solaris x64:

```
Node          State      Link    Status      Address
*0 galaxy      OPEN
                         e1000g:0 UP     08:00:20:93:0E:34
                         e1000g:1 UP     08:00:20:93:0E:34
1 nebula       OPEN
                         e1000g:0 UP     08:00:20:8F:D1:F2
                         e1000g:1 DOWN
2              CONNWAIT
                         e1000g:0 DOWN
                         e1000g:1 DOWN
3              CONNWAIT
                         e1000g:0 DOWN
                         e1000g:1 DOWN
.
.
.

31             CONNWAIT
                         e1000g:0 DOWN
                         e1000g:1 DOWN
```

Note that the output lists 32 nodes. The command reports the status on the two nodes in the cluster, galaxy and nebula, along with the details for the non-existent nodes.

For each correctly configured node, the information must show the following:

- A state of OPEN
- A status for each link of UP
- A MAC address for each link

However, the output in the example shows different details for the node nebula. The private network connection is possibly broken or the information in the /etc/llttab file may be incorrect.

6 To obtain information about the ports open for LLT, type `lltstat -p` on any node.

For example, type `lltstat -p` on the node galaxy in a two-node cluster:

```
lltstat -p
```

The output resembles:

```
LLT port information:
  Port  Usage       Cookie
  0     gab          0x0
        opens:       0 2 3 4 5 6 7 8 9 10 11 ... 28 29 30 31
        connects:    0 1
  7     gab          0x7
        opens:       0 2 3 4 5 6 7 8 9 10 11 ... 28 29 30 31
        connects:    0 1
  31    gab          0x1F
        opens:       0 2 3 4 5 6 7 8 9 10 11 ... 28 29 30 31
        connects:    0 1
```

Verifying GAB

Verify the GAB operation using the `gabconfig -a` command. This command returns the GAB port membership information.

The ports indicate the following:

Port a
- Nodes have GAB communication.
- gen a36e0003 is a randomly generated number
- membership 01 indicates that nodes 0 and 1 are connected

Port b
- Indicates that the I/O fencing driver is connected to GAB port b.

  Note: After you configure VCS using the installer, port b in the `gabconfig` command output indicates that I/O fencing is up in disabled mode. You must separately configure I/O fencing to use the feature.
- gen a23da40d is a randomly generated number
- membership 01 indicates that nodes 0 and 1 are connected

Port h
- VCS is started.
- gen fd570002 is a randomly generated number
- membership 01 indicates that nodes 0 and 1 are both running VCS

For more information on GAB, refer to the *Veritas Cluster Server Administrator's Guide*.

To verify GAB

1 To verify that GAB operates, type the following command on each node:

```
/sbin/gabconfig -a
```

2 Review the output of the command:

- If GAB operates, the following GAB port membership information is returned:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port b gen a23da40d membership 01
Port h gen fd570002 membership 01
```

  Note that port b in the `gabconfig` command output may not indicate that I/O fencing feature is configured. After you configure VCS using the installer, the installer starts I/O fencing in disabled mode. You can use the `vxfenadm -d` command to verify the I/O fencing configuration.

- If GAB does not operate, the command does not return any GAB port membership information:

```
GAB Port Memberships
===================================
```

- If only one network is connected, the command returns the following GAB port membership information:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port a gen a36e0003 jeopardy   ;1
Port h gen fd570002 membership 01
Port h gen fd570002 jeopardy   ;1
```

Verifying the cluster

Verify the status of the cluster using the `hastatus` command. This command returns the system state and the group state.

Refer to the `hastatus(1M)` manual page.

Refer to the *Veritas Cluster Server Administrator's Guide* for a description of system states and the transitions between them.

To verify the cluster

1 To verify the status of the cluster, type the following command:

```
hastatus -summary
```

The output resembles:

```
-- SYSTEM STATE
-- System               State                Frozen

A  galaxy                RUNNING               0
A  nebula                RUNNING               0

-- GROUP STATE
-- Group           System        Probed  AutoDisabled   State


B  ClusterService  galaxy         Y       N              ONLINE
B  ClusterService  nebula         Y       N              OFFLINE
```

2 Review the command output for the following information:

- The system state
  If the value of the system state is RUNNING, the cluster is successfully started.
- The ClusterService group state
  In the sample output, the group state lists the ClusterService group, which is ONLINE on galaxy and OFFLINE on nebula.

Verifying the cluster nodes

Verify the information of the cluster systems using the `hasys -display` command. The information for each node in the output should be similar.

Refer to the `hasys(1M)` manual page.

Refer to the *Veritas Cluster Server Administrator's Guide* for information about the system attributes for VCS.

To verify the cluster nodes

- On one of the nodes, type the `hasys -display` command:

  ```
  hasys -display
  ```

  The example shows the output when the command is run on the node galaxy. The list continues with similar information for nebula (not shown) and any other nodes in the cluster.

  Note: The following example is for SPARC. x64 clusters have different command output.

  ```
  #System    Attribute             Value

  galaxy     AgentsStopped         0

  galaxy     AvailableCapacity     100

  galaxy     CPUBinding            BindTo None CPUNumber 0

  galaxy     CPUUsage              0

  galaxy     CPUUsageMonitoring    Enabled 0 ActionThreshold 0
                                   ActionTimeLimit 0 Action NONE
                                   NotifyThreshold 0 NotifyTimeLimit 0


  galaxy     Capacity              100

  galaxy     ConfigBlockCount      130

  galaxy     ConfigCheckSum        46688

  galaxy     ConfigDiskState       CURRENT

  galaxy     ConfigFile            /etc/VRTSvcs/conf/config

  galaxy     ConfigInfoCnt         0

  galaxy     ConfigModDate         Wed 14 Oct 2009 17:22:48

  galaxy     ConnectorState        Down

  galaxy     CurrentLimits

  galaxy     DiskHbStatus
  ```

```
#System    Attribute             Value

galaxy     DynamicLoad           0

galaxy     EngineRestarted       0

galaxy     EngineVersion         5.1.00.0

galaxy     Frozen                0

galaxy     GUIIPAddr

galaxy     HostUtilization       CPU 0 Swap 0

galaxy     LLTNodeId             0

galaxy     LicenseType           DEMO

galaxy     Limits

galaxy     LinkHbStatus          link2 UP link3 UP

galaxy     LoadTimeCounter       0

galaxy     LoadTimeThreshold     600

galaxy     LoadWarningLevel      80

galaxy     NoAutoDisable         0

galaxy     NodeId                0

galaxy     OnGrpCnt              1

galaxy     ShutdownTimeout       600

galaxy     SourceFile            ./main.cf

galaxy     SysInfo               Solaris:galaxy,Generic_
                                 118558-11,5.9,sun4u

galaxy     SysName               galaxy

galaxy     SysState              RUNNING

galaxy     SystemLocation

galaxy     SystemOwner

galaxy     TFrozen               0

galaxy     TRSE                  0
```

```
#System    Attribute             Value

galaxy     UpDownState           Up

galaxy     UserInt               0

galaxy     UserStr

galaxy     VCSFeatures           DR

galaxy     VCSMode               VCS
```

Section 9

Uninstalling VCS

Chapter 26

Uninstalling VCS using the installer

This chapter includes the following topics:

Preparing to uninstall VCS

Review the following prerequisites before you uninstall VCS:

- Before you remove VCS from any node in the cluster, shut down the applications that depend on VCS. For example, applications such as Java Console or any high availability agents for VCS.
- Before you remove VCS from fewer than all nodes in a cluster, stop the service groups on the nodes from which you uninstall VCS. You must also reconfigure VCS on the remaining nodes.
  See "About adding and removing nodes" on page 347.
- If you have manually edited any of the VCS configuration files, you need to reformat them.
  See "Reformatting VCS configuration files on a stopped cluster" on page 68.

Uninstalling VCS 5.1 using the script-based installer

You must meet the following conditions to use the uninstallvcs program to uninstall VCS on all nodes in the cluster at one time:

- Make sure that the communication exists between systems. By default, the uninstaller uses ssh.
- Make sure you can execute `ssh` or `rsh` commands as superuser on all nodes in the cluster.
- Make sure that the `ssh` or `rsh` is configured to operate without requests for passwords or passphrases.

If you cannot meet the prerequisites, then you must run the uninstallvcs program on each node in the cluster.

The uninstallvcs program removes all VCS packages and VCS language packages.

The example demonstrates how to uninstall VCS using the uninstallvcs program. The uninstallvcs program uninstalls VCS on two nodes: galaxy nebula. The example procedure uninstalls VCS from all nodes in the cluster.

Removing VCS 5.1 packages

The program stops the VCS processes that are currently running during the uninstallation process.

To uninstall VCS

1. Log in as superuser from the node where you want to uninstall VCS.
2. Start uninstallvcs program.

   ```
   # cd /opt/VRTS/install
   # ./uninstallvcs
   ```

   The program specifies the directory where the logs are created. The program displays a copyright notice and a description of the cluster:
3. Enter the names of the systems from which you want to uninstall VCS.

   The program performs system verification checks and asks to stop all running VCS processes.
4. Enter **y** to stop all the VCS processes.

   The program proceeds with uninstalling the software.
5. Review the output as the uninstallvcs program continues to do the following:
   - Verifies the communication between systems

- Checks the installations on each system to determine the packages to be uninstalled.

6 Review the output as the uninstaller stops processes, unloads kernel modules, and removes the packages.

7 Note the location of summary and log files that the uninstaller creates after removing all the packages.

Running uninstallvcs from the VCS 5.1 disc

You may need to use the uninstallvcs program on the VCS 5.1 disc in one of the following cases:

- You need to uninstall VCS after an incomplete installation.
- The uninstallvcs program is not available in /opt/VRTS/install.

Uninstalling VCS with the Veritas Web-based installer

This section describes uninstalling VCS with the Veritas Web-based installer.

To uninstall VCS

1 Perform the required steps to save any data that you wish to preserve. For example, take back-ups of configuration files.

2 In an HA configuration, stop VCS processes on either the local system or all systems.

To stop VCS processes on the local system:

```
# hastop -local
```

To stop VCS processes on all systems:

```
# hastop -all
```

3 Start the Web-based installer.

See "Starting the Veritas Web-based installer" on page 156.

4 On the Select a task and a product page, select **Uninstall a Product** from the Task drop-down list.

5 Select **Veritas Cluster Server** from the Product drop-down list, and click **Next**.

6 Indicate the systems on which to uninstall. Enter one or more system names, separated by spaces. Click **Validate**.

7 After the validation completes successfully, click **Uninstall** to uninstall VCS on the selected system.

8 If there are any processes running on the target system, the installer stops the processes. Click **Next**.

9 After the installer stops the processes, the installer removes the products from the specified system.

Click **Next**.

10 After the uninstall completes, the installer displays the location of the log and summary files. If required, view the files to confirm the status of the removal.

11 Click **Finish**. The webinstaller prompts you for another task.

Removing language packages using the uninstaller program

The uninstallvcs program removes all VCS packages and language packages.

Removing the CP server configuration using the removal script

This section describes how to remove the CP server configuration from a node or cluster hosting the CP server.

Warning: Ensure that no VCS cluster is using the CP server that will have its CP server configuration removed.

A configuration utility that is part of VRTScps package is used to remove the CP server configuration. When using the configuration utility, a configuration removal script is run and the following tasks are performed:

- All CP server configuration files are removed
- The VCS configuration for CP server is removed

After running the utility and script, you can then uninstall VCS from the node or cluster.

Note: The configuration script has to run only once per CP server (which can be on a single node or SFHA cluster), when removing the CP server configuration.

The configuration utility performs the following steps to remove the CP server configuration:

- Offlines the CP server service group (CPSSG), if it is online
- Removes the CPSSG service group from the VCS configuration

The following procedure describes how to remove the CP server configuration.

To remove the CP server configuration

1 To run the configuration removal script, enter the following command on the node where you want to remove the CP server configuration:

```
root@mycps1.symantecexample.com # /opt/VRTScps/bin/configure_cps.pl
```

2 The Veritas Coordination Point Server Configuration utility appears with an option menu.

```
VERITAS COORDINATION POINT SERVER CONFIGURATION UTILITY
=======================================================

Select one of the following:

[1] Configure Coordination Point Server on single node VCS system

[2] Configure Coordination Point Server on SFHA cluster

[3] Unconfigure Coordination Point Server
```

3 Select option 3 to unconfigure the Coordination Point Server.

4 A warning appears and prompts you to confirm the action to unconfigure the Coordination Point Server.

Enter "y" to proceed.

```
Unconfiguring Coordination Point Server stops the vxcpserv process.
VCS clusters using this server for coordination purpose
will have one less coordination point.

Are you sure you want to bring down the cp server? (y/n)[Default:n] :y
```

5 After entering "y" to proceed, messages appear informing you of the progress in removing the CP server configuration.

When the CP server configuration has been unconfigured, a success message appears.

For an example of the messages from a single node VCS cluster:

```
A single node VCS cluster is currently configured.
Stopping the CP server ...

Removing the CP Server from VCS configuration..

Removing resource dependencies...
Deleting the resources configured under CPSSG service group...
Deleting the CPSSG service group...

Successfully unconfigured the Veritas Coordination Point Server.
```

For an example of the messages from a CP server on an SFHA cluster:

```
A multinode CP Server cluster is currently configured.
Stopping the CP server ...

Removing the CP Server from VCS configuration..

Removing resource dependencies...
Deleting the resources configured under CPSSG service group...
Deleting the CPSSG service group...

Successfully unconfigured the Veritas Coordination Point Server.
```

6 You are then prompted to delete the CP server database. Enter "y" to delete the database.

For example:

```
Do you want to delete the CP Server database? (y/n) (Default:n) :
```

7 You are then prompted to delete the CP server configuration file and log files. Enter "y" to delete these files.

For example:

```
Do you want to delete the CP Server configuration file
(/etc/vxcps.conf) and log files (in /var/VRTScps)? (y/n)
(Default:n) : y
```

8 Run the following `hagrp -state` command to ensure that the CPSSG resource has been removed from the node.

For example:

```
root@mycps1.symantecexample.com # hagrp -state CPSSG

VCS WARNING V-16-1-40131 Group CPSSG does not exist
in the local cluster
```

Chapter 27

Uninstalling VCS using response files

This chapter includes the following topics:

Uninstalling VCS using response files

Typically, you can use the response file that the installer generates after you perform VCS uninstallation on one cluster to uninstall VCS on other clusters.

To perform automated VCS uninstallation

1. Make sure that you meet the pre-requisites to uninstall VCS.
2. Copy the response file to one of the cluster systems where you want to uninstall VCS.

   See "Sample response file for uninstalling VCS" on page 339.
3. Edit the values of the response file variables as necessary.

   See "Response file variables to uninstall VCS" on page 338.
4. Start the uninstallation from the system to which you copied the response file. For example:

   ```
   # /opt/VRTS/install/installvcs -responsefile /tmp/response_file
   ```

   Where /tmp/*response_file* is the response file's full path name.

Response file variables to uninstall VCS

Table 27-1 lists the response file variables that you can define to uninstall VCS.

Table 27-1 Response file variables specific to uninstalling VCS

Variable	List or Scalar	Description
CFG{opt}{uninstall}	Scalar	Uninstalls VCS packages. (Required)
CFG{opt}{stopfail_allow}	Scalar	Decides whether or not to proceed if the installer fails while stopping the processes or while unloading the drivers. (Optional)
CFG{systems}	List	List of systems on which the product is to be uninstalled. (Required)
CFG{prod}	Scalar	Defines the product to be uninstalled. The value is VCS51 for VCS. (Required)
CFG{opt}{keyfile}	Scalar	Defines the location of an ssh keyfile that is used to communicate with all remote systems. (Optional)
CFG{opt}{rsh}	Scalar	Defines that *rsh* must be used instead of ssh as the communication method between systems. (Optional)

Table 27-1 Response file variables specific to uninstalling VCS *(continued)*

Variable	List or Scalar	Description
CFG{opt}{logpath}	Scalar	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. **Note:** The installer copies the response files and summary files also to the specified *logpath* location. (Optional)

Sample response file for uninstalling VCS

Review the response file variables and their definitions.

See "Response file variables to uninstall VCS" on page 338.

```
#
# Configuration Values:
#
our %CFG;

$CFG{opt}{uninstall}=1;
$CFG{prod}="VCS51";
$CFG{systems}=[ qw(galaxy nebula) ];
```

Chapter 28

Manually uninstalling VCS

This chapter includes the following topics:

Removing VCS packages manually

You must remove the VCS packages from each node in the cluster to uninstall VCS.

To manually remove VCS packages on a node

1. Shut down VCS on the local system using the `hastop` command.

   ```
   # hastop -local
   ```

2. Unconfigure the fencing, GAB, and LLT modules.

   ```
   # /sbin/vxfenconfig -U
   # /sbin/gabconfig -U
   # /sbin/lltconfig -U
   ```

3. Determine the GAB kernel module ID:

   ```
   # modinfo | grep gab
   ```

   The module ID is in the left-hand column of the output.

4. Unload the GAB module from the kernel:

   ```
   # modunload -i gab_id
   ```

5 Determine the LLT kernel module ID:

```
# modinfo | grep llt
```

The module ID is in the left-hand column of the output.

6 Unload the LLT module from the kernel:

```
# modunload -i llt_id
```

7 Remove the VCS 5.1 packages in the following order:

```
# pkgrm VRTSvcsea
# pkgrm VRTSat
# pkgrm VRTScutil
# pkgrm VRTSvcsag
# pkgrm VRTScps
# pkgrm VRTSvcs
# pkgrm VRTSvxfen
# pkgrm VRTSgab
# pkgrm VRTSllt
# pkgrm VRTSspt
# pkgrm VRTSperl
# pkgrm VRTSvlic
```

8 Remove the following language packages:

- Remove the Chinese language support packages.

```
# pkgrm VRTSzhvm
# pkgrm VRTSatZH
# pkgrm VRTSmulic
```

- Remove the Chinese language support packages.

```
# pkgrm VRTSjavm
# pkgrm VRTSjaodm
# pkgrm VRTSjafs
# pkgrm VRTSjadbe
# pkgrm VRTSjadba
# pkgrm VRTSjacsu
# pkgrm VRTSjacs
# pkgrm VRTSjacse
# pkgrm VRTSjacav
```

```
# pkgrm VRTSatJA
# pkgrm VRTSmulic
```

Section 10

Adding and removing nodes

Chapter 29

Adding and removing cluster nodes

This chapter includes the following topics:

About adding and removing nodes

After you install VCS and create a cluster, you can add and remove nodes from the cluster. You can create a cluster of up to 32 nodes.

Adding nodes using the VCS installer

The VCS installer performs the following tasks:

- Verifies that the node and the existing cluster meet communication requirements.
- Verifies the products and packages installed on the new node.
- Discovers the network interfaces on the new node and checks the interface settings.
- Creates the following files on the new node:

  `/etc/lltab`

  `/etc/VRTSvcs/conf/sysname`

- Updates the following configuration files and copies them on the new node:

  `/etc/llthosts`

  `/etc/gabtab`

  `/etc/VRTSvcs/conf/config/main.cf`

- Copies the following files from the existing cluster to the new node
  /etc/vxfenmode
  /etc/vxfendg
  /etc/vx/.uuids/clusuuid
  /etc/default/llt
  /etc/default/gab
  /etc/default/vxfen

- Configures security on the new node if the existing cluster is a secure cluster.

  Warning: If the root broker system has failed, then you must recover or reconfigure the root broker system before you add a new node to the cluster.

  See "Adding a node to the secure cluster whose root broker system has failed" on page 446.

- Configures disk-based or server-based fencing depending on the fencing mode in use on the existing cluster.

At the end of the process, the new node joins the VCS cluster.

Note: If you have configured server-based fencing on the existing cluster, make sure that the CP server does not contain entries for the new node. If the CP server already contains entries for the new node, remove these entries before adding the node to the cluster, otherwise the process may fail with an error.

To add the node to an existing VCS cluster using the VCS installer

1. Log in as the root user on one of the nodes of the existing cluster.
2. Run the VCS installer with the -addnode option.

   ```
   # cd /opt/VRTS/install

   # ./installvcs -addnode
   ```

   The installer displays the copyright message and the location where it stores the temporary installation logs.

3 Enter the name of a node in the existing VCS cluster. The installer uses the node information to identify the existing cluster.

```
Enter a node name in the VCS cluster to which
you want to add a node: galaxy
```

4 Review and confirm the cluster information.

5 Enter the name of the systems that you want to add as new nodes to the cluster.

```
Enter the system names separated by spaces
to add to the cluster: saturn
```

The installer checks the installed products and packages on the nodes and discovers the network interfaces.

6 Enter the name of the network interface that you want to configure as the first private heartbeat link.

Note: The network interface names used for the private interconnects on the new node must be the same as that of the existing nodes in the cluster. The LLT configuration for the new node must be the same as that of the existing cluster.

```
Enter the NIC for the first private heartbeat
link on saturn: [b,q,?] qfe:0
```

7 Enter **y** to configure a second private heartbeat link.

Note: At least two private heartbeat links must be configured for high availability of the cluster.

```
Would you like to configure a second private
heartbeat link? [y,n,q,b,?] (y)
```

8 Enter the name of the network interface that you want to configure as the second private heartbeat link.

```
Enter the NIC for the second private heartbeat link
on saturn: [b,q,?] qfe:1
```

9 Depending on the number of LLT links configured in the existing cluster, configure additional private heartbeat links for the new node.

The installer verifies the network interface settings and displays the information.

10 Review and confirm the information.

11 If you have configured SMTP, SNMP, or the global cluster option in the existing cluster, you are prompted for the NIC information for the new node.

```
Enter the NIC for VCS to use on saturn: qfe:2
```

12 If the existing cluster uses server-based fencing in secure mode, provide responses to the following installer prompts.

If you are using different root brokers for the CP server and the client VCS cluster, enter **y** to confirm the use of different root brokers. The installer attempts to establish trust between the new node being added to the cluster and the authentication broker of the CP server.

```
Are you using different Root Brokers for the CP Server(s) and the
client cluster? (If so then installer will try to establish trust
between the new node(s) being added and CP Server's
Authentication Broker) [y,n,q] (n) y
```

Enter the host name of the authentication broker used for any one of the CP servers.

```
Enter hostname of the Authentication Broker being used for any one
of the CP Server(s): [b] mycps1.symantecexample.com
```

Enter the port number where the authentication broker for the CP server listens to establish trust with the new node:

```
Enter the port where the Authentication Broker
mycps1.symantecexample.com for the CP Server(s) is listening
for establishing trust: [b] (2821)
```

Manually adding a node to a cluster

The system you add to the cluster must meet the hardware and software requirements.

See “Hardware requirements” on page 33.

Table 29-1 specifies the tasks that are involved in adding a cluster. The example demonstrates how to add a node saturn to already existing nodes, galaxy and nebula.

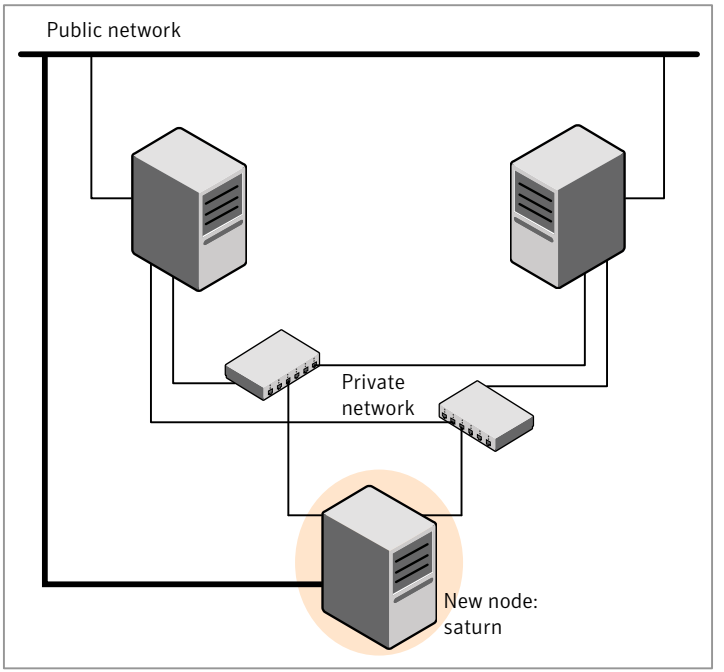
Table 29-1 Tasks that are involved in adding a node to a cluster

Task	Reference
Set up the hardware.	See "Setting up the hardware" on page 351.
Install the software manually.	See "Preparing for a manual installation" on page 191. See "Installing VCS packages for a manual installation" on page 195.
Add a license key.	See "Adding a license key for a manual installation" on page 197.
If the existing cluster runs in secure mode, set up the new node to run in secure mode.	See "Setting up the node to run in secure mode" on page 353. **Warning:** If the root broker system has failed, then you must recover or reconfigure the root broker system before you add a new node to the cluster. See "Adding a node to the secure cluster whose root broker system has failed" on page 446.
Configure LLT and GAB.	See "Configuring LLT and GAB" on page 355.
If the existing cluster is configured for I/O fencing, configure I/O fencing on the new node.	See "Configuring I/O fencing on the new node" on page 358.
Add the node to the existing cluster.	See "Adding the node to the existing cluster" on page 363.
Start VCS and verify the cluster.	See "Starting VCS and verifying the cluster" on page 364.

Setting up the hardware

Figure 29-1 shows that before you configure a new system on an existing cluster, you must physically add the system to the cluster.

Figure 29-1 Adding a node to a two-node cluster using two switches



To set up the hardware

1 Connect the VCS private Ethernet controllers.

Perform the following tasks as necessary:

- When you add nodes to a two-node cluster, use independent switches or hubs for the private network connections. You can only use crossover cables for a two-node cluster, so you might have to swap out the cable for a switch or hub.
- If you already use independent hubs, connect the two Ethernet controllers on the new node to the independent hubs.

Figure 29-1 illustrates a new node being added to an existing two-node cluster using two independent hubs.

2 Connect the system to the shared storage, if required.

Installing the VCS software manually when adding a node

Install the VCS 5.1 packages manually and add a license key.

For more information, see the following:

- See "Adding a license key for a manual installation" on page 197.

Setting up the node to run in secure mode

You must follow this procedure only if you are adding a node to a cluster that is running in secure mode. If you are adding a node to a cluster that is not running in a secure mode, proceed with configuring LLT and GAB.

See "Configuring LLT and GAB" on page 355.

Table 29-2 uses the following information for the following command examples.

Table 29-2 The command examples definitions

Name	Fully-qualified host name (FQHN)	Function
saturn	saturn.nodes.example.com	The new node that you are adding to the cluster.
RB1	RB1.brokers.example.com	The root broker for the cluster
RB2	RB2.brokers.example.com	Another root broker, not the cluster's RB

To verify the existing security setup on the node

1. If node saturn is configured as an authentication broker (AB) belonging to a root broker, perform the following steps. Else, proceed to configuring the authentication broker on node saturn.

   See "Configuring the authentication broker on node saturn" on page 354.

2. Find out the root broker to which the node saturn belongs using the following command.

   ```
   # vssregctl -l -q -b \
   "Security\Authentication\Authentication Broker" \
    -k "BrokerName"
   ```

3. If the node saturn already belongs to root broker RB1, it is configured as part of the cluster. Proceed to setting up VCS related security configuration.

   See "Setting up VCS related security configuration" on page 355.

4. If the node saturn belongs to a different root broker (for example RB2), perform the following steps to remove the security credentials from node saturn.

- Kill /opt/VRTSat/bin/vxatd process.
- Remove the credential that RB2 has given to AB on node saturn.

```
# vssat deletecred --domain type:domainname \
--prplname prplname
```

For example:

```
# vssat deletecred --domain vx:root@RB2.brokers.example.com \
--prplname saturn.nodes.example.com
```

Configuring the authentication broker on node saturn

Configure a new authentication broker (AB) on node saturn. This AB belongs to root broker RB1.

To configure the authentication broker on node saturn

1. Create a principal for node saturn on root broker RB1. Execute the following command on root broker RB1.

```
# vssat addprpl --pdrtype root --domain domainname \
 --prplname prplname --password password \
 --prpltype service
```

For example:

```
# vssat addprpl --pdrtype root \
--domain root@RB1.brokers.example.com \
--prplname saturn.nodes.example.com \
--password flurbdicate --prpltype service
```

2. Ensure that there is no clock skew between the times on node saturn and RB1.
3. Copy the /opt/VRTSat/bin/root_hash file from RB1 to node saturn.

4 Configure AB on node saturn to talk to RB1.

```
# vxatd -o -a -n prplname -p password -x vx -y domainname -q \
rootbroker -z 2821 -h roothash_file_path
```

For example:

```
# vxatd -o -a -n saturn.nodes.example.com -p flurbdicate \
-x vx -y root@RB1.brokers.example.com -q RB1 \
-z 2821 -h roothash_file_path
```

5 Verify that AB is configured properly.

```
# vssat showbrokermode
```

The command should return 1, indicating the mode to be AB.

Setting up VCS related security configuration

Perform the following steps to configure VCS related security settings.

Setting up VCS related security configuration

1 Start /opt/VRTSat/bin/vxatd process.

2 Create HA_SERVICES domain for VCS.

```
# vssat createpd --pdrtype ab --domain HA_SERVICES
```

3 Add VCS and webserver principal to AB on node saturn.

```
# vssat addprpl --pdrtype ab --domain HA_SERVICES --prplname
webserver_VCS_prplname --password new_password --prpltype
service --can_proxy
```

4 Create /etc/VRTSvcs/conf/config/.secure file.

```
# touch /etc/VRTSvcs/conf/config/.secure
```

Configuring LLT and GAB

Create the LLT and GAB configuration files on the new node and update the files on the existing nodes.

To configure LLT

1 Create the file /etc/llthosts on the new node. You must also update it on each of the current nodes in the cluster.

For example, suppose you add saturn to a cluster consisting of galaxy and nebula:

- If the file on one of the existing nodes resembles:

```
0 galaxy
1 nebula
```

- Update the file for all nodes, including the new one, resembling:

```
0 galaxy
1 nebula
2 saturn
```

2 Create the file /etc/llttab on the new node, making sure that line beginning "`set-node`" specifies the new node.

The file /etc/llttab on an existing node can serve as a guide.

The following example describes a system where node saturn is the new node on cluster ID number 2:

- For Solaris SPARC:

```
set-node saturn
set-cluster 2
link qfe0 qfe:0 - ether - -
link qfe1 qfe:1 - ether - -
```

- For Solaris x64:

```
set-node saturn
set-cluster 2
link e1000g0 e1000g:0 - ether - -
link e1000g1 e1000g:1 - ether - -
```

3 Copy the following file from one of the nodes in the existing cluster to the new node:

/etc/default/llt

4 On the new system, run the command:

```
# /sbin/lltconfig -c
```

To configure GAB

1 Create the file /etc/gabtab on the new system.

- If the /etc/gabtab file on the existing nodes resembles:

```
/sbin/gabconfig -c
```

The file on the new node should be the same. Symantec recommends that you use the `-c -nN` option, where *N* is the total number of cluster nodes.

- If the /etc/gabtab file on the existing nodes resembles:

  ```
  /sbin/gabconfig -c -n2
  ```

  The file on all nodes, including the new node, should change to reflect the change in the number of cluster nodes. For example, the new file on each node should resemble:

  ```
  /sbin/gabconfig -c -n3
  ```

  The `-n` flag indicates to VCS the number of nodes that must be ready to form a cluster before VCS starts.

2. Copy the following file from one of the nodes in the existing cluster to the new node:

   /etc/default/gab

3. On the new node, to configure GAB run the command:

   ```
   # /sbin/gabconfig -c
   ```

To verify GAB

1 On the new node, run the command:

```
# /sbin/gabconfig -a
```

The output should indicate that port a membership shows all nodes including the new node. The output should resemble:

```
GAB Port Memberships
===================================
Port a gen a3640003 membership 012
```

See "Verifying GAB" on page 320.

2 Run the same command on the other nodes (galaxy and nebula) to verify that the port a membership includes the new node:

```
# /sbin/gabconfig -a
GAB Port Memberships
===================================
Port a gen a3640003 membership 012
Port h gen fd570002 membership 01
Port h gen fd570002    visible ; 2
```

Configuring I/O fencing on the new node

If the existing cluster is configured for I/O fencing, perform the following tasks on the new node:

- Prepare to configure I/O fencing on the new node.
  See "Preparing to configure I/O fencing on the new node" on page 359.
- If the existing cluster runs server-based fencing, configure server-based fencing on the new node.
  See "Configuring server-based fencing on the new node" on page 359.
  If the existing cluster runs disk-based fencing, you need not perform any additional step. Skip to the next task. After you copy the I/O fencing files and start I/O fencing, disk-based fencing automatically comes up.
- Copy the I/O fencing files from an existing node to the new node and start I/O fencing on the new node.
  See "Starting I/O fencing on the new node" on page 362.

If the existing cluster is not configured for I/O fencing, perform the procedure to add the new node to the existing cluster.

See "Adding the node to the existing cluster" on page 363.

Preparing to configure I/O fencing on the new node

Perform the following tasks before you configure and start I/O fencing on the new node.

To prepare to configure I/O fencing on the new node

1 Determine whether the existing cluster runs disk-based or server-based fencing mechanism. On one of the nodes in the existing cluster, run the following command:

```
# vxfenadm -d
```

If the fencing mode in the output is SCSI3, then the cluster uses disk-based fencing.

If the fencing mode in the output is CUSTOMIZED, then the cluster uses server-based fencing.

2 In the following cases, install and configure Veritas Volume Manager (VxVM) on the new node.

- The existing cluster uses disk-based fencing.
- The existing cluster uses server-based fencing with at least one coordinator disk.

You need not perform this step if the existing cluster uses server-based fencing with all coordination points as CP servers.

See the *Veritas Storage Foundation and High Availability Installation Guide* for installation instructions.

Configuring server-based fencing on the new node

This section describes the procedures to configure server-based fencing on a new node. Depending on whether server-based fencing is configured in secure or non-secure mode on the existing cluster, perform the tasks in one of the following procedures:

- Server-based fencing in non-secure mode:
  To configure server-based fencing in non-secure mode on the new node
- Server-based fencing in secure mode:
  To configure server-based fencing with security on the new node

To configure server-based fencing in non-secure mode on the new node

1 Log in to each CP server as the root user.

2 Update each CP server configuration with the new node information:

```
# cpsadm -s mycps1.symantecexample.com \
-a add_node -c clus1 -h saturn -n2

Node 2 (saturn) successfully added
```

3 Verify that the new node is added to the CP server configuration:

```
# cpsadm -s mycps1.symantecexample.com \
-a list_nodes
```

The new node must be listed in the command output.

4 Add the VCS user cpsclient@saturn to each CP server:

```
# cpsadm -s mycps1.symantecexample.com \
-a add_user -e cpsclient@saturn \
-f cps_operator -g vx

User cpsclient@saturn successfully added
```

Perform the following procedure for a secure configuration.

To configure server-based fencing with security on the new node

1 As the root user, create the VCS user and the domain on the new node:

- Create a dummy configuration file /etc/VRTSvcs/conf/config/main.cf that resembles the following example:

```
# cat main.cf

include "types.cf"
cluster clus1 {
     SecureClus = 1
     }

system saturn {
    }
```

- Verify the dummy configuration file:

```
# cd /etc/VRTSvcs/conf/config

# /opt/VRTSvcs/bin/hacf -verify .
```

- Start VCS in one node mode on the new node:

```
# /opt/VRTSvcs/bin/hastart -onenode
```

2 Verify that the VCS user and the domain are created on the new node:

```
# /opt/VRTScps/bin/cpsat showcred | grep _HA_VCS_

# /opt/VRTScps/bin/cpsat listpd -t local | grep HA_SERVICES
```

3 Stop VCS if the VCS user and domain are created successfully on the new node:

```
# /opt/VRTSvcs/bin/hastop -local
```

4 If the root broker for the CP server and the new node are different, run the following command to establish trust between the authentication broker of the CP Server and the new node:

```
# /usr/bin/echo y | /opt/VRTScps/bin/cpsat setuptrust \
-b mycps1.symantecexample.com -s high
```

5 Log in to each CP server as the root user.

6 Update each CP server configuration with the new node information:

```
# cpsadm -s mycps1.symantecexample.com \
-a add_node -c clus1 -h saturn -n2

Node 2 (saturn) successfully added
```

7 Verify that the new node is added to the CP server configuration:

```
# cpsadm -s mycps1.symantecexample.com -a list_nodes
```

The new node must be listed in the output.

8 Add the VCS user _HA_VCS_saturn@HA_SERVICES@saturn.symantec.com to each CP server:

```
# cpsadm -s mycps1.symantecexample.com \
-a add_user -e _HA_VCS_ssaturn@HA_SERVICES@saturn.symantec.com \
-f cps_operator -g vx

User _HA_VCS_saturn@HA_SERVICES@saturn.symantec.com successfully added
```

Adding the new node to the vxfen service group

Perform the steps in the following procedure to add the new node to the vxfen service group.

To add the new node to the vxfen group using the CLI

1 On one of the nodes in the existing VCS cluster, set the cluster configuration to read-write mode:

```
# haconf -makerw
```

2 Add the node saturn to the existing vxfen group.

```
# hagrp -modify vxfen SystemList -add saturn 2
```

3 Save the configuration by running the following command from any node in the VCS cluster:

```
# haconf -dump -makero
```

Starting I/O fencing on the new node

Copy the I/O fencing files from an existing node to the new node and start I/O fencing on the new node. This task starts I/O fencing based on the fencing mechanism that is configured in the existing cluster.

To start I/O fencing on the new node

1 Copy the following I/O fencing configuration files from one of the nodes in the existing cluster to the new node:

- /etc/vxfenmode

- /etc/vxfendg—This file is required only for disk-based fencing.
- /etc/default/vxfen

2 Start I/O fencing on the new node.

Depending on the Solaris version on the cluster nodes, run the following command:

- Solaris 9:

```
# /etc/init.d/vxfen start
```

- Solaris 10:

```
# svcadm enable vxfen
```

3 Run the GAB configuration command on the new node to verify that the port b membership is formed.

```
# gabconfig -a
```

Adding the node to the existing cluster

Perform the tasks on one of the existing nodes in the cluster.

To add the new node to the existing cluster

1 Copy the cluster UUID from the one of the nodes in the existing cluster to the new node:

```
# /opt/VRTSvcs/bin/uuidconfig.pl -clus -copy -from_sys \
node_name_in_running_cluster -to_sys new_sys1 ... new_sysn
```

Where you are copying the cluster UUID from a node in the cluster (*node_name_in_running_cluster*) to systems from *new_sys1* through *new_sysn* that you want to join the cluster.

2 Copy the following file from one of the nodes in the existing cluster to the new node:

/etc/default/vcs

3 Enter the command:

```
# haconf -makerw
```

4 Add the new system to the cluster:

```
# hasys -add saturn
```

5 Copy the main.cf file from an existing node to your new node:

```
# rcp /etc/VRTSvcs/conf/config/main.cf \
  saturn:/etc/VRTSvcs/conf/config/
```

6 Check the VCS configuration file. No error message and a return value of zero indicates that the syntax is legal.

```
# hacf -verify /etc/VRTSvcs/conf/config/
```

7 If necessary, modify any new system attributes.

8 Enter the command:

```
# haconf -dump -makero
```

Starting VCS and verifying the cluster

Start VCS after adding the new node to the cluster and verify the cluster.

To start VCS and verify the cluster

1 Start VCS on the newly added system:

```
# hastart
```

2 Run the GAB configuration command on each node to verify that port a and port h include the new node in the membership:

```
# /sbin/gabconfig -a
  GAB Port Memberships
  ===================================
  Port a gen a3640003 membership 012
  Port h gen fd570002 membership 012
```

If the cluster uses I/O fencing, then the GAB output also shows port b membership.

Removing a node from a cluster

Table 29-3 specifies the tasks that are involved in removing a node from a cluster. In the example procedure, the cluster consists of nodes galaxy, nebula, and saturn; node saturn is to leave the cluster.

Table 29-3 Tasks that are involved in removing a node

Task	Reference
■ Back up the configuration file. ■ Check the status of the nodes and the service groups.	See "Verifying the status of nodes and service groups" on page 365.
■ Switch or remove any VCS service groups on the node departing the cluster. ■ Delete the node from VCS configuration.	See "Deleting the departing node from VCS configuration" on page 366.
Modify the llthosts and gabtab files to reflect the change.	See "Modifying configuration files on each remaining node" on page 369.
If the existing cluster is configured to use server-based I/O fencing, remove the node configuration from the CP server.	See "Removing the node configuration from the CP server" on page 369.
For a cluster that is running in a secure mode, remove the security credentials from the leaving node.	See "Removing security credentials from the leaving node " on page 370.
On the node departing the cluster: ■ Modify startup scripts for LLT, GAB, and VCS to allow reboot of the node without affecting the cluster. ■ Unconfigure and unload the LLT and GAB utilities. ■ Remove the VCS packages.	See "Unloading LLT and GAB and removing VCS on the departing node" on page 370. See "Removing VCS packages manually" on page 341.

Verifying the status of nodes and service groups

Start by issuing the following commands from one of the nodes to remain, node galaxy or node nebula.

To verify the status of the nodes and the service groups

1 Make a backup copy of the current configuration file, main.cf.

```
# cp -p /etc/VRTSvcs/conf/config/main.cf\
/etc/VRTSvcs/conf/config/main.cf.goodcopy
```

2 Check the status of the systems and the service groups.

```
# hastatus -summary

    -- SYSTEM STATE
    -- System      State          Frozen
    A  galaxy      RUNNING        0
    A  nebula      RUNNING        0
    A  saturn      RUNNING        0

    -- GROUP STATE
    -- Group    System      Probed   AutoDisabled   State
    B  grp1     galaxy      Y        N              ONLINE
    B  grp1     nebula      Y        N              OFFLINE
    B  grp2     galaxy      Y        N              ONLINE
    B  grp3     nebula      Y        N              OFFLINE
    B  grp3     saturn      Y        N              ONLINE
    B  grp4     saturn      Y        N              ONLINE
```

The example output from the `hastatus` command shows that nodes galaxy, nebula, and saturn are the nodes in the cluster. Also, service group grp3 is configured to run on node nebula and node saturn, the departing node. Service group grp4 runs only on node saturn. Service groups grp1 and grp2 do not run on node saturn.

Deleting the departing node from VCS configuration

Before you remove a node from the cluster you need to identify the service groups that run on the node.

You then need to perform the following actions:

- Remove the service groups that other service groups depend on, or
- Switch the service groups to another node that other service groups depend on.

To remove or switch service groups from the departing node

1 Switch failover service groups from the departing node. You can switch grp3 from node saturn to node nebula.

```
# hagrp -switch grp3 -to nebula
```

2 Check for any dependencies involving any service groups that run on the departing node; for example, grp4 runs only on the departing node.

```
# hagrp -dep
```

3 If the service group on the departing node requires other service groups—if it is a parent to service groups on other nodes—unlink the service groups.

```
# haconf -makerw
# hagrp -unlink grp4 grp1
```

These commands enable you to edit the configuration and to remove the requirement grp4 has for grp1.

4 Stop VCS on the departing node:

```
# hastop -sys saturn
```

5 Check the status again. The state of the departing node should be EXITED. Make sure that any service group that you want to fail over is online on other nodes.

```
# hastatus -summary

    -- SYSTEM STATE
    -- System      State          Frozen
    A  galaxy      RUNNING        0
    A  nebula      RUNNING        0
    A  saturn      EXITED         0

    -- GROUP STATE
    -- Group    System      Probed   AutoDisabled   State
    B  grp1     galaxy      Y        N              ONLINE
    B  grp1     nebula      Y        N              OFFLINE
    B  grp2     galaxy      Y        N              ONLINE
    B  grp3     nebula      Y        N              ONLINE
    B  grp3     saturn      Y        Y              OFFLINE
    B  grp4     saturn      Y        N              OFFLINE
```

6 Delete the departing node from the SystemList of service groups grp3 and grp4.

```
# hagrp -modify grp3 SystemList -delete saturn
# hagrp -modify grp4 SystemList -delete saturn
```

7 For the service groups that run only on the departing node, delete the resources from the group before you delete the group.

```
# hagrp -resources grp4
    processx_grp4
    processy_grp4
# hares -delete processx_grp4
# hares -delete processy_grp4
```

8 Delete the service group that is configured to run on the departing node.

```
# hagrp -delete grp4
```

9 Check the status.

```
# hastatus -summary
    -- SYSTEM STATE
    -- System      State          Frozen
    A  galaxy      RUNNING        0
    A  nebula      RUNNING        0
    A  saturn      EXITED         0

    -- GROUP STATE
    -- Group    System      Probed   AutoDisabled   State
    B  grp1     galaxy      Y        N              ONLINE
    B  grp1     nebula      Y        N              OFFLINE
    B  grp2     galaxy      Y        N              ONLINE
    B  grp3     nebula      Y        N              ONLINE
```

10 Delete the node from the cluster.

```
# hasys -delete saturn
```

11 Save the configuration, making it read only.

```
# haconf -dump -makero
```

Modifying configuration files on each remaining node

Perform the following tasks on each of the remaining nodes of the cluster.

To modify the configuration files on a remaining node

1. If necessary, modify the /etc/gabtab file.

   No change is required to this file if the `/sbin/gabconfig` command has only the argument `-c`. Symantec recommends using the `-nN` option, where *N* is the number of cluster systems.

   If the command has the form `/sbin/gabconfig -c -nN`, where *N* is the number of cluster systems, make sure that *N* is not greater than the actual number of nodes in the cluster. When *N* is greater than the number of nodes, GAB does not automatically seed.

   Symantec does not recommend the use of the `-c -x` option for `/sbin/gabconfig`.

2. Modify /etc/llthosts file on each remaining nodes to remove the entry of the departing node.

   For example, change:

   ```
   0 galaxy
   1 nebula
   2 saturn
   ```

   To:

   ```
   0 galaxy
   1 nebula
   ```

Removing the node configuration from the CP server

After removing a node from a VCS cluster, perform the steps in the following procedure to remove that node's configuration from the CP server.

To remove the node configuration from the CP server

1. Log into the CP server as the root user.
2. View the list of VCS users on the CP server, using the following command:

   ```
   # cpsadm -s cp_server -a list_users
   ```

   Where *cp_server* is the virtual IP/ virtual hostname of the CP server.

3 Remove the VCS user associated with the node you previously removed from the cluster.

For CP server in secure mode:

```
# cpsadm -s cp_server -a rm_user \
-e _HA_VCS_saturn@HA_SERVICES@saturn.nodes.example.com \
-f cps_operator  -g vx
```

For CP server in non-secure mode:

```
 # cpsadm -s cp_server  -a rm_user \
 -e cpsclient@saturn  -f cps_operator  -g vx
```

4 Remove the node entry from the CP server:

```
cpsadm -s cp_server -a rm_node  -h saturn -c clus1 -n 2
```

5 View the list of nodes on the CP server to ensure that the node entry was removed:

```
cpsadm -s cp_server -a list_nodes
```

Removing security credentials from the leaving node

If the leaving node is part of a cluster that is running in a secure mode, you must remove the security credentials from node saturn. Perform the following steps.

To remove the security credentials

1 Kill /opt/VRTSat/bin/vxatd process.

2 Remove the root credentials on node saturn.

```
# vssat deletecred --domain type:domainname --prplname prplname
```

Unloading LLT and GAB and removing VCS on the departing node

Perform the tasks on the node that is departing the cluster.

If you have configured VCS as part of the Storage Foundation and High Availability products, you may have to delete other dependent packages before you can delete all of the following ones.

To unconfigure and unload LLT and GAB and remove VCS

1 If you had configured I/O fencing in enabled mode, then stop I/O fencing.

On Solaris 9:

```
# /etc/init.d/vxfen stop
```

On Solaris 10:

```
# /lib/svc/method/vxfen stop
```

2 Unconfigure GAB and LLT:

```
# /sbin/gabconfig -U
# /sbin/lltconfig -U
```

3 Unload the GAB and LLT modules from the kernel.

- Determine the kernel module IDs:

```
# modinfo | grep gab
# modinfo | grep llt
```

The module IDs are in the left-hand column of the output.

- Unload the module from the kernel:

```
# modunload -i gab_id
# modunload -i llt_id
```

4 Disable the startup files to prevent LLT, GAB, or VCS from starting up:

- Solaris 9:

```
# /etc/init.d/llt stop
# /etc/init.d/gab stop
# /etc/init.d/vxfen stop
# /opt/VRTSvcs/bin/hastop
```

- Solaris 10:

```
# /usr/sbin/svcadm disable llt
# /usr/sbin/svcadm disable gab
```

```
# /usr/sbin/svcadm disable vcs
```

5 To determine the packages to remove, enter:

```
# pkginfo | grep VRTS
```

6 To permanently remove the VCS packages from the system, use the `pkgrm` command. Start by removing the following packages, which may have been optionally installed, in the order shown:

```
# pkgrm VRTSvcsea
# pkgrm VRTSat
# pkgrm VRTScutil
# pkgrm VRTSvcsag
# pkgrm VRTScps
# pkgrm VRTSvcs
# pkgrm VRTSvxfen
# pkgrm VRTSgab
# pkgrm VRTSllt
# pkgrm VRTSspt
# pkgrm VRTSperl
# pkgrm VRTSvlic
```

7 Remove the LLT and GAB configuration files.

```
# rm /etc/llttab
# rm /etc/gabtab
# rm /etc/llthosts
```

8 Remove the language packages and patches.

See "Removing VCS packages manually" on page 341.

Chapter 30

Adding a node to a single-node cluster

This chapter includes the following topics:

Adding a node to a single-node cluster

All nodes in the new cluster must run the same version of VCS. The example procedure refers to the existing single-node VCS node as Node A. The node that is to join Node A to form a multiple-node cluster is Node B.

Table 30-1 specifies the activities that you need to perform to add nodes to a single-node cluster.

Table 30-1 Tasks to add a node to a single-node cluster

Task	Reference
Set up Node B to be compatible with Node A.	See "Setting up a node to join the single-node cluster" on page 374.
■ Add Ethernet cards for private heartbeat network for Node B. ■ If necessary, add Ethernet cards for private heartbeat network for Node A. ■ Make the Ethernet cable connections between the two nodes.	See "Installing and configuring Ethernet cards for private network" on page 375.
Connect both nodes to shared storage.	See "Configuring the shared storage" on page 376.

Table 30-1 Tasks to add a node to a single-node cluster *(continued)*

Task	Reference
■ Bring up VCS on Node A. ■ Edit the configuration file.	See "Bringing up the existing node" on page 376.
If necessary, install VCS on Node B and add a license key. Make sure Node B is running the same version of VCS as the version on Node A.	See "Installing the VCS software manually when adding a node to a single node cluster" on page 377.
Edit the configuration files on Node B.	See "Creating configuration files" on page 377.
Start LLT and GAB on Node B.	See "Starting LLT and GAB" on page 377.
■ Start LLT and GAB on Node A. ■ Restart VCS on Node A. ■ Modify service groups for two nodes.	See "Reconfiguring VCS on the existing node" on page 378.
■ Start VCS on Node B. ■ Verify the two-node cluster.	See "Verifying configuration on both nodes" on page 379.

Setting up a node to join the single-node cluster

The new node to join the existing single node that runs VCS must run the same operating system.

To set up a node to join the single-node cluster

1 Do one of the following tasks:

- If VCS is not currently running on Node B, proceed to step 2.
- If the node you plan to add as Node B is currently part of an existing cluster, remove the node from the cluster. After you remove the node from the cluster, remove the VCS packages and configuration files.
  See "Removing a node from a cluster" on page 365.
- If the node you plan to add as Node B is also currently a single VCS node, uninstall VCS.
  See "Removing VCS packages manually" on page 341.
- If you renamed the LLT and GAB startup files, remove them.

See "Renaming the LLT and GAB startup files" on page 422.

2 If necessary, install VxVM and VxFS.

See "Installing VxVM or VxFS if necessary" on page 375.

Installing VxVM or VxFS if necessary

If you have either VxVM or VxFS with the cluster option installed on the existing node, install the same version on the new node.

Refer to the appropriate documentation for VxVM and VxFS to verify the versions of the installed products. Make sure the same version runs on all nodes where you want to use shared storage.

Installing and configuring Ethernet cards for private network

Both nodes require Ethernet cards (NICs) that enable the private network. If both Node A and Node B have Ethernet cards installed, you can ignore this step.

For high availability, use two separate NICs on each node. The two NICs provide redundancy for heartbeating.

See "Setting up the private network" on page 53.

To install and configure Ethernet cards for private network

1 Shut down VCS on Node A.

```
# hastop -local
```

2 Shut down the node to get to the OK prompt:

```
# sync;sync;init 0
```

3 Install the Ethernet card on Node A.

If you want to use aggregated interface to set up private network, configure aggregated interface.

4 Install the Ethernet card on Node B.

If you want to use aggregated interface to set up private network, configure aggregated interface.

5 Configure the Ethernet card on both nodes.

6 Make the two Ethernet cable connections from Node A to Node B for the private networks.

7 Restart the nodes.

Configuring the shared storage

Make the connection to shared storage from Node B. Configure VxVM on Node B and reboot the node when you are prompted.

See "Setting up shared storage" on page 60.

Bringing up the existing node

Bring up the node.

To bring up the node

1. Start the operating system. On a SPARC node (Node A) enter the command:

   ```
   ok boot -r
   ```

2. Log in as superuser.
3. Make the VCS configuration writable.

   ```
   # haconf -makerw
   ```

4. Display the service groups currently configured.

   ```
   # hagrp -list
   ```

5. Freeze the service groups.

   ```
   # hagrp -freeze group -persistent
   ```

   Repeat this command for each service group in step 4.

6. Make the configuration read-only.

   ```
   # haconf -dump -makero
   ```

7. Stop VCS on Node A.

   ```
   # hastop -local -force
   ```

8. If you have configured I/O Fencing, GAB, and LLT on the node, stop them.
   - Solaris 9:

     ```
     # /etc/init.d/gab stop
     # /etc/init.d/llt stop
     ```

   - Solaris 10:

```
# /usr/sbin/svcadm disable gab
# /usr/sbin/svcadm disable llt
```

Installing the VCS software manually when adding a node to a single node cluster

Install the VCS 5.1 packages manually and install the license key.

Refer to the following sections:

- See "Preparing for a manual installation" on page 191.
- See "Adding a license key for a manual installation" on page 197.

Creating configuration files

Create the configuration files for your cluster.

To create the configuration files

1. Create the file /etc/llttab that lists both the nodes.

   See "Setting up /etc/llttab for a manual installation" on page 206.
2. Create the file /etc/llthosts. Set up /etc/llthosts for a two-node cluster.

   See "Setting up /etc/llthosts for a manual installation" on page 206.
3. Create the file /etc/gabtab.

   See "Configuring GAB for a manual installation" on page 208.

Starting LLT and GAB

On the new node, start LLT and GAB.

To start LLT and GAB

1. Start LLT on Node B.
   - On Solaris 9:

     ```
     # /etc/init.d/llt start
     ```

   - On Solaris 10:

     ```
     # /usr/sbin/svcadm enable llt
     ```

2. Start GAB on Node B

- On Solaris 9:

  ```
  # /etc/init.d/gab start
  ```

- On Solaris 10:

  ```
  # /usr/sbin/svcadm enable gab
  ```

Reconfiguring VCS on the existing node

Reconfigure VCS on the existing nodes.

To reconfigure VCS on existing nodes

1. On Node A, create the files /etc/llttab, /etc/llthosts, and /etc/gabtab. Use the files that are created on Node B as a guide, customizing the /etc/llttab for Node A.
2. Start LLT on Node A.
   - Solaris 9:

     ```
     # /etc/init.d/llt start
     ```

   - Solaris 10:

     ```
     # /usr/sbin/svcadm enable llt
     ```

3. Start GAB on Node A.
   - Solaris 9:

     ```
     # /etc/init.d/gab start
     ```

   - Solaris 10:

     ```
     # /usr/sbin/svcadm enable gab
     ```

4. Check the membership of the cluster.

   ```
   # gabconfig -a
   ```

5 Copy the cluster UUID from the existing node to the new node:

```
# /opt/VRTSvcs/bin/uuidconfig.pl -clus -copy -from_sys \
node_name_in_running_cluster -to_sys new_sys1 ... new_sysn
```

Where you are copying the cluster UUID from a node in the cluster (*node_name_in_running_cluster*) to systems from *new_sys1* through *new_sysn* that you want to join the cluster.

6 Start VCS on Node A.

```
# hastart
```

7 Make the VCS configuration writable.

```
# haconf -makerw
```

8 Add Node B to the cluster.

```
# hasys -add sysB
```

9 Add Node B to the system list of each service group.

- List the service groups.

```
# hagrp -list
```

- For each service group that is listed, add the node.

```
# hagrp -modify group SystemList -add sysB 1
```

Verifying configuration on both nodes

Verify the configuration for the nodes.

To verify the nodes' configuration

1 On Node B, check the cluster membership.

```
# gabconfig -a
```

2 Start the VCS on Node B.

```
# hastart
```

3 Verify that VCS is up on both nodes.

```
# hastatus
```

4 List the service groups.

```
# hagrp -list
```

5 Unfreeze the service groups.

```
# hagrp -unfreeze group -persistent
```

6 Implement the new two-node configuration.

```
# haconf -dump -makero
```

Section 11

Installation reference

Appendix A

VCS installation packages

This appendix includes the following topics:

Veritas Cluster Server installation packages

Table A-1 shows the package name and contents for each Veritas Cluster Server package.

Table A-1 Veritas Cluster Server packages

Package	Contents	Required/Optional
VRTSat	Contains the binaries for Symantec Product Authentication Service. Installs Symantec Product Authentication Service, which provides authentication services for other Symantec products. VRTSat contains a server component and a client component. The server provides services for a root broker, authentication broker, or both. The client allows Symantec products to communicate with the brokers.	Optional. Required to use Symantec Product Authentication Service.
VRTScps	Contains the binaries for the Veritas Coordination Point Server.	Optional. Required to Coordination Point Server (CPS). Depends on VRTSvxfen.

Table A-1 Veritas Cluster Server packages *(continued)*

Package	Contents	Required/Optional
VRTScutil	VRTScutil contains the following components: ■ Contains the binaries for the Veritas Cluster Server utilities. ■ Contains the binaries for the Veritas Cluster Server configuration wizards. ■ Contains the binaries for the Veritas Cluster Server Simulator. ■ Contains the binaries for the Veritas agent for Oracle and SF Oracle RAC configuration wizards.	Required Depends on VRTSvcsag.
VRTSgab	Contains the binaries for Veritas Cluster Server group membership and atomic broadcast services.	Required Depends on VRTSllt.
VRTSllt	Contains the binaries for Veritas Cluster Server low-latency transport.	Required
VRTSperl	Contains Perl for Veritas.	Required
VRTSspt	Contains the binaries for Veritas Software Support Tools.	Required
VRTSvcs	VRTSvcs contains the following components: ■ Contains the binaries for Veritas Cluster Server. ■ Contains the binaries for Veritas Cluster Server manual pages. ■ Contains the binaries for Veritas Cluster Server English message catalogs. ■ Contains the binaries for Veritas Cluster Server utilities. These utilities include security services.	Required Depends on VRTSvxfen, VRTSgab, and VRTSllt.

Table A-1 Veritas Cluster Server packages *(continued)*

Package	Contents	Required/Optional
VRTSvcsag	Contains the binaries for Veritas Cluster Server bundled agents.	Required Depends on VRTSvcs.
VRTSvcsea	VRTSvcsea contains the binaries for Veritas high availability agents for DB2, Sybase, and Oracle.	Optional for VCS. Required to use VCS with the high availability agents for DB2, Sybase, or Oracle.
VRTSvlic	Contains the binaries for Symantec License Utilities.	Required
VRTSvxfen	Contains the binaries for Veritas I/O Fencing .	Optional. Required to use fencing. Depends on VRTSgab.

Table A-2 shows the package name, contents, and type for each Veritas Cluster Server language package.

Table A-2 Veritas Cluster Server language packages

Package	Contents	Package type
VRTSmulic	Contains the multi-language Symantec license utilities.	Common L10N package
VRTSatJA	Contains the binaries for Symantec Product Authentication Service Software Japanese language Kit.	Japanese language package
VRTSjacav	Contains the binaries for Japanese VERITAS Cluster Server Agent Extensions for Storage Cluster File System - Manual Pages and Message Catalogs.	Japanese language package
VRTSjacse	Contains Japanese Veritas High Availability Enterprise Agents by Symantec.	Japanese language package
VRTSjacs	Contains the binaries for Veritas Cluster Server Japanese Message Catalogs by Symantec.	Japanese language package

Table A-2 Veritas Cluster Server language packages *(continued)*

Package	Contents	Package type
VRTSjacsu	Contains the binaries for Japanese Veritas Cluster Utility Language Pack by Symantec.	Japanese language package
VRTSjadba	Contains the binaries for Japanese RAC support package by Symantec.	Japanese language package
VRTSjadbe	Contains the Japanese Storage Management Software for Databases - Message Catalog.	Japanese language package
VRTSjafs	Contains the binaries for Japanese Language Message Catalog and Manual Pages for VERITAS File System.	Japanese language package
VRTSjaodm	Contains the binaries for Japanese Message Catalog and Man Pages for ODM.	Japanese language package
VRTSjavm	Contains the binaries for Japanese Virtual Disk Subsystem Message Catalogs and Manual Pages.	Japanese language package
VRTSatZH	Contains the binaries for Symantec Product Authentication Service Software Chinese language Kit.	Chinese language package
VRTSzhvm	Contains the binaries for Chinese Virtual Disk Subsystem Message Catalogs and Manual Pages.	Chinese language package

Appendix B

Installation command options

This appendix includes the following topics:

Command options for installvcs program

The `installvcs` command usage takes the following form:

```
installvcs [ system1 system2... ]
 [ -configure | -install | -license | -precheck | -requirements | -start
              | -stop | -uninstall | -upgrade ]
 [ -logpath log_path ]
 [ -responsefile response_file ]
 [ -tmppath tmp_path ]
 [ -hostfile hostfile_path ]

 [ -jumpstart jumpstart_path ]

 [ -keyfile ssh_key_file ]
 [ -patchpath patch_path ]
 [ -pkgpath pkg_path ]

 [ -rootpath root_path ]

[ -rsh | -redirect | -installminpkgs | -installrecpkgs | -installallpkgs
        | -minpkgs | -recpkgs | -allpkgs | -ha | -pkgset | -pkginfo
        | -serial | -makeresponsefile | -pkgtable | -security |
          -addnode | -fencing ]
```

Table B-1 lists the `installvcs` command options.

Table B-1 installvcs options

Option and Syntax	Description
`-addnode`	Adds a node that you specify to a cluster. The cluster must be online to use this command option to add a node.
`-allpkgs`	View a list of all VCS packages and patches. The installvcs program lists the packages and patches in the correct installation order. You can use the output to create scripts for command-line installation, or for installations over a network. See the -minpkgs and the -recpkgs options.
`-configure`	Configure VCS after using `-install` option to install VCS.
`-fencing`	Configure I/O fencing after you configure VCS. The script provides an option to configure disk-based I/o fencing or server-based I/O fencing.
`-hostfile`	Specifies the location of a file that contains the system names for the installer.
`-install`	Install product packages on systems without configuring VCS.
`-installallpkgs`	Selects all the packages for installation. See the `-allpkgs` option.
`-installminpkgs`	Selects the minimum packages for installation. See the `-minpkgs` option.
`-installrecpkgs`	Selects the recommended packages for installation. See the `-recpkgs` option.
`-jumpstart` *`dir_path`*	Use this option to generate the finish scripts that the Solaris JumpStart Server can use for Veritas products. The *dir_path* indicates the path to an existing directory where the installer must store the finish scripts.
`-keyfile` *`ssh_key_file`*	Specifies a key file for SSH. The option passes `-i` *`ssh_key_file`* with each SSH invocation.
`-license`	Register or update product licenses on the specified systems. This option is useful to replace a demo license.

Table B-1 installvcs options *(continued)*

Option and Syntax	Description
`-logpath` *log_path*	Specifies that log_path, not /opt/VRTS/install/logs, is the location where installvcs log files, summary file, and response file are saved.
`-makeresponsefile`	Create a response file. This option only generates a response file and does not install VCS.
`-minpkgs`	View a list of the minimal packages and the patches that are required for VCS. The installvcs program lists the packages and patches in the correct installation order. The list does not include the optional packages. You can use the output to create scripts for command-line installation, or for installations over a network. See the -allpkgs and the -recpkgs options.
`-osversion`	View the list of packages and patches that apply to the specified Solaris version. Valid values are `sol8`, `sol9`, or `sol10`. Use this option with one of the following options: ■ -allpkgs ■ -minpkgs ■ -recpkgs ■ -jumpstart
`-patchpath` *patch_path*	Specifies that *patch_path* contains all patches that the installvcs program is about to install on all systems. The *patch_path* is the complete path of a directory. **Note:** You can use this option when you download recent versions of patches.
`-pkginfo`	Displays a list of packages in the order of installation in a user-friendly format. Use this option with one of the following options: ■ -allpkgs If you do not specify an option, -allpkgs is used by default. ■ -minpkgs ■ -recpkgs

Table B-1 installvcs options *(continued)*

Option and Syntax	Description
`-pkgpath` *pkg_path*	Specifies that *pkg_path* contains all packages that the installvcs program is about to install on all systems. The *pkg_path* is the complete path of a directory, usually NFS mounted.
`-pkgset`	Discovers and lists the 5.1 packages installed on the systems that you specify.
`-pkgtable`	Displays the VCS 5.1 packages in the correct installation order.
`-precheck`	Verify that systems meet the installation requirements before proceeding with VCS installation. Symantec recommends doing a precheck before you install VCS. See "Performing automated preinstallation check" on page 67.
`-recpkgs`	View a list of the recommended packages and the patches that are required for VCS. The installvcs program lists the packages and patches in the correct installation order. The list does not include the optional packages. You can use the output to create scripts for command-line installation, or for installations over a network. See the -allpkgs and the -minpkgs options.
`-requirements`	View a list of required operating system version, required patches, file system space, and other system requirements to install VCS.

Table B-1 installvcs options *(continued)*

Option and Syntax	Description
`-responsefile` *response_file* [`-enckeyfile` *encryption_key_file*]	Perform automated VCS installation using the system and the configuration information that is stored in a specified file instead of prompting for information. The *response_file* must be a full path name. If not specified, the response file is automatically generated as `installer`*number*`.response` where *number* is random. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file. The `-enckeyfile` option and *encryption_key_file* name are required with the `-responsefile` option when the response file contains encrypted passwords. See "Installing VCS using response files" on page 165. See "Configuring VCS using response files" on page 171. See "Upgrading VCS using response files" on page 261.
`-rootpath` *root_path*	Specifies that root_path is the root location for the installation of all packages. On Solaris, `-rootpath` passes `-R` *root_path* to pkgadd command.
`-redirect`	Specifies that the installer need not display the progress bar details during the installation.
`-rsh`	Specifies that *rsh* and `rcp` are to be used for communication between systems instead of ssh and `scp`. This option requires that systems be preconfigured such that *rsh* commands between systems execute without prompting for passwords or confirmations
`-security`	Enable or disable Symantec Product Authentication Service in a VCS cluster that is running. See the *Veritas Cluster Server Administrator's Guide* for instructions. See "About Symantec Product Authentication Service (AT)" on page 29.

Table B-1 installvcs options *(continued)*

Option and Syntax	Description
`-serial`	Performs the installation, uninstallation, start, and stop operations on the systems in a serial fashion. By default, the installer performs these operations simultaneously on all the systems.
`-start`	Starts the daemons and processes for VCS. If the installvcs program failed to start up all the VCS processes, you can use the -stop option to stop all the processes and then use the -start option to start the processes. See the -stop option. See "Starting and stopping processes for the Veritas products" on page 442.
`-stop`	Stops the daemons and processes for VCS. If the installvcs program failed to start up all the VCS processes, you can use the -stop option to stop all the processes and then use the -start option to start the processes. See the -start option. See "Starting and stopping processes for the Veritas products" on page 442.
`-tmppath` *tmp_path*	Specifies that *tmp_path* is the working directory for installvcs program. This path is different from the /var/tmp path. This destination is where the installvcs program performs the initial logging and where the installvcs program copies the packages on remote systems before installation.
`-upgrade`	Upgrades the installed packages on the systems that you specify.
`-uninstall`	Uninstalls VCS from the systems that you specify.

Command options for uninstallvcs program

The `uninstallvcs` command usage takes the following form:

```
uninstallvcs [ system1 system2... ]
 [ -logpath <log_path> ]
 [ -responsefile <response_file> ]
 [ -tmppath <tmp_path> ]
```

```
[ -hostfile <hostfile_path> ]
[ -keyfile <shh_key_file> ]
[ -patchpath <patch_path> ]
[ -pkgpath <pkg_path> ]
[ -rsh | -redirect | -minpkgs | -recpkgs | -allpkgs | -ha | -pkgset |
          -pkginfo | -serial | -makeresponsefile | -pkgtable ]
```

Table B-2 lists the `uninstallvcs` command options.

Table B-2 uninstallvcs options

Option and Syntax	Description
`-hostfile`	Specifies the location of a file that contains the system names for the installer.
`-keyfile` *ssh_key_file*	Specifies a key file for SSH. The option passes `-i` *ssh_key_file* with each SSH invocation.
`-logpath` *log_path*	Specifies that log_path, not /opt/VRTS/install/logs, is the location where installvcs log files, summary file, and response file are saved.
`-makeresponsefile`	Use this option to create a response file or to verify that your system configuration is ready for uninstalling VCS.
`-osversion`	View the list of packages and patches that apply to the specified Solaris version. Valid values are `sol8`, `sol9`, or `sol10`. Use this option with one of the following options: ■ -allpkgs ■ -minpkgs ■ -recpkgs ■ -jumpstart
`-patchpath` *patch_path*	Specifies that *patch_path* contains all patches that the uninstallvcs program is about to uninstall on all systems. The *patch_path* is the complete path of a directory.
`-pkginfo`	Displays a list of packages in a user-friendly format in the order that the uninstallvcs program uninstalls. Use this option with one of the following options: ■ -allpkgs If you do not specify an option, -allpkgs is used by default. ■ -minpkgs ■ -recpkgs

Table B-2 uninstallvcs options *(continued)*

Option and Syntax	Description
`-pkgpath` *pkg_path*	Specifies that *pkg_path* contains all packages that the uninstallvcs program is about to uninstall on all systems. The *pkg_path* is the complete path of a directory, usually NFS mounted.
`-pkgset`	Discovers the package set that is installed on the systems that you specify.
`-pkgtable`	Displays VCS packages in the order that the uninstallvcs program uninstalls.
`-redirect`	Displays progress details without showing progress bar.
`-responsefile` *response_file*	Perform automated VCS uninstallation using the system and the configuration information that is stored in a specified file instead of prompting for information. The *response_file* must be a full path name. If not specified, the response file is automatically generated as `installer`*number*`.response` where *number* is random. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file. See "Uninstalling VCS using response files" on page 337.
`-rootpath` *root_path*	Specifies that *root_path* is the root location for uninstalling all packages. On Solaris, `-rootpath` passes `-R` *root_path* to pkgrm command.
`-rsh`	Specifies that *rsh* and `rcp` are to be used for communication between systems instead of ssh and `scp`. This option requires that systems be preconfigured such that *rsh* commands between systems execute without prompting for passwords or confirmations
`-serial`	Performs the installation, uninstallation, start, and stop operations on the systems in a serial fashion. By default, the installer performs these operations simultaneously on all the systems.

Table B-2 uninstallvcs options *(continued)*

Option and Syntax	Description
`-tmppath` *tmp_path*	Specifies that *tmp_path* is the working directory for uninstallvcs program. This path is different from the /var/tmp path. This destination is where the uninstallvcs program performs the initial logging and where the installvcs program copies the packages on remote systems before installation.

Appendix C

Changes to bundled agents in VCS 5.1

This appendix includes the following topics:

Deprecated agents

The following agents are no longer supported:

- CampusCluster
- CFSQlogckd
- ClusterMonitorConfig
- Disk
- DiskReservation
- NFSLock—Use the NFSRestart agent to provide high availability to NFS record locks.
- Service group heartbeat (ServiceGroupHB)—VCS does not support service group heartbeats in this release. Symantec recommends using I/O fencing.
- SANVolume

New agents

The following new agents are in the VCS 5.1 release:

- CoordPoint—Provides server-based I/O fencing.

The following new agents were added in the 5.0 MP3 release:

- DiskGroupSnap—Verifies the configuration and the data integrity in a campus cluster environment.
- LDom—Monitors and manages logical domains on Solaris SPARC.
- Zpool—Monitors ZFS storage pools.
- SambaServer—Monitors the smbd process.
- SambaShare—Use to make a Samba Share highly available or to monitor it.
- NetBios—Use to make the nmbd process highly available or to monitor it.

The following new agents were added in the 5.0 release:

- Apache (now bundled on all platforms)—Provides high availability to an Apache Web server.
- NFSRestart—Provides high availability for NFS record locks.
- ProcessOnOnly—Starts and monitors a user-specified process.
- RemoteGroup—Monitors and manages a service group on another system.

Refer to the *Veritas Cluster Server Bundled Agents Reference Guide* for more information on these new agents.

New and modified attributes for 5.1 agents

Table C-1 lists the attributes that VCS adds or modifies when you upgrade from VCS 5.0 MP3 to VCS 5.1.

Table C-1 New and modified attributes for VCS agents for upgrades from VCS 5.0 MP3

Agent	New and modified attributes	Default value
Apache		
Modified attribute		
	ContainerType	
New attribute		

Table C-1 New and modified attributes for VCS agents for upgrades from VCS 5.0 MP3 *(continued)*

Agent	New and modified attributes	Default value
	ContainerOpts	RunInContainer=1, PassCInfo=0
New attribute		
	ContainerOpts	RunInContainer=1, PassCInfo=0
Application		
Modified attribute		
	ContainerType	
New attribute		
	ContainerOpts	RunInContainer=1, PassCInfo=0
DNS		
Modified attributes		
	Alias	
	Hostname	
DiskGroup		
Modified attributes		
	StartVolumes	1
	StopVolumes	1
	PanicSystemOnDGLoss	0
IP		
New attributes		
	RouteOptions	
	PrefixLen	
	ContainerOpts	RunInContainer=0, PassCInfo=1
Modified attribute		

Table C-1 New and modified attributes for VCS agents for upgrades from VCS 5.0 MP3 *(continued)*

Agent	New and modified attributes	Default value
	ContainerName	
IPMultiNIC		
New attributes		
	RouteOptions	
	PrefixLen	
	ContainerOpts	RunInContainer=0, PassCInfo=1
	IgnoreMultiNICBFailure	0
Modified attribute		
	ContainerName	
LDOM		
New attributes		
	MonitorCPU	1
Mount		
New attributes		
	OptCheck	0
	CreateMountPt	0
	ReuseMntPt	0
	MntPtPermission	
	MntPtOwner	
	MntPtGroup	
	AccessPermissionChk	0
	RecursiveMnt	0
	ContainerOpts	RunInContainer=0, PassCInfo=0
Modified attributes		

Table C-1 New and modified attributes for VCS agents for upgrades from VCS 5.0 MP3 *(continued)*

Agent	New and modified attributes	Default value
	ContainerName	
	ContainerType	Zone
MultiNICA		
New attributes		
	Protocol	
MultiNICB		
Modified attribute		
	MpathdCommand	/usr/lib/inet/in.mpathd
New attribute		
	Protocol	
NFS		
New attribute		
	UseSMF	0
NFSRestart		
New attribute		
	LockServers	20
NIC		
New attribute		
	Protocol	
Phantom		
Modified attribute		
	Dummy	
Process		
New attribute		

Table C-1 New and modified attributes for VCS agents for upgrades from VCS 5.0 MP3 *(continued)*

Agent	New and modified attributes	Default value
	ContainerOpts	RunInContainer=1, PassCInfo=0
Modified attributes		
	ContainerName	
	ContainerType	Zone
ProcessOnOnly		
New attribute		
	ContainerOpts	RunInContainer=1, PassCInfo=0
Modified attributes		
	ContainerName	
	ContainerType	Zone
Share		
New attribute		
	NFSRes	
Zone		
New attributes		
	ContainerOpts	RunInContainer=1, PassCInfo=0
	BootState	
	Pool	
Modified attribute		
	ZoneName	

Table C-2 lists the attributes that VCS adds or modifies when you upgrade from VCS 5.0 to VCS 5.0 MP3.

Table C-2 New and modified attributes for VCS agents for upgrades from VCS 5.0

Agent	New and modified attributes	Default value
Apache		
New attribute		
	SupportedActions	"checkconffile.vfd"
	ContainerType	Zone
	PidFile	
	ContainerName	
	IntentionalOffline	0
DNS		
New attributes		
	SupportedActions	"dig.vfd", "keyfile.vfd", "master.vfd"
	ResRecord	
	CreatePTR	0
	OffDelRR	0
DiskGroup		
New attributes		
	SupportedActions	"license.vfd", "disk.vfd", "udid.vfd", "verifyplex.vfd", "checkudid", "campusplex", "numdisks", "joindg", "splitdg", "getvxvminfo", "volinuse"
	UmountVolumes	0
Mount		
New attribute		
	VxFSMountLock	1
Modified attribute		

Table C-2 New and modified attributes for VCS agents for upgrades from VCS 5.0 *(continued)*

Agent	New and modified attributes	Default value
	SupportedActions	"mountpoint.vfd", "mounted.vfd", "vxfslic.vfd", "chgmntlock", "mountentry.vfd"
NFSRestart		
New attributes		
	SupportedActions	"lockdir.vfd", "nfsconf.vfd"
Share		
New attributes		
	SupportedActions	"direxists.vfd"

Table C-3 lists the attributes that VCS adds or modifies when you upgrade to VCS 4.1 to VCS 5.0.

Table C-3 New and modified attributes for VCS agents for upgrades from VCS 4.1

Agent	New and modified attributes	Default value
Application		
New attributes		
	SupportedActions	program.vfd, user.vfd, cksum.vfd, getcksum
DiskGroup		
New attributes		
	SupportedActions	"license.vfd", "disk.vfd", "udid.vfd", "verifyplex.vfd", "checkudid", "campusplex", "numdisks", "joindg", "splitdg", "getvxvminfo", "volinuse"
	PanicSystemOnDGLoss	1
	DiskGroupType	Private
	UmountVolumes	0

Table C-3 New and modified attributes for VCS agents for upgrades from VCS 4.1 *(continued)*

Agent	New and modified attributes	Default value
Modified attributes		
	tempUseFence	Invalid
DNS		
New attributes		
	SupportedActions	"dig.vfd", "keyfile.vfd", "master.vfd"
	ResRecord	
	CreatePTR	0
	OffDelRR	0
IP		
New attributes		
	SupportedActions	"device.vfd", "route.vfd"
	ContainerName	
Modified attribute		
	IfconfigTwice	
IPMultiNIC		
New attributes		
	ContainerName	
Modified attribute		
	IfconfigTwice	
IPMultiNICB		
New attributes		
	ToleranceLimit	1
	MonitorInterval	30

Table C-3 New and modified attributes for VCS agents for upgrades from VCS 4.1 *(continued)*

Agent	New and modified attributes	Default value
	ContainerName	
Modified attribute		
	DeviceChoice	0
Mount		
New attributes		
	SupportedActions	"mountpoint.vfd", "mounted.vfd", "vxfslic.vfd", "chgmntlock", "mountentry.vfd"
	VxFSMountLock	1
	ContainerName	
Modified attribute		
	SnapUmount	
MultiNICA		
Modified attribute		
	IfconfigTwice	
MultiNICB		
New attributes		
	GroupName	
Modified attributes		
	NoBroadcast	
	Failback	
NFS		
New attributes		
	LockFileTimeout	180

Table C-3 New and modified attributes for VCS agents for upgrades from VCS 4.1 *(continued)*

Agent	New and modified attributes	Default value
NIC		
New attributes		
	SupportedActions	"device.vfd"
Process		
New attribute		
	SupportedActions	"program.vfd", getcksum
Share		
New attribute		
	SupportedActions	"direxists.vfd"

Manually removing deprecated resource types and modifying attributes

With VCS 5.1, certain resource type definitions are no longer used. Before you start the upgrade process, you must remove the resources of the deprecated resource types from your cluster configuration.

If you use the resource type ServiceGroupHB, Symantec recommends the use of I/O fencing.

VCS 5.1 does not support gabdiskhb. So, the installvcs program removes the gabdiskhb entry from the /etc/gabtab file.

Note: Make sure you start VCS on the local node before starting on the other nodes. This standard ensures that HAD reads the configuration from the local node and updates it on the remaining nodes.

To remove the deprecated resource types and modify attributes

1 Save the VCS configuration and stop the VCS engine.

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

2 Back up the configuration file, main.cf to a location on the cluster node.

3 Edit the main.cf located under `/etc/VRTSvcs/conf/config`.

Perform the following instructions:

- Remove the resource of the deprecated resource types.
  You must modify the resource dependencies to ensure that the configuration works properly.
  See "Deprecated agents" on page 397.
- Modify attribute values that might have changed.
  See Table C-1 on page 398.
  See Table C-2 on page 403.
  See Table C-3 on page 404.
- Save the main.cf.
- Reformat the main.cf file.

```
# hacf -cftocmd config
# hacf -cmdtocf config
```

4 Verify the configuration.

```
# cd /etc/VRTSvcs/conf/config
# hacf -verify config
```

5 Start VCS on the local node.

6 Start VCS on other nodes.

Creating new VCS accounts if you used native operating system accounts

VCS has deprecated the AllowNativeCliUsers attribute. To use native OS accounts with VCS, use the halogin command. After you run the halogin command, VCS encrypts and stores your VCS credentials in your home directory for a specific time period. After you run the halogin command, you need not authenticate

yourself every time you run a VCS command. In secure clusters, the command also sets up a trust relationship and retrieves a certificate from an authentication broker.

See the *Veritas Cluster Server Administrator's Guide* for information on assigning user privileges to OS user groups for clusters running in secure mode and clusters not running in secure mode.

Perform the following procedure if you used the AllowNativeCliUsers attribute. Ensure that each native user running VCS commands has a home directory on the system from which the user runs VCS commands.

To set up VCS authentication for clusters running in secure mode

1 Set the configuration (main.cf) mode to read/write.

```
# haconf -makerw
```

2 Assign proper privileges to the OS users or user groups. Each operating system user must perform steps 3 and 4.

3 If the user executes VCS commands from a remote host, set the following environment variables:

- VCS_HOST: Name of the VCS node on which you run commands. You may specify the virtual IP address associated with the cluster.
- VCS_DOMAIN: Name of the VxSS domain to which the user belongs.
- VCS_DOMAINTYPE: Type of VxSS domain: unixpwd, nt, nis, nisplus, or vx.

4 Run the halogin command:

```
$ halogin vcsusername password
```

To set up VCS authentication for clusters not running in secure mode

1 Set the configuration (main.cf) mode to read/write.

```
# haconf -makerw
```

2 Create VCS user accounts for all users and assign privileges to these users.

3 Each VCS user must run the halogin command:

```
$ halogin vcsusername
  password
```

Appendix D

Sample main.cf files

This appendix includes the following topics:

- Sample configuration files for CP server

Sample configuration files for CP server

This following are example main.cf files for a CP server that is hosted on a single node, and a CP server that is hosted on an SFHA cluster.

- The main.cf file for a CP server that is hosted on a single node:
  See "CP server hosted on a single node main.cf file" on page 411.
- The main.cf file for a CP server that is hosted on an SFHA cluster:
  See "CP server hosted on an SFHA cluster main.cf file" on page 413.

Note: The CP server supports Internet Protocol version 4 or version 6 (IPv4 or IPv6 addresses) when communicating with VCS clusters. The following example main.cf files use IPv4 addresses.

CP server hosted on a single node main.cf file

The following is an example of a single CP server node main.cf.

For this CP server single node main.cf, note the following values:

- Cluster name: cps1
- Node name: mycps1

```
include "types.cf"

// cluster name:  cps1
// CP server: mycps1
```

```
cluster cps1 (
     UserNames = { admin = bMNfMHmJNiNNlVNhMK, haris = fopKojNvpHouNn,
             "mycps1.symantecexample.com@root@vx" = aj,
             "root@mycps1.symantecexample.com" = hq }
     Administrators = { admin, haris,
             "mycps1.symantecexample.com@root@vx",
             "root@mycps1.symantecexample.com" }
     SecureClus = 1
     HacliUserLevel = COMMANDROOT
     )

system mycps1 (
     )

group CPSSG (
      SystemList = { mycps1 = 0 }
      AutoStartList = { mycps1 }
      )

      IP cpsvip (
            Device @mycps1 = bge0
            Address = "10.209.3.1"
            NetMask = "255.255.252.0"
            )

      NIC cpsnic (
            Device @mycps1 = bge0
            )

     Process vxcpserv (
           PathName = "/opt/VRTScps/bin/vxcpserv"
           ConfInterval = 30
           RestartLimit = 3
           )

 cpsvip requires cpsnic
 vxcpserv requires cpsvip


 // resource dependency tree
 //
 // group CPSSG
```

```
// {
// Process vxcpserv
//     {
//     IP cpsvip
//         {
//         NIC cpsnic
//         }
//     }
// }


group VxSS (
      SystemList = { mycps1 = 0 }
      Parallel = 1
      AutoStartList = { mycps1 }
      OnlineRetryLimit = 3
      OnlineRetryInterval = 120
      )

      Phantom phantom_vxss (
            )

      ProcessOnOnly vxatd (
            IgnoreArgs = 1
            PathName = "/opt/VRTSat/bin/vxatd"
            )



// resource dependency tree
//
//    group VxSS
//    {
//    Phantom phantom_vxss
//    ProcessOnOnly vxatd
//    }
```

CP server hosted on an SFHA cluster main.cf file

The following is an example of a main.cf, where the CP server is hosted on an SFHA cluster.

For this CP server hosted on an SFHA cluster main.cf, note the following values:

- Cluster name: cps1
- Nodes in the cluster: mycps1, mycps2

```
include "types.cf"
include "CFSTypes.cf"
include "CVMTypes.cf"


// cluster: cps1
// CP servers:
// mycps1
// mycps2

cluster cps1 (
     UserNames = { admin = ajkCjeJgkFkkIskEjh,
            "mycps1.symantecexample.com@root@vx" = JK,
            "mycps2.symantecexample.com@root@vx" = dl }
     Administrators = { admin, "mycps1.symantecexample.com@root@vx",
            "mycps2.symantecexample.com@root@vx" }
     SecureClus = 1
     )

system mycps1 (
     )

system mycps2 (
     )

group CPSSG (
      SystemList = { mycps1 = 0, mycps2 = 1 }
      AutoStartList = { mycps1, mycps2 } )

      DiskGroup cpsdg (
            DiskGroup = cps_dg
            )

      IP cpsvip (
            Device @mycps1 = bge0
            Device @mycps2 = bge0
            Address = "10.209.81.88"
            NetMask = "255.255.252.0"
            )
```

```
        Mount cpsmount (
              MountPoint = "/etc/VRTScps/db"
              BlockDevice = "/dev/vx/dsk/cps_dg/cps_volume"
              FSType = vxfs
              FsckOpt = "-y"
              )

        NIC cpsnic (
             Device @mycps1 = bge0
             Device @mycps2 = bge0
             )

        Process vxcpserv (
              PathName = "/opt/VRTScps/bin/vxcpserv"
              )

        Volume cpsvol (
              Volume = cps_volume
              DiskGroup = cps_dg
              )

cpsmount requires cpsvol
cpsvip requires cpsnic
cpsvol requires cpsdg
vxcpserv requires cpsmount
vxcpserv requires cpsvip


// resource dependency tree
//
// group CPSSG
// {
// Process vxcpserv
//     {
//     Mount cpsmount
//         {
//         Volume cpsvol
//             {
//             DiskGroup cpsdg
//             }
//         }
//     IP cpsvip
//         {
```

```
 //         NIC cpsnic
 //         }
 //     }
 // }


group VxSS (
      SystemList = { mycps1 = 0, mycps2 = 1 }
      Parallel = 1
      AutoStartList = { mycps1, mycps2 }
      OnlineRetryLimit = 3
      OnlineRetryInterval = 120
      )

      Phantom phantom_vxss (
            )

      ProcessOnOnly vxatd (
            IgnoreArgs = 1
            PathName = "/opt/VRTSat/bin/vxatd"
            )



 // resource dependency tree
 //
 // group VxSS
 // {
 // Phantom phantom_vxss
 // ProcessOnOnly vxatd
 // }


group cvm (
      SystemList = { mycps1 = 0, mycps2 = 1 }
      AutoFailOver = 0
      Parallel = 1
      AutoStartList = { mycps1, mycps2 }
      )

      CFSfsckd vxfsckd (
      )
```

```
        CVMCluster cvm_clus (
               CVMClustName = cpsl
               CVMNodeId = { mycps1 = 0, mycps2 = 1 }
               CVMTransport = gab
               CVMTimeout = 200
               )

        CVMVxconfigd cvm_vxconfigd (
              Critical = 0
              CVMVxconfigdArgs = { syslog }
              )

cvm_clus requires cvm_vxconfigd
vxfsckd requires cvm_clus


// resource dependency tree
//
// group cvm
// {
// CFSfsckd vxfsckd
//     {
//     CVMCluster cvm_clus
//         {
//         CVMVxconfigd cvm_vxconfigd
//         }
//     }
// }
```

Appendix E

Installing VCS on a single node

This appendix includes the following topics:

About installing VCS on a single node

You can install VCS 5.1 on a single node. You can subsequently add another node to the single-node cluster to form a multinode cluster. You can also prepare a single node cluster for addition into a multi-node cluster. Single node clusters can be used for testing as well.

You can install VCS onto a single node using the installer program or you can add it manually.

See "Creating a single-node cluster using the installer program" on page 420.

See "Creating a single-node cluster manually" on page 421.

Creating a single-node cluster using the installer program

Table E-1 specifies the tasks that are involved to install VCS on a single node using the installer program.

Table E-1 Tasks to create a single-node cluster using the installer

Task	Reference
Prepare for installation.	See "Preparing for a single node installation" on page 420.
Install the VCS software on the system using the installer.	See "Starting the installer for the single node cluster" on page 420.

Preparing for a single node installation

You can use the installer program to install a cluster on a single system for either of the two following purposes:

- To prepare the single node cluster to join a larger cluster
- To prepare the single node cluster to be a stand-alone single node cluster

When you prepare it to join a larger cluster, install it with LLT and GAB. For a stand-alone cluster, you do not need to enable LLT and GAB.

For more information about LLT and GAB:

See "About LLT and GAB" on page 23.

Starting the installer for the single node cluster

When you install VCS on a single system, follow the instructions in this guide for installing VCS using the product installer.

During the installation, you need to answer two questions specifically for single node installations. When the installer asks:

```
Enter the system names separated by spaces on which to install
VCS:
```

Enter a single system name. The installer now asks if you want to enable LLT and GAB:

```
If you plan to run VCS on a single node without any need for
adding cluster node online, you have an option to proceed
```

```
without starting GAB and LLT.
Starting GAB and LLT is recommended.
Do you want to start GAB and LLT? [y,n,q,?] (y)
```

Answer `n` if you want to use the single node cluster as a stand-alone cluster.

Answer `y` if you plan to incorporate the single node cluster into a multi-node cluster in the future.

Continue with the installation.

Creating a single-node cluster manually

Table E-2 specifies the tasks that you need to perform to install VCS on a single node.

Table E-2 Tasks to create a single-node cluster manually

Task	Reference
Set the PATH variable	See "Setting the path variable for a manual single node installation" on page 421.
Install the VCS software manually and add a license key	See "Installing VCS software manually on a single node" on page 422.
Remove any LLT or GAB configuration files and rename LLT and GAB startup files. A single-node cluster does not require the node-to-node communication service, LLT, or the membership communication service, GAB.	See "Renaming the LLT and GAB startup files" on page 422.
Create and modify the VCS configuration files.	See "Configuring VCS" on page 422.
Start VCS and verify single-node operation.	See "Verifying single-node operation" on page 422.

Setting the path variable for a manual single node installation

Set the path variable.

See "Setting the PATH variable" on page 64.

Installing VCS software manually on a single node

Install the VCS 5.1 packages and patches manually and install the license key.

Refer to the following sections:

- See “Installing VCS software manually” on page 193.
- See “Adding a license key for a manual installation” on page 197.

Renaming the LLT and GAB startup files

You may need the LLT and GAB startup files to upgrade the single-node cluster to a multiple-node cluster at a later time.

To rename the LLT and GAB startup files

- Rename the LLT and GAB startup files.

```
# mv /etc/rc2.d/S70llt /etc/rc2.d/X70llt
# mv /etc/rc2.d/S92gab /etc/rc2.d/X92gab
```

Configuring VCS

You now need to configure VCS.

See “Configuring VCS” on page 209.

Verifying single-node operation

After successfully creating a single-node cluster, start VCS and verify the cluster.

To verify single-node cluster

1. Bring up VCS manually as a single-node cluster using `hastart` with the `-onenode` option:

```
# hastart -onenode
```

2. Verify that the `had` and `hashadow` daemons are running in single-node mode:

```
# ps -ef | grep ha
root  285   1  0 14:49:31 ?  0:02 /opt/VRTSvcs/bin/had -onenode
root  288   1  0 14:49:33 ?  0:00 /opt/VRTSvcs/bin/hashadow
```

Appendix F

Configuring LLT over UDP using IPv4

This appendix includes the following topics:

Using the UDP layer for LLT

VCS 5.1 provides the option of using LLT over the UDP (User Datagram Protocol) layer for clusters using wide-area networks and routers. UDP makes LLT packets routable and thus able to span longer distances more economically.

When to use LLT over UDP

Use LLT over UDP in the following situations:

- LLT must be used over WANs
- When hardware, such as blade servers, do not support LLT over Ethernet

LLT over UDP is slower than LLT over Ethernet. Use LLT over UDP only when the hardware configuration makes it necessary.

Configuring LLT over UDP

The following checklist is to configure LLT over UDP:

- Make sure that the LLT private links are on different physical networks.

If the LLT private links are not on different physical networks, then make sure that the links are on separate subnets. Set the broadcast address in /etc/llttab explicitly depending on the subnet for each link.
See "Broadcast address in the /etc/llttab file" on page 424.

- Make sure that each NIC has an IP address that is configured before configuring LLT.
- Make sure the IP addresses in the /etc/llttab files are consistent with the IP addresses of the network interfaces.
- Make sure that each link has a unique not well-known UDP port.
See "Selecting UDP ports" on page 426.
- Set the broadcast address correctly for direct-attached (non-routed) links.
See "Sample configuration: direct-attached links" on page 428.
- For the links that cross an IP router, disable broadcast features and specify the IP address of each link manually in the /etc/llttab file.
See "Sample configuration: links crossing IP routers" on page 430.

Broadcast address in the /etc/llttab file

The broadcast address is set explicitly for each link in the following example.

- Display the content of the /etc/llttab file on the first node galaxy:

```
galaxy # cat /etc/llttab

set-node galaxy
set-cluster 1
link link1 /dev/udp - udp  50000  -  192.168.9.1 192.168.9.255
link link2 /dev/udp - udp  50001  -  192.168.10.1 192.168.10.255
```

Verify the subnet mask using the ifconfig command to ensure that the two links are on separate subnets.

- Display the content of the /etc/llttab file on the second node nebula:

```
nebula # cat /etc/llttab

set-node nebula
set-cluster 1
link link1 /dev/udp - udp  50000  -  192.168.9.2 192.168.9.255
link link2 /dev/udp - udp  50001  -  192.168.10.2 192.168.10.255
```

Verify the subnet mask using the ifconfig command to ensure that the two links are on separate subnets.

The link command in the /etc/llttab file

Review the link command information in this section for the /etc/llttab file. See the following information for sample configurations:

- See "Sample configuration: direct-attached links" on page 428.
- See "Sample configuration: links crossing IP routers" on page 430.

Table F-1 describes the fields of the link command that are shown in the /etc/llttab file examples. Note that some of the fields differ from the command for standard LLT links.

Table F-1 Field description for link command in /etc/llttab

Field	Description
tag-name	A unique string that is used as a tag by LLT; for example link1, link2,....
device	The device path of the UDP protocol; for example /dev/udp.
node-range	Nodes using the link. "-" indicates all cluster nodes are to be configured for this link.
link-type	Type of link; must be "udp" for LLT over UDP.
udp-port	Unique UDP port in the range of 49152-65535 for the link. See "Selecting UDP ports" on page 426.
MTU	"-" is the default, which has a value of 8192. The value may be increased or decreased depending on the configuration. Use the `lltstat -l` command to display the current value.
IP address	IP address of the link on the local node.
bcast-address	■ For clusters with enabled broadcasts, specify the value of the subnet broadcast address. ■ "-" is the default for clusters spanning routers.

The set-addr command in the /etc/llttab file

The `set-addr` command in the /etc/llttab file is required when the broadcast feature of LLT is disabled, such as when LLT must cross IP routers.

See "Sample configuration: links crossing IP routers" on page 430.

Table F-2 describes the fields of the set-addr command.

Table F-2 Field description for set-addr command in /etc/lltab

Field	Description
node-id	The ID of the cluster node; for example, 0.
link tag-name	The string that LLT uses to identify the link; for example link1, link2,....
address	IP address assigned to the link for the peer node.

Selecting UDP ports

When you select a UDP port, select an available 16-bit integer from the range that follows:

- Use available ports in the private range 49152 to 65535
- Do not use the following ports:
  - Ports from the range of well-known ports, 0 to 1023
  - Ports from the range of registered ports, 1024 to 49151

To check which ports are defined as defaults for a node, examine the file /etc/services. You should also use the `netstat` command to list the UDP ports currently in use. For example:

```
# netstat -a | more
UDP
   Local Address         Remote Address     State
-------------------- -------------------- -------
      *.sunrpc                            Idle
      *.*                                 Unbound
      *.32771                             Idle
      *.32776                             Idle
      *.32777                             Idle
      *.name                              Idle
      *.biff                              Idle
      *.talk                              Idle
      *.32779                             Idle
.
.
.
      *.55098                             Idle
      *.syslog                            Idle
```

```
*.58702                              Idle
*.*                                  Unbound
```

Look in the UDP section of the output; the UDP ports that are listed under Local Address are already in use. If a port is listed in the /etc/services file, its associated name is displayed rather than the port number in the output.

Configuring the netmask for LLT

For nodes on different subnets, set the netmask so that the nodes can access the subnets in use. Run the following command and answer the prompt to set the netmask:

```
# set_parms ip_address
```

For example:

- For the first network interface on the node galaxy:

  ```
  IP address=192.168.9.1, Broadcast address=192.168.9.255,
  Netmask=255.255.255.0
  ```

  For the first network interface on the node nebula:

  ```
  IP address=192.168.9.2, Broadcast address=192.168.9.255,
  Netmask=255.255.255.0
  ```

- For the second network interface on the node galaxy:

  ```
  IP address=192.168.10.1, Broadcast address=192.168.10.255,
  Netmask=255.255.255.0
  ```

  For the second network interface on the node nebula:

  ```
  IP address=192.168.10.2, Broadcast address=192.168.10.255,
  Netmask=255.255.255.0
  ```

Configuring the broadcast address for LLT

For nodes on different subnets, set the broadcast address in /etc/llttab depending on the subnet that the links are on.

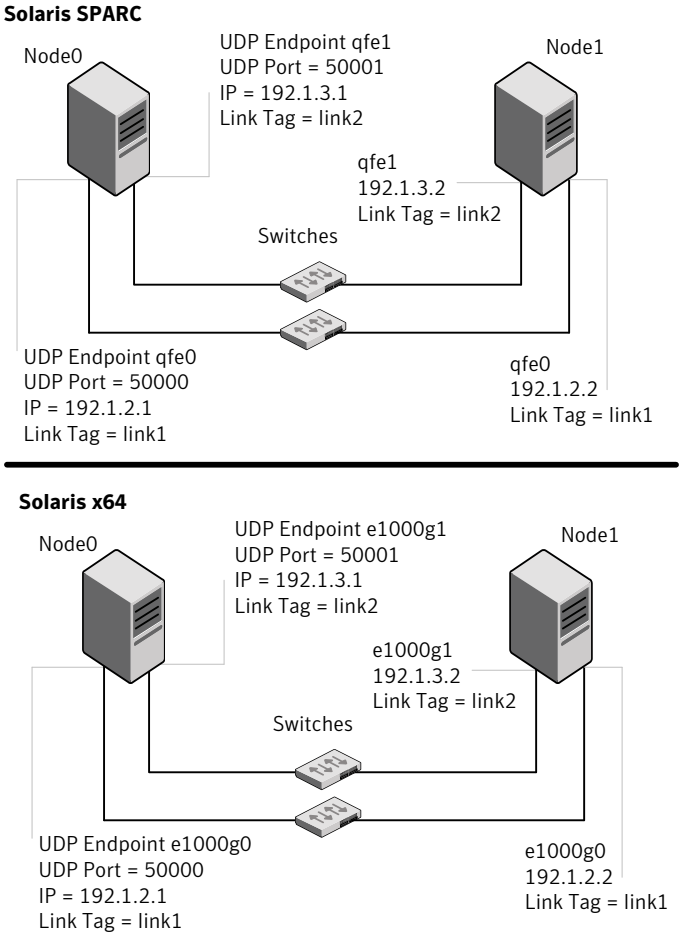
An example of a typical /etc/llttab file when nodes are on different subnets. Note the explicitly set broadcast address for each link.

```
# cat /etc/llttab
set-node nodexyz
set-cluster 100

link link1 /dev/udp - udp 50000 - 192.168.30.1 192.168.30.255
link link2 /dev/udp - udp 50001 - 192.168.31.1 192.168.31.255
```

Sample configuration: direct-attached links

Figure F-1 depicts a typical configuration of direct-attached links employing LLT over UDP.

Figure F-1 A typical configuration of direct-attached links that use LLT over UDP



The configuration that the /etc/llttab file for Node 0 represents has directly attached crossover links. It might also have the links that are connected through a hub or switch. These links do not cross routers.

LLT broadcasts requests peer nodes to discover their addresses. So the addresses of peer nodes do not need to be specified in the /etc/llttab file using the `set-addr` command. For direct attached links, you do need to set the broadcast address of

the links in the /etc/llttab file. Verify that the IP addresses and broadcast addresses are set correctly by using the `ifconfig -a` command.

```
set-node Node0
set-cluster 1
#configure Links
#link tag-name device node-range link-type udp port MTU \
IP-address bcast-address
link link1 /dev/udp - udp 50000 - 192.1.2.1 192.1.2.255
link link2 /dev/udp - udp 50001 - 192.1.3.1 192.1.3.255
```

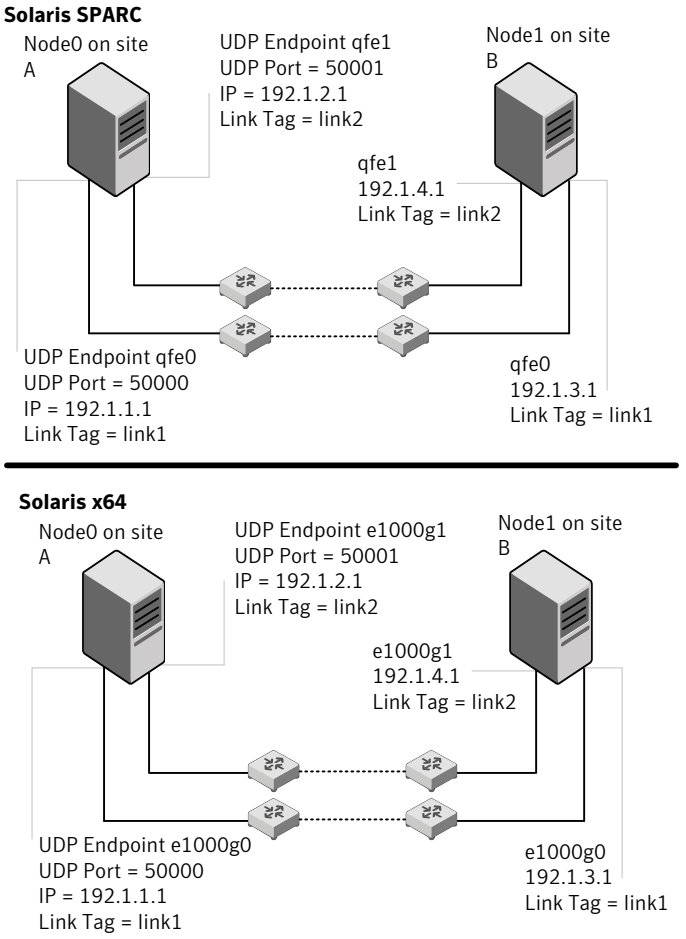
The file for Node 1 resembles:

```
set-node Node1
set-cluster 1
#configure Links
#link tag-name device node-range link-type udp port MTU \
IP-address bcast-address
link link1 /dev/udp - udp 50000 - 192.1.2.2 192.1.2.255
link link2 /dev/udp - udp 50001 - 192.1.3.2 192.1.3.255
```

Sample configuration: links crossing IP routers

Figure F-2 depicts a typical configuration of links crossing an IP router employing LLT over UDP. The illustration shows two nodes of a four-node cluster.

Figure F-2 A typical configuration of links crossing an IP router



The configuration that the following `/etc/lltab` file represents for Node 1 has links crossing IP routers. Notice that IP addresses are shown for each link on each peer node. In this configuration broadcasts are disabled. Hence, the broadcast address does not need to be set in the `link` command of the `/etc/lltab` file.

```
set-node Node1
set-cluster 1
```

```
link link1 /dev/udp - udp 50000 - 192.1.3.1 -
link link2  /dev/udp - udp 50001 - 192.1.4.1 -

#set address of each link for all peer nodes in the cluster
#format: set-addr node-id link tag-name address
set-addr        0 link1 192.1.1.1
set-addr        0 link2 192.1.2.1
set-addr        2 link1 192.1.5.2
set-addr        2 link2 192.1.6.2
set-addr        3 link1 192.1.7.3
set-addr        3 link2 192.1.8.3

#disable LLT broadcasts
set-bcasthb     0
set-arp         0
```

The `/etc/llttab` file on Node 0 resembles:

```
set-node Node0
set-cluster 1

link link1 /dev/udp - udp 50000 - 192.1.1.1 -
link link2 /dev/udp - udp 50001 - 192.1.2.1 -

#set address of each link for all peer nodes in the cluster
#format: set-addr node-id link tag-name address
set-addr        1 link1 192.1.3.1
set-addr        1 link2 192.1.4.1
set-addr        2 link1 192.1.5.2
set-addr        2 link2 192.1.6.2
set-addr        3 link1 192.1.7.3
set-addr        3 link2 192.1.8.3

#disable LLT broadcasts
set-bcasthb     0
set-arp         0
```

Appendix G

Configuring LLT over UDP using IPv6

This appendix includes the following topics:

Using the UDP layer of IPv6 for LLT

VCS 5.1 provides the option of using LLT over the UDP (User Datagram Protocol) layer for clusters using wide-area networks and routers. UDP makes LLT packets routable and thus able to span longer distances more economically.

When to use LLT over UDP

Use LLT over UDP in the following situations:

- LLT must be used over WANs
- When hardware, such as blade servers, do not support LLT over Ethernet

Configuring LLT over UDP using IPv6

The following checklist is to configure LLT over UDP:

- For UDP6, the multicast address is set to "-".
- Make sure that each NIC has an IPv6 address that is configured before configuring LLT.
- Make sure the IPv6 addresses in the /etc/llttab files are consistent with the IPv6 addresses of the network interfaces.

- Make sure that each link has a unique not well-known UDP port.
  See "Selecting UDP ports" on page 435.
- For the links that cross an IP router, disable multicast features and specify the IPv6 address of each link manually in the /etc/llttab file.
  See "Sample configuration: links crossing IP routers" on page 438.

The link command in the /etc/llttab file

Review the link command information in this section for the /etc/llttab file. See the following information for sample configurations:

- See "Sample configuration: direct-attached links" on page 436.
- See "Sample configuration: links crossing IP routers" on page 438.

Note that some of the fields in Table G-1 differ from the command for standard LLT links.

Table G-1 describes the fields of the link command that are shown in the /etc/llttab file examples.

Table G-1 Field description for link command in /etc/llttab

Field	Description
tag-name	A unique string that is used as a tag by LLT; for example link1, link2,....
device	The device path of the UDP protocol; for example /dev/udp6.
node-range	Nodes using the link. "-" indicates all cluster nodes are to be configured for this link.
link-type	Type of link; must be "udp6" for LLT over UDP.
udp-port	Unique UDP port in the range of 49152-65535 for the link. See "Selecting UDP ports" on page 435.
MTU	"-" is the default, which has a value of 8192. The value may be increased or decreased depending on the configuration. Use the `lltstat -l` command to display the current value.
IPv6 address	IPv6 address of the link on the local node.
mcast-address	"-" is the default for clusters spanning routers.

The set-addr command in the /etc/llttab file

The `set-addr` command in the /etc/llttab file is required when the multicast feature of LLT is disabled, such as when LLT must cross IP routers.

See "Sample configuration: links crossing IP routers" on page 438.

Table G-2 describes the fields of the set-addr command.

Table G-2 Field description for set-addr command in /etc/llttab

Field	Description
node-id	The ID of the cluster node; for example, 0.
link tag-name	The string that LLT uses to identify the link; for example link1, link2,....
address	IPv6 address assigned to the link for the peer node.

Selecting UDP ports

When you select a UDP port, select an available 16-bit integer from the range that follows:

- Use available ports in the private range 49152 to 65535
- Do not use the following ports:
  - Ports from the range of well-known ports, 0 to 1023
  - Ports from the range of registered ports, 1024 to 49151

To check which ports are defined as defaults for a node, examine the file /etc/services. You should also use the `netstat` command to list the UDP ports currently in use. For example:

```
# netstat -a |  more

UDP: IPv4
   Local Address        Remote Address      State
-------------------- -------------------- ----------
      *.sunrpc                            Idle
      *.*                                 Unbound
      *.32772                             Idle
      *.*                                 Unbound
      *.32773                             Idle
      *.lockd                             Idle
      *.32777                             Idle
```

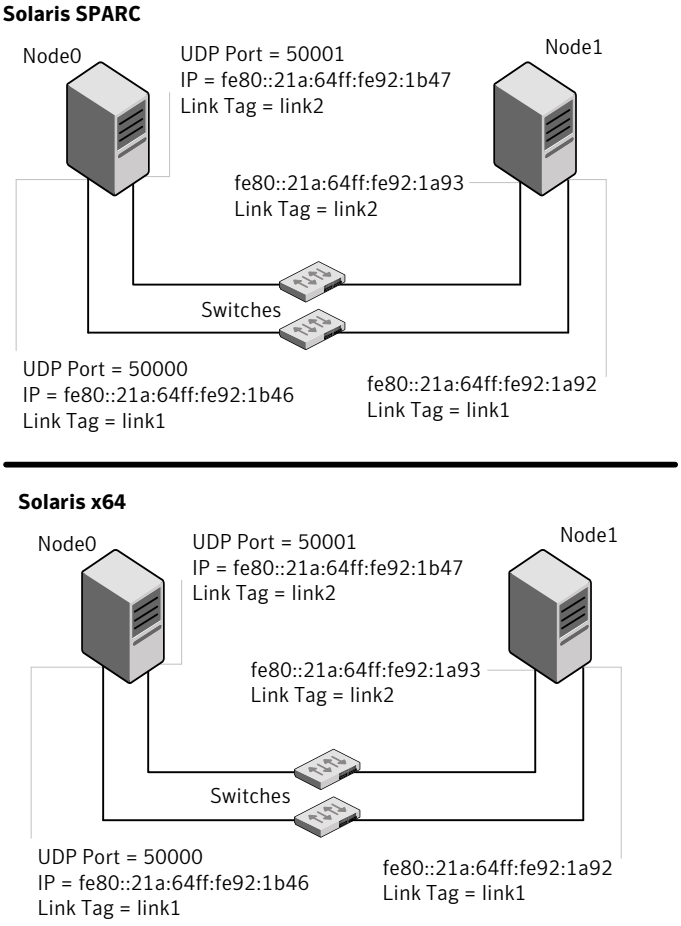
```
      *.32778                                Idle
      *.32779                                Idle
      *.32780                                Idle
      *.servicetag                           Idle
      *.syslog                               Idle
      *.16161                                Idle
      *.32789                                Idle
      *.177                                  Idle
      *.32792                                Idle
      *.32798                                Idle
      *.snmpd                                Idle
      *.32802                                Idle
      *.*                                    Unbound
      *.*                                    Unbound
      *.*                                    Unbound

UDP: IPv6
   Local Address             Remote Address           State      If
------------------------ ------------------------- ---------- -----
      *.servicetag                                  Idle
      *.177                                         Idle
```

Look in the UDP section of the output; the UDP ports that are listed under Local Address are already in use. If a port is listed in the /etc/services file, its associated name is displayed rather than the port number in the output.

Sample configuration: direct-attached links

Figure G-1 depicts a typical configuration of direct-attached links employing LLT over UDP.

Figure G-1 A typical configuration of direct-attached links that use LLT over UDP



The configuration that the /etc/llttab file for Node 0 represents has directly attached crossover links. It might also have the links that are connected through a hub or switch. These links do not cross routers.

LLT uses IPv6 multicast requests for peer node address discovery. So the addresses of peer nodes do not need to be specified in the /etc/llttab file using the `set-addr` command. Use the `ifconfig -a` command to verify that the IPv6 address is set correctly.

```
set-node Node0
set-cluster 1
```

```
#configure Links
#link tag-name device node-range link-type udp port MTU \
IP-address mcast-address
link link1 /dev/udp6 - udp6 50000 - fe80::21a:64ff:fe92:1b46 -
link link1 /dev/udp6 - udp6 50001 - fe80::21a:64ff:fe92:1b47 -
```

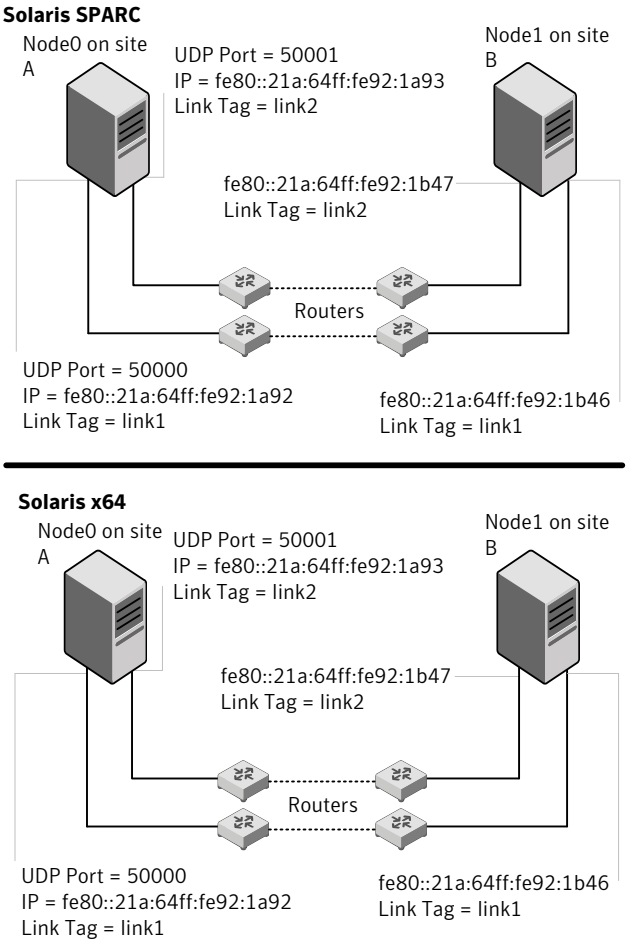
The file for Node 1 resembles:

```
set-node Node1
set-cluster 1
#configure Links
#link tag-name device node-range link-type udp port MTU \
IP-address mcast-address
link link1 /dev/udp6 - udp6 50000 - fe80::21a:64ff:fe92:1a92 -
link link1 /dev/udp6 - udp6 50001 - fe80::21a:64ff:fe92:1a93 -
```

Sample configuration: links crossing IP routers

Figure G-2 depicts a typical configuration of links crossing an IP router employing LLT over UDP. The illustration shows two nodes of a four-node cluster.

Figure G-2 A typical configuration of links crossing an IP router



The configuration that the following `/etc/lltab` file represents for Node 1 has links crossing IP routers. Notice that IPv6 addresses are shown for each link on each peer node. In this configuration multicasts are disabled.

```
set-node Node1
set-cluster 1

link link1 /dev/udp6 - udp6 50000 - fe80::21a:64ff:fe92:1a92 -
link link1 /dev/udp6 - udp6 50001 - fe80::21a:64ff:fe92:1a93 -

#set address of each link for all peer nodes in the cluster
```

```
#format: set-addr node-id link tag-name address
set-addr 0 link1 fe80::21a:64ff:fe92:1b46
set-addr 0 link2 fe80::21a:64ff:fe92:1b47
set-addr 2 link1 fe80::21a:64ff:fe92:1d70
set-addr 2 link2 fe80::21a:64ff:fe92:1d71
set-addr 3 link1 fe80::209:6bff:fe1b:1c94
set-addr 3 link2 fe80::209:6bff:fe1b:1c95

#disable LLT multicasts
set-bcasthb     0
set-arp         0
```

The `/etc/llttab` file on Node 0 resembles:

```
set-node Node0
set-cluster 1

link link1 /dev/udp6 - udp6 50000 - fe80::21a:64ff:fe92:1b46 -
link link2 /dev/udp6 - udp6 50001 - fe80::21a:64ff:fe92:1b47 -

#set address of each link for all peer nodes in the cluster
#format: set-addr node-id link tag-name address
set-addr 1 link1 fe80::21a:64ff:fe92:1a92
set-addr 1 link2 fe80::21a:64ff:fe92:1a93
set-addr 2 link1 fe80::21a:64ff:fe92:1d70
set-addr 2 link2 fe80::21a:64ff:fe92:1d71
set-addr 3 link1 fe80::209:6bff:fe1b:1c94
set-addr 3 link2 fe80::209:6bff:fe1b:1c95

#disable LLT multicasts
set-bcasthb     0
set-arp         0
```

Appendix H

Troubleshooting VCS installation

This appendix includes the following topics:

What to do if you see a licensing reminder

In this release, you can install without a license key. In order to comply with the End User License Agreement, you must either install a license key or make the host managed by a Management Server. If you do not comply with these terms within 60 days, the following warning messages result:

```
WARNING V-365-1-1 This host is not entitled to run Veritas Storage
Foundation/Veritas Cluster Server.As set forth in the End User
License Agreement (EULA) you must complete one of the two options
set forth below. To comply with this condition of the EULA and
stop logging of this message, you have <nn> days to either:
- make this host managed by a Management Server (see
```

```
  http://go.symantec.com/sfhakeyless for details and free download),
  or
- add a valid license key matching the functionality in use on this host
  using the command 'vxlicinst' and validate using the command
  'vxkeyless set NONE'
```

To comply with the terms of the EULA, and remove these messages, you must do one of the following within 60 days:

- Install a valid license key corresponding to the functionality in use on the host. After you install the license key, you must validate the license key using the following command:

  ```
  # vxkeyless set NONE
  ```

- Continue with keyless licensing by managing the server or cluster with a management server.
  For more information about keyless licensing, see the following URL: http://go.symantec.com/sfhakeyless

Restarting the installer after a failed connection

If an installation is killed because of a failed connection, you can restart the installer to resume the installation. The installer detects the existing installation. The installer prompts you whether you want to resume the installation. If you resume the installation, the installation proceeds from the point where the installation failed.

Starting and stopping processes for the Veritas products

After the installation and configuration is complete, the Veritas product installer starts the processes that are used by the installed products. You can use the product installer to stop or start the processes, if required.

To stop the processes

- Use the `-stop` option to the product installation script.

  For example, to stop VCS processes, enter the following command:

  ```
  # ./installvcs -stop
  ```

To start the processes

- Use the `-start` option to the product installation script.

  For example: To start VCS processes, enter the following command:

  ```
  # ./installvcs -start
  ```

Installer cannot create UUID for the cluster

The installer displays the following error message if the installer cannot find the uuidconfig.pl script before it configures the UUID for the cluster:

```
Couldn't find uuidconfig.pl for uuid configuration,
please create uuid manually before start vcs
```

You may see the error message during VCS configuration, upgrade, or when you add a node to the cluster using the installer.

Workaround: To start VCS, you must run the uuidconfig.pl script manually to configure the UUID on each cluster node.

See the *Veritas Cluster Server Administrator's Guide*.

LLT startup script displays errors

If more than one system on the network has the same LLT node ID and the same cluster ID, then the LLT startup script displays error messages similar to the following:

```
LLT lltconfig ERROR V-14-2-15238 node 1 already exists
in cluster 8383 and has the address - 00:18:8B:E4:DE:27
LLT lltconfig ERROR V-14-2-15241 LLT not configured,
use -o to override this warning
LLT lltconfig ERROR V-14-2-15664 LLT could not
configure any link
```

Recommended action: Ensure that all systems on the network have unique clusterid-nodeid pair. You can use the `lltdump -D` command to get the list of unique clusterid-nodeid pairs connected to the network. This utility is available only for LLT-over-ethernet.

The vxfentsthdw utility fails when SCSI TEST UNIT READY command fails

While running the vxfentsthdw utility, you may see a message that resembles as follows:

```
Issuing SCSI TEST UNIT READY to disk reserved by other node
FAILED.
Contact the storage provider to have the hardware configuration
fixed.
```

The disk array does not support returning success for a `SCSI TEST UNIT READY` command when another host has the disk reserved using SCSI-3 persistent reservations. This happens with the Hitachi Data Systems 99XX arrays if bit 186 of the system mode option is not enabled.

Issues during server-based fencing start up on VCS cluster node

The following issues may occur during fencing start up on the VCS cluster node:

- `cpsadm` command on the VCS cluster gives connection error
- Authentication failure
- Authorization failure
- Preexisting split-brain

cpsadm command on the VCS cluster node gives connection error

If you receive a connection error message after issuing the `cpsadm` command on the VCS cluster, perform the following actions:

- Ensure that the CP server is reachable from all the VCS cluster nodes.
- Check that the correct CP server virtual IP/virtual hostname and port number are being used by the VCS cluster nodes.
  Check the /etc/vxfenmode file.
- Ensure that the running CP server is using the same virtual IP/virtual hostname and port number.

Authentication failure

If secure communication has been configured between the CP server and the VCS cluster nodes, authentication failure can occur due to the following causes:

- Symantec Product Authentication Services is not properly configured on the CP server and/or the VCS cluster.
- The CP server and the VCS cluster nodes use the same root broker but the certificate hash of the root broker is not same on the VCS cluster and the CP server. Run the following command on both the CP server and the VCS cluster to see the certificate hash:

  ```
  # cpsat showalltrustedcreds
  ```

- The CP server and the VCS cluster nodes use different root brokers, and trust is not established between the authentication brokers:
- The CP server and VCS cluster do not have the same security setting.
  In order to configure secure communication, both the CP server and the VCS cluster must have same security setting.
  In order to have the same security setting, the security parameter must have same value in the /etc/vxcps.conf file on CP server and in the /etc/vxfenmode file on the VCS cluster nodes.

Authorization failure

Authorization failure occurs when the CP server's VCS cluster nodes or users are not added in the CP server configuration. Therefore, fencing on the VCS cluster node is not allowed to access the CP server and register itself on the CP server. Fencing fails to come up if it fails to register with a majority of the coordination points. To resolve this issue, add the VCS cluster node and user in the CP server configuration and restart fencing. Refer to the following section:

See "Preparing the CP servers manually for use by the VCS cluster" on page 219.

Preexisting split-brain

To illustrate preexisting split-brain, assume there are three CP servers acting as coordination points. One of the three CP servers then becomes inaccessible. While in this state, also one client node leaves the cluster. When the inaccessible CP server restarts, it has a stale registration from the node which left the VCS cluster. In this case, no new nodes can join the cluster. Each node that attempts to join the cluster gets a list of registrations from the CP server. One CP server includes an extra registration (of the node which left earlier). This makes the joiner node conclude that there exists a preexisting split-brain between the joiner node and

the node which is represented by the stale registration. The situation is similar to that of preexisting split-brain, with coordinator disks, where the problem is solved by the administrator running the `vxfenclearpre` command. A similar solution is required using the `cpsadm` command.

The following `cpsadm` command can be used to clear a registration on a CP server:

```
# cpsadm -s cp_server -a unreg_node -c cluster_name -n nodeid
```

where *cp_server* is the virtual IP address or virtual hostname on which the CP server is listening, *cluster_name* is the VCS name for the VCS cluster, and *nodeid* specifies the node id of VCS cluster node.

After removing all stale registrations, the joiner node will be able to join the cluster.

Adding a node to the secure cluster whose root broker system has failed

If the root broker system of a cluster in secure mode has failed, you can do one of the following before you add a node to the cluster:

- If you had backed up the AT configuration files after you configured the root broker and set up the security infrastructure, you can recover from a root broker failure. Thus, you can enable the root broker to use the same broker certificates and keys for the clusters that the root broker serves.
  See the Symantec Product Authentication Service documentation for more information on backing up the AT configuration files and recovering the failed root broker system.
- If you did not back up the AT configuration files, then you must unconfigure the authentication brokers in the cluster and repeat the secure cluster configuration steps.

To unconfigure the authentication brokers and enable security in the cluster

1 In each of the nodes in the cluster, run the following command to unconfigure the authentication broker. For example,

```
galaxy> # vssregctl -l -s
-b"Security\Authentication\Authentication Broker"
-t"int" -k"Mode" -v0
nebula> # vssregctl -l -s
-b"Security\Authentication\Authentication Broker"
-t"int" -k"Mode" -v0
```

2 Perform the following steps to configure the cluster in secure mode.

- If you use an external root broker, you must reconfigure the root broker.
  See "Preparing to configure the clusters in secure mode" on page 83.
  If you use one of the nodes in the cluster as root broker, proceed to the next step to enable security in the cluster.
- Run the following command on one of the nodes in the cluster and follow the prompts to enable security in the cluster.

  ```
  # /opt/VRTS/install/installvcs -security
  ```

  See the *Veritas Cluster Server Administrator's Guide* for more information.

Appendix I

Sample VCS cluster setup diagrams for CP server-based I/O fencing

This appendix includes the following topics:

Configuration diagrams for setting up server-based I/O fencing

The following CP server configuration diagrams can be used as guides when setting up CP server within your configuration:

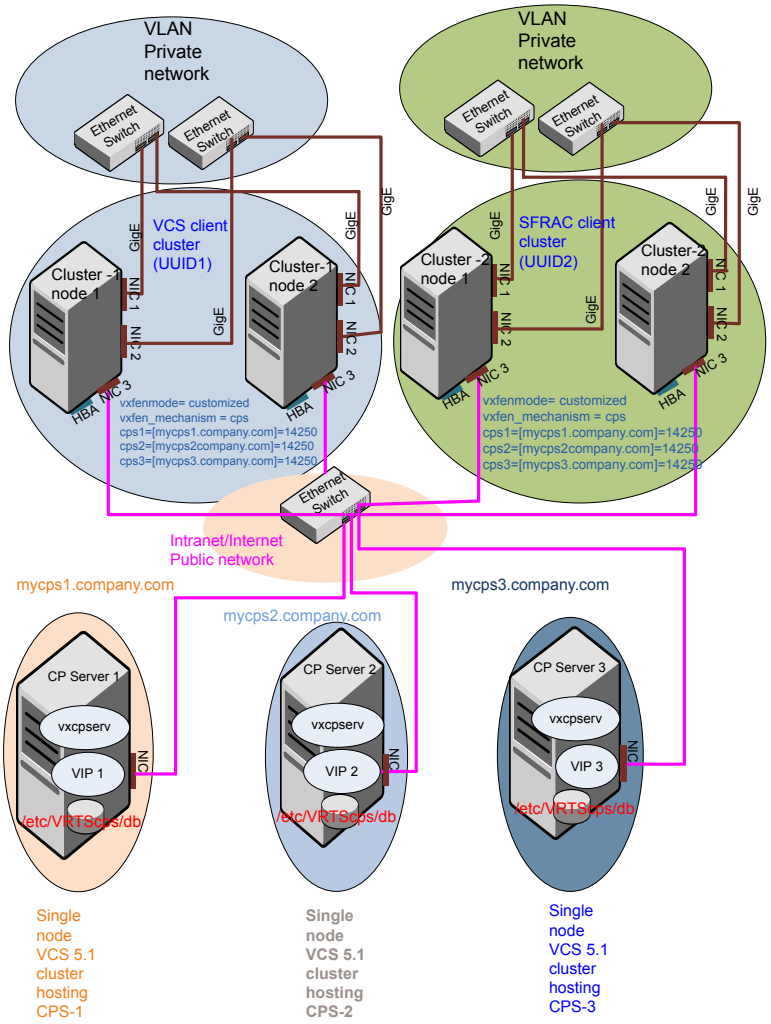
- Two unique client clusters that are served by 3 CP servers:
  See Figure I-1 on page 450.
- Client cluster that is served by highly available CP server and 2 SCSI-3 disks:
  See Figure I-2 on page 452.
- Two node campus cluster that is served be remote CP server and 2 SCSI-3 disks:
  See Figure I-3 on page 453.
- Multiple client clusters that are served by highly available CP server and 2 SCSI-3 disks:
  See Figure I-4 on page 455.

Two unique client clusters served by 3 CP servers

Figure I-1 displays a configuration where two unique client clusters are being served by 3 CP servers (coordination points). Each client cluster has its own unique user ID (UUID1 and UUID2).

In the `vxfenmode` file on the client nodes, vxfenmode is set to `customized` with vxfen mechanism set to `cps`.

Figure I-1 Two unique client clusters served by 3 CP servers



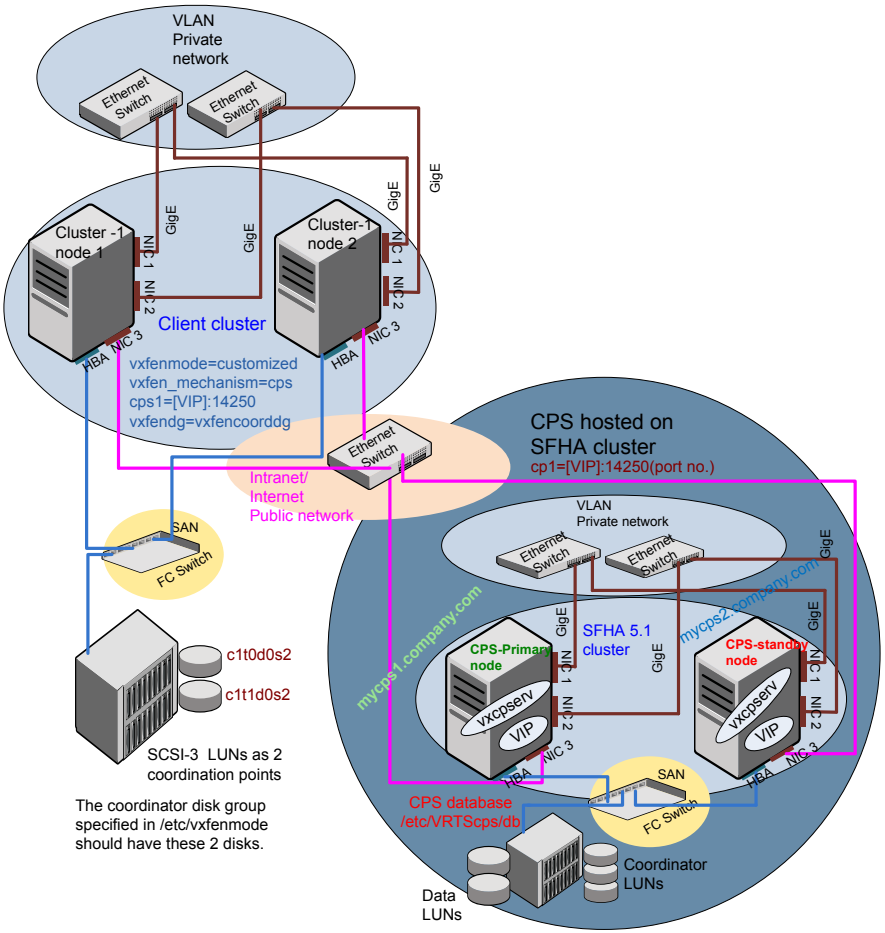
Client cluster served by highly available CPS and 2 SCSI-3 disks

Figure I-2 displays a configuration where a client cluster is served by one highly available CP server and 2 local SCSI-3 LUNs (disks).

In the `vxfenmode` file on the client nodes, `vxfenmode` is set to customized with vxfen mechanism set to `cps`.

The 2 SCSI-3 disks are: c1t0d0s2 and c1t1d0s2 which are part of disk group vxfencoorddg. The third coordination point is a CP server hosted on an SFHA cluster, with its own shared database and coordinator disks.

Figure I-2 Client cluster served by highly available CP server and 2 SCSI-3 disks



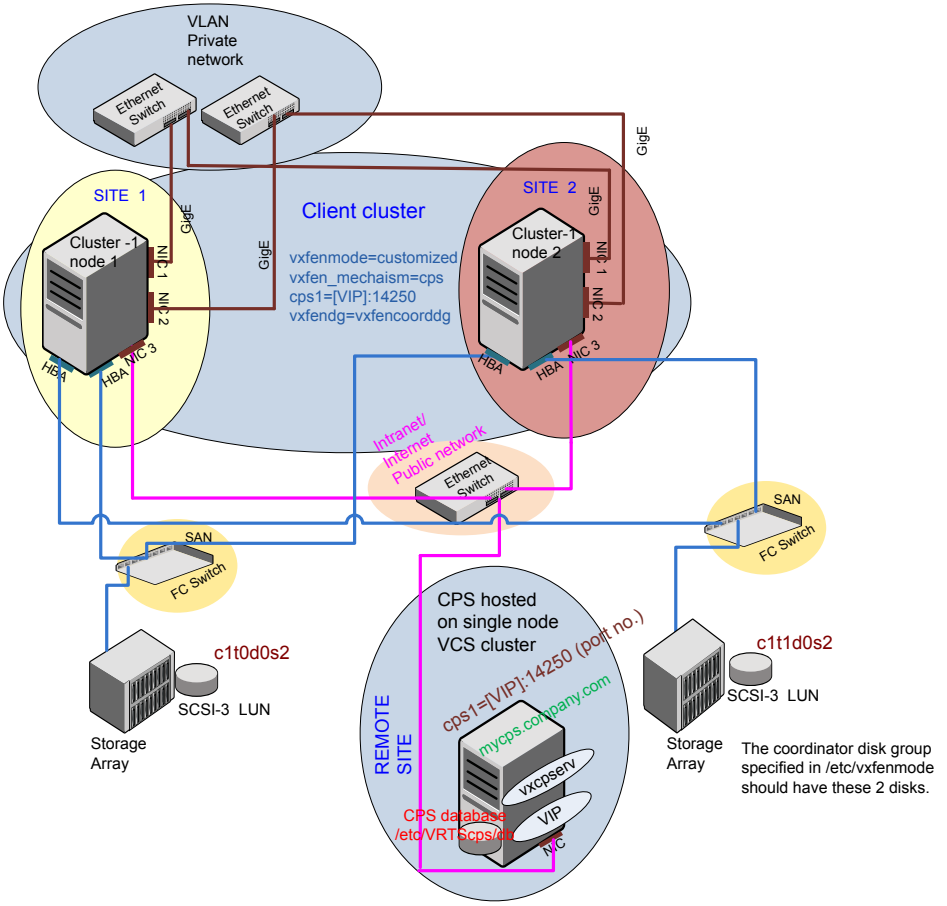
Two node campus cluster served by remote CP server and 2 SCSI-3 disks

Figure I-3 displays a configuration where a two node campus cluster is being served by one remote CP server and 2 local SCSI-3 LUN (disks).

In the `vxfenmode` file on the client nodes, vxfenmode is set to `customized` with vxfen mechanism set to `cps`.

The 2 SCSI-3 disks are: c1t0d0s2 and c1t1d0s2 which are part of disk group vxfencoorddg. The third coordination point is a CP server on a single node VCS cluster.

Figure I-3 Two node campus cluster served by remote CP server and 2 SCSI-3



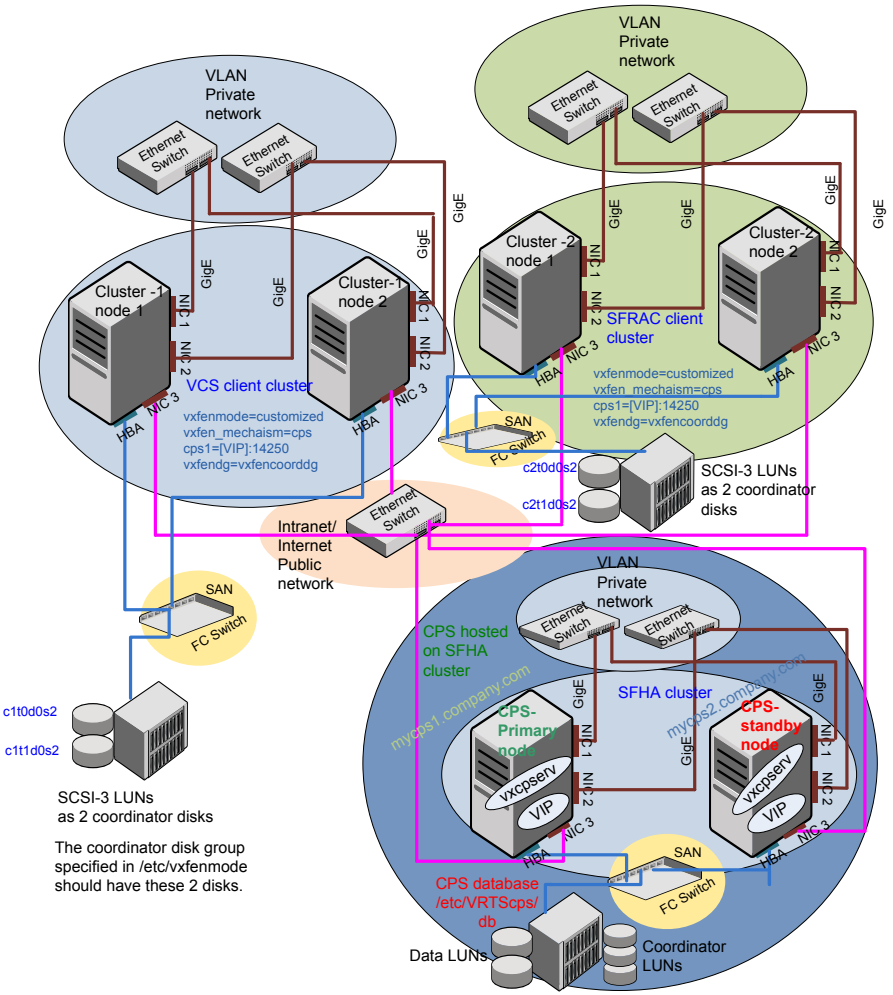
Multiple client clusters served by highly available CP server and 2 SCSI-3 disks

Figure I-4 displays a configuration where multiple client clusters are being served by one highly available CP server and 2 local SCSI-3 LUNS (disks).

In the `vxfenmode` file on the client nodes, vxfenmode is set to `customized` with vxfen mechanism set to `cps`.

The 2 SCSI-3 disks are: c1t0d0s2 and c1t1d0s2 which are part of disk group vxfencoorddg. The third coordination point is a CP server, hosted on an SFHA cluster, with its own shared database and coordinator disks.

Figure I-4 Multiple client clusters served by highly available CP server and 2 SCSI-3 disks



Appendix J

Reconciling major/minor numbers for NFS shared disks

This appendix includes the following topics:

Reconciling major/minor numbers for NFS shared disks

Your configuration may include disks on the shared bus that support NFS. You can configure the NFS file systems that you export on disk partitions or on Veritas Volume Manager volumes. An example disk partition name is `/dev/dsk/c1t1d0s3`. An example volume name is `/dev/vx/dsk/shareddg/vol3`. Each name represents the block device on which the file system is to be mounted.

In a VCS cluster, block devices providing NFS service must have the same major and minor numbers on each cluster node. Major numbers identify required device drivers (such as a Solaris partition or a VxVM volume). Minor numbers identify the specific devices themselves. NFS also uses major and minor numbers to identify the exported file system.

Major and minor numbers must be verified to ensure that the NFS identity for the file system is the same when exported from each node.

Checking major and minor numbers for disk partitions

The following sections describe checking and changing, if necessary, the major and minor numbers for disk partitions used by cluster nodes.

To check major and minor numbers on disk partitions

- Use the following command on all nodes exporting an NFS file system. This command displays the major and minor numbers for the block device.

  ```
  # ls -lL block_device
  ```

  The variable *block_device* refers to a partition where a file system is mounted for export by NFS. Use this command on each NFS file system. For example, type:

  ```
  # ls -lL /dev/dsk/c1t1d0s3
  ```

  Output on Node A resembles:

  ```
  crw-r-----  1 root  sys  32,1 Dec 3 11:50 /dev/dsk/c1t1d0s3
  ```

  Output on Node B resembles:

  ```
  crw-r-----  1 root  sys  32,1 Dec 3 11:55 /dev/dsk/c1t1d0s3
  ```

  Note that the major numbers (32) and the minor numbers (1) match, satisfactorily meeting the requirement for NFS file systems.

To reconcile the major numbers that do not match on disk partitions

1. Reconcile the major and minor numbers, if required. For example, if the output in the previous section resembles the following, perform the instructions beginning step 2:

   Output on Node A:

   ```
   crw-r-----  1 root  sys  32,1 Dec 3 11:50 /dev/dsk/c1t1d0s3
   ```

   Output on Node B:

   ```
   crw-r-----  1 root  sys  36,1 Dec 3 11:55 /dev/dsk/c1t1d0s3
   ```

2. Place the VCS command directory in your path. For example:

   ```
   # export PATH=$PATH:/usr/sbin:/sbin:/opt/VRTS/bin
   ```

3 Attempt to change the major number on System B (now 36) to match that of System A (32). Use the command:

```
# haremajor -sd major_number
```

For example, on Node B, enter:

```
# haremajor -sd 32
```

4 If the command succeeds, go to step 8.

5 If the command fails, you may see a message resembling:

```
Error: Preexisting major number 32
These are available numbers on this system: 128...
Check /etc/name_to_major on all systems for
available numbers.
```

6 Notice that the number 36 (the major number on Node A) is not available on Node B. Run the `haremajor` command on Node B and change it to 128,

```
# haremajor -sd 128
```

7 Run the same command on Node A. If the command fails on Node A, the output lists the available numbers. Rerun the command on both nodes, setting the major number to one available to both.

8 Reboot each system on which the command succeeds.

9 Proceed to reconcile the major numbers for your next partition.

To reconcile the minor numbers that do not match on disk partitions

1 In the example, the minor numbers are `1` and `3` and are reconciled by setting to 30 on each node.

2 Type the following command on both nodes using the name of the block device:

```
# ls -1 /dev/dsk/c1t1d0s3
```

Output from this command resembles the following on Node A:

```
lrwxrwxrwx  1 root  root  83 Dec 3 11:50
 /dev/dsk/c1t1d0s3          -> ../../
 devices/sbus@1f,0/QLGC,isp@0,10000/sd@1,0:d,raw
```

The `device name` (in bold) includes the slash following the word `devices`, and continues to, but does not include, the colon.

3 Type the following command on both nodes to determine the instance numbers that the SCSI driver uses:

```
# grep sd /etc/path_to_inst | sort -n -k 2,2
```

Output from this command resembles the following on Node A:

```
"/sbus@1f,0/QLGC,isp@0,10000/sd@0,0" 0 "sd"
"/sbus@1f,0/QLGC,isp@0,10000/sd@1,0" 1 "sd"
"/sbus@1f,0/QLGC,isp@0,10000/sd@2,0" 2 "sd"
"/sbus@1f,0/QLGC,isp@0,10000/sd@3,0" 3 "sd"
.
.
"/sbus@1f,0/SUNW,fas@e,8800000/sd@d,0" 27 "sd"
"/sbus@1f,0/SUNW,fas@e,8800000/sd@e,0" 28 "sd"
"/sbus@1f,0/SUNW,fas@e,8800000/sd@f,0" 29 "sd"
```

In the output, the instance numbers are in the second field.

The instance number that is associated with the device name that matches the name for Node A displayed in step 2, is "1."

4 Compare instance numbers for the device in the output on each node.

After you review the instance numbers, perform one of the following tasks:

- If the instance number from one node is unused on the other— it does not appear in the output of step 3—edit `/etc/path_to_inst`.
  You edit this file to make the second node's instance number similar to the number of the first node.
- If the instance numbers in use on both nodes, edit `/etc/path_to_inst` on both nodes. Change the instance number that is associated with the device name to an unused number. The number needs to be greater than the highest number that other devices use. For example, the output of step 3 shows the instance numbers that all devices use (from 0 to 29). You edit the file `/etc/path_to_inst` on each node and reset the instance numbers to 30.

5 Type the following command to reboot each node on which `/etc/path_to_inst` was modified:

```
# reboot -- -rv
```

Checking the major and minor number for VxVM volumes

The following sections describe checking and changing, if necessary, the major and minor numbers for the VxVM volumes that cluster systems use.

To check major and minor numbers on VxVM volumes

1. Place the VCS command directory in your path. For example:

   ```
   # export PATH=$PATH:/usr/sbin:/sbin:/opt/VRTS/bin
   ```

2. To list the devices, use the `ls -lL` *block_device* command on each node:

   ```
   # ls -lL /dev/vx/dsk/shareddg/vol3
   ```

   On Node A, the output may resemble:

   ```
   brw-------   1 root  root  32,43000 Mar 22 16:4 1
   /dev/vx/dsk/shareddg/vol3
   ```

   On Node B, the output may resemble:

   ```
   brw-------   1 root  root  36,43000 Mar 22 16:4 1
   /dev/vx/dsk/shareddg/vol3
   ```

3. Import the associated shared disk group on each node.

4 Use the following command on each node exporting an NFS file system. The command displays the major numbers for `vxio` and `vxspec` that Veritas Volume Manager uses . Note that other major numbers are also displayed, but only `vxio` and `vxspec` are of concern for reconciliation:

```
# grep vx /etc/name_to_major
```

Output on Node A:

```
vxdmp 30
vxio 32
vxspec 33
vxfen 87
vxglm 91
```

Output on Node B:

```
vxdmp 30
vxio 36
vxspec 37
vxfen 87
vxglm 91
```

5 To change Node B's major numbers for `vxio` and `vxspec` to match those of Node A, use the command:

```
haremajor -vx major_number_vxio major_number_vxspec
```

For example, enter:

```
# haremajor -vx 32 33
```

If the command succeeds, proceed to step 8. If this command fails, you receive a report similar to the following:

```
Error: Preexisting major number 32
These are available numbers on this system: 128...
Check /etc/name_to_major on all systems for
available numbers.
```

6 If you receive this report, use the `haremajor` command on Node A to change the major number (`32/33`) to match that of Node B (`36/37`). For example, enter:

```
# haremajor -vx 36 37
```

If the command fails again, you receive a report similar to the following:

```
Error: Preexisting major number 36
These are available numbers on this node: 126...
Check /etc/name_to_major on all systems for
available numbers.
```

7 If you receive the second report, choose the larger of the two available numbers (in this example, `128`). Use this number in the `haremajor` command to reconcile the major numbers. Type the following command on both nodes:

```
# haremajor -vx 128 129
```

8 Reboot each node on which `haremajor` was successful.

9 If the minor numbers match, proceed to reconcile the major and minor numbers of your next NFS block device.

10 If the block device on which the minor number does not match is a volume, consult the `vxdg`(1M) manual page. The manual page provides instructions on reconciling the Veritas Volume Manager minor numbers, and gives specific reference to the `reminor` option.

Node where the vxio driver number have been changed require rebooting.

Reconciling major/minor numbers for NFS shared disks

Index

M

N

O

P

R

S

T

U

V