Veritas InfoScale™ 7.0 Installation Guide - Linux

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VERITAS™

Veritas InfoScale™ Installation Guide

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Contents

Section 1

Introduction to Veritas InfoScale

Chapter 1

Introducing Veritas InfoScale

This chapter includes the following topics:

About the Veritas InfoScale product suite

The Veritas InfoScale product suite addresses enterprise IT service continuity needs. It draws on Veritas' long heritage of world-class availability and storage management solutions to help IT teams in realizing ever more reliable operations and better protected information across their physical, virtual, and cloud infrastructures. It provides resiliency and software defined storage for critical services across the datacenter infrastructure. It realizes better Return on Investment (ROI) and unlocks high performance by integrating next-generation storage technologies. The solution provides high availability and disaster recovery for complex multi-tiered applications across any distance. Management operations for Veritas InfoScale are enabled through a single, easy-to-use, web-based graphical interface, Veritas InfoScale Operations Manager.

The Veritas InfoScale product suite offers the following products:

- Veritas InfoScale Foundation
- Veritas InfoScale Storage
- Veritas InfoScale Availability
- Veritas InfoScale Enterprise

About Veritas InfoScale Foundation

Veritas InfoScale™ Foundation is specifically designed for enterprise edge-tier, departmental, and test/development systems. InfoScale Foundation combines the industry-leading File System and Volume Manager technology, and delivers a complete solution for heterogeneous online storage management while increasing storage utilization and enhancing storage I/O path availability.

Storage features included in InfoScale Foundation products are listed below:

- No restriction on number of Volumes or File Systems being managed
- Veritas InfoScale Operations Manager Support
- 1-256 TB File System
- Device names using Array Volume IDs
- Dirty region logging
- Dynamic LUN expansion
- Dynamic Multi-pathing
- Enclosure based naming
- iSCSI device support
- Keyless licensing
- Online file system defragmentation
- Online file system grow & shrink
- Online relayout
- Online volume grow & shrink
- Data Management Application Programming Interface
- File Change Log
- Mount lock
- Named data streams
- Partitioned directories

Storage features included in InfoScale Storage and Enterprise products, but not included in the InfoScale Foundation product are listed below:

- Hot-relocation
- Remote mirrors for campus clusters
- SCSI-3 based I/O Fencing
- SmartMove
- Split-mirror snapshot
- Thin storage reclamation
- File system snapshots
- Full-size instant snapshots
- Oracle Disk Manager library
- Portable Data Containers
- Quick I/O
- SmartIO support for read or write
- Flexible Storage Sharing
- Space-optimized instant snapshot
- User and group quotas

About Veritas InfoScale Storage

Veritas InfoScale™ Storage enables organizations to provision and manage storage independently of hardware types or locations. InfoScale Storage delivers predictable Quality-of-Service by identifying and optimizing critical workloads. InfoScale Storage increases storage agility enabling you to work with and manage multiple types of storage to achieve better ROI without compromising on performance and flexibility.

About Veritas InfoScale Availability

Veritas InfoScale™ Availability helps keep organizations' information available and critical business services up and running with a robust software-defined approach. Organizations can innovate and gain cost benefits of physical and virtual across commodity server deployments. Maximum IT service continuity is ensured at all times, moving resiliency from the infrastructure layer to the application layer.

About Veritas InfoScale Enterprise

Veritas InfoScale™ Enterprise addresses enterprise IT service continuity needs. It provides resiliency and software defined storage for critical services across your datacenter infrastructure. Realize better ROI and unlock high performance by integrating next-generation storage technologies. The solution provides high availability and disaster recovery for complex multi-tiered applications across any distance in physical and virtual environments.

Components of the Veritas InfoScale product suite

Each new InfoScale product consists of two or more components. Each component within a product offers a unique capability that you can configure for use in your environment.

Table 1-1 lists the components of each Veritas InfoScale product.

Table 1-1 Veritas InfoScale product suite

Product	Description	Components
Veritas InfoScale™ Foundation	Veritas InfoScale™ Foundation delivers a comprehensive solution for heterogeneous online storage management while increasing storage utilization and enhancing storage I/O path availability.	Storage Foundation (SF) Standard (entry-level features)
Veritas InfoScale™ Storage	Veritas InfoScale™ Storage enables organizations to provision and manage storage independently of hardware types or locations while delivering predictable Quality-of-Service, higher performance, and better Return-on-Investment.	Storage Foundation (SF) Enterprise including Replication Storage Foundation (SF) Standard (entry-level features) Storage Foundation Cluster File System (SFCFS)
Veritas InfoScale™ Availability	Veritas InfoScale™ Availability helps keep an organization's information and critical business services up and running on premise and across globally dispersed data centers.	Cluster Server (VCS) including HA/DR

Table 1-1 Veritas InfoScale product suite *(continued)*

Product	Description	Components
Veritas InfoScale™ Enterprise	Veritas InfoScale™ Enterprise addresses enterprise IT service continuity needs. It provides resiliency and software defined storage for critical services across your datacenter infrastructure.	Cluster Server (VCS) including HA/DR Storage Foundation (SF) Enterprise including Replication Storage Foundation and High Availability (SFHA) Storage Foundation Cluster File System High Availability (SFCFSHA) Storage Foundation for Oracle RAC (SF Oracle RAC) Storage Foundation for Sybase ASE CE (SFSYBASECE)

About the Dynamic Multi-Pathing for VMware component

Dynamic Multi-Pathing for VMware 7.0 (VxDMP) is a multi-pathing solution integrated with VMware's vSphere infrastructure, which brings the established and proven enterprise-class functionality to VMware virtual environments.

In Veritas InfoScale 7.0, there are two installers. The Veritas InfoScale installer does not install the Dynamic Multi-Pathing for VMware component. To install the Dynamic Multi-Pathing for VMware component, you must use one of the following:

- Veritas_InfoScale_Dynamic_Multi-Pathing_7.0_VMware.zip
- Veritas_InfoScale_Dynamic_Multi-Pathing_7.0_VMware.iso

For the procedure to mount an ISO image, See "Mounting the ISO image" on page 29.

For more information about the Dynamic Multi-Pathing for VMware component, refer to the following guides:

- *Dynamic Multi-Pathing Installation Guide - VMware ESXi*
- *Dynamic Multi-Pathing Administrator's Guide - VMware ESXi*

Chapter 2

Licensing Veritas InfoScale

This chapter includes the following topics:

About Veritas InfoScale product licensing

You must obtain a license to install and use Veritas InfoScale products.

You can choose one of the following licensing methods when you install a product:

- Install with a license key for the product
  When you purchase a Veritas InfoScale product, you receive a License Key certificate. The certificate specifies the product keys and the number of product licenses purchased.
  See "Registering Veritas InfoScale using product license keys" on page 17.
- Install without a license key (keyless licensing)
  Installation without a license does not eliminate the need to obtain a license. 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.

See "Registering Veritas InfoScale product using keyless licensing" on page 18.

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

http://www.symantec.com/products-solutions/licensing/activating-software/detail.jsp?detail_id=licensing_portal

Registering Veritas InfoScale using product license keys

You can register your product license key in the following ways:

Using the `installer`

The installer automatically registers the license at the time of installation or upgrade.

- You can register your license keys during the installation process. During the installation, you will get the following prompt:

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

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

  Enter **1** to register your license key.
  See "Installing Veritas InfoScale using the installer" on page 53.
- You can also register your license keys using the installer menu. Run the following command:

```
./installer
```

  Select the **L) License a Product** option in the installer menu.

Manual

If you are performing a fresh installation, run the following commands on each node:

```
# cd /opt/VRTS/bin

# ./vxlicinst -k license key

# vxdctl license init
```

If you are performing an upgrade, run the following commands on each node:

```
# cd /opt/VRTS/bin

# ./vxlicinstupgrade -k license key
```

For more information:

See "Using the `vxlicinstupgrade` utility" on page 20.

Even though other products are included on the enclosed software discs, you can only use the Veritas InfoScale software products for which you have purchased a license.

Registering Veritas InfoScale product using keyless licensing

The keyless licensing method uses product levels to determine the Veritas InfoScale products and functionality that are licensed.

You can register a Veritas InfoScale product in the following ways:

Using the `installer`

- Run the following command:

  `./installer`

  The installer automatically registers the license at the time of installation or upgrade.
  See "Installing Veritas InfoScale using the installer" on page 53.
- You can also register your license keys using the installer menu.
  Run the following command:

  `./installer`

  Select the **L) License a Product** option in the installer menu.

Manual	Perform the following steps after installation or upgrade:
	1 Change your current working directory:
	`# export PATH=$PATH:/opt/VRTSvlic/bin`
	2 View the possible settings for the product level:
	`# vxkeyless displayall`
	3 Register the desired product:
	`# vxkeyless set prod_levels`
	where *prod_levels* is a comma-separated list of keywords. The keywords are the product levels as shown by the output of step 2.

Warning: 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 systems with Veritas InfoScale Operation Manager. If you fail to comply with the above terms, continuing to use the Veritas InfoScale 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

For more information to use keyless licensing and to download the Veritas InfoScale Operation Manager, see the following URL:

http://go.symantec.com/vom

Updating your product licenses

At any time, you can update your product licenses in any of the following ways:

Move from one product to another	Perform the following steps:
	`# export PATH=$PATH:/opt/VRTSvlic/bin`
	`# vxkeyless set prod_levels`

Move from keyless licensing to key-based licensing	You will need to remove the keyless licenses by using the NONE keyword. **Note:** Clearing the keys disables the Veritas InfoScale products until you install a new key or set a new product level. `# vxkeyless [-q] set NONE` Register a Veritas InfoScale product using a license key: See "Registering Veritas InfoScale using product license keys" on page 17.

Using the `vxlicinstupgrade` utility

The `vxlicinstupgrade` utility enables you to perform the following tasks:

- Upgrade to another Veritas InfoScale product
- Update a temporary license to a permanent license
- Manage co-existence of multiple licenses

On executing the `vxlicinstupgrade` utility, the following checks are done:

- If the current license key is keyless or user-defined and if the user is trying to install the keyless or user defined key of the same product.
  Example: If the 7.0 Foundation Keyless license key is already installed on a system and the user tries to install another 7.0 Foundation Keyless license key, then `vxlicinstupgrade` utility shows an error message:

  ```
  vxlicinstupgrade WARNING: The input License key and Installed key are same.
  ```

- If the current key is keyless and the newly entered license key is user-defined of the same product
  Example: If the 7.0 Foundation Keyless license key is already installed on a system and the user tries to install 7.0 Foundation user-defined license, then the `vxlicinstupgrade` utility installs the new licenses at `/etc/vx/licenses/lic` and all the 7.0 Foundation Keyless keys are deleted and backed up at `/var/vx/licenses/lic<date-timestamp>`.
- If the current key is of higher version and the user tries to install a lower version license key.
  Example: If the 7.0 Enterprise license key is already installed on a system and the user tries to install the 6.0 SFSTD license key, then the `vxlicinstupgrade` utility shows an error message:

```
 vxlicinstupgrade WARNING: The input License key is lower than the
Installed key.
```

- If the current key is of a lower version and the user tries to install a higher version license key.
  Example: If 6.0 SFSTD license key is already installed on a system and the user tries to install 7.0 Storage license key, then the `vxlicinstupgrade` utility installs the new licenses at `/etc/vx/licenses/lic` and all the 6.0 SFSTD keys are deleted and backed up at `/var/vx/licenses/lic<date-timestamp>`.
- Supported Co-existence scenarios:
- InfoScale Foundation and InfoScale Availability
- InfoScale Storage and InfoScale Availability

Example: If the 7.0 Foundation or 7.0 Storage license key is already installed and the user tries to install 7.0 Availability license key or vice -versa, then the `vxlicinstupgrade` utility installs the new licenses and both the keys are preserved at `/etc/vx/licenses/lic`.

Note: When registering license keys manually during upgrade, you have to use the `vxlicinstupgrade` command. When registering keys using the installer script, the same procedures are performed automatically.

About the `VRTSvlic` RPM

The `VRTSvlic` RPM 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 Veritas InfoScale product See the `vxlicinst(1m)` manual page
`vxlicinstupgrade`	Upgrades your license key when you have a product or older license already present on the system. See the `vxlicinstupgrade(1m)` manual page
`vxlicrep`	Displays the currently installed licenses
`vxlictest`	Retrieves the features and their descriptions that are encoded in a license key

Section 2

Planning and preparation

Chapter 3

System requirements

This chapter includes the following topics:

Important release information

Review the Release notes for the latest information before you install the product.

Review the current compatibility lists to confirm the compatibility of your hardware and software:

- For important updates regarding this release, review the Late-Breaking News TechNote on the Symantec Technical Support website:
  http://www.symantec.com/docs/TECH230620
- For the latest patches available for this release, go to:
  https://sort.symantec.com/
- 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://www.symantec.com/docs/TECH230646
- The software compatibility list summarizes each Veritas InfoScale product stack and the product features, operating system versions, and third-party products it supports. For the latest information on supported software, visit the following URL:

http://www.symantec.com/docs/TECH230619

Disk space requirements

Table 3-1 lists the minimum disk space requirements for RHEL each product.

Table 3-1 Disk space requirements

Product name	RHEL 6 (MB)	RHEL 7 (MB)
Veritas InfoScale Foundation	713	569
Veritas InfoScale Availability	783	742
Veritas InfoScale Storage	1405	1219
Veritas InfoScale Enterprise	1500	1301

Table 3-2 lists the minimum disk space requirements for SLES each product.

Table 3-2 Disk space requirements

Product name	SLES 11 (MB)	SLES 12 (MB)
Veritas InfoScale Foundation	1040	558
Veritas InfoScale Availability	721	700
Veritas InfoScale Storage	1670	1165
Veritas InfoScale Enterprise	1745	1240

Hardware requirements

This section lists the hardware requirements for Veritas InfoScale.

Table 3-3 lists the hardware requirements for each component in Veritas InfoScale.

Table 3-3 Hardware requirements for components in Veritas InfoScale

Component	Requirement
Dynamic Multi-Pathing (DMP) Storage Foundation (SF) Storage Foundation for High Availability (SFHA)	See "SF and SFHA hardware requirements" on page 25.

Table 3-3 Hardware requirements for components in Veritas InfoScale *(continued)*

Component	Requirement
Storage Foundation Cluster File System (SFCFS) and Storage Foundation Cluster File System for High Availability (SFCFSHA)	See "SFCFS and SFCFSHA hardware requirements" on page 25.
Storage Foundation for Oracle RAC (SF Oracle RAC) Storage Foundation for Sybase CE (SF Sybase CE)	See "SF Oracle RAC and SF Sybase CE hardware requirements" on page 26.
Cluster Server (VCS)	See "VCS hardware requirements" on page 27.

For additional information, see the hardware compatibility list (HCL) at:

http://entsupport.symantec.com/docs/283161

SF and SFHA hardware requirements

Table 3-4 lists the hardware requirements for SF and SFHA.

Table 3-4 SF and SFHA hardware requirements

Item	Requirement
Memory	Each system requires at least 1 GB.

SFCFS and SFCFSHA hardware requirements

Table 3-5 lists the hardware requirements for SFCFSHA.

Table 3-5 Hardware requirements for SFCFSHA

Requirement	Description
Memory (Operating System)	2 GB of memory.
CPU	A minimum of 2 CPUs.

Table 3-5 Hardware requirements for SFCFSHA *(continued)*

Requirement	Description
Node	All nodes in a Cluster File System must have the same operating system version.
Shared storage	Shared storage can be one or more shared disks or a disk array connected either directly to the nodes of the cluster or through a Fibre Channel Switch. Nodes can also have non-shared or local devices on a local I/O channel. It is advisable to have `/`, `/usr`, `/var` and other system partitions on local devices. In a Flexible Storage Sharing (FSS) environment, shared storage may not be required.
Fibre Channel or iSCSI storage	Each node in the cluster must have a Fibre Channel I/O channel or iSCSI storage to access shared storage devices. The primary component of the Fibre Channel fabric is the Fibre Channel switch.
Cluster platforms	There are several hardware platforms that can function as nodes in a Veritas InfoScale cluster. See the *Veritas InfoScale 7.0 Release Notes*. For a cluster to work correctly, all nodes must have the same time. If you are not running the Network Time Protocol (NTP) daemon, make sure the time on all the systems comprising your cluster is synchronized.
SAS or FCoE	Each node in the cluster must have an SAS or FCoE I/O channel to access shared storage devices. The primary components of the SAS or Fibre Channel over Ethernet (FCoE) fabric are the switches and HBAs.

SF Oracle RAC and SF Sybase CE hardware requirements

Table 3-6 Hardware requirements for basic clusters

Item	Description
DVD drive	A DVD drive on one of the nodes in the cluster.

Table 3-6 Hardware requirements for basic clusters *(continued)*

Item	Description
Disks	All shared storage disks support SCSI-3 Persistent Reservations (PR). **Note:** The coordinator disk does not store data, so configure the disk as the smallest possible LUN on a disk array to avoid wasting space. The minimum size required for a coordinator disk is 128 MB.
RAM	Each system requires at least 8 GB.
Swap space	For SF Oracle RAC: See the Oracle Metalink document: 169706.1
Network	Two or more private links and one public link. Links must be 100BaseT or gigabit Ethernet directly linking each node to the other node to form a private network that handles direct inter-system communication. These links must be of the same type; you cannot mix 100BaseT and gigabit. Symantec recommends gigabit Ethernet using enterprise-class switches for the private links. application requires that all nodes use the IP addresses from the same subnet.
Fiber Channel or SCSI host bus adapters	At least one additional SCSI or Fibre Channel Host Bus Adapter per system for shared data disks.

VCS hardware requirements

Table 3-7 lists the hardware requirements for a VCS cluster.

Table 3-7 Hardware requirements for a VCS cluster

Item	Description
DVD drive	One drive in a system that can communicate to all the nodes in the cluster.

Table 3-7 Hardware requirements for a VCS cluster *(continued)*

Item	Description
Disks	Typical configurations require that the applications are configured to use shared disks/storage to enable migration of applications between systems in the cluster. The SFHA I/O fencing feature requires that all data and coordinator disks support SCSI-3 Persistent Reservations (PR). **Note:** SFHA also supports non-SCSI3 server-based fencing configuration in virtual environments that do not support SCSI-3 PR-compliant storage.
Network Interface Cards (NICs)	In addition to the built-in public NIC, VCS requires at least one more NIC per system. Symantec recommends two additional NICs. You can also configure aggregated interfaces. Symantec recommends that you turn off the spanning tree on the LLT switches, and set port-fast on.
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 1024 megabytes.

Supported operating systems and database versions

For information on supported operating systems and database versions for various components of Veritas InfoScale, see the *Veritas InfoScale Release Notes*.

Number of nodes supported

Veritas InfoScale supports cluster configurations up to 64 nodes. At the time of product release, cluster configurations have been qualified and tested with up to 32 nodes.

SFHA, SFCFSHA, SF Oracle RAC: Flexible Storage Sharing (FSS) only supports cluster configurations with up to 8 nodes.

SFHA, SFCFSHA: SmartIO writeback caching only supports cluster configurations with up to 2 nodes.

Chapter 4

Preparing to install

This chapter includes the following topics:

Mounting the ISO image

An ISO file is a disc image that must be mounted to a virtual drive for use. You must have superuser (root) privileges to mount the Veritas InfoScale ISO image.

To mount the ISO image

1. Log in as superuser on a system where you want to install Veritas InfoScale.
2. Mount the image:

```
# mount -o loop <ISO_image_path> /mnt
```

Setting up ssh or rsh for inter-system communications

The installer uses passwordless Secure Shell (ssh) or Remote Shell (rsh) communications among systems. During an installation, you choose the communication method that you want to use. Or, you can run the `installer -comsetup` command to set up ssh or rsh explicitly. When the installation process completes, the installer asks you if you want to remove the password-less connection. If installation terminated abruptly, use the installation script's `-comcleanup` option to remove the ssh or rsh configuration from the systems.

In most installation, configuration, upgrade (where necessary), and uninstallation scenarios, the installer configures ssh or rsh on the target systems. When you perform installation using a response file, you need to set up ssh or rsh manually, or use the`installer -comsetup` option to set up an ssh or rsh configuration from the systems.

See “Installation script options” on page 93.

Obtaining installer patches

You can access public installer patches automatically or manually on the Symantec Operations Readiness Tools (SORT) website's Patch Finder page at:

https://sort.symantec.com/patch/finder

To download installer patches automatically

- If you are running Veritas InfoScale version 7.0 or later, and your system has Internet access, the installer automatically imports any needed installer patch, and begins using it.

Automatically downloading installer patches requires the installer to make outbound networking calls. You can also disable external network connection attempts.

See “Disabling external network connection attempts” on page 31.

If your system does not have Internet access, you can download installer patches manually.

To download installer patches manually

1. Go to the Symantec Operations Readiness Tools (SORT) website's Patch Finder page, and save the most current patch on your local system.
2. Navigate to the directory where you want to unzip the file you downloaded in step 1.

3 Unzip the patch tar file. For example, run the following command:

```
# gunzip cpi-7.0P2-patches.tar.gz
```

4 Untar the file. For example, enter the following:

```
# tar -xvf cpi-7.0P2-patches.tar
patches/
patches/CPI70P2.pl
README
```

5 Navigate to the installation media or to the installation directory.

6 To start using the patch, run the `installer` command with the `-require` option. For example, enter the following:

```
# ./installer -require /target_directory/patches/CPI70P2.pl
```

Disabling external network connection attempts

When you execute the `installer` command, the installer attempts to make an outbound networking call to get information about release updates and installer patches. If you know your systems are behind a firewall, or do not want the installer to make outbound networking calls, you can disable external network connection attempts by the installer.

To disable external network connection attempts

- Disable inter-process communication (IPC).

  To disable IPC, run the installer with the `-noipc` option.

  For example, to disable IPC for system1 (sys1) and system2 (sys2) enter the following:

  ```
  # ./installer -noipc sys1 sys2
  ```

Verifying the systems before installation

Use any of the following options to verify your systems before installation:

- Option 1: Run Symantec Operations Readiness Tools (SORT).
  For information on downloading and running SORT:
  https://sort.symantec.com

Note: You can generate a pre-installation checklist to determine the pre-installation requirements: Go to the SORT installation checklist tool. From the drop-down lists, select the information for the Veritas InfoScale product you want to install, and click Generate Checklist.

- Option 2: Run the installer with the "-precheck" option as follows:
  Navigate to the directory that contains the installation program.
  Start the preinstallation check:

  ```
  # ./installer -precheck sys1 sys2
  ```

  where *sys1, sys2* are the names of the nodes in the cluster.
  The program proceeds in a non-interactive mode, examining the systems for licenses, RPMs, disk space, and system-to-system communications. The program displays the results of the check and saves them in a log file. The location of the log file is displayed at the end of the precheck process.

Setting up the private network

This topic applies to VCS, SFHA, SFCFS, SFCFSHA, SF Oracle RAC, and SF Sybase CE.

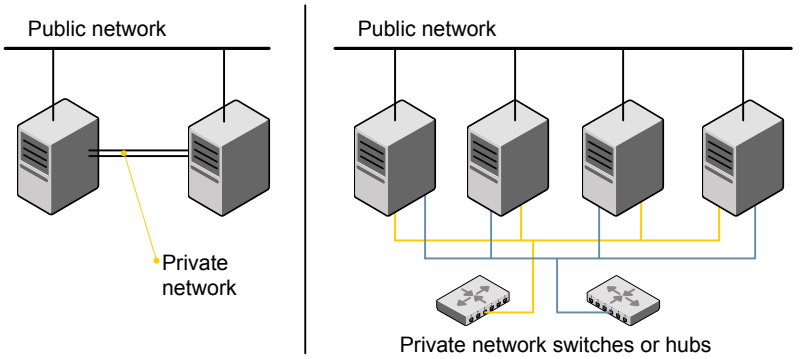
VCS requires you to set up a private network between the systems that form a cluster. You can use either NICs or aggregated interfaces to set up private network.

You can use network switches instead of hubs.

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

Figure 4-1 shows two private networks for use with VCS.

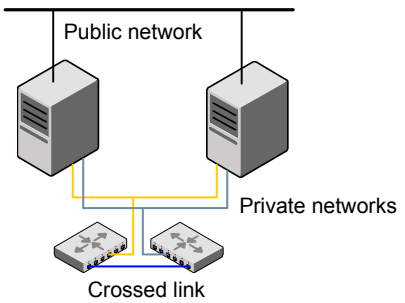
Figure 4-1 Private network setups: two-node and four-node clusters



You need to configure at least 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 4-2 shows a private network configuration with crossed links between the network switches.

Figure 4-2 Private network setup with crossed links



Symantec recommends one of the following two configurations:

- Use at least two private interconnect links and one public link. The public link can be a low priority link for LLT. The private interconnect link is used to share cluster status across all the systems, which is important for membership arbitration and high availability. The public low priority link is used only for heartbeat communication between the systems.
- If your hardware environment allows use of only two links, use one private interconnect link and one public low priority link. If you decide to set up only two links (one private and one low priority link), then the cluster must be configured

to use I/O fencing, either disk-based or server-based fencing configuration. With only two links, if one system goes down, I/O fencing ensures that other system can take over the service groups and shared file systems from the failed node.

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 Veritas InfoScale private NICs on each system.

3. Use crossover Ethernet cables, switches, or independent hubs for each Veritas InfoScale 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. 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 installer configures the private network in the cluster during configuration.

   You can also manually configure LLT.

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.

If you use different media speed for the private NICs, Symantec recommends that you configure the NICs with lesser speed as low-priority links to enhance LLT performance.

Guidelines for setting the media speed for LLT interconnects

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

- Symantec recommends that you manually set the same media speed setting on each Ethernet card on each node.
  If you use different media speed for the private NICs, Symantec recommends that you configure the NICs with lesser speed as low-priority links to enhance LLT performance.
- 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.

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

Guidelines for setting the maximum transmission unit (MTU) for LLT interconnects in Flexible Storage Sharing (FSS) environments

Review the following guidelines for setting the MTU for LLT interconnects in FSS environments:

- Set the maximum transmission unit (MTU) to 9000 for all NICs used under LLT (both high priority and low priority links). Ensure that the switch is also set to 9000 MTU.
- For virtual NICs, all the components—the virtual NIC, the corresponding physical NIC, and the virtual switch—must be set to 9000 MTU.
- If a higher MTU cannot be configured on the public link (because of restrictions on other components such as a public switch), do not configure the public link in LLT. LLT uses the lowest of the MTU that is configured among all high priority and low priority links.

Setting up shared storage

This topic applies to VCS, SFHA, SFCFSHA, SF Oracle RAC, and SF Sybase CE.

The sections describe how to set up the SCSI and the Fibre Channel devices that the cluster systems share.

Setting up shared storage: SCSI

Perform the following steps to set up shared storage.

To set up shared storage

1. Connect the disk to the first cluster system.
2. Power on the disk.
3. Connect a terminator to the other port of the disk.
4. Boot the system. The disk is detected while the system boots.
5. Press CTRL+A to bring up the SCSI BIOS settings for that disk.

   Set the following:

   - Set Host adapter SCSI ID = 7, or to an appropriate value for your configuration.
   - Set Host Adapter BIOS in Advanced Configuration Options to Disabled.
6. Format the shared disk and create required partitions on it.

   Perform the following:

   - Identify your shared disk name. If you have two internal SCSI hard disks, your shared disk is /dev/sdc.
     Identify whether the shared disk is sdc, sdb, and so on.
   - Type the following command:

     ```
     # fdisk /dev/shareddiskname
     ```

     For example, if your shared disk is sdc, type:

     ```
     # fdisk /dev/sdc
     ```

   - Create disk groups and volumes using Volume Manager utilities.
   - To apply a file system on the volumes, type:

     ```
     # mkfs -t fs-type /dev/vx/dsk/disk-group/volume
     ```

     For example, enter the following command:

```
# mkfs -t vxfs /dev/vx/dsk/dg/vol01
```

Where the name of the disk group is dg, the name of the volume is vol01, and the file system type is vxfs.

7. Power off the disk.
8. Remove the terminator from the disk and connect the disk to the other cluster system.
9. Power on the disk.
10. Boot the second system. The system can now detect the disk.
11. Press Ctrl+A to bring up the SCSI BIOS settings for the disk.

    Set the following:

    - Set Host adapter SCSI ID = 6, or to an appropriate value for your configuration. Note that the SCSI ID should be different from the one configured on the first cluster system.
    - Set Host Adapter BIOS in Advanced Configuration Options to Disabled.
12. Verify that you can view the shared disk using the `fdisk` command.

Setting up shared storage: Fibre Channel

Perform the following steps to set up Fibre Channel.

To set up shared storage for Fibre Channel

1. Connect the Fibre Channel disk to a cluster system.
2. Boot the system and change the settings of the Fibre Channel. Perform the following tasks for all QLogic adapters in the system:
    - Press Alt+Q to bring up the QLogic adapter settings menu.
    - Choose **Configuration Settings**.
    - Click Enter.
    - Choose **Advanced Adapter Settings**.
    - Click Enter.
    - Set the Enable Target Reset option to **Yes** (the default value).
    - Save the configuration.
    - Reboot the system.
3. Verify that the system detects the Fibre Channel disks properly.

4. Create volumes. Format the shared disk and create required partitions on it and perform the following:
   - Identify your shared disk name. If you have two internal SCSI hard disks, your shared disk is /dev/sdc.
     Identify whether the shared disk is sdc, sdb, and so on.
   - Type the following command:

     ```
     # fdisk /dev/shareddiskname
     ```

     For example, if your shared disk is sdc, type:

     ```
     # fdisk /dev/sdc
     ```

   - Create disk groups and volumes using Volume Manager utilities.
   - To apply a file system on the volumes, type:

     ```
     # mkfs -t fs-type /dev/vx/rdsk/disk-group/volume
     ```

     For example, enter the following command:

     ```
     # mkfs -t vxfs /dev/vx/rdsk/dg/vol01
     ```

     Where the name of the disk group is dg, the name of the volume is vol01, and the file system type is vxfs.
5. Repeat step 2 and step 3 for all nodes in the clusters that require connections with Fibre Channel.
6. Power off this cluster system.
7. Connect the same disks to the next cluster system.
8. Turn on the power for the second system.
9. Verify that the second system can see the disk names correctly—the disk names should be the same.

Synchronizing time settings on cluster nodes

Make sure that the time settings on all cluster nodes are synchronized. If the nodes are not in sync, timestamps for change (`ctime`) and modification (`mtime`) may not be consistent with the sequence in which operations actually happened.

For instructions, see the operating system documentation.

Setting the kernel.hung_task_panic tunable

The topic applies to SFHA, SFCFSHA, and VCS.

By default, in the Linux kernel the `kernel.hung_task_panic` tunable is enabled and the `kernel.hung_task_timeout_secs` tunable is set to a default non-zero value.

To ensure that the node does not panic, the `kernel.hung_task_panic` tunable must be disabled. If `kernel.hung_task_panic` is enabled, then it causes the kernel to panic when any of the following kernel threads waits for more than the `kernel.hung_task_timeout_secs` value:

- The vxfenconfig thread in the vxfen configuration path waits for GAB to seed.
- The vxfenswap thread in the online coordinator disks replacement path waits for the snapshot of peer nodes of the new coordinator disks.

To disable the `kernel.hung_task_panic` tunable:

- Set the `kernel.hung_task_panic` tunable to zero (0) in the `/etc/sysctl.conf` file. This step ensures that the change is persistent across node restarts.
- Run the command on each node.
  `# sysctl -w kernel.hung_task_panic=0`

To verify the `kernel.hung_task_panic tunable` value, run the following command:

- `# sysctl -a | grep hung_task_panic`

Planning the installation setup for SF Oracle RAC and SF Sybase CE systems

This section provides guidelines and best practices for planning resilient, high-performant clusters. These best practices suggest optimal configurations for your core clustering infrastructure such as network and storage. Recommendations are also provided on planning for continuous data protection and disaster recovery.

Review the following planning guidelines before you install Veritas InfoScale:

- Planning your network configuration
  See “Planning your network configuration” on page 40.
- Planning the storage
  See “Planning the storage” on page 43.
- Planning volume layout
  See “Planning volume layout” on page 49.

- Planning file system design
  See "Planning file system design" on page 49.

Planning your network configuration

The following practices are recommended for a resilient network setup:

- Configure the private cluster interconnect over multiple dedicated gigabit Ethernet links. All single point of failures such as network interface cards (NIC), switches, and interconnects should be eliminated.
- The NICs used for the private cluster interconnect should have the same characteristics regarding speed, MTU, and full duplex on all nodes. Do not allow the NICs and switch ports to auto-negotiate speed.
- Configure non-routable IP addresses for private cluster interconnects.
- The default value for LLT peer inactivity timeout is 16 seconds.
  For SF Oracle RAC: The value should be set based on service availability requirements and the propagation delay between the cluster nodes in case of campus cluster setup. The LLT peer inactivity timeout value indicates the interval after which Veritas InfoScale on one node declares the other node in the cluster dead, if there is no network communication (heartbeat) from that node.
  The default value for the CSS miss-count in case of Veritas InfoScale is 600 seconds. The value of this parameter is much higher than the LLT peer inactivity timeout so that the two clusterwares, VCS and Oracle Clusterware, do not interfere with each other's decisions on which nodes should remain in the cluster in the event of network split-brain. Veritas I/O fencing is allowed to decide on the surviving nodes first, followed by Oracle Clusterware. The CSS miss-count value indicates the amount of time Oracle Clusterware waits before evicting another node from the cluster, when it fails to respond across the interconnect.
  For more information, see the Oracle Metalink document: 782148.1

Planning the public network configuration for application

Identify separate public virtual IP addresses for each node in the cluster. application requires one public virtual IP address for the application listener process on each node. Public virtual IP addresses are used by client applications to connect to the application database and help mitigate TCP/IP timeout delays.

For SF Oracle RAC: For Oracle 11g Release 2 and later versions, additionally, you need a Single Client Access Name (SCAN) registered in Enterprise DNS that resolves to three IP addresses (recommended). Oracle Clusterware/Grid Infrastructure manages the virtual IP addresses.

Planning the private network configuration for Oracle RAC

application requires a minimum of one private IP address on each node for Oracle Clusterware heartbeat.

You must use UDP IPC for the database cache fusion traffic. The application UDP IPC protocol requires an IP address. Depending on your deployment needs, this IP address may be a dedicated IP address or one that is shared with Oracle Clusterware.

Note: The private IP addresses of all nodes that are on the same physical network must be in the same IP subnet.

The following practices provide a resilient private network setup:

- Configure Oracle Clusterware interconnects over LLT links to prevent data corruption.

  In an Veritas InfoScale cluster, the Oracle Clusterware heartbeat link MUST be configured as an LLT link. If Oracle Clusterware and LLT use different links for their communication, then the membership change between VCS and Oracle Clusterware is not coordinated correctly. For example, if only the Oracle Clusterware links are down, Oracle Clusterware kills one set of nodes after the expiry of the css-misscount interval and initiates the Oracle Clusterware and database recovery, even before CVM and CFS detect the node failures. This uncoordinated recovery may cause data corruption.

- Oracle Clusterware interconnects need to be protected against NIC failures and link failures. For Oracle RAC 10g Release 2 and 11.2.0.1 versions, the PrivNIC or MultiPrivNIC agent can be used to protect against NIC failures and link failures, if multiple links are available. Even if link aggregation solutions in the form of bonded NICs are implemented, the PrivNIC or MultiPrivNIC agent can be used to provide additional protection against the failure of the aggregated link by failing over to available alternate links. These alternate links can be simple NIC interfaces or bonded NICs.

  An alternative option is to configure the Oracle Clusterware interconnects over bonded NIC interfaces.

  See "High availability solutions for Oracle RAC private network" on page 42.

  Note: The PrivNIC and MultiPrivNIC agents are no longer supported in Oracle RAC 11.2.0.2 and later versions for managing cluster interconnects.

  For 11.2.0.2 and later versions, Symantec recommends the use of alternative solutions such as bonded NIC interfaces or Oracle High Availability IP (HAIP).

- Configure Oracle Cache Fusion traffic to take place through the private network. Symantec also recommends that all UDP cache-fusion links be LLT links. Oracle database clients use the public network for database services. Whenever there is a node failure or network failure, the client fails over the connection, for both existing and new connections, to the surviving node in the cluster with which it is able to connect. Client failover occurs as a result of Oracle Fast Application Notification, VIP failover and client connection TCP timeout. It is strongly recommended not to send Oracle Cache Fusion traffic through the public network.
- Use NIC bonding to provide redundancy for public networks so that application can fail over virtual IP addresses if there is a public link failure.

High availability solutions for Oracle RAC private network

Table 4-1 lists the high availability solutions that you may adopt for your private network.

Table 4-1 High availability solutions for Oracle RAC private network

Options	Description
Using link aggregation/ NIC bonding for Oracle Clusterware	Use a native NIC bonding solution to provide redundancy, in case of NIC failures. Make sure that a link configured under a aggregated link or NIC bond is not configured as a separate LLT link. When LLT is configured over a bonded interface, do one of the following steps to prevent GAB from reporting jeopardy membership: ■ Configure an additional NIC under LLT in addition to the bonded NIC. ■ Add the following line in the `/etc/llttab` file: `set-dbg-minlinks 2`

Table 4-1 High availability solutions for Oracle RAC private network *(continued)*

Options	Description
Using PrivNIC/MultiPrivNIC agents	**Note:** The PrivNIC and MultiPrivNIC agents are no longer supported in Oracle RAC 11.2.0.2 and later versions for managing cluster interconnects. For 11.2.0.2 and later versions, Symantec recommends the use of alternative solutions such as bonded NIC interfaces or Oracle HAIP. Use the PrivNIC agent when operating system limitations prevent you from using NIC bonding to provide high availability using multiple network interfaces. Use the MultiPrivNIC agent when operating system limitations prevent you from using NIC bonding to provide high availability and increased bandwidth using multiple network interfaces. For more deployment scenarios that illustrate the use of PrivNIC/MultiPrivNIC deployments, see the appendix "SF Oracle RAC deployment scenarios" in this document.

Planning the public network configuration for application

Public interconnects are used by the clients to connect to application database. The public networks must be physically separated from the private networks.

See application documentation for more information on recommendations for public network configurations.

Planning the private network configuration for application

Private interconnect is an essential component of a shared disk cluster installation. It is a physical connection that allows inter-node communication. Symantec recommends that these interconnects and LLT links must be the same. You must have the IP addresses configured on these interconnects, persistent after reboot. You must use solutions specific to the operating System.

See application documentation for more information on recommendations for private network configurations.

Planning the storage

Veritas InfoScale provides the following options for shared storage:

- CVM
  CVM provides native naming (OSN) as well as enclosure-based naming (EBN).

Use enclosure-based naming for easy administration of storage. Enclosure-based naming guarantees that the same name is given to a shared LUN on all the nodes, irrespective of the operating system name for the LUN.

- CFS
- **For SF Oracle RAC:** Local storage
  With FSS, local storage can be used as shared storage. The local storage can be in the form of Direct Attached Storage (DAS) or internal disk drives.
- **For SF Oracle RAC:**Oracle ASM over CVM

The following recommendations ensure better performance and availability of storage.

- Use multiple storage arrays, if possible, to ensure protection against array failures. The minimum recommended configuration is to have two HBAs for each host and two switches.
- Design the storage layout keeping in mind performance and high availability requirements. Use technologies such as striping and mirroring.
- Use appropriate stripe width and depth to optimize I/O performance.
- Use SCSI-3 persistent reservations (PR) compliant storage.
- Provide multiple access paths to disks with HBA/switch combinations to allow DMP to provide high availability against storage link failures and to provide load balancing.

Planning the storage

Table 4-2 lists the type of storage required for SF Oracle RAC and SF Sybase CE.

Table 4-2 Type of storage required for SF Oracle RAC and SF Sybase CE

Files	Type of storage
SF Oracle RAC and SF Sybase CE binaries	Local
SF Oracle RAC and SF Sybase CE database storage management repository	Shared

Planning the storage for Oracle RAC

Review the storage options and guidelines for application:

- Storage options for OCR and voting disk

See "Planning the storage for OCR and voting disk" on page 45.

- Storage options for the application installation directories (ORACLE_BASE, CRS_HOME or GRID_HOME (depending on application version), and ORACLE_HOME)
  See "Planning the storage for Oracle RAC binaries and data files" on page 47.

Planning the storage for OCR and voting disk

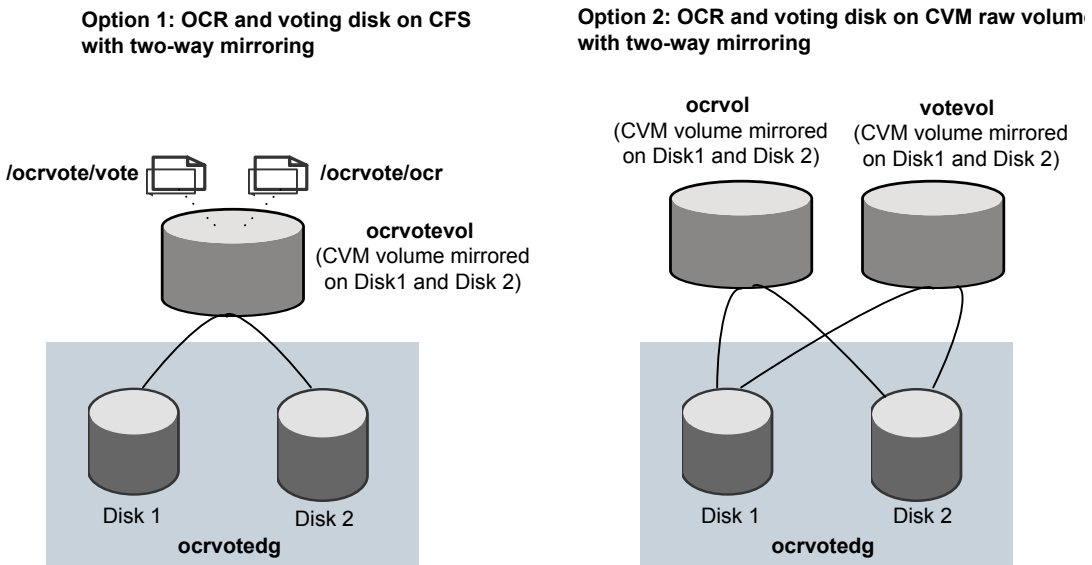
Review the following notes before you proceed:

- Set the disk detach policy setting to (`local`) with ioship off for OCR and voting disk.
- Configure OCR and voting disk on non-replicated shared storage when you configure global clusters.
- If you plan to use FSS, configure OCR and voting disk on SAN storage.

OCR and voting disk storage configuration for external redundancy

Figure 4-3 illustrates the OCR and voting disk storage options for external redundancy.

Figure 4-3 OCR and voting disk storage configuration for external redundancy



- If you want to place OCR and voting disk on a clustered file system (option 1), you need to have two separate files for OCR and voting information respectively on CFS mounted on a CVM mirrored volume.
- If you want to place OCR and voting disk on ASM disk groups that use CVM raw volumes (option 2), you need to use two CVM mirrored volumes for configuring OCR and voting disk on these volumes.

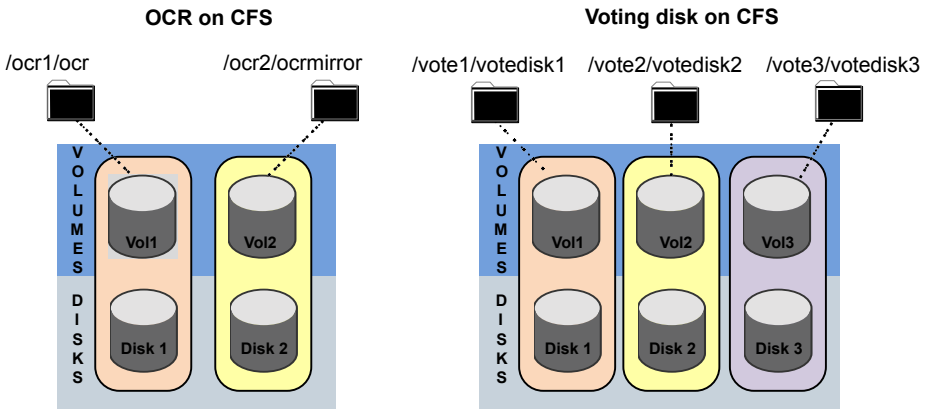
For both option 1 and option 2:

- The option **External Redundancy** must be selected at the time of installing Oracle Clusterware/Grid Infrastructure.
- The installer needs at least two LUNs for creating the OCR and voting disk storage.
  See the application documentation for application's recommendation on the required disk space for OCR and voting disk.

OCR and voting disk storage configuration for normal redundancy

Figure 4-4 illustrates the OCR and voting disk storage options for normal redundancy.

Figure 4-4 OCR and voting disk storage configuration for normal redundancy



The OCR and voting disk files exist on separate cluster file systems.

Configure the storage as follows:

- Create separate filesystems for OCR and OCR mirror.
- Create separate filesystems for a minimum of 3 voting disks for redundancy.
- The option **Normal Redundancy** must be selected at the time of installing Oracle Clusterware/Grid Infrastructure.

Note: It is recommended that you configure atleast resource dependency for high availability of the OCR and voting disk resources.

Planning the storage for Oracle RAC binaries and data files

The Oracle RAC binaries can be stored on local storage or on shared storage, based on your high availability requirements.

Note: Symantec recommends that you install the Oracle Clusterware and Oracle RAC database binaries local to each node in the cluster.

Consider the following points while planning the installation:

- Local installations provide improved protection against a single point of failure and also allows for applying Oracle RAC patches in a rolling fashion.
- CFS installations provide a single Oracle installation to manage, regardless of the number of nodes. This scenario offers a reduction in storage requirements and easy addition of nodes.

Table 4-3 lists the type of storage for Oracle RAC binaries and data files.

Table 4-3 Type of storage for application binaries and data files

Oracle RAC files	Type of storage
Oracle base	Local
Oracle Clusterware/Grid Infrastructure binaries	Local Placing the Oracle Grid Infrastructure binaries on local disks enables rolling upgrade of the cluster.
Oracle RAC database binaries	Local Placing the Oracle RAC database binaries on local disks enables rolling upgrade of the cluster.

Table 4-3 Type of storage for application binaries and data files *(continued)*

Oracle RAC files	Type of storage
Database datafiles	Shared Store the Oracle RAC database files on CFS rather than on raw device or CVM raw device for easier management. Create separate clustered file systems for each Oracle RAC database. Keeping the Oracle RAC database datafiles on separate mount points enables you to unmount the database for maintenance purposes without affecting other databases. If you plan to store the Oracle RAC database on ASM, configure the ASM disk groups over CVM volumes to take advantage of dynamic multi-pathing.
Database recovery data (archive, flash recovery)	Shared Place archived logs on CFS rather than on local file systems.

Planning for Oracle RAC ASM over CVM

Review the following information on storage support provided by Oracle RAC ASM:

Supported by ASM	ASM provides storage for data files, control files, Oracle Cluster Registry devices (OCR), voting disk, online redo logs and archive log files, and backup files.
Not supported by ASM	ASM does not support Oracle binaries, trace files, alert logs, export files, tar files, core files, and application binaries.

The following practices offer high availability and better performance:

- Use CVM mirrored volumes with dynamic multi-pathing for creating ASM disk groups. Select external redundancy while creating ASM disk groups.
- The CVM raw volumes used for ASM must be used exclusively for ASM. Do not use these volumes for any other purpose, such as creation of file systems. Creating file systems on CVM raw volumes used with ASM may cause data corruption.
- Do not link the Veritas ODM library when databases are created on ASM. ODM is a disk management interface for data files that reside on the Veritas File System.
- Use a minimum of two application ASM disk groups. Store the data files, one set of redo logs, and one set of control files on one disk group. Store the Flash Recovery Area, archive logs, and a second set of redo logs and control files on the second disk group.

For more information, see application's ASM best practices document.

- Do not configure DMP meta nodes as ASM disks for creating ASM disk groups. Access to DMP meta nodes must be configured to take place through CVM.
- Do not combine DMP with other multi-pathing software in the cluster.
- Do not use coordinator disks, which are configured for I/O fencing, as ASM disks. I/O fencing disks should not be imported or used for data.
- Volumes presented to a particular ASM disk group should be of the same speed and type.

Planning volume layout

The following recommendations ensure optimal layout of VxVM/CVM volumes:

- Mirror the volumes across two or more storage arrays, if using VxVM mirrors. Keep the Fast Mirror Resync regionsize equal to the database block size to reduce the copy-on-write (COW) overhead. Reducing the regionsize increases the amount of Cache Object allocations leading to performance overheads.
- Distribute the I/O load uniformly on all Cache Objects when you create multiple Cache Objects.
- Implement zoning on SAN switch to control access to shared storage. Be aware that physical disks may be shared by multiple servers or applications and must therefore be protected from accidental access.
- Choose DMP I/O policy based on the storage network topology and the application I/O pattern.
- Exploit thin provisioning for better return on investment.
- **For SF Oracle RAC:**
  Separate the Oracle recovery structures from the database files to ensure high availability when you design placement policies.
  Separate redo logs and place them on the fastest storage (for example, RAID 1+ 0) for better performance.
  Use "third-mirror break-off" snapshots for cloning the Oracle log volumes. Do not create Oracle log volumes on a Space-Optimized (SO) snapshot.
  Create as many Cache Objects (CO) as possible when you use Space-Optimized (SO) snapshots for Oracle data volumes.

Planning file system design

The following recommendations ensure an optimal file system design for databases:

- Create separate file systems for application binaries, data, redo logs, and archive logs. This ensures that recovery data is available if you encounter problems with database data files storage.
- Always place archived logs on CFS file systems rather then local file systems.
- **For SF Oracle RAC:** If using VxVM mirroring, use ODM with CFS for better performance. ODM with SmartSync enables faster recovery of mirrored volumes using Oracle resilvering.

Setting the umask before installation

The topic applies to SF Oracle RAC.

Set the umask to provide appropriate permissions for Veritas InfoScale binaries and files. This setting is valid only for the duration of the current session.

```
# umask 0022
```

Setting the kernel.panic tunable

The topic applies to SF Oracle RAC and SF Sybase CE.

By default, the kernel.panic tunable is set to zero. Therefore the kernel does not restart automatically if a node panics. To ensure that the node restarts automatically after it panics, this tunable must be set to a non-zero value.

To set the kernel.panic tunable

1. Set the kernel.panic tunable to a desired value in the /etc/sysctl.conf file.

   For example, kernel.panic = 10, will assign a value 10 seconds to the kernel.panic tunable. This step makes the change persistent across restarts.

2. Run the command:

   ```
   sysctl -w kernel.panic=10
   ```

   In case of a panic, the node will restart after 10 seconds.

Configuring the I/O scheduler

The topic applies to SF Oracle RAC and SF Sybase CE.

Symantec recommends using the Linux 'deadline' I/O scheduler for database workloads. Configure your system to boot with the 'elevator=deadline' argument to select the 'deadline' scheduler.

For information on configuring the 'deadline' scheduler for your Linux distribution, see the operating system documentation.

To determine whether a system uses the deadline scheduler, look for "elevator=deadline" in /proc/cmdline.

To configure a system to use the deadline scheduler

1. Include the elevator=deadline parameter in the boot arguments of the GRUB or ELILO configuration file. The location of the appropriate configuration file depends on the system's architecture and Linux distribution. For x86_64, the configuration file is /boot/grub/menu.lst
   - A setting for the elevator parameter is always included by SUSE in its ELILO and its GRUB configuration files. In this case, change the parameter from elevator=cfq to elevator=deadline.
2. Reboot the system once the appropriate file has been modified.

   See the operating system documentation for more information on I/O schedulers.

Section 3

Installation of Veritas InfoScale

Chapter 5

Installing Veritas InfoScale using the installer

This chapter includes the following topics:

Installing Veritas InfoScale using the installer

The product installer is the recommended method to license and install Veritas InfoScale.

To install Veritas Infoscale

1. Load and mount the software disc. If you downloaded the software, navigate to the top level of the download directory and skip the next step.

2. Move to the top-level directory on the disc.

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

3. From this directory, type the following command to start the installation on the local system.

   ```
   # ./installer
   ```

4. Press **I** to install and press **Enter**.

5 The list of available products is displayed. Select the product that you want to install on your system.

```
1)  Veritas InfoScale Foundation
2)  Veritas InfoScale Availability
3)  Veritas InfoScale Storage
4)  Veritas InfoScale Enterprise
b)  Back to previous menu
Select a product to install: [1-4,b,q]
```

6 The installer asks whether you wants to configure the product.

```
Would you like to configure InfoScale Enterprise after installation?
[y,n,q]
```

If you enter **y**, the installer configures the product after installation. If you enter **n**, the installer quits after the installation is complete.

7 At the prompt, specify whether you accept the terms of the End User License Agreement (EULA).

```
Do you agree with the terms of the End User License Agreement as
specified in the EULA/en/EULA_InfoScale_Ux_7.0.pdf file
present on media? [y,n,q,?] y
```

8 The installer performs the pre-checks. If it is a fresh system, the product is set as the user defined it. If the system already has a different product installed, the product is set as Veritas InfoScale Enterprise with a warning message after pre-check.

```
Veritas InfoScale Availability is installed. Installation of two
products is not supported, Veritas InfoScale Enterprise will be
installed to include Veritas InfoScale Storage and Veritas
InfoScale Availability on all the systems.
```

9 Choose the licensing method. Answer the licensing questions and follow the prompts.

```
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)
```

Note: You can also register your license using the installer menu by selecting the **L) License a Product** option.

See "Registering Veritas InfoScale using product license keys" on page 17.

---

10 Check the log file to confirm the installation. The log files, summary file, and response file are saved at: `/opt/VRTS/install/logs` directory.

Chapter 6

Installing Veritas InfoScale using response files

This chapter includes the following topics:

About response files

The installer script or product installation script generates a response file during any installation, configuration, upgrade, or uninstall procedure. The response file contains the configuration information that you entered during the procedure. When the procedure completes, the installation script displays the location of the response files.

You can use the response file for future installation procedures by invoking an installation script with the `-responsefile` option. The response file passes arguments to the script to automate the installation of that product. You can edit the file to automate installation and configuration of additional systems.

Note: Symantec recommends that you use the response file created by the installer and then edit it as per your requirement.

Syntax in the response file

The syntax of the Perl statements that is 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 1 ", "value 2 ", "value 3 "];
```

Installing Veritas InfoScale using response files

Typically, you can use the response file that the installer generates after you perform Veritas InfoScale installation on a system to install Veritas InfoScale on other systems..

To install Veritas InfoScale using response files

1. Make sure the systems where you want to install Veritas InfoScale meet the installation requirements.
2. Make sure that the preinstallation tasks are completed.
3. Copy the response file to the system where you want to install Veritas InfoScale.
4. Edit the values of the response file variables as necessary.
5. Mount the product disc and navigate to the directory 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
   ```

   Where `/tmp/response_file` is the response file's full path name.
7. Complete the Veritas InfoScale post-installation tasks.

   For instructions, see the chapter *Performing post-installation tasks* in this document.

Response file variables to install Veritas InfoScale

Table 6-1 lists the response file variables that you can define to install Veritas InfoScale.

Table 6-1 Response file variables for installing Veritas InfoScale

Variable	Description
CFG{opt}{install}	Installs Veritas InfoScale RPMs. Configuration can be performed at a later time using the `-configure` option. List or scalar: scalar Optional or required: optional
CFG{activecomponent}	Specifies the component for operations like precheck, configure, addnode, install and configure(together). List or scalar: list Optional or required: required
CFG{accepteula}	Specifies whether you agree with the EULA.pdf file on the media. List or scalar: scalar Optional or required: required
CFG{keys}{vxkeyless} CFG{keys}{license}	`CFG{keys}{vxkeyless}` gives the list of keyless keys to be registered on the system. `CFG{keys}{license}` gives the list of user defined keys to be registered on the system List of Scalar: List Optional or required: Required.
CFG{systems}	List of systems on which the product is to be installed or uninstalled. List or scalar: list Optional or required: required
CFG{prod}	Defines the product to be installed or uninstalled. List or scalar: scalar Optional or required: required

Table 6-1 Response file variables for installing Veritas InfoScale *(continued)*

Variable	Description
CFG{opt}{keyfile}	Defines the location of an ssh keyfile that is used to communicate with all remote systems. List or scalar: scalar Optional or required: optional
CFG{opt}{tmppath}	Defines the location where a working directory is created to store temporary files and the RPMs that are needed during the install. The default location is /var/tmp. List or scalar: scalar Optional or required: optional
CFG{opt}{rsh}	Defines that *rsh* must be used instead of ssh as the communication method between systems. List or scalar: scalar Optional or required: optional
CFG{opt}{logpath}	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. List or scalar: scalar Optional or required: optional

Sample response file for Veritas InfoScale installation

The following example shows a response file for installing Veritas InfoScale.

```
our %CFG;

$CFG{accepteula}=1;
$CFG{keys}{keyless}=[ qw(ENTERPRISE) ];
$CFG{opt}{gco}=1;
$CFG{opt}{install}=1;
$CFG{prod}="ENTERPRISE70";
$CFG{systems}=[ qw(system1 system2) ];

1;
```

Chapter 7

Installing Veritas Infoscale using operating system-specific methods

This chapter includes the following topics:

Verifying Veritas InfoScale RPMs

InfoScale RPMs include digital signatures in order to verify their authenticity. If you want to install the RPMs manually, you must import keys first. To import keys, perform the following steps:

1. Import the Veritas GPG key to verify InfoScale packages:

```
# rpm --import RPM-GPG-KEY-veritas-infoscale7
```

2. Display the list of Veritas keys installed for RPM verification:

```
# rpm -q gpg-pubkey --qf '%{name}-%{version}-%{release}
 -->%{summary}\n' | grep Symantec
```

3. Display the fingerprint of the Veritas key file:

   ```
   # gpg --quiet --with-fingerprint ./RPM-GPG-KEY-veritas-infoscale7
   ```

   For example:

   ```
   Key fingerprint = C031 8CAB E668 4669 63DB  C8EA 0B0B C720 A17A 604B
   ```

To display details about the installed Veritas key file, use the `rpm -qi` command followed by the output from the previous command:

```
# rpm -qi <gpg-pubkey-file>
```

You can also use the following command to show information for the installed Veritas key file:

```
# rpm -qi `rpm -q gpg-pubkey --qf '%{name}-%{version}-%{release}
 --> %{summary}\n' | awk '/Symantec/ { print $1 }'`
```

To check the GnuPG signature of an RPM file after importing the builder's GnuPG key, use the following command:

```
# rpm -K <rpm-file>
```

Where <*rpm-file*> is the filename of the RPM package.

If the signature of the package is verified, and it is not corrupt, the following message is displayed:

```
md5 gpg OK
```

To verify the signature for all Veritas InfoScale RPMs:

```
# for i in *.rpm; do rpm -K $i; done
VRTSamf-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSaslapm-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTScavf-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTScps-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSdbac-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSdbed-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSfsadv-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSfssdk-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSgab-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSglm-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSgms-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSllt-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSodm-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
```

```
VRTSperl-5.20.1.0-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSrhevm-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSsfcpi-7.0.0.000-GENERIC.noarch.rpm: rsa sha1 (md5) pgp md5 OK
VRTSsfmh-7.0.0.0_Linux.rpm: rsa sha1 (md5) pgp md5 OK
VRTSspt-7.0.0.000-RHEL6.noarch.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvbs-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvcs-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvcsag-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvcsea-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvcsnr-7.0.0.000-GENERIC.noarch.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvcswiz-7.0.0.000-RHEL6.i686.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvlic-3.02.70.008-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvxfen-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvxfs-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
VRTSvxvm-7.0.0.000-RHEL6.x86_64.rpm: rsa sha1 (md5) pgp md5 OK
```

About installing Veritas InfoScale using operating system-specific methods

On Linux, you can install Veritas InfoScale using the following methods:

- You can install Veritas InfoScale using Kickstart. Kickstart is supported for Red Hat Enterprise Linux 6 (RHEL6) and Red Hat Enterprise Linux 7 (RHEL7).
  See "Installing Veritas InfoScale using Kickstart" on page 62.
- You can install Veritas InfoScale using yum. yum is supported for Red Hat Enterprise Linux 6 (RHEL6) and Red Hat Enterprise Linux 7 (RHEL7).
  See "Installing Veritas InfoScale using yum" on page 66.
- You can install Veritas InfoScale using the Red Hat Satellite server. Red Hat Satellite server is supported for Red Hat Enterprise Linux 6 (RHEL6) and Red Hat Enterprise Linux 7 (RHEL7).
  See "Installing Veritas InfoScale using the Red Hat Satellite server" on page 69.

Installing Veritas InfoScale using Kickstart

You can install Veritas InfoScale using Kickstart. Kickstart is supported for Red Hat Enterprise Linux operating system.

To install Veritas InfoScale using Kickstart

1. Create a directory for the Kickstart configuration files.

   ```
   # mkdir /kickstart_files/
   ```

2. Generate the Kickstart configuration files. The configuration files have the extension `.ks.`:

   Enter the following command:

   ```
   # ./installer -kickstart /kickstart_files/
   ```

   The system lists the files.

   The output includes the following:

   ```
   The kickstart script for ENTERPRISE is generated at
   /kickstart_files/kickstart_enterprise.ks
   ```

3. Set up an NFS exported location which the Kickstart client can access. For example, if `/nfs_mount_kickstart` is the directory which has been NFS exported, the NFS exported location may look similar to the following:

   ```
   # cat /etc/exports
   /nfs_mount_kickstart  * (rw,sync,no_root_squash)
   ```

4. Copy the `rpms` directory from the installation media to the NFS location.
5. Verify the contents of the directory.

   ```
   # ls /nfs_mount_kickstart/
   ```

6. In the Veritas InfoScale Kickstart configuration file, modify the `BUILDSRC` variable to point to the actual NFS location. The variable has the following format:

   ```
   BUILDSRC="hostname_or_ip:/nfs_mount_kickstart"
   ```

7. Append the entire modified contents of the Kickstart configuration file to the operating system `ks.cfg` file.
8. Launch the Kickstart installation for the operating system.
9. After the operating system installation is complete, check the file `/var/tmp/kickstart.log` for any errors that are related to the installation of RPMs and product installer scripts.

10 Verify that all the product RPMs have been installed. Enter the following command:

```
# rpm -qa | grep -i vrts
```

11 If you do not find any installation issues or errors, configure the product stack. Enter the following command:

```
# /opt/VRTS/install/installer -configure sys1 sys2
```

Sample Kickstart configuration file

The following is a sample RedHat Enterprise Linux 6 (RHEL6) Kickstart configuration file.

```
# The packages below are required and will be installed
from OS installation media automatically # during the automated
installation of products in the DVD, if they have not been
installed yet.
%packages
systemd-libs.i686
device-mapper
device-mapper-libs
parted
libgcc.i686
ed
ksh
nss-softokn-freebl.i686
glibc.i686
libstdc++.i686
audit-libs.i686
cracklib.i686
libselinux.i686
pam.i686
libattr.i686
libacl.i686
%end

%post --nochroot
# Add necessary scripts or commands here to your need
# This generated kickstart file is only for the automated installation of
products in the DVD
```

```
PATH=$PATH:/sbin:/usr/sbin:/bin:/usr/bin
export PATH

#
# Notice:
# * You do not have to change the following scripts
#

# define path varibles
ROOT=/mnt/sysimage
BUILDDIR="${ROOT}/build"
RPMDIR="${BUILDDIR}/rpms"

# define log path
KSLOG="${ROOT}/var/tmp/kickstart.log"

echo "==== Executing kickstart post section: ====" >> ${KSLOG}

mkdir -p ${BUILDDIR}
mount -t nfs -o nolock,vers=3 ${BUILDSRC} ${BUILDDIR} >> ${KSLOG} 2>&1


# Install the RPMs in the following order.
 for RPM in VRTSperl VRTSvlic VRTSspt VRTSvxvm VRTSaslapm VRTSob
 VRTSvxfs VRTSfsadv VRTSfssdk VRTSdbed VRTSodm VRTSsfmh VRTSsfcpi


do
    echo "Installing package  -- $RPM" >> ${KSLOG}
    rpm -U -v --root ${ROOT} ${RPMDIR}/${RPM}-* >> ${KSLOG} 2>&1
done

umount ${BUILDDIR}

CALLED_BY=KICKSTART ${ROOT}/opt/VRTS/install/bin/
UXRT70/add_install_scripts >> ${KSLOG} 2>&1

echo "==== Completed kickstart file ====" >> ${KSLOG}

exit 0
%end
```

Installing Veritas InfoScale using yum

You can install Veritas InfoScale using yum. yum is supported for Red Hat Enterprise operating system.

To install Veritas InfoScale using yum

1 Configure a yum repository on a client system.

- Create a `.repo` file under `/etc/yum.repos.d/`. An example of this `.repo` file for Veritas InfoScale is:

```
# cat /etc/yum.repos.d/veritas_infoscale7.repo
[repo-Veritas InfoScale]
name=Repository for Veritas InfoScale
baseurl=file:///path/to/repository/
enabled=1
gpgcheck=1
gpgkey=file:///path/to/repository/RPM-GPG-KEY-veritas-infoscale7
```

  The values for the `baseurl` attribute can start with http://, ftp://, or file:///. The URL you choose needs to be able to access the `repodata` directory. It also needs to access all the Veritas InfoScale RPMs in the repository that you create or update.

- Run the following commands to get the yum repository updated:

```
# yum repolist

# yum updateinfo
```

- Check the yum group information:

```
# yum grouplist | grep 70
   AVAILABILITY70
   ENTERPRISE70
   FOUNDATION70
   STORAGE70

# yum groupinfo AVAILABILITY70

# yum groupinfo FOUNDATION70

# yum groupinfo STORAGE70

# yum groupinfo ENTERPRISE70
```

- Check the yum configuration. List Veritas InfoScale RPMs.

```
# yum list 'VRTS*'
Available Packages
VRTSperl.x86_64        5.16.1.4-RHEL5.2
VRTSsfcpi.noarch     7.0.0.000-GENERIC
VRTSvlic.x86_64        3.02.70.010-0
...
```

The Veritas InfoScale RPMs may not be visible immediately if:

- The repository was visited before the Veritas InfoScale RPMs were added, and
- The local cache of its metadata has not expired.

To eliminate the local cache of the repositories' metadata and get the latest information from the specified `baseurl`, run the following commands:

```
# yum clean expire-cache
# yum list 'VRTS*'
```

Refer to the *Red Hat Enterpirse Linux Deployment Guide* for more information on yum repository configuration.

2 Install the RPMs on the target systems.

- **To install all the RPMs**

  1. Specify each RPM name as its yum equivalent. For example:

     ```
     # yum install VRTSvlic VRTSperl ... VRTSsfcpi
     ```

  2. Specify all of the Veritas InfoScale RPMs using its RPM glob. For example:

     ```
     # yum install 'VRTS*'
     ```

  3. Specify the group name if a group is configured for Veritas InfoScale's RPMs. This name should keep consistency with the one in xml file. In this example, the group name is *ENTERPRISE70*:

     ```
     # yum install @ENTERPRISE70
     ```

     Or

     ```
     # yum groupinstall -y ENTERPRISE70
     ```

- **To install one RPM at a time**

1. Run the `installer -allpkgs` command to determine RPM installation order.

```
# ./installer -allpkgs

InfoScale Foundation: PKGS: VRTSperl VRTSvlic VRTSspt
VRTSveki VRTSvxvm VRTSaslapm VRTSvxfs VRTSsfmh VRTSsfcpi

InfoScale Availability: PKGS: VRTSperl VRTSvlic VRTSspt
VRTSveki VRTSllt VRTSgab VRTSvxfen VRTSamf VRTSvcs VRTScps
VRTSvcsag VRTSvcsea VRTSsfmh VRTSvbs VRTSvcswiz VRTSsfcpi

InfoScale Storage: PKGS: VRTSperl VRTSvlic VRTSspt VRTSveki
VRTSvxvm VRTSaslapm VRTSvxfs VRTSfsadv VRTSllt VRTSgab VRTSvxfen
VRTSamf VRTSvcs VRTScps VRTSvcsag VRTSdbed VRTSglm VRTScavf
VRTSgms VRTSodm VRTSsfmh VRTSsfcpi

InfoScale Enterprise: PKGS: VRTSperl VRTSvlic VRTSspt VRTSveki
VRTSvxvm VRTSaslapm VRTSvxfs VRTSfsadv VRTSllt VRTSgab VRTSvxfen
VRTSamf VRTSvcs VRTScps VRTSvcsag VRTSvcsea VRTSdbed VRTSglm
VRTScavf VRTSgms VRTSodm VRTSdbac VRTSsfmh VRTSvbs VRTSvcswiz
VRTSsfcpi
```

2. Use the same order as the output from the `installer -allpkgs` command:

```
# yum install VRTSperl
# yum install VRTSvlic
  ...
# yum install VRTSsfcpi
```

3 After you install all the RPMs, use the `/opt/VRTS/install/installer` command to license, configure, and start the product.

If the `VRTSsfcpi` RPM is installed before you use yum to install Veritas InfoScale, the RPM is not upgraded or uninstalled. If the `/opt/VRTS/install/installer` script is not created properly, use the `/opt/VRTS/install/bin/UXRT70/add_install_scripts` script after all the other Veritas InfoScale RPMs are installed. For example, your output may be similar to the following, depending on the products you install:

```
# /opt/VRTS/install/bin/UXRT70/add_install_scripts
Creating install/uninstall scripts for installed products
Creating /opt/VRTS/install/installer for UXRT70
Creating /opt/VRTS/install/showversion for UXRT70
```

To uninstall Veritas InfoScale using yum

- You can uninstall Veritas InfoScale using yum. Use one of the following commands depending on the product that you have installed:

```
# yum groupremove -y AVAILABILITY70

# yum groupremove -y FOUNDATION70

# yum groupremove -y STORAGE70

# yum groupremove -y ENTERPRISE70
```

Installing Veritas InfoScale using the Red Hat Satellite server

You can install Veritas InfoScale using the Red Hat Satellite server. Red Hat Satellite is supported for Red Hat Enterprise Linux operating system. You can install RPMs and rolling patches on the systems which the Red Hat Satellite server manages.

Red Hat Satellite server is a systems management solution. It lets you:

- Inventory the hardware and the software information of your systems.
- Install and update software on systems.
- Collect and distribute custom software RPMs into manageable groups.
- Provision (Kickstart) systems.
- Manage and deploy configuration files to systems.
- Monitor your systems.
- Provision virtual guests.
- Start, stop, and configure virtual guests.

In a Red Hat Satellite server, you can manage the system by creating a channel. A Red Hat Satellite channel is a collection of software RPMs. Using channels, you can segregate the RPMs by defining some rules. For instance, a channel may contain RPMs only from a specific Red Hat distribution. You can define channels according to your own requirement. You can create a channel that contains Veritas InfoScale RPMs for custom usage in your organization's network.

Channels are of two types:

- Base channel

A base channel consists of RPMs based on a specific architecture and Red Hat Enterprise Linux release.

- Child channel
  A child channel is a channel which is associated with a base channel that contains extra custom RPMs like Veritas InfoScale.

A system can subscribe to only one base channel and multiple child channels of its base channel. The subscribed system can only install or update the RPMs that are available through its satellite channels.

For more information, see the *Red Hat Satellite5.6 User Guide*.

Using Red Hat Satellite server to install Veritas InfoScale products

You can use the Red Hat Satellite server to install Veritas InfoScale products on your system.

To use Red Hat Satellite server to install Veritas InfoScale products

1. Set the base channel, child channel, and target system by following the Red Hat Satellite documentation. You need to ensure that:
   - The base channel consists of RPMs based on RHEL6.3, RHEL6.4, RHEL6.5, or the RHEL7 release
   - The child channel consists of Veritas InfoScale RPMs or patches.
   - The target system is registered to the Red Hat Satellite.
2. Log on to the Red Hat Satellite admin page. Select the **Systems** tab. Click on the **target system**.
3. Select **Alter Channel Subscriptions** to alter the channel subscription of the target system.
4. Select the channel which contains the repository of Veritas InfoScale.
5. Enter the following command to check the YUM repository on the target system.

   ```
   # yum repolist
   ```

6. Enter the following command to install the Veritas InfoScale RPMs using YUM:

   ```
   # yum install @ENTERPRISE70
   ```

7 Enter the following command to generate the script of the installer:

```
# /opt/VRTS/install/bin/UXRT70/add_install_scripts
```

8 Enter the following command to configure Veritas InfoScale using the installer:

```
# ./installer -configure
```

Section 4

Post-installation tasks

Chapter 8

Verifying the Veritas InfoScale installation

This chapter includes the following topics:

Verifying product installation

Verify that the Veritas InfoScale products are installed.

You can verify the version of the installed product. Use the following command:

```
# /opt/VRTS/install/installer -version
```

You can find out the about the installed RPMs and its versions by using the following command:

```
# /opt/VRTS/install/showversion
```

Use the following sections to further verify the product installation.

Installation log files

After every product installation, the installer creates three text files:

- Installation log file

- Response file
- Summary file

The name and location of each file is displayed at the end of a product installation, and are always located in the `/opt/VRTS/install/logs` directory. It is recommended that you keep the files for auditing, debugging, and future use.

Using the installation log file

The installation log file contains all commands executed during the procedure, their output, and errors generated by the commands. This file is for debugging installation problems and can be used for analysis by Symantec Support.

Using the summary file

The summary file contains the results of the installation by the installer or product installation scripts. The summary includes the list of the RPMs, and the status (success or failure) of each RPM. The summary also indicates which processes were stopped or restarted during the installation. After installation, refer to the summary file to determine whether any processes need to be started.

Setting environment variables

Most of the commands which are used in the installation are present in the `/sbin` or `/usr/sbin` directory. Add these directories to your `PATH` environment variable as necessary.

After installation, Veritas InfoScale commands are in `/opt/VRTS/bin`. Veritas InfoScale manual pages are stored in `/opt/VRTS/man`.

Specify `/opt/VRTS/bin` in your `PATH` after the path to the standard Linux commands.

Some VCS custom scripts reside in `/opt/VRTSvcs/bin`. If you want to install a high availability product, add `/opt/VRTSvcs/bin` to the `PATH` also.

To invoke the VxFS-specific `df`, `fsdb`, `ncheck`, or `umount` commands, type the full path name: `/opt/VRTS/bin/`*command*.

To set your `MANPATH` environment variable to include `/opt/VRTS/man` do the following:

- If you want to use a shell such as `sh` or `bash`, enter the following:

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

- If you want to use a shell such as `csh` or `tcsh`, enter the following:

```
% setenv MANPATH $(MANPATH):/opt/VRTS/man
```

On a Red Hat system, also include the 1m manual page section in the list defined by your `MANSECT` environment variable.

- If you want to use a shell such as `sh` or `bash`, enter the following:

```
$ MANSECT=$MANSECT:1m; export MANSECT
```

- If you want to use a shell such as `csh` or `tcsh`, enter the following:

```
% setenv MANSECT $(MANSECT):1m
```

If you use the `man`(1) command to access manual pages, set `LC_ALL=C` in your shell to ensure that they display correctly.

Checking installed product versions and downloading maintenance releases and patches

Use the `installer` command with the `-version` option to:

- Determine the product RPMs that are installed on your system.
- Download required maintenance releases or patches .

The `version` option or the `showversion` script in the `/opt/VRTS/install` directory checks the specified systems and discovers the following:

- Veritas InfoScale product versions that are installed on the system
- All the required RPMs and the optional RPMs installed on the system
- Any required or optional RPMs (if applicable) that are not present
- Installed patches
- Available base releases (major or minor)
- Available maintenance releases
- Available patch releases

To check your systems and download maintenance releases and patches

1. Mount the media, or navigate to the installation directory.
2. Start the installer with the `-version` option.

   ```
   # ./installer -version sys1 sys2
   ```

   For each system, the installer lists all of the installed base releases, maintenance releases, and patches, followed by the lists of available downloads.
3. If you have Internet access, follow the prompts to download the available maintenance releases and patches to the local system.
4. If you do not have Internet access, you can download any needed maintenance releases and patches from the Symantec Operations Readiness Tools (SORT) Patch Finder page at:

   https://sort.symantec.com/patch/finder

   You can obtain installer patches automatically or manually.

   See "Obtaining installer patches" on page 30.

Downloading maintenance releases and patches requires the installer to make outbound networking calls. You can also disable external network connection attempts.

See "Disabling external network connection attempts" on page 31.

Chapter 9

After Installation

This chapter includes the following topics:

Next steps after installation

Once installation is complete, you can configure a component of your choice.

Table 9-1 lists the components and the respective Configuration and Upgrade guides that are available.

Table 9-1 Guides available for configuration

Component	Document name
Storage Foundation	See *Storage Foundation Configuration and Upgrade Guide* See *Storage Foundation Administrator's Guide*
Storage Foundation and High Availability	See *Storage Foundation and High Availability Configuration and Upgrade Guide*
Storage Foundation Cluster File System HA	See *Storage Foundation Cluster File System High Availability Configuration and Upgrade Guide* See *Storage Foundation Cluster File System High Availability Administrator's Guide*

Table 9-1 Guides available for configuration *(continued)*

Component	Document name
Cluster Server	See *Cluster Server Configuration and Upgrade Guide* See *Cluster Server Administrator's Guide* See *Symantec High Availability Solution Guide for VMware*
Storage Foundation for Oracle RAC	See *Storage Foundation for Oracle RAC Configuration and Upgrade Guide* See *Storage Foundation for Oracle RAC Administrator's Guide*
Storage Foundation for Sybase SE	See *Storage Foundation for Sybase ASE CE Configuration and Upgrade Guide* See *Storage Foundation for Sybase ASE CE Administrator's Guide*

Section 5

Uninstallation of Veritas InfoScale

Chapter 10

Uninstalling Veritas InfoScale using the installer

This chapter includes the following topics:

Removing VxFS file systems

The VxFS RPM cannot be removed if there are any mounted VxFS file systems. Unmount all VxFS file systems before removing the RPM. After you remove the VxFS RPM, VxFS file systems are not mountable or accessible until another VxFS RPM is installed. It is advisable to back up VxFS file systems before installing a new VxFS RPM. If VxFS will not be installed again, all VxFS file systems must be converted to a new file system type.

To remove VxFS file systems

1. Check if any VxFS file systems or Storage Checkpoints are mounted:

   ```
   # df -T | grep vxfs
   ```

2. Make backups of all data on the file systems that you wish to preserve, or recreate them as non-VxFS file systems on non-VxVM volumes or partitions.
3. Unmount all Storage Checkpoints and file systems:

   ```
   # umount /checkpoint_name
   # umount /filesystem
   ```

4. Comment out or remove any VxFS file system entries from the `/etc/fstab` file.

Removing rootability

Perform this procedure if you configured rootability by encapsulating the root disk.

To remove rootability

1. Check if the system's root disk is under VxVM control by running this command:

   ```
   # df -v /
   ```

   The root disk is under VxVM control if `/dev/vx/dsk/rootdg/rootvol` is listed as being mounted as the root (`/`) file system. If so, unmirror and unencapsulate the root disk as described in the following steps:

2. Use the `vxplex` command to remove all the plexes of the volumes `rootvol`, `swapvol`, `usr`, `var`, `opt` and `home` that are on disks other than the root disk.

   For example, the following command removes the plexes `mirrootvol-01`, and `mirswapvol-01` that are configured on a disk other than the root disk:

   ```
   # vxplex -o rm dis mirrootvol-01 mirswapvol-01
   ```

   Warning: Do not remove the plexes that correspond to the original root disk partitions.

3. Enter the following command to convert all the encapsulated volumes in the root disk back to being accessible directly through disk partitions instead of through volume devices:

   ```
   # /etc/vx/bin/vxunroot
   ```

   Following the removal of encapsulation, the system is rebooted from the unencapsulated root disk.

Moving volumes to disk partitions

All volumes must be moved to disk partitions.

This can be done using one of the following procedures:

- Back up the system fully onto tape and then recover from it.
- Back up each file system individually and then recover them all after creating new file systems on disk partitions.
- Use VxVM to move volumes incrementally onto disk partitions as described in the following section.

Moving volumes onto disk partitions using VxVM

Use the following procedure to move volumes onto disk partitions.

To move volumes onto disk partitions

1. Evacuate disks using the `vxdiskadm` program or the `vxevac` script. You should consider the amount of target disk space required for this before you begin.

   Evacuation moves subdisks from the specified disks to target disks. The evacuated disks provide the initial free disk space for volumes to be moved to disk partitions.

2. Remove the evacuated disks from VxVM control using the following commands:

   ```
   # vxdg -g diskgroup rmdisk disk _media_name
   # vxdisk rm disk_access_name
   ```

3. Decide which volume to move first. If the volume to be moved is mounted, unmount it.

4. If the volume is being used as a raw partition for database applications, make sure that the application is not updating the volume and that data on the volume is synced.

5. Create a partition on free disk space of the same size as the volume. If there is not enough free space for the partition, a new disk must be added to the system for the first volume removed. Subsequent volumes can use the free space generated by the removal of this volume.

6. `Copy` the data on the volume onto the newly created disk partition using a command similar to the following:

   ```
   # dd if=/dev/vx/dsk/diskgroup/volume-name of=/dev/sdb2
   ```

   where `sdb` is the disk outside of VxVM and `2` is the newly created partition on that disk.

7. Replace the entry for that volume (if present) in `/etc/fstab` with an entry for the newly created partition.

8. Mount the disk partition if the corresponding volume was previously mounted.

9. Stop the volume and remove it from VxVM using the following commands:

   ```
   # vxvol -g diskgroup -f stop volume_name
   # vxedit -g diskgroup -rf rm volume_name
   ```

10. Remove any disks that have become free (have no subdisks defined on them) by removing volumes from VxVM control. To check if there are still some subdisks remaining on a particular disk, use the following command:

    ```
    # vxprint -F "%sdnum" disk_media_name
    ```

11 If the output is not 0, there are still some subdisks on this disk that must be subsequently removed. If the output is 0, remove the disk from VxVM control using the following commands:

```
# vxdg -g diskgroup rmdisk disk_media_name
# vxdisk rm disk_access_name
```

12 The free space now created can be used for adding the data in the next volume to be removed.

13 After all volumes have been converted into disk partitions successfully, reboot the system. After the reboot, none of the volumes should be open. To verify that none of the volumes are open, use the following command:

```
# vxprint -Aht -e v_open
```

14 If any volumes remain open, repeat the steps listed above.

Removing the Replicated Data Set

If you use VVR, you need to perform the following steps. This section gives the steps to remove a Replicated Data Set (RDS) when the application is either active or stopped.

Note: If you are upgrading Volume Replicator, do not remove the Replicated Data Set.

To remove the Replicated Data Set

1. Verify that all RLINKs are up-to-date:

   ```
   # vxrlink -g diskgroup status rlink_name
   ```

   If the Secondary is not required to be up-to-date, proceed to 2 and stop replication using the `-f` option with the `vradmin stoprep` command.

2. Stop replication to the Secondary by issuing the following command on any host in the RDS:

   The `vradmin stoprep` command fails if the Primary and Secondary RLINKs are not up-to-date. Use the `-f` option to stop replication to a Secondary even when the RLINKs are not up-to-date.

   ```
   # vradmin -g diskgroup stoprep local_rvgname sec_hostname
   ```

   The argument `local_rvgname` is the name of the RVG on the local host and represents its RDS.

   The argument `sec_hostname` is the name of the Secondary host as displayed in the output of the `vradmin printrvg` command.

3. Remove the Secondary from the RDS by issuing the following command on any host in the RDS:

   ```
   # vradmin -g diskgroup delsec local_rvgname sec_hostname
   ```

   The argument local_rvgname is the name of the RVG on the local host and represents its RDS.

   The argument sec_hostname is the name of the Secondary host as displayed in the output of the `vradmin printrvg` command.

4. Remove the Primary from the RDS by issuing the following command on the Primary:

   ```
   # vradmin -g diskgroup delpri local_rvgname
   ```

   When used with the `-f` option, the `vradmin delpri` command removes the Primary even when the application is running on the Primary.

   The RDS is removed.

5. If you want to delete the SRLs from the Primary and Secondary hosts in the RDS, issue the following command on the Primary and all Secondaries:

   ```
   # vxedit -r -g diskgroup rm srl_name
   ```

Uninstalling Veritas InfoScale RPMs using the product installer

Use the following procedure to remove Veritas InfoScale products.

Not all RPMs may be installed on your system depending on the choices that you made when you installed the software.

Note: After you uninstall the product, you cannot access any file systems you created using the default disk layout version in Veritas InfoScale 7.0 with a previous version of Veritas InfoScale.

To shut down and remove the installed Veritas InfoScale RPMs

1. Comment out or remove any Veritas File System (VxFS) entries from the file system table `/etc/fstab`. Failing to remove these entries could result in system boot problems later.
2. Unmount all mount points for VxFS file systems.

   ```
   # umount /mount_point
   ```

3. If the VxVM RPM (`VRTSvxvm`) is installed, read and follow the uninstallation procedures for VxVM.

   See "Removing rootability" on page 81.

4. If a cache area is online, you must take the cache area offline before uninstalling the VxVM RPM. Use the following command to take the cache area offline:

   ```
   # sfcache offline cachename
   ```

5. Make sure you have performed all of the prerequisite steps.
6. 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
   ```

7 Move to the `/opt/VRTS/install` directory and run the uninstall script.

```
# cd /opt/VRTS/install

# ./installer -uninstall
```

8 The uninstall script prompts for the system name. Enter one or more system names, separated by a space, from which to uninstall Veritas InfoScale.

```
Enter the system names separated by spaces: [q?] sys1 sys2
```

9 The uninstall script prompts you to stop the product processes. If you respond yes, the processes are stopped and the RPMs are uninstalled.

The uninstall script creates log files and displays the location of the log files.

10 Most RPMs have kernel components. In order to ensure complete removal, a system reboot is recommended after all RPMs have been removed.

11 In case the uninstallation fails to remove any of the VRTS RPMs, check the installer logs for the reason for failure or try to remove the RPMs manually using the following command:

```
# rpm -e VRTSvxvm
```

Removing license files (Optional)

Optionally, you can remove the license files.

To remove the Veritas license files

1 To see what license key files you have installed on a system, enter:

```
# /sbin/vxlicrep
```

The output lists the license keys and information about their respective products.

2 Go to the directory containing the license key files and list them:

```
# cd /etc/vx/licenses/lic
# ls -a
```

3 Using the output from step 1, identify and delete the unwanted key files that are listed in step 2. Unwanted keys may be deleted by removing the license key file.

Removing the Storage Foundation for Databases (SFDB) repository

After removing the product, you can remove the SFDB repository file and any backups.

Removing the SFDB repository file disables the SFDB tools.

To remove the SFDB repository

1. Identify the SFDB repositories created on the host.

   Oracle:

   ```
   # cat /var/vx/vxdba/rep_loc
   ```

   ```
   {
      "sfae_rept_version" : 1,
      "oracle" : {
         "SFAEDB" : {
            "location" : "/data/sfaedb/.sfae",
            "old_location" : "",
            "alias" : [
               "sfaedb"
            ]
         }
      }
   }
   ```

2. Remove the directory identified by the `location` key.

   Oracle:

   ```
   # rm -rf /data/sfaedb/.sfae
   ```

   DB2 9.5 and 9.7:

   ```
   # rm -rf /db2data/db2inst1/NODE0000/SQL00001/.sfae
   ```

   DB2 10.1 and 10.5:

   ```
   # rm -rf /db2data/db2inst1/NODE0000/SQL00001/MEMBER0000/.sfae
   ```

3. Remove the repository location file.

   ```
   # rm -rf /var/vx/vxdba/rep_loc
   ```

   This completes the removal of the SFDB repository.

Chapter 11

Uninstalling Veritas InfoScale using response files

This chapter includes the following topics:

Uninstalling Veritas InfoScale using response files

Typically, you can use the response file that the installer generates after you perform Veritas InfoScale uninstallation on one system to uninstall Veritas InfoScale on other systems.

To perform an automated uninstallation

1. Make sure that you meet the prerequisites to uninstall Veritas InfoScale.
2. Copy the response file to the system where you want to uninstall Veritas InfoScale.
3. Edit the values of the response file variables as necessary.

4 Start the uninstallation from the system to which you copied the response file. For example:

```
# /opt/VRTS/install/installer -responsefile
/tmp/response_file
```

Where `/tmp/response_file` is the response file's full path name.

Response file variables to uninstall Veritas InfoScale

Table 11-1 lists the response file variables that you can define to configure Veritas InfoScale.

Table 11-1 Response file variables for uninstalling Veritas InfoScale

Variable	Description
CFG{systems}	List of systems on which the product is to be installed or uninstalled. List or scalar: list Optional or required: required
CFG{prod}	Defines the product to be installed or uninstalled. List or scalar: scalar Optional or required: required
CFG{opt}{keyfile}	Defines the location of an ssh keyfile that is used to communicate with all remote systems. List or scalar: scalar Optional or required: optional
CFG{opt}{tmppath}	Defines the location where a working directory is created to store temporary files and the RPMs that are needed during the install. The default location is /var/tmp. List or scalar: scalar Optional or required: optional
CFG{opt}{logpath}	Mentions the location where the log files are to be copied. The default location is /opt/VRTS/install/logs. List or scalar: scalar Optional or required: optional

Table 11-1 Response file variables for uninstalling Veritas InfoScale *(continued)*

Variable	Description
CFG{opt}{uninstall}	Uninstalls Veritas InfoScale RPMs. List or scalar: scalar Optional or required: optional

Sample response file for Veritas InfoScale uninstallation

The following example shows a response file for uninstalling Veritas InfoScale

```
our %CFG;

$CFG{opt}{uninstall}=1;
$CFG{opt}{vr}=1;
$CFG{prod}="ENTERPRISE70";
$CFG{systems}=[ qw(system1 system2) ];

1;
```

Section 6

Installation reference

Appendix A

Installation scripts

This appendix includes the following topics:

Installation script options

Table A-1 shows command line options for the installation script. For an initial install or upgrade, options are not usually required. The installation script options apply to all Veritas InfoScale product scripts, except where otherwise noted.

Table A-1 Available command line options

Command Line Option	Function
-addnode	Adds a node to a high availability cluster.
-allpkgs	Displays all RPMs required for the specified product. The RPMs are listed in correct installation order. The output can be used to create scripts for command line installs, or for installations over a network.
-comcleanup	The `-comcleanup` option removes the secure shell or remote shell configuration added by installer on the systems. The option is only required when installation routines that performed auto-configuration of the shell are abruptly terminated.
-comsetup	The `-comsetup` option is used to set up the ssh or rsh communication between systems without requests for passwords or passphrases.

Table A-1 Available command line options *(continued)*

Command Line Option	Function
-configcps	The `-configcps` option is used to configure CP server on a running system or cluster.
-configure	Configures the product after installation.
-fencing	Configures I/O fencing in a running cluster.
-fips	The `-fips` option is used to enable or disable security with fips mode on a running VCS cluster. It could only be used together with `-security` or `-securityonenode` option.
–hostfile *full_path_to_file*	Specifies the location of a file that contains a list of hostnames on which to install.
-disable_dmp_native_support	Disables Dynamic Multi-pathing support for the native LVM volume groups and ZFS pools during upgrade. Retaining Dynamic Multi-pathing support for the native LVM volume groups and ZFS pools during upgrade increases RPM upgrade time depending on the number of LUNs and native LVM volume groups and ZFS pools configured on the system.
-online_upgrade	Used to perform online upgrade. Using this option, the installer upgrades the whole cluster and also supports customer's application zero down time during the upgrade procedure. Now this option only supports VCS and ApplicationHA.
-patch_path	Defines the path of a patch level release to be integrated with a base or a maintenance level release in order for multiple releases to be simultaneously installed .
-patch2_path	Defines the path of a second patch level release to be integrated with a base or a maintenance level release in order for multiple releases to be simultaneously installed.
-patch3_path	Defines the path of a third patch level release to be integrated with a base or a maintenance level release in order for multiple releases to be simultaneously installed.

Table A-1 Available command line options *(continued)*

Command Line Option	Function
-patch4_path	Defines the path of a fourth patch level release to be integrated with a base or a maintenance level release in order for multiple releases to be simultaneously installed.
-patch5_path	Defines the path of a fifth patch level release to be integrated with a base or a maintenance level release in order for multiple releases to be simultaneously installed.
–keyfile *ssh_key_file*	Specifies a key file for secure shell (SSH) installs. This option passes `-I ssh_key_file` to every SSH invocation.
–kickstart *dir_path*	Produces a kickstart configuration file for installing with Linux RHEL Kickstart. The file contains the list of Symantec RPMs in the correct order for installing, in a format that can be used for Kickstart installations. The *dir_path* indicates the path to the directory in which to create the file.
-license	Registers or updates product licenses on the specified systems.
–logpath *log_path*	Specifies a directory other than `/opt/VRTS/install/logs` as the location where installer log files, summary files, and response files are saved.
-noipc	Disables the installer from making outbound networking calls to Symantec Operations Readiness Tool (SORT) in order to automatically obtain patch and release information updates.
-nolic	Allows installation of product RPMs without entering a license key. Licensed features cannot be configured, started, or used when this option is specified.
–pkginfo	Displays a list of RPMs and the order of installation in a human-readable format. This option only applies to the individual product installation scripts. For example, use the -pkginfo option with the installer script to display VCS RPMs.

Table A-1 Available command line options *(continued)*

Command Line Option	Function
–pkgset	Discovers and displays the RPM group (minimum, recommended, all) and RPMs that are installed on the specified systems.
-pkgtable	Displays product's RPMs in correct installation order by group.
–postcheck	Checks for different HA and file system-related processes, the availability of different ports, and the availability of cluster-related service groups.
-precheck	Performs a preinstallation check to determine if systems meet all installation requirements. Symantec recommends doing a precheck before installing a product.
-prod	Specifies the product for operations.
-component	Specifies the component for operations.
-redirect	Displays progress details without showing the progress bar.
-require	Specifies an installer patch file.
-requirements	The `-requirements` option displays required OS version, required RPMs and patches, file system space, and other system requirements in order to install the product.
–responsefile *response_file*	Automates installation and configuration by using system and configuration information stored in a specified file instead of prompting for information. The *response_file* must be a full path name. You must edit the response file to use it for subsequent installations. Variable field definitions are defined within the file.
-rsh	Specify this option when you want to use RSH and RCP for communication between systems instead of the default SSH and SCP.
-security	The -security option is used to convert a running VCS cluster between secure and non-secure modes of operation.

Table A-1 Available command line options *(continued)*

Command Line Option	Function
-securityonenode	The `-securityonenode` option is used to configure a secure cluster node by node.
-securitytrust	The `-securitytrust` option is used to setup trust with another broker.
–serial	Specifies that the installation script performs install, uninstall, start, and stop operations on each system in a serial fashion. If this option is not specified, these operations are performed simultaneously on all systems.
-settunables	Specify this option when you want to set tunable parameters after you install and configure a product. You may need to restart processes of the product for the tunable parameter values to take effect. You must use this option together with the `-tunablesfile` option.
-start	Starts the daemons and processes for the specified product.
-stop	Stops the daemons and processes for the specified product.
-timeout	The `-timeout` option is used to specify the number of seconds that the script should wait for each command to complete before timing out. Setting the `-timeout` option overrides the default value of 1200 seconds. Setting the `-timeout` option to 0 prevents the script from timing out. The `-timeout` option does not work with the `-serial option`
–tmppath *tmp_path*	Specifies a directory other than `/var/tmp` as the working directory for the installation scripts. This destination is where initial logging is performed and where RPMs are copied on remote systems before installation.
-tunables	Lists all supported tunables and create a tunables file template.

Table A-1 Available command line options *(continued)*

Command Line Option	Function
-tunables_file *tunables_file*	Specify this option when you specify a tunables file. The tunables file should include tunable parameters.
-upgrade	Specifies that an existing version of the product exists and you plan to upgrade it.
-version	Checks and reports the installed products and their versions. Identifies the installed and missing RPMs and patches where applicable for the product. Provides a summary that includes the count of the installed and any missing RPMs and patches where applicable. Lists the installed patches, patches, and available updates for the installed product if an Internet connection is available.
-yumgroupxml	The `-yumgroupxml` option is used to generate a yum group definition XML file. The `createrepo` command can use the file on Redhat Linux to create a yum group for automated installation of all RPMs for a product. An available location to store the XML file should be specified as a complete path. The `-yumgroupxml` option is supported on Redhat Linux only.

Appendix B

Tunable files for installation

This appendix includes the following topics:

About setting tunable parameters using the installer or a response file

You can set non-default product and system tunable parameters using a tunables file. With the file, you can set tunables such as the I/O policy or toggle native multi-pathing. The tunables file passes arguments to the installer script to set tunables. With the file, you can set the tunables for the following operations:

- When you install, configure, or upgrade systems.

  ```
  # ./installer -tunablesfile tunables_file_name
  ```

  See “Setting tunables for an installation, configuration, or upgrade” on page 100.

- When you apply the tunables file with no other installer-related operations.

```
# ./installer -tunablesfile tunables_file_name -settunables [
sys1 sys2 ...]
```

See "Setting tunables with no other installer-related operations" on page 101.

- When you apply the tunables file with an un-integrated response file.

```
# ./installer -responsefile response_file_name -tunablesfile
tunables_file_name
```

See "Setting tunables with an un-integrated response file" on page 102.

See "About response files" on page 56.

You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 104.

Setting tunables for an installation, configuration, or upgrade

You can use a tunables file for installation procedures to set non-default tunables. You invoke the installation script with the `tunablesfile` option. The tunables file passes arguments to the script to set the selected tunables. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 104.

Note: Certain tunables only take effect after a system reboot.

To set the non-default tunables for an installation, configuration, or upgrade

1. Prepare the tunables file.

   See "Preparing the tunables file" on page 103.

2. Make sure the systems where you want to install Veritas InfoScale meet the installation requirements.
3. Complete any preinstallation tasks.
4. Copy the tunables file to one of the systems where you want to install, configure, or upgrade the product.
5. Mount the product disc and navigate to the directory that contains the installation program.

6 Start the installer for the installation, configuration, or upgrade. For example:

```
# ./installer -tunablesfile /tmp/tunables_file
 -settunables [sys1 sys2 ...]
```

Where /tmp/*tunables_file* is the full path name for the tunables file.

7 Proceed with the operation. When prompted, accept the tunable parameters.

Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Setting tunables with no other installer-related operations

You can use the installer to set tunable parameters without any other installer-related operations. You must use the parameters described in this guide. Note that many of the parameters are product-specific. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 104.

Note: Certain tunables only take effect after a system reboot.

To set tunables with no other installer-related operations

1 Prepare the tunables file.

See "Preparing the tunables file" on page 103.

2 Make sure the systems where you want to install Veritas InfoScale meet the installation requirements.

3 Complete any preinstallation tasks.

4 Copy the tunables file to one of the systems that you want to tune.

5 Mount the product disc and navigate to the directory that contains the installation program.

6 Start the installer with the `-settunables` option.

```
# ./installer -tunablesfile tunables_file_name -settunables [
sys123 sys234 ...]
```

Where /tmp/*tunables_file* is the full path name for the tunables file.

7 Proceed with the operation. When prompted, accept the tunable parameters.

Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Setting tunables with an un-integrated response file

You can use the installer to set tunable parameters with an un-integrated response file. You must use the parameters described in this guide. Note that many of the parameters are product-specific. You must select the tunables that you want to use from this guide.

See "Tunables value parameter definitions" on page 104.

Note: Certain tunables only take effect after a system reboot.

To set tunables with an un-integrated response file

1 Make sure the systems where you want to install Veritas InfoScale meet the installation requirements.

2 Complete any preinstallation tasks.

3 Prepare the tunables file.

See "Preparing the tunables file" on page 103.

4 Copy the tunables file to one of the systems that you want to tune.

5 Mount the product disc and navigate to the directory that contains the installation program.

6 Start the installer with the `-responsefile` and `-tunablesfile` options.

```
# ./installer -responsefile response_file_name -tunablesfile
tunables_file_name
```

Where *response_file_name* is the full path name for the response file and *tunables_file_name* is the full path name for the tunables file.

7 Certain tunables are only activated after a reboot. Review the output carefully to determine if the system requires a reboot to set the tunable value.

8 The installer validates the tunables. If an error occurs, exit the installer and check the tunables file.

Preparing the tunables file

A tunables file is a Perl module and consists of an opening and closing statement, with the tunables defined between. Use the hash symbol at the beginning of the line to comment out the line. The tunables file opens with the line "our %TUN;" and ends with the return true "1;" line. The final return true line only needs to appear once at the end of the file. Define each tunable parameter on its own line.

You can use the installer to create a tunables file template, or manually format tunables files you create.

To create a tunables file template

- Start the installer with the `-tunables` option. Enter the following:

  ```
  # ./installer -tunables
  ```

  You see a list of all supported tunables, and the location of the tunables file template.

To manually format tunables files

- Format the tunable parameter as follows:

  ```
  $TUN{"tunable_name"}{"system_name"|"*"}=value_of_tunable;
  ```

For the *system_name*, use the name of the system, its IP address, or a wildcard symbol. The *value_of_tunable* depends on the type of tunable you are setting. End the line with a semicolon.

The following is an example of a tunables file.

```
#
# Tunable Parameter Values:
#
our %TUN;

$TUN{"tunable1"}{"*"}=1024;
$TUN{"tunable3"}{"sys123"}="SHA256";

1;
```

Setting parameters for the tunables file

Each tunables file defines different tunable parameters. The values that you can use are listed in the description of each parameter. Select the tunables that you want to add to the tunables file and then configure each parameter.

See "Tunables value parameter definitions" on page 104.

Each line for the parameter value starts with $TUN. The name of the tunable is in curly brackets and double-quotes. The system name is enclosed in curly brackets and double-quotes. Finally define the value and end the line with a semicolon, for example:

```
$TUN{"dmp_daemon_count"}{"node123"}=16;
```

In this example, you are changing the dmp_daemon_count value from its default of 10 to 16. You can use the wildcard symbol "*" for all systems. For example:

```
$TUN{"dmp_daemon_count"}{"*"}=16;
```

Tunables value parameter definitions

When you create a tunables file for the installer you can only use the parameters in the following list.

Prior to making any updates to the tunables, refer to the *Storage Foundation Cluster File System High Availability Administrator's Guide* for detailed information on product tunable ranges and recommendations.

Table B-1 describes the supported tunable parameters that can be specified in a tunables file.

Table B-1 Supported tunable parameters

Tunable	Description
autoreminor	(Veritas Volume Manager) Enable reminoring in case of conflicts during disk group import.
autostartvolumes	(Veritas Volume Manager) Enable the automatic recovery of volumes.
dmp_cache_open	(Dynamic Multi-Pathing) Whether the first open on a device performed by an array support library (ASL) is cached.
dmp_daemon_count	(Dynamic Multi-Pathing) The number of kernel threads for DMP administrative tasks.
dmp_delayq_interval	(Dynamic Multi-Pathing) The time interval for which DMP delays the error processing if the device is busy.

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
dmp_fast_recovery	(Dynamic Multi-Pathing) Whether DMP should attempt to obtain SCSI error information directly from the HBA interface. This tunable must be set after Dynamic Multi-Pathing is started.
dmp_health_time	(Dynamic Multi-Pathing) The time in seconds for which a path must stay healthy.
dmp_log_level	(Dynamic Multi-Pathing) The level of detail to which DMP console messages are displayed.
dmp_low_impact_probe	(Dynamic Multi-Pathing) Whether the low impact path probing feature is enabled.
dmp_lun_retry_timeout	(Dynamic Multi-Pathing) The retry period for handling transient errors.
dmp_monitor_fabric	(Dynamic Multi-Pathing) Whether the Event Source daemon (`vxesd`) uses the Storage Networking Industry Association (SNIA) HBA API. This tunable must be set after Dynamic Multi-Pathing is started.
dmp_monitor_osevent	(Dynamic Multi-Pathing) Whether the Event Source daemon (vxesd) monitors operating system events.
dmp_monitor_ownership	(Dynamic Multi-Pathing) Whether the dynamic change in LUN ownership is monitored.
dmp_native_support	(Dynamic Multi-Pathing) Whether DMP does multi-pathing for native devices.
dmp_path_age	(Dynamic Multi-Pathing) The time for which an intermittently failing path needs to be monitored before DMP marks it as healthy.
dmp_pathswitch_blks_shift	(Dynamic Multi-Pathing) The default number of contiguous I/O blocks sent along a DMP path to an array before switching to the next available path.
dmp_probe_idle_lun	(Dynamic Multi-Pathing) Whether the path restoration kernel thread probes idle LUNs.

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
dmp_probe_threshold	(Dynamic Multi-Pathing) The number of paths will be probed by the restore daemon.
dmp_restore_cycles	(Dynamic Multi-Pathing) The number of cycles between running the check_all policy when the restore policy is check_periodic.
dmp_restore_interval	(Dynamic Multi-Pathing) The time interval in seconds the restore daemon analyzes the condition of paths.
dmp_restore_policy	(Dynamic Multi-Pathing) The policy used by DMP path restoration thread.
dmp_restore_state	(Dynamic Multi-Pathing) Whether kernel thread for DMP path restoration is started.
dmp_retry_count	(Dynamic Multi-Pathing) The number of times a path reports a path busy error consecutively before DMP marks the path as failed.
dmp_scsi_timeout	(Dynamic Multi-Pathing) The timeout value for any SCSI command sent via DMP.
dmp_sfg_threshold	(Dynamic Multi-Pathing) The status of the subpaths failover group (SFG) feature.
dmp_stat_interval	(Dynamic Multi-Pathing) The time interval between gathering DMP statistics.
fssmartmovethreshold	(Veritas Volume Manager) The file system usage threshold for SmartMove (percent). This tunable must be set after Veritas Volume Manager is started.
max_diskq	(Veritas File System) Specifies the maximum disk queue generated by a single file. The installer can only set the system default value of max_diskq. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
read_ahead	(Veritas File System) The 0 value disables read ahead functionality, the 1 value (default) retains traditional sequential read ahead behavior, and the 2 value enables enhanced read ahead for all reads. The installer can only set the system default value of read_ahead. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.
read_nstream	(Veritas File System) The number of parallel read requests of size read_pref_io that can be outstanding at one time. The installer can only set the system default value of read_nstream. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.
read_pref_io	(Veritas File System) The preferred read request size. The installer can only set the system default value of read_pref_io. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.
reclaim_on_delete_start_time	(Veritas Volume Manager) Time of day to start reclamation for deleted volumes. This tunable must be set after Veritas Volume Manager is started.
reclaim_on_delete_wait_period	(Veritas Volume Manager) Days to wait before starting reclamation for deleted volumes. This tunable must be set after Veritas Volume Manager is started.
same_key_for_alldgs	(Veritas Volume Manager) Use the same fencing key for all disk groups. This tunable must be set after Veritas Volume Manager is started.
sharedminorstart	(Veritas Volume Manager) Start of range to use for minor numbers for shared disk groups. This tunable must be set after Veritas Volume Manager is started.

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
storage_connectivity	(Veritas Volume Manager) The CVM storage connectivity type. This tunable must be set after Veritas Volume Manager is started.
usefssmartmove	(Veritas Volume Manager) Configure SmartMove feature (all, thinonly, none). This tunable must be set after Veritas Volume Manager is started.
vol_checkpt_default	(Veritas File System) Size of VxVM storage checkpoints (kBytes). This tunable requires a system reboot to take effect.
vol_cmpres_enabled	(Veritas Volume Manager) Allow enabling compression for Volume Replicator.
vol_cmpres_threads	(Veritas Volume Manager) Maximum number of compression threads for Volume Replicator.
vol_default_iodelay	(Veritas Volume Manager) Time to pause between I/O requests from VxVM utilities (10ms units). This tunable requires a system reboot to take effect.
vol_fmr_logsz	(Veritas Volume Manager) Maximum size of bitmap Fast Mirror Resync uses to track changed blocks (KBytes). This tunable requires a system reboot to take effect.
vol_max_adminio_poolsz	(Veritas Volume Manager) Maximum amount of memory used by VxVM admin I/O's (bytes). This tunable requires a system reboot to take effect.
vol_max_nmpool_sz	(Veritas Volume Manager) Maximum name pool size (bytes).
vol_max_rdback_sz	(Veritas Volume Manager) Storage Record readback pool maximum (bytes).
vol_max_wrspool_sz	(Veritas Volume Manager) Maximum memory used in clustered version of Volume Replicator .

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
vol_maxio	(Veritas Volume Manager) Maximum size of logical VxVM I/O operations (kBytes). This tunable requires a system reboot to take effect.
vol_maxioctl	(Veritas Volume Manager) Maximum size of data passed into the VxVM ioctl calls (bytes). This tunable requires a system reboot to take effect.
vol_maxparallelio	(Veritas Volume Manager) Number of I/O operations vxconfigd can request at one time. This tunable requires a system reboot to take effect.
vol_maxspecialio	(Veritas Volume Manager) Maximum size of a VxVM I/O operation issued by an ioctl call (kBytes). This tunable requires a system reboot to take effect.
vol_min_lowmem_sz	(Veritas Volume Manager) Low water mark for memory (bytes).
vol_nm_hb_timeout	(Veritas Volume Manager) Volume Replicator timeout value (ticks).
vol_rvio_maxpool_sz	(Veritas Volume Manager) Maximum memory requested by Volume Replicator (bytes).
vol_stats_enable	(Veritas Volume Manager) Enable VxVM I/O stat collection.
vol_subdisk_num	(Veritas Volume Manager) Maximum number of subdisks attached to a single VxVM plex. This tunable requires a system reboot to take effect.
voldrl_max_drtregs	(Veritas Volume Manager) Maximum number of dirty VxVM regions. This tunable requires a system reboot to take effect.
voldrl_max_seq_dirty	(Veritas Volume Manager) Maximum number of dirty regions in sequential mode. This tunable requires a system reboot to take effect.

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
voldrl_min_regionsz	(Veritas Volume Manager) Minimum size of a VxVM Dirty Region Logging (DRL) region (kBytes). This tunable requires a system reboot to take effect.
voldrl_volumemax_drtregs	(Veritas Volume Manager) Max per volume dirty regions in log-plex DRL.
voldrl_volumemax_drtregs_20	(Veritas Volume Manager) Max per volume dirty regions in DCO version 20.
voldrl_dirty_regions	(Veritas Volume Manager) Number of regions cached for DCO version 30.
voliomem_chunk_size	(Veritas Volume Manager) Size of VxVM memory allocation requests (bytes). This tunable requires a system reboot to take effect.
voliomem_maxpool_sz	(Veritas Volume Manager) Maximum amount of memory used by VxVM (bytes). This tunable requires a system reboot to take effect.
voliot_errbuf_dflt	(Veritas Volume Manager) Size of a VxVM error trace buffer (bytes). This tunable requires a system reboot to take effect.
voliot_iobuf_default	(Veritas Volume Manager) Default size of a VxVM I/O trace buffer (bytes). This tunable requires a system reboot to take effect.
voliot_iobuf_limit	(Veritas Volume Manager) Maximum total size of all VxVM I/O trace buffers (bytes). This tunable requires a system reboot to take effect.
voliot_iobuf_max	(Veritas Volume Manager) Maximum size of a VxVM I/O trace buffer (bytes). This tunable requires a system reboot to take effect.
voliot_max_open	(Veritas Volume Manager) Maximum number of VxVM trace channels available for vxtrace commands. This tunable requires a system reboot to take effect.
volpagemod_max_memsz	(Veritas Volume Manager) Maximum paging module memory used by Instant Snapshots (Kbytes).

Table B-1 Supported tunable parameters *(continued)*

Tunable	Description
volraid_rsrtransmax	(Veritas Volume Manager) Maximum number of VxVM RAID-5 transient reconstruct operations in parallel. This tunable requires a system reboot to take effect.
vxfs_mbuf	(Veritas File System) Maximum memory used for VxFS buffer cache. This tunable requires a system reboot to take effect.
vxfs_ninode	(Veritas File System) Number of entries in the VxFS inode table. This tunable requires a system reboot to take effect.
write_nstream	(Veritas File System) The number of parallel write requests of size write_pref_io that can be outstanding at one time. The installer can only set the system default value of write_nstream. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.
write_pref_io	(Veritas File System) The preferred write request size. The installer can only set the system default value of write_pref_io. Refer to the tunefstab(4) manual page for setting this tunable for a specified block device.

Appendix C

Troubleshooting installation issues

This appendix includes the following topics:

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.

About the VRTSspt RPM troubleshooting tools

The VRTSspt RPM provides a group of tools for troubleshooting a system and collecting information on its configuration. If you install and use the VRTSspt RPM, it will be easier for Symantec Support to diagnose any issues you may have.

The tools can gather Veritas File System and Veritas Volume Manager metadata information and establish various benchmarks to measure file system and volume manager performance. Although the tools are not required for the operation of any Veritas InfoScale product, Symantec recommends installing them should a support case be needed to be opened with Symantec Support. Use caution when you use the VRTSspt RPM, and always use it in concert with Symantec Support.

Incorrect permissions for root on remote system

The permissions are inappropriate. Make sure you have remote root access permission on each system to which you are installing.

```
Failed to setup rsh communication on 10.198.89.241:
'rsh 10.198.89.241 <command>' failed
Trying to setup ssh communication on 10.198.89.241.
Failed to setup ssh communication on 10.198.89.241:
Login denied

Failed to login to remote system(s) 10.198.89.241.
Please make sure the password(s) are correct and superuser(root)
can login to the remote system(s) with the password(s).
If you want to setup rsh on remote system(s), please make sure
rsh with command argument ('rsh <host> <command>') is not
denied by remote system(s).

Either ssh or rsh is needed to be setup between the local node
and 10.198.89.241 for communication

Would you like the installer to setup ssh/rsh communication
automatically between the nodes?
Superuser passwords for the systems will be asked. [y,n,q] (y) n

System verification did not complete successfully

The following errors were discovered on the systems:

The ssh permission denied on 10.198.89.241
rsh exited 1 on 10.198.89.241
either ssh or rsh is needed to be setup between the local node
and 10.198.89.241 for communication
```

Suggested solution: You need to set up the systems to allow remote access using `ssh` or `rsh`.

Note: Remove remote shell permissions after completing the Veritas InfoScale installation and configuration.

Inaccessible system

The system you specified is not accessible. This could be for a variety of reasons such as, the system name was entered incorrectly or the system is not available over the network.

```
 Verifying systems: 12% ..................................
 Estimated time remaining: 0:10 1 of 8
 Checking system communication ............................. Done
System verification did not complete successfully
The following errors were discovered on the systems:
cannot resolve hostname host1
Enter the Linux system names separated by spaces: q,? (host1)
```

Suggested solution: Verify that you entered the system name correctly; use the `ping`(1M) command to verify the accessibility of the host.

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