VERITAS™

VERITAS Storage Foundation™ 4.1

Installation Guide

HP-UX

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Contents

Preface

VERITAS Storage Foundation is an integrated set of system software enhancements and configuration guidelines. This guide provides information on installing, upgrading, configuring, and uninstalling the components of VERITAS Storage Foundation products.

Follow the instructions in this guide if you are installing one of the following products:

◆ VERITAS Storage Foundation, formerly known as VERITAS Foundation Suite (Standard, Enterprise, Enterprise HA Editions)

◆ VERITAS Storage Foundation *for Oracle*, formerly known as VERITAS Database Edition *for Oracle* (Standard, Enterprise, Enterprise HA Editions)

Previously, VERITAS Storage Foundation *for Oracle* had a separate installation guide. All Storage Foundation product installation information has been combined in this document for this release. For more information, see "Preinstallation Instructions" on page 1.

What's In This Guide?

This guide is organized as follows:

Chapters in This Guide

Chapter	Description
Chapter 1. "Preinstallation Instructions" on page 1	Describes the licensing, product, and system requirements for installing and using VERITAS Storage Foundation.
Chapter 2. "Installing the VERITAS Software" on page 19	Provides the installation procedures for VERITAS Storage Foundation, VERITAS Storage Foundation *for Oracle*, and VERITAS Volume Manager.
Chapter 3. "Configuring the VERITAS Software" on page 53	Describes how to configure the VERITAS Storage Foundation software.

Chapters in This Guide

Chapter	Description
Chapter 4. "Uninstalling the VERITAS Software" on page 69	Provides the uninstallation procedures for VERITAS Storage Foundation, VERITAS Volume Manager, and VERITAS File System.
Appendix A. "Installation Script Options" on page 81	Describes the options available if you choose to install using the installation script instead of the product installer.
Appendix B. "Sample Output" on page 87	Shows an example of the installation output.

How to Use This Guide

This guide describes how to install, upgrade, configure, and remove VERITAS Storage Foundation, VERITAS Volume Manager, and VERITAS File System.

This guide assumes that the user has a:

◆ basic understanding of system and database administration

◆ working knowledge of the operating system

◆ general understanding of file systems

Conventions

Typographical and Symbolic

Here are the typographical and symbolic conventions used throughout the guides:

Typographical Conventions

Typeface	Usage	Examples
monospace	Computer output, files, directories, software elements such as command options, function names, and parameters	Read tunables from the /etc/vx/tunefstab file. See the ls(1) manual page for more information.
monospace (bold)	User input	# **mount -F vxfs /h/filesys**
italic	New terms, book titles, emphasis, variables replaced with a name or value	See the *User's Guide* for details. The variable *ncsize* determines the value of...

Symbolic Conventions

Symbol	Usage	Examples
%	C shell prompt	
$	Bourne/Korn shell prompt	
#	Superuser prompt (all shells)	
SQL>	Oracle SQL prompt for Oracle9*i*.	SQL> **alter tablespace ts1 ** **begin backup;**
\	Continued input on the following line; you do not type this character	# **mkfs -F vxfs -o largefiles ** **/dev/vx/rdsk/PRODdg/db01**
[ ]	In a command synopsis, brackets indicates an optional argument	ls [-a]

Symbolic Conventions

Symbol	Usage	Examples
|	In a command synopsis, a vertical bar separates mutually exclusive arguments	`mount [suid	nosuid]`
blue text	In PDF and HTML files, click on these active hyperlinks to move to the specified location	See "Using Snapshots for Database Backup" on page 97 for more information.

Notes and Cautions

Note Used for important information that you should know, but that shouldn't cause any damage to your data or your system if you choose to ignore it.

Caution Used for information that will prevent a problem. Ignore a caution at your own risk.

Getting Help

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

Diagnostic tools are also available to assist in troubleshooting problems associated with the product. These tools are available on disc or can be downloaded from the VERITAS FTP site. See the README.VRTSspt file in the support directory for details.

For license information, software updates and sales contacts, visit https://my.veritas.com/productcenter/ContactVeritas.jsp. For information on purchasing product documentation, visit http://webstore.veritas.com.

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Preinstallation Instructions 1

Follow the preinstallation instructions outlined in this chapter if you are installing one of the following VERITAS Storage Foundation products:

◆ VERITAS Storage Foundation, formerly known as VERITAS Foundation Suite (Standard, Enterprise, Enterprise HA Editions)

◆ VERITAS Storage Foundation *for Oracle*, formerly known as VERITAS Database Edition *for Oracle* (Standard, Enterprise, Enterprise HA Editions)

Note If you are installing VERITAS Volume Replicator, see the *VERITAS Volume Replicator Installation Guide* on the product disc. The *VERITAS Volume Replicator Installation Guide* explains how to install the product and directs you to the VERITAS Volume Replicator documentation.

After reviewing the information in this chapter, see "Installing the VERITAS Software" on page 19 for information on installing the software.

Topics covered in this chapter include:

◆ "VERITAS Storage Foundation Product Suites" on page 2

◆ "General Installation Requirements" on page 4

◆ "VERITAS Volume Manager Requirements" on page 13

◆ "File System Preinstallation Instructions" on page 18

VERITAS Storage Foundation Product Suites

The following table lists the VERITAS products and optionally licensed features available with each Storage Foundation product suite.

Storage Foundation Version	Products and Features
Storage Foundation Standard	VERITAS File System VERITAS Volume Manager
	Optionally licensed features:
	VERITAS Volume Replicator
Storage Foundation Standard HA	VERITAS File System VERITAS Volume Manager VERITAS Cluster Server
	Optionally licensed features:
	VERITAS Volume Replicator
Storage Foundation Enterprise	VERITAS File System VERITAS Volume Manager VERITAS FlashSnap Option
	Optionally licensed features:
	VERITAS Volume Replicator
Storage Foundation Enterprise HA	VERITAS File System VERITAS Volume Manager VERITAS Cluster Server VERITAS FlashSnap Option
	Optionally licensed features:
	VERITAS Volume Replicator
Storage Foundation *for Oracle* Standard	VERITAS File System VERITAS Volume Manager VERITAS Quick I/O option VERITAS Extension for Oracle Disk Manager option
	Optionally licensed features:
	VERITAS Volume Replicator

Storage Foundation Version	Products and Features
Storage Foundation *for Oracle* Enterprise	VERITAS File System VERITAS Volume Manager VERITAS FlashSnap Option VERITAS Quick I/O option VERITAS Extension for Oracle Disk Manager option VERITAS Storage Checkpoint option VERITAS Storage Mapping option
	Optionally licensed features:
	VERITAS Volume Replicator
Storage Foundation *for Oracle* Enterprise HA	VERITAS File System VERITAS Volume Manager VERITAS Cluster Server VERITAS FlashSnap Option VERITAS Quick I/O option VERITAS Extension for Oracle Disk Manager option VERITAS Storage Checkpoint option VERITAS Storage Mapping option
	Optionally licensed features:
	VERITAS Volume Replicator

Note If you are installing VERITAS Volume Replicator, see the *VERITAS Volume Replicator Installation Guide* on the product disc. The *VERITAS Volume Replicator Installation Guide* explains how to install the product and directs you to the VERITAS Volume Replicator documentation.

General Installation Requirements

Before installing VERITAS Storage Foundation, read the following sections to make sure you understand and comply with the basic requirements of the software.

VERITAS Product Licensing

Product keys are available on the License Key certificate. The certificate also includes the number of product licenses purchased. A single key enables product installation on the number and the type of systems for which you purchased the license. A key may enable the operation of more products than specified on the certificate, but you are legally limited to the number of product licenses purchased.

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

   vxlicinst - installs a license key for a VERITAS product

   vxlicrep - displays currently installed licenses

   vxlictest - retrieves features and their descriptions encoded in a license key

If you encounter problems while licensing your product, visit the VERITAS licensing support website at http://www.veritas.com/buy/vLicense/vLicenseHome.jhtml.

System Requirements

The following sections provide requirements that your system must meet before installing the VERITAS software.

Dependencies

VERITAS Storage Foundation and VERITAS Storage Foundation *for Oracle* can only be installed on a system running the September 2004 HP-UX 11i version 2.0 release or later.

▼ **To verify the operating system version**

Use the swlist command as follows:

```
# swlist | grep HPUXBaseAux
HPUXBaseAux         B.11.23.0409 HP-UX Base OS Auxiliary
```

JFS must be installed on your system prior to installing any VERITAS software.

▼ **To verify that JFS is installed**

Use the `swlist` command as follows:

```
# swlist -l product JFS
JFS B.11.23          The Base VxFS File System
```

Software and Hardware Requirements

For information on hardware requirements, see the *VERITAS Volume Manager Hardware Notes*.

For information on specific HA setup requirements, see Chapter 2, "Preparing to Install VCS 4.1," in the *VERITAS Cluster Server Installation Guide*.

Oracle Requirements

The following list identifies the supported Oracle and HP-UX combinations if you plan to use VERITAS Storage Foundation with an Oracle database:

Oracle Release	September 2004 HP-UX 11i version 2.0 or later
9.2	Yes
10.1	Yes

Refer to the appropriate Oracle installation guide that accompanied your Oracle software for additional preinstallation information.

In order to use VERITAS Extension for Oracle Disk Manager, you must use Oracle9*i* release 92 or later. Refer to Oracle bug number 1824061.

To use the Storage Mapping functionality, you must install Oracle 9.2.0.3 or higher.

Using Asynchronous I/O on Oracle

If you did not use raw devices for your database, it is likely that your system was not configured to perform asynchronous I/O. VERITAS Storage Foundation *for Oracle* supports asynchronous I/O on Quick I/O files and Oracle Disk Manager files.

For the Oracle database to take advantage of the asynchronous I/O capability offered by VERITAS Storage Foundation *for Oracle*, you must create the following device:

```
/dev/async
```

Refer to your *Oracle Administrator's Reference Guide* for instructions on how to create this device.

There are system and database configuration requirements that must be met before enabling asynchronous I/O. To make sure your environment meets those requirements, see your Oracle documentation.

Required HP-UX Patches

The 4.1 release of VERITAS File System operates only on HP-UX 11i 64-bit operating systems with the September 2004 HP-UX 11i Version 2.0 (or later) release installed. The 4.1 release requires the following HP-UX patches. The VERITAS Volume Manager patches must be installed only if you are using VxFS in conjunction with VxVM:

HP-UX Patch ID	Description
PHCO_32385	Enables fscat(1M).
PHCO_32387	Enables getext(1M).
PHCO_32388	Enables setext(1M).
PHCO_32389	Enables vxdump(1M).
PHCO_32390	Enables vxrestore(1M).
PHCO_32391	Enables vxfsstat(1M).
PHCO_32392	Enables vxtunefs(1M).
PHCO_32393	Enables vxupgrade(1M).
PHCO_32488	Enables LIBC for VxFS 4.1 file system.
PHCO_32523	Enhancement to quota(1) for supporting large uids.
PHCO_32524	Enhancement to edquota for supporting large uids.
PHCO_32551	Enhancement to quotaon/quotaoff for supporting large uids.
PHCO_32552	Enhancement to repquota for supporting large uids.
PHCO_32596	Enables df(1M).

HP-UX Patch ID	Description
PHCO_32608	Enables `bdf`(1M).
PHCO_32609	Enables `fstyp`(1M).
PHCO_32610	Enables `mount`(1M).
PHCO_32611	Fix `fs_wrapper` to accept "vxfs" from subtype.
PHKL_31500	Sept04 Base Patch
PHKL_32272	Changes to fix intermittent failures in `getacl/setacl`.
PHKL_32425	Changes to fix the leaking of VM pages in case of I/O errors.
PHKL_32430	Changes to separate vxfs symbols from libdebug.a, so that VxFS 4.1 symbols are easily available in q4/p4.
PHKL_32431	Changes to disallow mounting of a file system on a vnode having VNOMOUNT set. Enhancements for supporting quotas on large uids.

In addition to the above patches the `EnableVXFS41` bundle needs to be installed before installing the VxFS 4.1 file system. This bundle is an HP bundle and contains enhancements to various commands to understand the new Version 6 layout. The `EnableVXFS41` bundle contains the following patches:

HP-UX Patch ID	Description
FsLibEnh	Enhancements to LIBC libraries to understand VxFS disk layout Version 6.
DiskQuota-Enh	Enhancements to various quota related commands to support large uids.
FsCmdsEnh	Enhancements to the `mount` command to support VxFS 4.1.

Note Install all the latest required HP-UX patches *before* you install VxFS. You can use the `swlist` command to determine whether the correct update and patches are installed.

HP may release patches that supersede the ones in this list. To verify that you have the latest HP-UX patches, go to the VERITAS support website to view the following TechNote:

http://support.veritas.com/docs/275787

Also, you can get the patches from Hewlett-Packard's Patch Database offered under the Maintenance and Support section of the HP Services & Support - IT Resource Center. HP's Patch Database provides fast, accurate searches for the latest recommended and superseded patches available for VERITAS File System or VERITAS Volume Manager.

Disk Space

Before installing any of the VERITAS Storage Foundation products, confirm that your system has enough free disk space. Use the "Perform a Preinstallation Check" (P) option of the product installer to determine whether there is sufficient space.

The following table shows the approximate disk space used by the Storage Foundation products for all (both the required and optional) packages:

Product Name	Minimum Space Required (Without Optional Packages)	Maximum Space Required (Including All Packages)
Storage Foundation Standard	698 MB	850 MB
Storage Foundation Enterprise	699 MB	851 MB
Storage Foundation Enterprise HA	1131 MB	1311 MB
Storage Foundation for Oracle Standard	825 MB	983 MB
Storage Foundation for Oracle Enterprise	830 MB	984 MB
Storage Foundation for Oracle Enterprise HA	1265 MB	1446 MB

Package Information

The following table shows the package name and contents for each package:

Package	Contents
Volume Manager Packages	
VRTSvxvm	VERITAS Volume Manager
VRTSvmpro	VERITAS Volume Manager Management Services Provider
VRTSalloc	VERITAS Volume Manager: VERITAS Intelligent Storage Provisioning
VRTSvmdoc	VERITAS Volume Manager (user documentation) (optional)
VRTSvmman	VERITAS Volume Manager, Manual Pages (optional)
File System Packages	
VRTSvxfs	VERITAS File System
VRTSfspro	VERITAS File System Management Services Provider
VRTSfsman	VERITAS File System - Manual Pages (optional)
VRTSfsdoc	VERITAS File System Documentation (optional)
Database Packages	
VRTSdbed	VERITAS Storage Foundation *for Oracle*
VRTSorgui	VERITAS Storage Foundation *for Oracle* Graphical User Interface
VRTSodm	VERITAS Extension for Oracle Disk Manager
VRTSvxmsa	VERITAS Mapping Service, Application Libraries
VRTSdbdoc	VERITAS Storage Foundation Database Documentation (optional)

Package	Contents
VERITAS Enterprise Administrator Packages	
VRTSob	VERITAS Enterprise Administrator Service
VRTSobgui	VERITAS Enterprise Administrator (optional)
Infrastructure Packages	
VRTSddlpr	VERITAS Device Discovery Layer Services Provider
VRTSvail	VERITAS Array Providers (VERITAS Array Integration Layer)
VRTSap	VERITAS Action Provider (optional)
	Note VRTSap is the rules engine add-on for the VERITAS Enterprise Administrator GUI. Installing VRTSap enables SNMP trap and email
VRTStep	VERITAS Task Execution Provider (optional)
	Note VRTStep provides the command execution add-on for the VERITAS Enterprise Administrator GUI. Installing VRTStep and VRTSap enables command execution in response to an alert.
High Availability (VERITAS Cluster Server) Packages	
VRTSat	VERITAS Authentication Service
VRTScscm	VERITAS Cluster Server Cluster Manager
VRTScscw	VERITAS Cluster Server Configuration Wizards
VRTScssim	VERITAS Cluster Server Simulator
VRTScutil	VERITAS Cluster Utility
VRTSgab	VERITAS Group Membership and Atomic Broadcast
VRTSjre	VERITAS JRE Redistribution
VRTSllt	VERITAS Low Latency Transport

Package	Contents
VRTSvcs	VERITAS Cluster Server
VRTSvcsag	VERITAS Cluster Server Bundled Agents
VRTSvcsmg	VERITAS Cluster Server Message Catalogs
VRTSvcsw	VERITAS Cluster Server (Web Console)
VRTSvxfen	VERITAS I/O Fencing
VRTSweb	VERITAS Web Server
VRTSvcsdc	VERITAS Cluster Server Documentation (optional)
VRTSvcsmn	VERITAS Cluster Server Manual Pages (optional)
Other Packages	
VRTSvlic	VERITAS License Utilities
VRTSperl	Perl 5.8.0 for VERITAS
VRTScpi	VERITAS Cross Product Installation Framework
windows/vrtsobgui.msi	VERITAS Enterprise Administrator for Windows

/opt Directory

The directory /opt must exist, be writable and must not be a symbolic link. If you are upgrading, you cannot have a symbolic link from /opt to an unconverted volume. If you do have a symbolic link to an unconverted volume, the symbolic link will not function during the upgrade and items in /opt will not be installed.

Environment Variables

Most of the commands used in the installation are in the /sbin or /usr/sbin directory. However, there are additional variables needed to use the VERITAS Storage Foundation product after installation. Add the following directories to your PATH environment variable:

◆ If you are using Bourne or Korn shell (sh or ksh), use the commands:

```
$ PATH=$PATH:/usr/sbin:/opt/VRTS/bin:/opt/VRTSvxfs/sbin:\
/opt/VRTSdbed/bin:/opt/VRTSob/bin:/opt/VRTSvcs/bin
$ MANPATH=/usr/share/man:/opt/VRTS/man:$MANPATH
$ export PATH MANPATH
```

◆ If you are using a C shell (csh or tcsh), use the commands:

```
% set path = ( $path /usr/sbin /opt/VRTSvxfs/sbin \
  /opt/VRTSdbed/bin /opt/VRTSvcs/bin /opt \
  /opt/VRTSob/bin:/opt/VRTS/bin )
% setenv MANPATH /usr/share/man:/opt/VRTS/man:$MANPATH
```

Note If you are not installing VERITAS Storage Foundation *for Oracle*, you can omit /opt/VRTSdbed/bin.

If you are not installing an HA product, you can omit /opt/VRTSvcs/bin.

When VxFS 4.1 is installed, the /opt/VRTS/vxfs4.1 directory is automatically added to the MANPATH. Verify that /opt/VRTS/vxfs4.1 appears before /usr/share/man in the MANPATH variable. This displays the latest VxFS 4.1 manual pages.

Prerequisites for Remote and Cluster Installation and Uninstallation

Establishing communication between nodes is required to install VERITAS software from a remote system, or to install and configure a cluster. The node from which the installation utility is run must have permissions to run rsh (remote shell) or ssh (secure shell) utilities as root on all cluster nodes or remote systems. See "Configuring SSH or RSH Before Installing VERITAS Products" in the *Getting Started Guide* for more information.

Release Notes

Read the *Release Notes* for all products included with this product. Portable Document Format (.pdf) versions of the *Release Notes* are included on the software disc in the `storage_foundation/release_notes` directory.

Because product *Release Notes* are not installed by any packages, VERITAS recommends that you copy them from the disc to the `/opt/VRTS/docs` directory on your system so that they are available for future reference.

VERITAS Volume Manager Requirements

Review the following Volume Manager-related items before installing or upgrading VERITAS Storage Foundation or VERITAS Volume Manager.

Taking a Disk Inventory

Selecting Disks

Decide which disks you want to place under VxVM control. The other disks in your configuration are not affected. Disks may be brought under VxVM control in two ways:

◆ Root disks—Data in all existing file systems and partitions on the disk are preserved.

◆ Initialized disks—Data on the disks is removed.

Verifying Disk Contents

Verify the disk contents. Answer the following questions and list the data for your convenience.

1. Make sure you are aware of the contents of each disk. Determine which disks can be initialized (destroying any existing data on the disks).

2. Do you want to place the system root disk under VxVM control?
   _____

3. Do you want to initialize *all* disks on a controller together? Identify the controllers (for example c0t0d0) - where c0t0d0 represents a disk on controller c0.

_____

_____

_____

4. Identify the disks to be initialized or excluded in a table similar to the following.

Disk ID	Initialize, Exclude

Excluding Disks

It is possible to configure the `vxdiskadm` utility not to list certain disks or controllers as being available. For example, this may be useful in a SAN environment where disk enclosures are visible to a number of separate systems.

To exclude a device from the view of VxVM, select item 16 (`Prevent multipathing/Suppress devices from VxVM's view`) from the `vxdiskadm` main menu. See "Disabling and Enabling Multipathing for Specific Devices" in the "Administering Dynamic Multipathing (DMP)" chapter of the *VERITAS Volume Manager Administrator's Guide* for details.

Array Support Libraries (ASL)

VxVM provides support for new disk arrays in the form of Array Support Library (ASL) software packages. You can obtain ASL packages from:

◆ The VxVM release package

◆ The disk array provided by the vendor

◆ The VERITAS Technical Support site, http://support.veritas.com

For further information on supported ASLs and installing ASLs, see the *VERITAS Volume Manager Hardware Notes*.

Disabling Hot-Relocation

The hot-relocation feature detects disk failure automatically, notifies you of the nature of the failure, attempts to relocate any affected subdisks that are redundant, and initiates recovery procedures.

The hot-relocation feature is enabled by default and it is recommended that you leave it on. However, if you need to disable it for some reason (for example, you do not want the free space on some of your disks used for relocation), you can do so by preventing the vxrelocd daemon from starting during system startup. Disable hot-relocation only after you install the VERITAS Volume Manager packages.

▼ **To disable hot-relocation**

1. Comment out the vxrelocd line in the startup file /sbin/rc2.d/S096vxvm-recover, as follows:

```
# vxrelocd root &
```

2. After editing the file, you can kill the vxrelocd process or reboot the system.

Note If you disable hot-relocation, you are not notified by electronic mail of any failures that occur. This is because vxrelocd is responsible for notifying the system administrator of failures.

For more information on hot-relocation and vxrelocd, refer to the vxrelocd (1M) manual page.

VERITAS Enterprise Administrator

The VERITAS Storage Foundation software must be installed and run on an HP-UX machine. The VERITAS Enterprise Administrator (VEA) client can be installed and run on any HP-UX, Windows XP, Windows NT, Windows ME, Windows 2000, or Windows 98 machine that supports the Java Runtime Environment.

VERITAS Enterprise Administrator (VEA) is required to access the graphical user interface (GUI) for VERITAS Storage Foundation. You can use the GUI to administer disks, volumes, file systems, and database functionality on local or remote machines.

One of the following packages needs to be installed and running on the client:

◆ VERITAS Enterprise Administrator (`VRTSobgui`)

 This is the client package for HP-UX.

◆ VERITAS Enterprise Administrator for Windows (`windows/VRTSobgui.msi`)

 This is the client package for Windows.

Check the *VERITAS Storage Foundation Release Notes* for any patch information before you install VEA.

Requirements

The following are system recommendations for the GUI:

HP-UX	Minimum of 512MB of memory
Windows XP, NT, ME, 2000, or 98	300MHz Pentium with at least 256MB of memory

Cluster Environment Requirements

If your configuration has a cluster, which is a set of hosts that share a set of disks, follow these steps:

1. If you plan to place the root disk group under VxVM control, decide into which disk group you want to configure it for each node in the cluster. The root disk group, usually aliased as `bootdg`, contains the volumes that are used to boot the system. VxVM sets `bootdg` to the appropriate disk group if it takes control of the root disk. Otherwise `bootdg` is set to `nodg`. To check the name of the disk group, enter the command:

   ```
   # vxdg bootdg
   ```

2. Decide on the layout of shared disk groups. There may be one or more shared disk groups. Determine how many you wish to use.

3. If you plan to use Dirty Region Logging (DRL) with VxVM in a cluster, leave a small amount of space on the disk for these logs. The log size is proportional to the volume size and the number of nodes. Refer to the *VERITAS Volume Manager Administrator's Guide* and the *VERITAS Storage Foundation Cross-Platform Data Sharing Administrator's Guide* for more information on DRL.

4. Install the license that supports the clustering feature on every node in the cluster. For more information on enabling clustering, see "Enabling Cluster Support in VxVM (Optional)" on page 65.

File System Preinstallation Instructions

Before installing VERITAS File System:

◆ Review the *VERITAS Storage Foundation Release Notes*, `sf_notes.pdf`, located under the `storage_foundation/release_notes` directory on the VERITAS software disc. Because product release notes are not installed by any packages, VERITAS recommends that you copy them from the software disc to the `/opt/VRTS/docs` directory so that they are available for future reference.

◆ In the *VERITAS Storage Foundation Release Notes*, review the information on VRTSexplorer and installing the `VRTSspt` package. `VRTSspt` is a group of tools for troubleshooting a system and collecting information on its configuration. The tools can gather VxFS metadata information and establish various benchmarks to measure file system performance. The tools are not required for the operation of any VERITAS product, and they may adversely impact system performance if not used correctly. VERITAS provides these tools to analyze systems if you suspect that there are performance problems, and should be used only under the direction of a VERITAS Technical Support Engineer.

◆ Ensure that the `/opt` directory exists and has write permissions for `root`.

◆ If the `VRTSfsnbl` package is installed on the system, you must remove it before installing VxFS 4.1.

To verify the `VRTSfsnbl` package is installed, enter:

```
# swlist -l product | egrep -i 'VRTSfsnbl'
```

If the `VRTSfsnbl` package is installed, you must remove it:

```
# swremove VRTSfsnbl
```

◆ The VERITAS File System does not support OmniStorage. Do not install VxFS without first retrieving any files archived using OmniStorage.

◆ Install all the latest required HP-UX patches listed under "Required HP-UX Patches" on page 6.

Installing the VERITAS Software   **2**

This chapter provides an overview of the installation tasks for VERITAS Storage Foundation products and describes how to install the packages.

Because VERITAS Volume Manager 3.5 and VERITAS File System 3.5 are bundled in the September 2004 HP-UX 11i version 2.0 release, a fresh installation is not possible. You must perform an upgrade to move to the 4.1 versions of the VERITAS products.

Caution   After you install the 4.1 software, the VERITAS Volume Manager 3.5 software that was bundled with the HP-UX operating system is no longer available. To reinstall VERITAS Volume Manager 3.5, you must use your HP-UX software discs. Because you can only have one version of VERITAS Volume Manager on your system, if you choose to reinstall VERITAS Volume Manager 3.5 (with the appropriate swinstall options to downgrade the version), the 4.1 software will no longer be available.

Installing the 4.1 VERITAS software will not overwrite VERITAS File System 3.5. Both the 4.1 and 3.5 versions will be on your system.

Topics covered in this chapter include:

- ◆ "Installing the VEA Client" on page 48
- ◆ "Installing VERITAS Volume Manager" on page 50

> **Note** Only users with superuser (root) privileges can install VERITAS products.

Installation Requirements

VERITAS software and operating system installation requirements are described in the following sections.

> **Note** If you are not running the September 2004 HP-UX 11i version 2.0 release, upgrade HP-UX on your system before you install the new VERITAS software. See "Upgrading HP-UX" on page 22 for more information.
>
> Only users with superuser privileges can install, upgrade, or initialize VERITAS Storage Foundation and HP-UX.

Mapping Services and Performance Statistics for Oracle

- ◆ You must install VERITAS Array Integration Layer (VAIL) and VERITAS Mapping Services (VxMS) if you want to use deep mapping services and performance statistics for supported storage arrays.
- ◆ Install the EMC Solutions Enabler (SYMCLI) *before* you install VAIL. If you install Solutions Enabler after you install VAIL, rescan the EMC Symmetrix arrays so that they can be discovered. For more information, see the *VERITAS Storage Foundation for Oracle Administrator's Guide*.

Operating System

If patches to the HP-UX operating system are required, the patches should be applied just prior to installing the VERITAS products. Patches may be required to resolve HP-UX kernel, product performance, or other issues.

The system should be in a quiescent state before adding patches.

> **Note** See "System Requirements" on page 4 for information on patches required for VERITAS, HP-UX, or Oracle software.

Summary of VERITAS Storage Foundation Installation Tasks

Installation of VERITAS Storage Foundation products consists of the following tasks:

◆ Reviewing *Release Notes* for the most current product information.

◆ Reviewing preinstallation requirements (see "Preinstallation Instructions" on page 1) and making any necessary modifications.

◆ Adding HP-UX operating system patches, if needed. Refer to "System Requirements" on page 4 for specific software patch information.

◆ Obtaining a license key.

◆ Installing the VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle* software packages. Follow the instructions in this chapter.

◆ Configuring the VERITAS software (see "Configuring the VERITAS Software" on page 53)

Note Installing VERITAS Storage Foundation using the product installer will automatically configure the software. If you install using an alternative method, you will have to run the product installer to configure the software.

Using Existing Licenses

You must obtain new licenses to use all of the features in the VERITAS Storage Foundation 4.1 software. Any VERITAS licenses for previous releases that are currently installed will allow you to use only a limited subset of these features. See "Preinstallation Instructions" on page 1 for more information.

Upgrading HP-UX

If you need to upgrade the HP-UX operating system, do so *before* installing the VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle* software. See the flowchart for the recommended sequence of steps for all VERITAS Storage Foundation products:
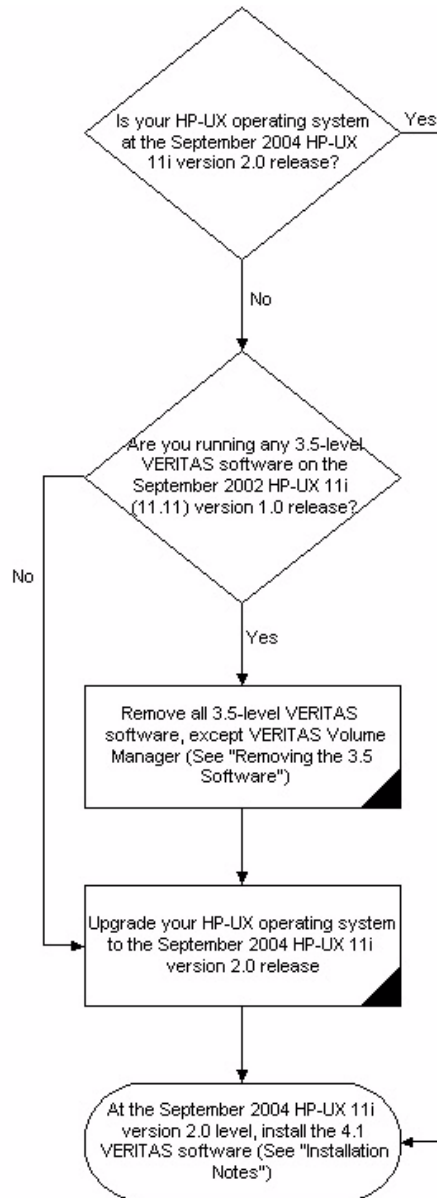
Removing the 3.5 VERITAS Software

Before upgrading the OS, you must remove all 3.5-level VERITAS software, except VERITAS Volume Manager.

Removing Patches

Before removing the base 3.5 software, you must remove any VERITAS File System, VERITAS Database Edition *for Oracle*, or VERITAS Enterprise Administrator patches you may have installed with Update 1, Update 2, or Update 3.

▼ **To remove the VERITAS patches**

1. Log in as superuser.

2. Stop the VEA service:

   # **/opt/VRTSob/bin/vxsvcctrl stop**

3. Remove the following file:

   # **rm -f /var/vx/isis/vxisis.lock**

4. To remove the patches, enter:

   # **swremove -x autoreboot=true** *patch_name* *patch_name* \
   patch_name **...**

   For a list of patches, see "3.5 Patches" on page 24.

5. After removing the patches, restart the VEA service:

   # **/opt/VRTSob/bin/vxsvcctrl start**

3.5 Patches

VERITAS Product	Patches To Be Removed	Availability
VERITAS File System	PHKL_28503	Update 1
	PHCO_28504	Update 2
	PHKL_28785	Update 2
	PHKL_29212	Update 2
	PHCO_30689	Update 3
	PHKL_31983	Update 3
VERITAS Database Edition	PVCO_03604	Update 2
	PVCO_03606	Update 2
Note VERITAS Database Edition *for Oracle* is now VERITAS Storage Foundation *for Oracle*.	PVKL_03609	Update 2
	PVCO_03633	Update 3
	PVCO_03634	Update 3
	PVKL_03635	Update 3
VERITAS Enterprise Administrator	PHCO_28651	Update 1
	PHCO_28656	Update 1
	PHCO_28692	Update 2
	PHCO_28693	Update 2
	PHCO_30730	Update 3
	PHCO_30731	Update 3
	PHCO_30700	Update 3
	PHCO_31203	Update 3

Removing Packages

Refer to the appropriate set of steps to either remove VERITAS Database Edition 3.5 *for Oracle* or VERITAS File System 3.5.

Note If you have VERITAS Database Edition 3.5 *for Oracle* installed, the removeDBED script will remove VERITAS File System 3.5. You do not need to remove VERITAS File System separately.

▼ **To remove the VERITAS Database Edition 3.5 for Oracle packages**

1. Shut down VERITAS Volume Manager. Use the `vxdctl` and `vxiod` commands as follows:

```
# vxdctl stop
# vxiod -f set 0
```

2. Run the `removeDBED` script as follows:

```
# /opt/VRTSdbed/bin/removeDBED
```

▼ **To remove the VERITAS File System 3.5 software**

1. Check `/etc/vx/tunefstab` and remove any VxFS 3.5 tunable settings.

Note Three tunables, `hsm_write_prealloc`, `read_ahead`, and `write_throttle` were added in VxFS 3.5. The JFS/OnLineJFS 3.3 `vxtunefs` command does not recognize the VxFS 3.5 tunables and will fail if it tries to access them.

---

2. To remove all the VERITAS File System packages, enter:

```
# swremove -x autoreboot=true VRTSvxfs VRTSfsdoc VRTSvlic
```

Caution Do not remove the `VRTSvlic` package if there are any other VERITAS products running on your system.

---

3. Manually remove all device file entries for the QuickLog driver:

```
# rm -rf /dev/qlog
```

Installation Notes for the VERITAS 4.1 Software

◆ You cannot install the 4.1 VERITAS software on an HP-UX OS other than the September 2004 HP-UX 11i version 2.0 release.

◆ When upgrading your OS, you must remove all 3.5 VERITAS software, except for VERITAS Volume Manager.

◆ When you install VERITAS Volume Manager 4.1, the installation will overwrite the 3.5 version of the software that came bundled with the OS.

◆ When you install VERITAS File System 4.1, the installation will install the 4.1 version of the software in a different location. Both the 3.5- and 4.1-level software can coexist.

◆ Other packages, such as the database packages, will install normally.

Preparing to Install the VERITAS Software

Note You must ensure that you have made backups of all data that you want to preserve. In particular, you will need the information in files such as /etc/fstab. You should also run the vxlicrep, vxdisk list, and vxprint -ht commands, and record the output from these. You may need this information to reconfigure your system after the upgrade.

If you are upgrading an HA cluster, follow the guidelines given in the *VERITAS Cluster Server (VCS) Installation Guide* for information on preserving your VCS configuration across the upgrade procedure. In particular, you should take care to make backups of configuration files, such as main.cf and types.cf, in the /etc/VRTSvcs/conf/config directory. Additional configuration files, such as Oracletypes.cf, may also be present in this directory if you have installed any VCS agents. You should also back up these files.

▼ **To prepare for the VERITAS software upgrade**

1. Log in as superuser.

2. Perform any necessary preinstallation checks and configuration. See "Preinstallation Instructions" on page 1 for more information.

3. Use the vxlicrep command to make a record of the currently installed VERITAS licenses. Print the output or save it on a different system.

4. If the systems are running as a cluster, take all service groups offline, and shut down VCS prior to launching the uninstallsf script:

```
# /opt/VRTSvcs/bin/hastop -all
```

Note Do not use the -force option when executing hastop. This will leave all service groups online and shut down VCS, causing undesired results during uninstallation of the packages.

5. Use the following command to check if any VxFS file systems or Storage Checkpoints are mounted:

```
# df -F vxfs
```

6. Unmount all Storage Checkpoints and VxFS file systems:

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

7. Verify that all file systems have been cleanly unmounted:

```
# echo "8192B.p S" | fsdb -F vxfs filesystem | grep clean
flags 0 mod 0 clean clean_value
```

A *clean_value* value of `0x5a` indicates the file system is clean, `0x3c` incidates the file system is dirty, and `0x69` indicates the file system is dusty. A dusty file system has pending extended operations.

a. If a file system is not clean, enter the following commands for that file system:

```
# fsck -F vxfs filesystem
# mount -F vxfs filesystem mountpoint
# umount mountpoint
```

This should complete any extended operations that were outstanding on the file system and unmount the file system cleanly.

There may be a pending large fileset clone removal extended operation if the `umount` command fails with the following error:

```
file system device busy
```

You know for certain that an extended operation is pending if the following message is generated on the console:

```
Storage Checkpoint asynchronous operation on file_system file
system still in progress.
```

b. If an extended operation is pending, you must leave the file system mounted for a longer time to allow the operation to complete. Removing a very large fileset clone can take several hours.

c. Repeat step 7 to verify that the unclean file system is now clean.

8. Stop activity to all VxVM volumes. For example, stop any applications such as databases that access the volumes, and unmount any file systems that have been created on the volumes.

9. Stop all the volumes by entering the following command for each disk group:

```
# vxvol -g diskgroup stopall
```

To verify that no volumes remain open, use the following command:

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

10. Make a record of the mount points for VxFS file systems and VxVM volumes that are defined in the /etc/fstab file. You will need to recreate these entries in the /etc/fstab file on the freshly installed system.

11. Reboot the system.

Installing the VERITAS Storage Foundation 4.1 Software

These steps apply to both VERITAS Storage Foundation and VERITAS Storage Foundation *for Oracle*. After you complete the installation procedure, read "Configuring the VERITAS Software" on page 53 for important details about initializing (where required), setting up, and using the VERITAS software shipped with VERITAS Storage Foundation.

Caution	Installing the 4.1 VERITAS software will overwrite the VERITAS Volume Manager 3.5 software on your system. To go back to VERITAS Volume Manager 3.5, you must reinstall using your HP-UX operating system discs.
	Installing the 4.1 VERITAS software will not overwrite VERITAS File System 3.5. Both the 4.1 and 3.5 versions will be on your system.

Note	If you have obtained a VERITAS product from an electronic download site, the single product download files do not contain the installer installation script, so you must use the product installation script to install the product. For example, if you download VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle*, use the installsf script (**./installsf** at the prompt). After invoking the installsf script, follow the instructions in "Installing Using the Product Installer" on page 29 starting with step 2.

Mounting the Software Disc

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

▼ **To mount the software disc**

1. Log in as superuser (root).

2. Create a mount point directory, /dvdrom, if it does not exist. The directory must have read/write permissions open.

3. Insert the appropriate media disc into your system's DVD-ROM drive connected to your system.

4. Determine the block device file for the DVD-ROM drive by entering:

```
# ioscan -fnC disk
```

Make a note of the device file as it applies to your system.

5. Mount the software disc. For example, to mount the software disc at the mount point /dvdrom, enter:

```
# /usr/sbin/mount -F cdfs /dev/dsk/c#t#d# /dvdrom
```

where /dev/dsk/c#t#d# is the location of the DVD drive.

6. To install, use the procedure described in "Installing Using the Product Installer" on page 29.

Installing Using the Product Installer

The product installer is the recommended method to license and install the product. The installer also enables you to configure the product, verify preinstallation requirements, and view the product's description.

At most points during an installation, you can type **b** ("**back**") to return to a previous section of the installation procedure. The **back** feature of the installation scripts is context-sensitive, so it returns to the beginning of a grouped section of questions. If an installation procedure hangs, use Control–c to stop and exit the program. There is a short delay before the script exits.

The following sample procedure is based on the installation of a VERITAS Storage Foundation Enterprise HA cluster with two nodes: "host1" and "host2." If you are installing on standalone systems only, some steps are unnecessary, and these are indicated. Default responses are enclosed by parentheses. Press Return to accept defaults.

Note If you have obtained a VERITAS product from an electronic download site, the single product download files do not contain the installer installation script, so you must use the product installation script to install the product. For example, if you download VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle*, use the installsf script (**./installsf** at the prompt). After invoking the installsf script, follow these instructions starting with step 2.

▼ **To install a Storage Foundation product**

1. To invoke the common installer, run the `installer` command on the disc as shown in this example:

   ```
   # cd /dvdrom
   # ./installer
   ```

   For information on installing on multiple hosts, see "Completing the Installation Procedure on an HA Environment" on page 36.

2. If the `VRTSvlic` licensing package is installed, the Product Status page displays the following:

   ◆ Products available for installation

   ◆ Products currently installed

   ◆ Products that are licensed

   ◆ Options for operations you can initiate

   > **Note** You can use the `/opt/VRTS/bin/vxlicrep` command to view a report of the license type for each product.

3. At the Product Status page, enter **I** for the product installer and press Return. The product installer is displayed.

4. At the VERITAS product installer page, enter the number of the product you want to install and press Return.

   The product installation begins automatically.

5. When you are prompted to enter the system names on which the software is to be installed, enter the system name or names and then press Enter to continue.

6. After the script checks your system configuration, press Enter. The utility begins installing the infrastructure packages.

7. During license verification, you are prompted to enter a license key. Select **y** to add a license key. Then, enter the license key and press Enter.

Note Each system requires a Storage Foundation product license before installation. License keys for additional product features should also be added at this time.

```
SF Licensing Verification:

Checking SF license key on host1 ................ not licensed
Enter a SF license key for host1: [?]
XXXX-XXXX-XXXX-XXXX-XXXX-XXXX-X
Registering VERITAS Storage Foundation Standard HA key on host1

Do you want to enter another license key for host1? [y,n,q,?] (n) n

Registering XXXX-XXXX-XXXX-XXXX-XXXX-XXXX-X on host1
Checking SF license key on host1 .......Storage Foundation
Enterprise HA

Do you want to enter another license key for host1? [y,n,q,?] (n) n
```

Enter **n** if you have no further license keys to add for a system. You are then prompted to enter the keys for the next system. The following prompt is displayed when you have added licenses to all the systems. Press Enter to continue.

8. A list of optional packages is now displayed. Enter **1** or press Enter to install the standard and all optional packages.

```
1)   Install all of the optional filesets
2)   Install none of the optional filesets
3)   View fileset descriptions and select optional filesets
```

 Select the optional filesets to be installed on all systems? [1-3,q,?] (1) 1

Note The list of optional packages may differ depending on the license keys that you entered in step 7.

The utility lists the packages to be installed. Press Enter to continue listing the packages.

9. Press Enter. The utility begins checking the installation requirements for each of the nodes.

---

10. If you are installing on a cluster, proceed to "Configuring VERITAS Storage Foundation on a Cluster" on page 32 to configure Storage Foundation Enterprise HA. Otherwise, read "Configuring the VERITAS Software" on page 53 for important details about initializing (where required), setting up, and using the VERITAS software shipped with VERITAS Storage Foundation.

Configuring VERITAS Storage Foundation on a Cluster

Note The procedure in this section is only relevant if you are installing an HA version of the Storage Foundation software.

As the installation and configuration procedure continues, a message displays notifying you that configuring Storage Foundation at this point in the installation procedure is optional.

▼ **To configure Storage Foundation on a cluster**

1. At the following prompt, enter **y** or press Enter to configure Storage Foundation.

```
Are you ready to configure SF? [y,n,q] (y) y
```

A message is displayed describing how to configure Storage Foundation using the product installer. If you choose not to configure at this time, you can run the installation script with the -configure option at a later time.

2. Press Enter to continue. A message is displayed describing the VERITAS Cluster Server (VCS) configuration requirements.

3. The installer lists the information required to configure a cluster and prompts you to enter the unique cluster name and the unique cluster ID.

```
To configure VCS the following is required:

A unique Cluster name
  A unique Cluster ID number between 0-255
  Two or more NIC cards per system used for heartbeat links

  One or more heartbeat links are configured as private links
  One heartbeat link may be configured as a low priority link

All systems are being configured to create one cluster

Enter the unique cluster name: [?] vcs_cluster2
Enter the unique Cluster ID number between 0-255: [b,?] 7
```

The installer discovers the NICs available on the first system and reports them:

```
Discovering NICs on host1 ...discovered lan0 lan1 lan2 lan3
```

4. Answer the questions the installer presents about configuring the discovered heartbeat NICS.

```
Enter the NIC for the first private heartbeat NIC on host1:
[b,?] lan1
Would you like to configure a second private heartbeat link?
[y,n,q,b,?] (y)
Enter the NIC for the second private heartbeat NIC on host1:
[b,?] lan2
Would you like to configure a third private heartbeat link?
[y,n,q,b,?](n)
Do you want to configure an additional low priority heartbeat
link? [y,n,q,b,?] (n)
Are you using the same NICs for private heartbeat links on all
systems? [y,n,q,b,?] (y)
```

Note When answering "Y," be sure that the same NICs are available on each system; the installer does not verify this.

Notice that in this example, `lan0` is not selected for use as a private heartbeat NIC because it already in use as the public network interface. The default responses are chosen.

5. The installer summarizes the information and prompts you to confirm it is correct:

```
Cluster information verification:

  Cluster Name: vcs_cluster2
  Cluster ID Number: 7
  Private Heartbeat NICs for north: link1=lan1 link2=lan2
  Private Heartbeat NICs for south: link1=lan1 link2=lan2

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

If the information is correct, press Return. If the information is *not* correct, answer "n." The installer prompts you to enter the information again.

6. A message displays notifying you of the information required to add VCS users. When prompted to add a password for the Administrator, enter **n** if you want to decline. If you enter **y**, you are prompted to change the password.

7. When prompted to add a user, enter **n** if you want to decline. If you enter **y**, you are prompted to enter a user name, password and privilege level for each user. After entering the required information, you are prompted to add another user. Enter **n** if you want to decline, enter **y** if you want to add another user.

8. When you are finished adding users, the utility begins to verify the VCS user information. When prompted, enter **y** to confirm the information is correct. If the information displayed is not correct, enter **n** to re-enter the information.

9. A message displays notifying you of the configuration requirements for Cluster Manager (the VCS graphical user interface). When prompted to configure this feature, enter **n** if you want to decline. If you enter **y**, you are prompted to enter details of the public NIC, virtual IP address and network mask to be used by Cluster Manager.

10. To configure Cluster Manager, confirm whether you want to use the discovered public NIC on the first system.

```
Active NIC devices discovered on north: lan0
Enter the NIC for Cluster Manager (Web Console) to use on north:
[b,?](lan0)
```

Press Return if the discovered NIC is the one to use. Otherwise, type the name of a NIC to use and press Return.

```
Is lan0 to be the public NIC used by all systems [y,n,q,b,?] (y)
```

Press Return if all systems use the same public NIC. You are prompted to enter a NIC for each system if unique NICs are used.

11. Enter the virtual IP address to be used by Cluster Manager:

```
Enter the Virtual IP address for Cluster Manager: [b,?]
99.999.99.999
```

12. You can confirm the default netmask, or enter another:

```
Enter the netmask for IP 99.999.99.999: [b,?] (999.999.999.9)
```

13. Enter the NetworkHosts IP addresses, separated by spaces, for checking the connections.

```
Enter the NetworkHosts IP addresses, separated by spaces: [b,?]
99.999.99.999
```

14. The installer prompts you to verify Cluster Manager information:

```
Cluster Manager (Web Console) verification:

  NIC: lan0
  IP: 99.999.99.999
  Netmask: 999.999.999.9
  NetworkHosts: 99.999.99.999

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

If the information is correct, press Return. If the information is *not* correct, answer "n." The installer prompts you to enter the information again.

15. A message displays notifying you of the configuration requirements for SMTP email notification. When prompted to configure this feature, enter **n** if you want to decline. If you enter **y**, you are prompted to enter details of the SMTP server's host name, email addresses of recipients, and the minimum security level of messages to be sent to each recipient.

16. When prompted, verify the SMTP notification information. If the information is correct, press Return. If the information is *not* correct, answer "n." The installer prompts you to enter the information again.

17. A message displays notifying you of the configuration requirements for SNMP trap notification. When prompted to configure this feature, enter **n** if you want to decline. If you enter **y**, you are prompted to enter details of the SNMP trap notification. For each SNMP trap notification, enter the daemon port, system name, and the minimum security level of events.

18. When prompted, verify the SMTP notification information. If the information is correct, press Return. If the information is *not* correct, answer "n." The installer prompts you to enter the information again.

19. A message displays notifying you of the configuration requirements for configuring the Global Cluster option. When prompted to configure this feature, enter **n** if you want to decline. If you enter **y**, you are prompted to enter the virtual IP address for Global Cluster Manager.

Press Return to accept the default, which is the virtual IP address, NIC, and netmask used by Cluster Manager. If you enter another IP address, you are prompted for a NIC and value for the netmask.

20. When prompted, verify the Global Cluster information. If the information is correct, press Return. If the information is *not* correct, answer "n." The installer prompts you to enter the information again.

21. Proceed to "Completing the Installation Procedure on an HA Environment" on page 36.

Completing the Installation Procedure on an HA Environment

At this point in the installation and configuration procedure, the utility begins to install the various packages on one node and copy them to any other specified nodes. The following sample output is for a Storage Foundation Enterprise HA installation.

▼ **To complete the installation procedure**

1. As the utility continues the procedure, you are prompted to choose whether to install on all systems simultaneously. Enter **y** or press Enter to accept simultaneous installation.

   ```
   Would you like to install Storage Foundation Standard HA on all
   systems simultaneously? [y,n,q,?] (y) y

   Installing Storage Foundation Enterprise HA 4.1 on all systems
   simultaneously:

   Copying VRTSperl to host2 ...... Done 1 of 102 steps
   Installing VRTSperl 4.1 on host2 ...... Done 2 of 102 steps
   Copying VRTSob to host2............ Done 3 of 102 steps
   Installing VRTSperl 4.1 on host1 ...... Done 4 of 102 steps
   Installing VRTSob 3.2.514.1 on host2 ...... Done 5 of 102 steps
   Installing VRTSob 3.2.514.1 on host1 ...... Done 6 of 102 steps
   .
   .
   ```

2. A message displays notifying you of successful installation. Press Enter to continue.

   ```
   Storage Foundation Enterprise HA installation completed
   successfully.

   Press [Return] to continue:
   ```

3. A message displays describing the VxVM enclosure-based naming scheme and showing which nodes are eligible. When prompted to configure this feature, enter **n** if you want to decline. If required, you can use the `vxdiskadm` command or the VERITAS Enterprise Administrator to configure this feature after installation. See the `vxdiskadm`(1M) manual page and the "Administering Disks" chapter of the *VERITAS Volume Manager Administrator's Guide* for more information.

4. If you are installing an HA version of the product, a message displays indicating the VCS configuration files are being created and copied. Press Enter to continue.

5. A message displays indicating which systems can be started and on the systems that VxVM selects as targets.

```
Evaluating which systems can now be started...

System host1 is eligible -- can be started.
System host2 is eligible -- can be started.

Preparing to start VxVM on target systems...

Begin initial start of VxVM on system host1
Starting vxconfigd for VxVM
Done with initial start of VxVM on system host1

Begin initial start of VxVM on system host2
Starting vxconfigd for VxVM .............................Succeeded
Done with initial start of VxVM on system host2

Done with starting VxVM on target systems...
```

6. Press Enter to continue. If you are installing an HA version of the product, a message displays notifying you that Cluster Server is starting. This message also contains information about configuring a default disk group.

```
Starting Cluster Server:

Starting LLT on host1 ............................... Started
Starting LLT on host2 ............................... Started
Starting GAB on host1 ............................... Started
Starting GAB on host2 ............................... Started
Starting Cluster Server on host1 .................... Started
Starting Cluster Server on host2 .................... Started
Confirming Cluster Server startup ............. 2 systems RUNNING
```

7. You are now given the option of specifying the default name of a disk group that is to be assumed by VERITAS Volume Manager commands if a disk group is not otherwise specified.

```
Many Volume Manager commands affect the contents or configuration
of a disk group. Such commands require that the user specify a disk
group. This is accomplished by using the -g option of a command or
setting the VXVM_DEFAULTDG environment variable. An alternative to
these two methods is to configure the default disk group of a
system.

Evaluating which systems can now have their default disk group
configured...
```

```
System host1 is eligible -- can configure the default diskgroup.
System host2 is eligible -- can configure the default diskgroup.

Do you want to set up the default disk group for each system?
[y,n,q,?] (y) n
```

Enter **n** if you do not want to specify the name of the default disk group at this time. You can set the name of the default disk group after installation by running the vxdctl defaultdg *diskgroup* command on a system. See the vxdctl(1M) manual page and the "Creating and Administering Disk Groups" chapter of the *VERITAS Volume Manager Administrator's Guide* for more information.

> **Note** If you specify the name of a default disk group, this step does not create the disk group. After installation, you can use menu item 1 in the vxdiskadm command or the VERITAS Enterprise Administrator to create the disk group.

8. Finally, a message displays indicating the utility is preparing to start the daemons on the target systems.

```
Preparing to start daemons on target system(s)...
Starting vxrelocd on host1 .......................... Success
Starting vxcached on host1 .......................... Success
Starting vxconfigbackupd on host1 ................... Success

Starting vxrelocd on host2.......................... Success
Starting vxcached on host2 .......................... Success
Starting vxconfigbackupd on host2 ................... Success

Storage Foundation Enterprise HA was started successfully.

Press [Return] to continue:
```

Press Enter. A message displays notifying you of a successful installation and the locations of the /opt/VRTS/install files.

```
The installation summary is saved at:

  /opt/VRTS/install/logs/installer610192714.summary

The installer log is saved at:

  /opt/VRTS/install/logs/installer610192714.log

The installation response file is saved at:

  /opt/VRTS/install/logs/installer610192714.response
```

Configuring Your System After the Installation

▼ **To configure your system after the software upgrade**

1. Reinstate the mount points in the `/etc/fstab` file that you recorded in step 10 on page 28.

2. Reboot the upgraded systems.

3. Restart all the volumes by entering the following command for each disk group:

```
# vxvol -g diskgroup startall
```

There are several optional configuration steps that you may want to perform:

◆ If you want to use features of VERITAS Storage Foundation 4.1 or VERITAS Storage Foundation 4.1 *for Oracle* for which you do not currently have an appropriate license installed, obtain the license and run the vxlicinst command to add it to your system.

◆ Stop the cluster, restore the VCS configuration files to the `/etc/VRTSvcs/conf/config` directory, and restart the cluster.

◆ To create root volumes that are under VxVM control after installation, use the vxcp_lvmroot command as described in "Converting to a VxVM Root Disk" on page 44, and in the "Administering Disks" chapter of the *VERITAS Volume Manager Administrator's Guide*.

◆ To upgrade VxFS Disk Layout versions and VxVM Disk Group versions, follow the instructions given in "Upgrading VxFS Disk Layout Versions" on page 45 and "Upgrading VxVM Disk Group Versions" on page 47.

4. After you complete the installation procedure, read "Configuring the VERITAS Software" on page 53 for important details about initializing (where required), setting up, and using the VERITAS software shipped with VERITAS Storage Foundation.

Verifying the VERITAS Storage Foundation Installation

You can use the `swlist` command to check which packages have been installed:

```
# swlist -l product | grep VRTS
```

Use the following sections to verify the product installation.

Checking Volume Manager Processes

After the Storage Foundation software has been successfully installed, you can confirm that key Volume Manager processes (`vxconfigd`, `vxnotify`, and `vxrelocd`) are running by using the following command:

```
# ps -e | grep vx
```

Entries for these processes appear in output similar to the following:

```
142  ?     00:00:00  vxiod
143  ?     00:00:00  vxiod
.
.
.
150  ?     00:00:00  vxiod
151  ?     00:00:00  vxiod
159  ?     00:01:12  vxconfigd
405  ?     00:00:00  vxrelocd
410  ?     00:00:00  vxnotify
411  ?     00:00:00  vxrelocd
```

Note If you disable hot-relocation, the `vxrelocd` and `vxnotify` processes are not displayed.

Verifying VxFS Installation

The VERITAS File System package consists of a kernel component and administrative commands.

Command Installation Verification

The VERITAS File System commands are installed in two directories:

`/sbin/fs/vxfs4.1`	Contains the VERITAS `mount` command required to mount file systems.
`/opt/VRTS/bin`	Contains symbolic links to all VERITAS-specific commands installed in the directories listed above.

Determine whether these subdirectories are present:

```
# ls /sbin/fs/vxfs4.1
# ls /opt/VRTS/bin
```

Make sure you have adjusted your environment variables accordingly. See "Environment Variables" on page 12 for details.

Checking Cluster Operation

> **Note** This section is only relevant if you installed and configured an HA version of the Storage Foundation software.

To verify that the cluster is operating, type the following command on any node:

```
# hastatus -summary

-- SYSTEM STATE
-- System          State           Frozen

A  sflx1           RUNNING         0
A  sflx2           RUNNING         0
```

If the state of all nodes is RUNNING, VCS is successfully installed and running. Refer to the hastatus(1M) manual page and the *VERITAS Cluster Server User's Guide* for more information on system states and state transitions.

To display the VCS attribute values for each node in the cluster, enter the following command on any node:

```
# hasys -display
```

For more information on interpreting the output from this command, see the hasys(1M) manual page and the *VERITAS Cluster Server User's Guide*.

Verifying the Low Latency Transport (LLT) Configuration

After installation, the /etc/llthosts and /etc/llttab files contain information about LLT configuration.

◆   /etc/llthosts

The llthosts file is a database containing one entry per node that links the LLT system ID (in the first column) with the LLT host name. This file is identical on each cluster node.

Based on the sample installation, /etc/llthosts contains the entries:

```
0   sflx1
1   sflx2
```

See the llthosts(4) manual page for more information.

◆   /etc/llttab

The llttab file contains information derived from the installation, and is used by the lltconfig utility. After installation, this file lists the network links that correspond to each node.

The first line identifies the node. The second line identifies the cluster, based on the cluster ID entered during installation. The next two lines, beginning with the link command, identify the two network cards used by the LLT protocol.

See the llttab(4) manual page for details on how to modify the LLT configuration. The manual page describes ordering the directives in the llttab file.

Verifying LLT Operation

Use the lltstat command to verify that links are active for LLT. This command returns information about the links for LLT for the node on which it is typed.

With LLT configured correctly, the output of lltstat -n shows all of the nodes in the cluster and two links for each node. If the output shows otherwise, type lltstat -nvv | more on any node to view additional information about LLT.

For information on ports open for LLT, type lltstat -p on any node.

Verifying Group Membership and Atomic Broadcast (GAB) Configuration

After installation, the /etc/gabtab file contains a gabconfig(1M) command line to configure the GAB driver. The following shows the format of an entry in this file:

```
/sbin/gabconfig -c -nN
```

The -c option configures the driver and -n*N* specifies the cluster will not be formed until at least *N* nodes are ready. The variable *N* represents the number of cluster nodes.

Verifying GAB Operation

To verify that GAB is operating, type the following command on each node:

```
# /sbin/gabconfig -a
```

If GAB is operating, GAB port membership information is returned:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port h gen fd570002 membership 01
```

Port a indicates that GAB is communicating, gen a36e0003 is a random generation number, and membership 01 indicates that nodes 0 and 1 are connected.

Port h indicates that VCS is started, gen fd570002 is a random generation number, and membership 01 indicates that nodes 0 and 1 are both running VCS.

If GAB is not operating, no GAB port membership information is returned.

If only one network is connected, the following GAB port membership information is returned:

```
GAB Port Memberships
===================================
Port a gen a36e0003 membership 01
Port a gen a36e0003 jeopardy   1
Port h gen fd570002 membership 01
Port h gen fd570002 jeopardy   1
```

For more information on GAB, including descriptions of ports, refer to the *VERITAS Cluster Server User's Guide*.

Converting to a VxVM Root Disk

From the September 2004 HP-UX 11i version 2.0 release, it is possible to select VxVM as a choice for your root disk when performing a new installation using Ignite-UX. Alternatively, you can use the following procedure to achieve VxVM rootability by cloning your LVM root disk using the `vxcp_lvmroot` command.

▼ **To convert to a VxVM root disk**

1. Select the disk to be used as your new VxVM root disk. It is recommended that this disk is internal to the main computer cabinet. If this is currently an LVM disk, then it must be removed from LVM control as follows:

   a. Use the `vgreduce` command to remove the disk from any LVM volume groups to which it belongs.

   b. Use the `lvremove` command to remove any LVM volumes that are using the disk.

   c. Use the `pvremove` command to erase the LVM disk headers

   Note If the disk to be removed is the last disk in the volume group, use the `vgremove` command to remove the volume group, and then use `pvremove` to erase the LVM disk headers.

   If the disk is not currently in use by any volume or volume group, but has been initialized by `pvcreate`, you must still use the `pvremove` command to remove LVM disk headers.

   If you want to mirror the root disk across multiple disks, make sure that all the disks are free from LVM control.

2. While booted on the newly upgraded LVM root disk, invoke the `vxcp_lvmroot` command to clone the LVM root disk to the disk(s) you have designated to be the new VxVM root disks. In the following example, `c1t0d0` is used for the target VxVM root disk:

   # **`/etc/vx/bin/vxcp_lvmroot -v c1t0d0`**

   To additionally create a mirror of the root disk on `c2t0d0`:

   # **`/etc/vx/bin/vxcp_lvmroot -v -m c2t0d0 c1t0d0`**

   Use of the `-v` (verbose) option is highly recommended. The cloning of the root disk is a lengthy operation, and this option gives a time-stamped progress indication as each volume is copied, and other major events.

3. Use the `setboot` (1M) command to save the hardware path of the new VxVM root disk in the system NVRAM. The disk hardware paths can be found using this command:

   ```
   # ioscan -kfnC disk
   ```

4. Reboot from the new VxVM root disk. If you created a mirrored root disk, then there is nothing more to do. The LVM root disk safely co-exists with your VxVM root disk, and provides a backup boot target.

5. If desired, you can convert the original LVM root disk into a mirror of your VxVM root disk by using the following commands:

   ```
   # /etc/vx/bin/vxdestroy_lvmroot -v c2t0d0
   # /etc/vx/bin/vxrootmir -v c2t0d0
   ```

   Once this operation is complete, the system is running on a completely mirrored VxVM root disk.

Note If later required, you can use the `vxres_lvmroot` command to restore the LVM root disk.

Upgrading VxFS Disk Layout Versions

VERITAS File System 4.1 allows Version 4, 5 and 6 file system disk layouts to be mounted. Disk layout Versions 1, 2, and 3 are not supported by VxFS 4.1. See Appendix C, "Disk Layout," in the *VERITAS File System Administrator's Guide* for disk layout information. VxFS 3.5 was the last major release to support disk layout Version 4. All file systems created on VxFS 4.1 use disk layout Version 6, except for the VxVM root disk.

To determine the disk layout version of a VxFS file system, run the `fstyp_vxfs` command on the file system physical device, for example:

```
# /opt/VRTS/bin/fstyp –v /dev/vx/dsk/rootdg/volname | grep version
magic a501fcf5  version 6  ctime Thu Jul 31 11:29:31 2004
```

When to Upgrade Disk Layout Versions

You must upgrade your older disk layout versions, to make use of the extended features available in the VxFS 4.1 release. Use the vxfsconvert or vxupgrade utilities to upgrade older disk layout versions to disk layout Version 6 as described in the following sections. (See the *VERITAS Storage Foundation Release Notes* for information on new features in VxFS 4.1.)

Caution	Never upgrade the / and /stand file systems to disk layout Version 6. The HP-UX bootloader does not support disk layout Version 6. The machine cannot be rebooted if these file systems are upgraded to disk layout Version 6.

When to Use vxfsconvert

You can use the vxfsconvert command to convert an unmounted ext2 or ext3 file system to a VERITAS file system with disk layout Version 4.

```
# vxfsconvert /device_name
```

See the vxfsconvert(1M) and fsadm_vxfs(1M) manual pages for more information on converting to VxFS file systems.

When to Use vxupgrade

You can use the vxupgrade command to upgrade disk layout Version 4 to disk layout Version 6 while the file system remains mounted.

```
# vxupgrade -n 6 /mount_point
```

See the vxupgrade(1M) and fsadm_vxfs(1M) manual pages for more information on upgrading VxFS file systems.

Note	The contents of intent logs created on a previous disk layout version cannot be used after the disk layout version is upgraded. See the *VERITAS Storage Foundation Release Notes* for information on the software limitations.

Requirements for Upgrading to Disk Layout Version 6

Converting a Version 4 disk layout to Version 6 disk layout requires adequate free space. The space and time required to complete the upgrade increases with the number of files, extended attributes, and hard links in the file system. Typical maximum space is at least two additional inodes with one block for every inode. Allow at least ten minutes to upgrade for every million inodes in the file system.

Upgrading VxVM Disk Group Versions

All VERITAS Volume Manager disk groups have an associated version number. Each VxVM release supports a specific set of disk group versions and can import and perform tasks on disk groups with those versions. Some new features and tasks work only on disk groups with the current disk group version, so you need to upgrade existing disk groups before you can perform the tasks. The following table summarizes the disk group versions that correspond to each VxVM release on HP-UX from 3.0 to the present.

VxVM Release	Disk Group Version	Supported Disk Group Versions
3.0	60	20-40, 60
3.1	70	20-70
3.1.1	80	20-80
3.5	90	90
4.1	120	90, 110, 120

Use the following command to find the version of a disk group:

```
# vxdg list diskgroup
```

To upgrade a disk group to version 120, use the following command:

```
# vxdg upgrade diskgroup
```

Upgrading the VxVM Cluster Protocol Version

If you are upgrading a cluster and you want to take advantage of the new features in this release, you must upgrade the version of the VxVM cluster protocol. To upgrade the protocol to version 50, enter the following command on the master node of the cluster:

```
# vxdctl upgrade
```

Installing the VEA Client

If you plan to run the VEA client, you must install the VRTSobgui package on the machine you are planning to use.

Installing the VEA Client on HP-UX

▼ **To install the VEA client on an HP-UX machine using swinstall**

1. Log in as root.

2. First, check to determine whether the VEA client package is already installed.

   # **swlist | grep VRTSobgui**

   This command will return VRTSobgui if VRTSobgui is already installed. It will return nothing if the package has not been installed.

3. To install the VEA client package for HP-UX, insert the appropriate media disc into your system's DVD-ROM drive and mount it as described in "Mounting the Software Disc" on page 28.

4. Run the swinstall command.

   # **swinstall -s /dvdrom/storage_foundation/pkgs**

5. Select the software bundle VRTSobgui for installation.

   The VEA client package for HP-UX is installed.

Installing the VEA Client on Windows

The VEA client runs on Windows NT, Windows XP, Windows 2000, Windows ME, Windows 98, and Windows 95 machines.

Before you install VEA on a Windows machine, you must uninstall any existing VERITAS Volume Manager Storage Administrator (VMSA) packages and remove the old `setup.exe` from that machine. Only one VEA package can be installed on a Windows machine at any given time.

> **Note** If you plan to install the GUI client on Windows NT 4.0, Windows Installer must be upgraded to version 2.0. For more information about upgrading Windows Installer, visit http://www.microsoft.com. If you are using Windows NT 4.0, it is also recommended that you use Windows NT 4.0 Service Pack 6.

▼ **To install the VEA client on a Windows machine**

   1. Insert the appropriate media disc into your system's DVD drive.

   2. Using Windows Explorer or a DOS Command window, go to the `/windows` directory and execute the `vrtsobgui.msi` program with Windows Installer.

   3. Follow the instructions presented by the `vrtsobgui.msi` program.

   4. After installation is complete, ensure environment changes made during installation take effect by performing one of the following procedures:

   ◆ For Windows NT, Windows 2000 or Windows XP, log out and then log back in.

   ◆ For Windows ME, Windows 98 or Windows 95, restart the computer.

Installing VERITAS Volume Manager

This section describes how to install the VERITAS Volume Manager software and license key. If you are installing VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle*, see "Installing the VERITAS Storage Foundation 4.1 Software" on page 28.

▼ **To install VERITAS Volume Manager**

1. Log in as superuser.

2. Run the `installer` command to install VERITAS Volume Manager. For example:

   ```
   # cd /dvdrom
   # ./installer
   ```

   From the product installer, choose the **I** option for Install, and select **VERITAS Volume Manager**.

   Note If you have obtained a VERITAS product from an electronic download site, the single product download files do not contain the `installer` installation script, so you must use the product installation script to install the product. For example, if you download VERITAS Volume Manager, use the `installvm` script instead of the `installer` script.

3. Enter one or more system names on which VERITAS Volume Manager is to be installed. For example:

   ```
   Enter the system names separated by spaces on which to install
   VxVM: system01
   ```

4. After the system check completes successfully, press **Return** to continue.

5. After the Infrastructure packages are installed successfully, press **Return** to continue.

6. Enter a VxVM license key. For example:

   ```
   Enter a VxVM license key for system01:[?]
   XXXX-XXXX-XXXX-XXXX-XXXX-X
   ```

7. Enter another license key. For example:

   ```
   Do you want to enter another license key for system02? [y,n,q,?]
   (n)
   ```

8. After VxVM licensing completes successfully, press **Return** to continue.

9. Select the optional packages to be installed. For example:

```
VRTSobgui    VERITAS Enterprise Administrator
VRTSvmdoc    VERITAS Volume Manager Documentation
VRTSap       VERITAS Action Provider
VRTStep      VERITAS Task Provider

    1)   Install all of the optional packages
    2)   Install none of the optional packages
    3)   View package descriptions and select optional packages

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

10. After the VERITAS Volume Manager installation completes successfully, press **Return** to continue.

11. Reboot the system.

```
# /sbin/usr/shutdown -r -y now
```

Configuring the VERITAS Software   3

This chapter covers important details about initializing (where required), setting up, and configuring the VERITAS software.

Topics covered in this document include:

Configuring VERITAS Storage Foundation

Once you install and initialize all of the VERITAS software, you can take advantage of the various storage management features to ease the task of system and database administration.

Database Configuration Requirements

Most relational database management system (RDBMS) software requires operating system parameters to be set prior to operation. The Oracle database requires modifications to kernel settings before the databases will run correctly. The most critical settings are normally located in the Shared Memory and Semaphore settings on HP-UX. For precise settings, consult your current database installation and configuration documentation.

Setting Administrative Permissions

To allow database administrators to administer a database using VERITAS Storage Foundation, you are required to change some permission settings. During the installation process, you have the opportunity to configure the product. Answering "y" allows you to provide database administrators access to various functionality. If you did not make the permission changes during installation, you can do so at a later time.

The default settings at installation time for the `/opt/VRTSdbed` directory allow only the `root` login to access the directory.

▼ **To allow the user "oracle" access to the /opt/VRTSdbed directory**

Use the `chown` and `chmod` commands, as follows:

```
# chown oracle /opt/VRTSdbed
# chmod 500 /opt/VRTSdbed
```

▼ **To allow users in the group "dba" access to the /opt/VRTSdbed directory**

Use the `chgrp` and `chmod` commands, as follows:

```
# chgrp dba /opt/VRTSdbed
# chmod 550 /opt/VRTSdbed
```

vxtunefs Command Permissions and Cached Quick I/O

By default, you must have superuser (`root`) privileges to use the `/opt/VRTS/bin/vxtunefs` command. The `vxtunefs` command is a tool that lets you change caching policies to enable Cached Quick I/O and change other file system options. Database administrators can be granted permission to change default file system behavior in order to enable and disable Cached Quick I/O. The system administrator must change the `vxtunefs` executable permissions as follows:

```
# chown root:dba /opt/VRTS/bin/vxtunefs
# chmod 4550 /opt/VRTS/bin/vxtunefs
```

Note Setting the permissions for `/opt/VRTS/bin/vxtunefs` to 4550 allows all users in the dba group to use the `vxtunefs` command to modify caching behavior for Quick I/O files.

For more information, see the *VERITAS File System Administrator's Guide.*

Configuring VERITAS Enterprise Administrator

You may need to update VERITAS Enterprise Administrator (VEA) so that users other than `root` can access features.

Adding Users to the VEA Service Console Registry for Oracle

You may want to add users to the VEA server console registry to allow access to the interface to users other than `root`. You also have the option to give database administrators `root` privileges.

▼ **To add users other than root to the VERITAS Enterprise Administrator Service console registry**

1. Make sure that the optional GUI package was installed.

   ```
   # swlist -l product | grep VRTSorgui
   VRTSorgui    4.1        VERITAS Storage Foundation Graphical User
                           Interface for Oracle
   ```

2. Stop the VEA server.

   ```
   # /opt/VRTS/bin/vxsvcctrl stop
   ```

3. To give `root` privileges to the database administrator, use the vxdbedusr command as follows.

   ```
   # /opt/VRTS/bin/vxdbedusr -a user [-A] [-f] -n user_name
   ```

   where:

   -a user adds a user to the registry

   -A grants the user root access

   -f allows the user to be a user other than the /opt/VRTSdbed owner.

   -n indicates the name of the user.

   For example, to add a database administrator with the name "oracle" as a user with `root` privileges, enter the following:

   ```
   # /opt/VRTS/bin/vxdbedusr -a user -A -f -n oracle
   ```

4. To add a user without `root` privileges, use the `vxdbedusr` command as follows.

```
# /opt/VRTS/bin/vxdbedusr -a user -n user_name
```

where `-a` adds a user to the registry.

For example, to add "oracle" as a user, enter the following:

```
# /opt/VRTS/bin/vxdbedusr -a user -n oracle
```

5. To add a group to the console registry, use the `vxdbedusr` command as follows:

```
# /opt/VRTS/bin/vxdbedusr -a group [-A] [-f] -n group_name
```

where:

`-a user` adds a user group to the registry

`-A` grants the user group root access

`-f` allows the group access to the GUI.

For example, to add "dba" as a group, enter the following:

```
# /opt/VRTS/bin/vxdbedusr -a group -A -f -n dba
```

6. Restart the VEA Server.

```
# /opt/VRTS/bin/vxsvcctrl start
```

Removing Users from the VEA Service Console Registry for Oracle

You may need to restrict access to the VEA server console registry. You can remove users or user groups from the registry if they have been previously added.

Note You cannot remove `root` from the VEA console registry.

▼ **To remove users other than root from the VERITAS Enterprise Administrator Service console registry**

1. Make sure that the optional GUI package was installed.

```
# swlist -l product | grep VRTSorgui
VRTSorgui    4.1        VERITAS Storage Foundation Graphical User
                        Interface for Oracle
```

2. Stop the VEA server.

```
# /opt/VRTS/bin/vxsvcctrl stop
```

3. Use the `vxdbedusr` command to remove a group or user.

```
# /opt/VRTS/bin/vxdbedusr -r <user or group> \
  -n <user_name or group_name>
```

where `-r` removes a user or user group from the registry.

For example, to remove the user "oracle," enter the following:

```
# /opt/VRTS/bin/vxdbedusr -r user -n oracle
```

4. Restart the VEA Server.

```
# /opt/VRTS/bin/vxsvcctrl start
```

Starting the VEA Server

After installing the VEA packages, the VEA server needs to be stopped and restarted. To check the state of the VEA server, enter:

```
# /opt/VRTS/bin/vxsvcctrl status
```

To stop the VEA server, enter:

```
# /opt/VRTS/bin/vxsvcctrl stop
```

You can also stop the VEA server manually by killing the `vxsvc` process.

Note The VEA server is automatically started on a reboot.

To start the VEA server, enter:

```
# /opt/VRTS/bin/vxsvcctrl start
```

Starting the VEA Client

Only users with appropriate privileges can run VEA. VEA can administer the local machine or a remote machine. However, VxVM and the VEA server must be installed on the machine to be administered. The VxVM `vxconfigd` daemon and the VEA server must be running on the machine to be administered.

After installing VxVM and VEA and starting the server, start the VEA client in one of the following ways.

HP-UX Operating system

To administer the HP-UX machine, use the following command:

```
# /opt/VRTSob/bin/vea
```

Windows Operating System

To administer a *remote* HP-UX machine from a Windows machine, select **Start** > **Programs** > **VERITAS** > **VERITAS Enterprise Administrator**.

Modifying Connection Access (optional)

To allow users other than *root* to access VEA, set up a group called *vrtsadm* in /etc/group, and add the users to this group. For example, adding the following entry:

```
vrtsadm::600:root,ed
```

will allow the two users, *root* and *ed,* to access VEA.

To specify a group other than *vrtsadm*, you should add the group to /etc/group, modify the Security key and restart the VEA server daemon, as in the following example.

▼ **To modify connection access**

1. Add a new group:

```
# groupadd -g gid veagrp
```

2. Edit /etc/group to add users to the group.

3. Modify the Security key in the registry:

```
# /opt/VRTSob/bin/vxregctl /etc/vx/isis/Registry setvalue \
Software/VERITAS/VxSvc/Current/Version/Security AccessGroups \
REG_SZ veagrp
```

4. Restart the VEA server.

```
# /opt/VRTS/bin/vxsvcctrl restart
```

Configuring VERITAS Volume Manager

This section explains how to set up VxVM enclosure-based naming. To complete further tasks such as disk initialization, please see the *VERITAS Volume Manager System Administrator's Guide.*

Note In releases of VxVM (Volume Manager) prior to 4.1, a system installed with Volume Manager was configured with a default disk group, rootdg, that had to contain at least one disk. By default, operations were directed to the rootdg disk group. From release 4.1 onward, Volume Manager can function without any disk group having been configured. Only when the first disk is placed under Volume Manager control must a disk group be configured. There is no longer a requirement that you name any disk group rootdg, and any disk group that is named rootdg has no special properties by having this name. During the setup procedures, you will be asked if you want to create a default disk group, and asked to specify its name.

Enabling Enclosure-based Naming

Note If you used the VERITAS Installation Menu or the installvm script, you do not need to carry out the instructions in this section. Licensing, configuration of enclosure based naming and creation of a default disk group are managed by the menu installer and the installvm script.

Because you are no longer required to configure VxVM disks straightaway, vxinstall no longer invokes the vxdiskadm program, so it is much simpler than in previous versions, and will cover the following three functions:

◆   Licensing VxVM

◆   Enabling Enclosure-based naming

◆   Setting up a system-wide default group

To run the command, enter:

```
# vxinstall
```

which will prompt you to enter a license key:

```
VxVM INFO V-5-2-1310 Are you prepared to enter a license key
[y,n,q,?] (default: y) y
```

◆   If you don't have a license key, see "VERITAS Product Licensing" on page 4.

Note The presence of certain hardware arrays (for example, A5000) automatically generates a key.

The vxinstall program then asks if you want to use enclosure-based naming:

```
VxVM INFO V-5-2-1341 Do you want to use enclosure based names for
all disks ?
[y,n,q,?] (default: n)
```

After installation, disks use the traditional naming format, usually c#t#d#s#. Enclosure-based naming provides an alternative that allows disk devices to be named for enclosures rather than for the controllers through which they are accessed. In a Storage Area Network (SAN) that uses Fibre Channel hubs or fabric switches, information about disk location provided by the operating system may not correctly indicate the physical location of the disks. Enclosure-based naming allows Volume Manager to access enclosures as separate physical entities. By configuring redundant copies of your data on separate enclosures, you can safeguard against failure of one or more enclosures.

If you want to use enclosure-based naming, enter 'y' and vxinstall asks you whether you want to set up a systemwide default disk group:

```
Do you want to setup a system wide default disk group ?
```

[y,n,q,?] (default: y)

VxVM will continue with the question:

```
Which disk group ?
```

If you know the name of the disk group that you want to use as the default disk group, enter it at the prompt, or use the list option and make a selection.

In releases prior to Volume Manager 4.1, the default disk group was rootdg (the *root disk group*). For Volume Manager to function, the rootdg disk group had to exist and it had to contain at least one disk. This requirement no longer exists, however you may find it convenient to create a system-wide default disk group. For operations that require a disk group, the system-wide default disk group will be used if the VxVM command is not specified with the -g option. The main benefit of creating a default disk group is that VxVM commands default to the default disk group and you will not need to use the -g option. To verify the default disk group after it has been created, enter the command:

vxdg defaultdg

Note VxVM does not allow you use the following names for the default disk group because they are reserved words: bootdg, defaultdg and nodg.

At this stage, the installation of VxVM is complete. To complete further tasks such as disk initialization, please see the *VERITAS Volume Manager Administrator's Guide.*

Using Storage Expert

System administrators often find that gathering and interpreting data about large and complex configurations can be a difficult task. VERITAS Storage Expert (*vxse*) is designed to help in diagnosing configuration problems with VxVM.

Storage Expert consists of a set of simple commands that collect VxVM configuration data and compare it with "best practice." Storage Expert then produces a summary report that shows which objects do not meet these criteria and makes recommendations for VxVM configuration improvements. These user-configurable tools help you as an administrator to verify and validate systems and non-optimal configurations in both small and large VxVM installations. Storage Expert components include a set of rule scripts and a rules engine. The rules engine runs the scripts and produces ASCII output, which is organized and archived by Storage Expert's report generator. This output contains information about areas of VxVM configuration that do not meet the set criteria. By default, output is sent to the screen, but you can redirect it to a file using standard UNIX redirection. For more information on using Storage Expert, see the *VERITAS Volume Manager System Administrator's Guide.*

Starting and Enabling the Configuration Daemon

The VxVM configuration daemon (`vxconfigd`) maintains VxVM disk and disk group configurations. The `vxconfigd` communicates configuration changes to the kernel and modifies configuration information stored on disk.

Startup scripts usually invoke `vxconfigd` at system boot time. The `vxconfigd` daemon must be running for VxVM to operate properly.

The following procedures describe how to check that `vxconfigd` is started, whether it is enabled or disabled, how to start it manually, or how to enable it as required.

To determine whether `vxconfigd` is enabled, use the following command:

```
# vxdctl mode
```

The following message indicates that the `vxconfigd` daemon is running and enabled:

```
mode: enabled
```

This message indicates that `vxconfigd` is not running:

```
mode: not-running
```

To start the `vxconfigd` daemon, enter the following command:

```
# vxconfigd
```

This message indicates that `vxconfigd` is running, but not enabled:

```
mode: disabled
```

To enable the volume daemon, enter the following command:

```
# vxdctl enable
```

Once started, vxconfigd automatically becomes a background process.

By default, vxconfigd writes error messages to the console. However, you can configure it to write errors to a log file. For more information, see the vxconfigd(1M) and vxdctl(1M) manual pages.

Starting Volume I/O Daemons

The volume I/O daemon (vxiod) provides extended I/O operations without blocking calling processes. Several vxiod daemons are usually started at system boot time after initial installation, and they should be running at all times. The procedure below describes how to verify that the vxiod daemons are running, and how to start them if necessary.

To verify that vxiod daemons are running, enter the following command:

```
# vxiod
```

Note The vxiod daemon is a kernel thread and is not visible using the ps command.

If, for example, 10 vxiod daemons are running, the following message displays:

```
10 volume I/O daemons running
```

where 10 is the number of vxiod daemons currently running. If no vxiod daemons are currently running, start some by entering this command:

```
# vxiod set 10
```

where 10 is the desired number of vxiod daemons. It is recommended that at least one vxiod daemon should be run for each CPU in the system.

For more information, see the vxiod(1M) manual page.

Adding New Array Support

After installation, add any disk arrays that are unsupported by VERITAS to the JBOD category as described in the section "Hot-Relocation" on page 63.

Hot-Relocation

Hot-relocation automatically restores redundancy and access to mirrored and RAID-5 volumes when a disk fails. This is done by relocating the affected subdisks to disks designated as spares and/or free space in the same disk group.

The hot-relocation feature is enabled by default. The associated daemon, `vxrelocd`, is automatically started during system startup.

Follow these recommendations:

1. Leave the VxVM hot-relocation feature enabled to detect disk failures automatically. It will notify you of the nature of the failure, attempt to relocate any affected subdisks that are redundant, and initiate recovery procedures.

2. Configure at least one hot-relocation spare disk in each disk group. This will allow sufficient space for relocation in the event of a failure.

If you decide to disable hot-relocation, prevent `vxrelocd` from running after you load the VxVM software. See the section "Modifying the behavior of Hot-Relocation" in Chapter 9 of the *VERITAS Volume Manager Administrator's Guide* for details.

Placing Disks in another Disk Group

To place disks in another disk group, use VEA or the `vxdiskadm` program after completing the `vxinstall` program. See the *VERITAS Volume Manager Administrator's Guide* for information on how to create other disk groups for your disks.

Adding Disks After Initialization

Disks that are not initially placed under VxVM control by the `vxinstall` program can be added later using another VxVM interface (such as VEA or the `vxdiskadm` program). See the *VERITAS Volume Manager Administrator's Guide* for details.

Protecting Your System and Data

A disk failure can cause loss of data on the failed disk and loss of access to your system. Loss of access is due to the failure of a key disk used for system operations. VxVM can protect your system from these problems.

To maintain system availability, data important to running and booting your system must be mirrored. The data must be preserved so it can be used in case of failure.

The following are suggestions for protecting your system and data:

- Place the disk containing the root file system (the root or boot disk) under VxVM control.

- Mirror the root disk so that an alternate root disk exists for booting purposes. By mirroring disks critical to booting, you ensure that no single disk failure leaves your system unbootable and unusable.

  For maximum availability of the system, create mirrors for the rootvol, swapvol, usr, and var volumes. For more information, see the *VERITAS Volume Manager Troubleshooting Guide*.

- Use mirroring to protect data against loss from a disk failure. To preserve data, create and use mirrored volumes that have at least two data plexes. The plexes must be on different disks. If a disk failure causes a plex to fail, the data in the mirrored volume still exists on the other disk.

- Leave the VxVM hot-relocation feature enabled to detect disk failures automatically. It will notify you of the nature of the failure, attempt to relocate any affected subdisks that are redundant, and initiate recovery procedures. Configure at least one hot-relocation spare disk in each disk group. This will allow sufficient space for relocation in the event of a failure.

  If the root disk is mirrored, hot-relocation can automatically create another mirror of the root disk if the original root disk fails. The rootdg must contain enough contiguous spare or free space for the volumes on the root disk (rootvol and swapvol volumes require contiguous disk space).

- Use the DRL feature to speed up recovery of mirrored volumes after a system crash. Make sure that each mirrored volume has at least one log subdisk.

Note rootvol, swapvol, and usr volumes cannot be DRL volumes.

- Use logging to prevent corruption of recovery data in RAID-5 volumes. Make sure that each RAID-5 volume has at least one log plex.

- Perform regular backups to protect your data. Backups are necessary if all copies of a volume are lost or corrupted. Power surges can damage several (or all) disks on your system. Also, typing a command in error can remove critical files or damage a file system directly. Performing regular backups ensures that lost or corrupted data is available to be retrieved.

Enabling Cluster Support in VxVM (Optional)

This release includes an *optional* cluster feature that enables VxVM to be used in a cluster environment. The cluster functionality in VxVM allows multiple hosts to simultaneously access and manage a set of disks under VxVM control. A *cluster* is a set of hosts sharing a set of disks; each host is referred to as a *node* in the cluster.

> **Note** The VxVM cluster feature requires a license, which can be obtained from your Customer Support channel.

▼ **To enable the cluster functionality in VxVM**

1. Obtain a license for the VxVM cluster feature.

2. Install the software packages onto each system (node) to be included in the cluster as described in "Installing the VERITAS Storage Foundation 4.1 Software" on page 28 and "Installing the VEA Client" on page 48.

3. Initialize VxVM using the procedures described in "Configuring VERITAS Volume Manager" on page 59.

4. Start VEA as described in "Starting the VEA Server" on page 57 and "Starting the VEA Client" on page 57.

5. Configure shared disks as described in "Configuring Shared Disks" on page 65.

Configuring Shared Disks

If you are installing VxVM for the first time or adding disks to an existing cluster, you need to configure new shared disks. If you are upgrading VxVM, verify that your shared disks still exist.

The shared disks should be configured from one node only. Since the VxVM software cannot tell whether a disk is shared or not, you must specify which are the shared disks.

Make sure that the shared disks are not being accessed from another node while you are performing the configuration. If you start the cluster on the node where you perform the configuration only, you can prevent disk accesses from other nodes because the quorum control reserves the disks for the single node.

Configuring New Disks

Use this procedure if you are installing and setting up VxVM for the first time.

▼ **To configure new shared disks**

1. Start the cluster on at least one node.

2. On one node, run the `vxdiskadm` program and choose option 1 to initialize new disks. When asked to add these disks to a disk group, choose `none` to leave the disks for future use.

3. On other nodes in the cluster, run `vxdctl enable` to see the newly initialized disks.

4. From the master node, create disk groups on the shared disks. To determine if a node is a master or slave, run `vxdctl -c mode`.

   Use the `vxdg` program or VEA to create disk groups. In the `vxdg` program, use the `-s` option to create shared disk groups.

5. From the master node only, use `vxassist` or VEA to create volumes in the disk groups.

Note The volumes must be of type `gen`. Do not create RAID-5 volumes. Before creating any log subdisks, read the section on DRL in the *VERITAS Volume Manager Adminstrator's Guide.*

6. If the cluster is only running with one node, bring up the other cluster nodes. Enter the `vxdg list` command on each node to display the shared disk groups.

Verifying Existing Shared Disks

Use this procedure if you are upgrading from a previous release of VxVM or a Storage Foundation product.

▼ **To verify that your shared disk groups still exist**

1. Start the cluster on all nodes.

2. Enter the following command on all nodes:

   ```
   # vxdg list
   ```

   This displays the existing shared disk groups.

Converting Existing VxVM Disk Groups to Shared Disk Groups

Use this procedure if you are upgrading from VxVM 3.x to VxVM 4.1 (or Storage Foundation 3.x to a Storage Foundation product at the 4.1 level) and you want to convert existing disk groups to shared disk groups.

▼ **To convert existing disk groups to shared disk groups**

1. Start the cluster on at least one node.

   For a two-node cluster, start the cluster on one node; for a four-node cluster, start the cluster on three nodes.

2. Configure the disk groups using the following procedure.

   To list all disk groups, use the following command:

   ```
   # vxdg list
   ```

   To deport disk groups to be shared, use the following command:

   ```
   # vxdg deport disk_group_name
   ```

   To import disk groups to be shared, use the following command on the master node:

   ```
   # vxdg -s import disk_group_name
   ```

   This procedure marks the disks in the shared disk groups as shared and stamps them with the ID of the cluster, enabling other nodes to recognize the shared disks.

   If dirty region logs exist, ensure they are active. If not, replace them with larger ones.

   To display the shared flag for all the shared disk groups, use the following command:

   ```
   # vxdg list
   ```

   The disk groups are now ready to be shared.

3. If the cluster is only running with one node, bring up the other cluster nodes. Enter the vxdg list command on each node to display the shared disk groups. This command displays the same list of shared disk groups displayed earlier.

4. For information on upgrading in a Cluster Volume Manager (CVM) environment, see the *VERITAS Storage Foundation Cluster File System Installation and Administration Guide.*

Upgrading in a Clustered Environment with FastResync Set

If there are volumes in the shared disk groups with FastResync set (`fastresync=on`), before beginning the upgrade procedure, reattach each snapshot to its data volume, using this procedure:

▼ **To upgrade in a clustered environment when FastResync is set**

1. You should run this procedure from the master node; to find out if you are on the master node, enter the command:

   # `vxdctl -c mode`

2. On the master node, list which disk groups are shared by entering:

   # `vxdg -s list`

3. Using the diskgroup names displayed by the previous command, list the disk groups that have volumes on which FastResync is set:

   # `vxprint -g diskgroup -F "%name" -e "v_fastresync"`

4. Reattach each snapshot:

   # `vxassist -g diskgroup -o nofmr snapback snapshot_volume`

5. If you are upgrading from VxVM 3.5 Maintenance Patch 3 or from VxVM 3.2 Maintenance Patch 5, set FastResync to off for each volume:

   # `vxvol -g diskgroup set fastresync=off volume`

Configuring VERITAS File System

After installing VERITAS File System, you can create a file system on a disk slice or VERITAS Volume Manager volume with the `mkfs` command. Before you can use this file system, you must mount it with the `mount` command. You can unmount the file system later with the `umount` command. A file system can be automatically mounted at system boot time if you add an entry for it in the `/etc/fstab` file.

The VERITAS-specific commands are described in the VERITAS File System guides and online manual pages. See the Quick Start Guide Reference chapter of the *VERITAS File System Administrator's Guide* for examples of the most common VxFS operating procedures.

Uninstalling the VERITAS Software   **4**

This chapter covers uninstallation requirements and steps to uninstall the VERITAS software.

Once you uninstall VERITAS Volume Manager, you will be left without volume management software on your machine.

Note The information in "Uninstalling VERITAS Storage Foundation Packages" on page 76 pertains to VERITAS Storage Foundation and VERITAS Storage Foundation *for Oracle*.

Topics covered in this document include:

Summary of VERITAS Storage Foundation Uninstallation Tasks

Uninstallation of VERITAS Storage Foundation products consists of the following tasks:

- ◆ Shutting down cluster operations.
- ◆ Removing the root disk from VxVM control.
- ◆ Removing VxFS file systems and Storage Checkpoints.
- ◆ Moving volumes to disk partitions.
- ◆ Removing the VERITAS Storage Foundation.
- ◆ Removing the VERITAS infrastructure packages.
- ◆ Removing the license files (optional).

Caution	Failure to follow the instructions in the following sections may result in unexpected behavior.

See "Uninstalling the VERITAS Enterprise Administrator Client" on page 78 for instructions on how to uninstall the VEA client from a Windows system.

Shutting Down Cluster Operations

If the systems are running as an HA cluster, use the following command to take all service groups offline, and shut down VCS:

```
# /opt/VRTSvcs/bin/hastop -all
```

Note	Do not use the -force option when executing hastop. This will leave all service groups online and shut down VCS, causing undesired results during uninstallation of the packages.

Removing the Root Disk from VxVM Control

If the system's root disk is under VxVM control, use the following command to copy its contents to a new LVM root disk:

```
# /etc/vx/bin/vxres_lvmroot -v -b [-p c#t#d#2,c#t#d#3,...] c#t#d#
```

where `c#t#d#` is the access name of the new LVM root disk. If the root disk volumes are distributed over several disks, use the `-p` option to specify a comma-separated list of additional disks that are to be used to set up the LVM root volume group. The operation to clone a new LVM root volume group can take some time, so the `-v` (verbose) option is specified to show how far this has progressed.

Moving Volumes to Disk Partitions

All volumes must be moved to disk partitions. This can be done using one of these 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

▼ **To move volumes to disk partitions**

1. Evacuate disks using `vxdiskadm`, the GUI, or the `vxevac` script.

   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 VERITAS Volume Manager control by entering:

   ```
   # vxdg rmdisk diskname
   # vxdisk rm devname
   ```

3. Decide which volume to move first, and if the volume 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 you have applied the `sync` command to the data on the volume.

5. Create a partition on free disk space of the same size as the volume using the `format` command.

   If there is not enough free space for the partition, add a new disk to the system for the first volume removed. Subsequent volumes can use the free space generated by the removal of this first volume.

6. Copy the data on the volume onto the newly created disk partition using a command such as `dd`.

   ```
   # dd if=/dev/vx/dsk/diskgroup/lhome of=/dev/dsk/c2t2d2
   ```

   where `c2t2d2` is the disk outside of Volume Manager and `s7` is the newly created partition.

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. Remove the volume from VERITAS Volume Manager using the command.

   ```
   # vxedit -rf rm volume_name
   ```

10. Remove any free disks (those having no subdisks defined on them) by removing the volumes from VERITAS Volume Manager control.

    To check if there are still some subdisks remaining on a particular disk, use the `vxprint` command.

    ```
    # vxprint -F '%sdnum' diskname
    ```

    If the output is not 0, there are still some subdisks on this disk that you need to remove. If the output is 0, remove the disk from VERITAS Volume Manager control.

    ```
    # vxdg rmdisk diskname
    # vxdisk rm devname
    ```

    Use the free space created for adding the data from the next volume you want to remove.

11. After you successfully convert all volumes into disk partitions, reboot the system.

12. After the reboot, make sure none of the volumes are open by using the `vxprint` command.

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

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

Example

This example shows how to move the data on a volume to a disk partition. In the example, there are three disks: `disk1` and `disk2` are subdisks on volume `vol01` and `disk3` is a free disk. The data on `vol01` is copied to `disk3` using `vxevac`.

Diskgroup `voldg` content before the data on `vol01` is copied to `disk3`.

```
# vxprint -g voldg -ht
DG NAME          NCONFIG      NLOG     MINORS   GROUP-ID
DM NAME          DEVICE       TYPE     PRIVLEN  PUBLEN   STATE
RV NAME          RLINK_CNT    KSTATE   STATE    PRIMARY  DATAVOLS   SRL
RL NAME          RVG          KSTATE   STATE    REM_HOST REM_DG     REM_RLNK
V  NAME          RVG          KSTATE   STATE    LENGTH   READPOL    PREFPLEX
UTYPE
PL NAME          VOLUME       KSTATE   STATE    LENGTH   LAYOUT     NCOL/WID
MODE
SD NAME          PLEX         DISK     DISKOFFS LENGTH   [COL/]OFF DEVICE
MODE
SV NAME          PLEX         VOLNAME  NVOLLAYR LENGTH   [COL/]OFF AM/NM
MODE
DC NAME          PARENTVOL    LOGVOL
SP NAME          SNAPVOL      DCO

dg voldg         default      default  115000
1017856044.1141.hostname.veritas.com

dm disk1         c1t12d0 auto:hpdisk  2591     17900352 -
dm disk2         c1t14d0 auto:hpdisk  2591     17899056 -
dm disk3         c1t3d0  auto:hpdisk  2591     17899056 -

v  vol1          -            ENABLED  ACTIVE   4196448  ROUND      -
fsgen
pl pl1           vol1         ENABLED  ACTIVE   4196448  CONCAT     -
RW
sd sd1           pl1          disk1    0        2098224  0          c1t12d0
ENA
sd sd2           pl1          disk2    0        2098224  2098224    c1t14d0
ENA
```

Evacuate `disk1` to `disk3`.

```
# /etc/vx/bin/vxevac -g voldg disk1 disk3
# vxprint -g voldg -ht

DG NAME          NCONFIG      NLOG     MINORS   GROUP-ID
DM NAME          DEVICE       TYPE     PRIVLEN  PUBLEN   STATE
RV NAME          RLINK_CNT    KSTATE   STATE    PRIMARY  DATAVOLS   SRL
RL NAME          RVG          KSTATE   STATE    REM_HOST REM_DG     REM_RLNK
V  NAME          RVG          KSTATE   STATE    LENGTH   READPOL    PREFPLEX
UTYPE
PL NAME          VOLUME       KSTATE   STATE    LENGTH   LAYOUT     NCOL/WID
MODE
SD NAME          PLEX         DISK     DISKOFFS LENGTH   [COL/]OFF DEVICE
```

```
                MODE
SV NAME         PLEX          VOLNAME  NVOLLAYR LENGTH   [COL/]OFF AM/NM
                MODE
DC NAME         PARENTVOL     LOGVOL
SP NAME         SNAPVOL       DCO

dg voldg        default       default  115000
1017856044.1141.hostname.veritas.com

dm disk1        c1t12d0 auto:hpdisk  2591      17900352 -
dm disk2        c1t14d0 auto:hpdisk  2591      17899056 -
dm disk3        c1t3d0  auto:hpdisk  2591      17899056 -

v  vol1         -             ENABLED  ACTIVE   4196448  ROUND      -
fsgen
pl pl1          vol1          ENABLED  ACTIVE   4196448  CONCAT     -
RW
sd disk3-01     pl1           disk3    0        2098224  0          c1t3d0
ENA
sd sd2          pl1           disk2    0        2098224  2098224    c1t14d0
ENA
```

Evacuate `disk2` to `disk3`.

```
# /etc/vx/bin/vxevac -g voldg disk2 disk3
# vxprint -g voldg -ht
```

```
DG NAME         NCONFIG       NLOG     MINORS   GROUP-ID
DM NAME         DEVICE        TYPE     PRIVLEN  PUBLEN   STATE
RV NAME         RLINK_CNT     KSTATE   STATE    PRIMARY  DATAVOLS   SRL
RL NAME         RVG           KSTATE   STATE    REM_HOST REM_DG     REM_RLNK
V  NAME         RVG           KSTATE   STATE    LENGTH   READPOL    PREFPLEX
                UTYPE
PL NAME         VOLUME        KSTATE   STATE    LENGTH   LAYOUT     NCOL/WID
                MODE
SD NAME         PLEX          DISK     DISKOFFS LENGTH   [COL/]OFF DEVICE
                MODE
SV NAME         PLEX          VOLNAME  NVOLLAYR LENGTH   [COL/]OFF AM/NM
                MODE
DC NAME         PARENTVOL     LOGVOL
SP NAME         SNAPVOL       DCO

dg voldg        default       default  115000
1017856044.1141.hostname.veritas.com

dm disk1        c1t12d0 auto:hpdisk  2591      17900352 -
dm disk2        c1t14d0 auto:hpdisk  2591      17899056 -
dm disk3        c1t3d0  auto:hpdisk  2591      17899056 -

v  vol1         -             ENABLED  ACTIVE   4196448  ROUND      -
fsgen
pl pl1          vol1          ENABLED  ACTIVE   4196448  CONCAT     -
RW
sd disk3-01     pl1           disk3    0        2098224  0          c1t3d0
```

```
ENA
sd disk3-02     pl1          disk3     2098224  2098224  2098224  c1t3d0
ENA
```

Remove the evacuated disks from VERITAS Volume Manager control.

```
# vxdisk -g voldg list
DEVICE          TYPE              DISK         GROUP        STATUS
c1t3d0          auto:hpdisk       disk3        voldg        online
c1t12d0         auto:hpdisk       disk1        voldg        online
c1t14d0         auto:hpdisk       disk2        voldg        online

# vxdg rmdisk disk1
# vxdg rmdisk disk2
# vxdisk rm c1t12d0
# vxdisk rm c1t14d0
```

Verify that the evacuated disks have been removed from VERITAS Volume Manager control.

```
# vxdisk -g voldg list
DEVICE          TYPE         DISK        GROUP        STATUS
c1t3d0          auto:hpdisk  disk3       voldg        online
```

Check to see whether the volume you want to move first is mounted.

```
# mount | grep vol1
/vol1 on /dev/vx/dsk/voldg/vol1
read/write/setuid/log/nolargefiles/dev=12dc138 on Wed Apr  3
10:13:11 2002
```

Create a partition on free disk space of the same size as the volume. In this example, a 2G partition is created on disk1 (c1t12d0).

Copy the data on vol01 to the newly created disk partition.

```
# dd if=/dev/vx/dsk/voldg/vol01 of=/dev/dsk/c1t12d0
```

In the /etc/fstab file, remove the following entry.

```
/dev/vx/dsk/voldg/vol1 /dev/vx/rdsk/voldg/vol1 /vol1 vxfs 4  yes rw
```

Replace it with an entry for the newly created partition.

```
/dev/dsk/c1t12d0 /dev/rdsk/c1t12d0 /vol01 vxfs 4  yes rw
```

Mount the disk partition.

```
# mount -F vxfs /dev/dsk/c1t12d0 /vol01
```

Remove vol01 from VERITAS Volume Manager.

```
# vxedit -rf rm /dev/vx/dsk/voldg/vol01
```

To complete the procedure, follow Steps 10 through 12 in the previous section, "Moving Volumes to Disk Partitions" on page 71.

Shutting Down VERITAS Volume Manager

To shut down VERITAS Volume Manager, enter the vxdctl and vxiod commands as follows:

```
# vxdctl stop
# vxiod -f set 0
```

Uninstalling VERITAS Storage Foundation Packages

To shut down and remove the installed VERITAS Storage Foundation packages, use the following commands:

```
# cd /opt/VRTS/install
# ./uninstallsf
```

You can use this command to remove the packages from one or more systems.

Note To remove packages from remote systems, configure ssh or rsh as described in "Prerequisites for Remote and Cluster Installation and Uninstallation" on page 12.

Not all these packages may be installed on your system depending on the choices that you made when you installed VxVM.

If you have obtained a VERITAS product from an electronic download site, the single product download files do not contain the uninstallsf installation script, so you must use the product uninstallation script to uninstall the product. For example, if you download VERITAS Volume Manager, use the uninstallvm script instead of the uninstallsf script.

Uninstalling VERITAS Infrastructure Packages

There are several packages, referred to as *infrastructure* packages, that are used by multiple VERITAS products. These packages are not removed when uninstalling a single VERITAS product. If you remove all VERITAS products from a system and want to ensure that there are no remaining VERITAS packages, use the following commands:

```
# cd /opt/VRTS/install
# ./uninstallinfr
```

The uninstallinfr script removes the remaining packages that are required for product installation. The VERITAS Enterprise Administrator packages, VRTSob and VRTSobgui, are also removed.

To verify whether any VERITAS software packages remain on your system, use the following command:

```
# swlist | grep VRTS
```

Removing License Files (Optional)

▼ **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 unwanted key files listed in step 2. Unwanted keys may be deleted by removing the license key file.

Uninstalling the VERITAS Enterprise Administrator Client

You should also remove the client software from any machines you used to access the VERITAS software.

▼ **To remove the VEA client from an HP-UX system other than the server**

1. Stop the VEA Service.

   # **/opt/VRTS/bin/vxsvcctrl stop**

2. Use the swremove command to remove the VRTSobgui software package.

   # **swremove VRTSobgui**

▼ **To remove the VEA client from a Windows system**

1. Log in as the database administrator.

2. Select **Start** > **Settings** > **Control Panel**.

3. Double-click **Add/Remove Programs** to display a list of installed products.

4. Select **VERITAS Enterprise Administrator** from the list, and click the **Remove** button.

5. Click **Yes** when a dialog box appears asking you to confirm the removal.

Uninstalling VERITAS Volume Manager

This section describes how to uninstall VERITAS Volume Manager and the product license. To uninstall VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle*, see ".

▼ **To uninstall VERITAS Volume Manager**

1. Log in as superuser.

2. Run the installer command to uninstall VERITAS Volume Manager. For example:

```
# cd /dvdrom
# ./installer
```

3. From the product installer, choose the **U** option for Uninstall, and select **VERITAS Volume Manager**.

4. Enter one or more system names from which VERITAS Volume Manager is to be uninstalled. For example:

```
Enter the system names separated by spaces on which to uninstall
VxVM: system01
```

5. After the system check completes successfully, press **Return** to continue.

6. Enter **y** to uninstall the VxVM packages. For example:

```
Are you sure you want to uninstall VxVM packages? [y,n,q] (y)
```

7. After uninstallation completes, reboot the system.

```
# /sbin/usr/shutdown -r -y now
```

Installation Script Options A

If you choose to install using the product installation script or if you obtained a VERITAS product from an electronic download site, which does not include the product installer, you have several script options. This appendix describes those options.

If you download VERITAS Storage Foundation or VERITAS Storage Foundation *for Oracle*, use the installsf script (**./installsf** at the prompt).

The following options apply to all VERITAS Storage Foundation products.

Options for the Installation Script

The following options are available when using the product installation script. For an initial install or upgrade, options are not usually required.

Available Command Line Options

Command Line Option	Function
–configure *system1 system2...*	Configures the product after installing using the -installonly option.
–installonly *system1 system2...*	Installs packages, but does not configure the product.
–license *system1 system2...*	Updates or installs a product license.
–nolic *system1 system2...*	Installs product packages without licensing or configuring. Licensed features are not installed when using this option.

Available Command Line Options

Command Line Option	Function
–patchpath *patch_path*	Designates a path to VERITAS patches. Used for cluster updates. This option enables the installation of patches without having to copy them to all systems in a cluster. *patch_path* must be a full path name, typically to an NFS-mounted location, that contains the patches to be installed on all systems by any cluster product installation script.
–pkgpath *package_path*	Designates a path to VERITAS packages. Used for cluster installations. This option enables the installation of packages without having to copy them to all systems in a cluster. *package_path* must be a full path name, typically to an NFS-mounted location, that contains the packages to be installed on all systems by any cluster product installation script.
–precheck *system1 system2...*	Performs a preinstallation check to determine if systems meet all installation requirements.
–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. For more information, see "Using a Response File With the Installation Script" on page 83.
–systems *system1 system2...*	Specifies the systems to be installed.
–tmppath *tmp_path*	Selects a directory other than `/var/tmp` as the working directory for the installation scripts. This destination is where initial logging is performed and where packages are copied on remote systems before installation.
–usessh	Specifies when the secure shell (`ssh`) or secure copy (`scp`) programs are used for communication between systems instead of `rsh` and `rcp`. The `-usessh` option requires that systems be preconfigured to allow execution of secure commands without prompting for passwords or confirmations.

Using a Response File With the Installation Script

To use a response file for a fresh installation, you can use any text editor to create a file similar to the following:

```
#
# installsf configuration values:
#
$CFG{DONOTINSTALL}=[];
$CFG{DONOTREMOVE}=[];
$CFG{INSTALL}{AUTOSTART}=1;
$CFG{INSTALL}{SIMULTANEOUS}=0;
$CFG{INSTALL}{SYSTEMS}=["system_name"];
$CFG{INSTALL}{USESSH}=0;
$CFG{KEYS}{system_name}=[];
$CFG{NEWNAMES_FILE}{system_name}=0;
$CFG{VM_RESTORE_CFG}{system_name}=1;
```

Refer to the following table for descriptions of the response file variables:

Response File Variable Explanations

Response File Variable	Description
CFG{DONOTINSTALL}{package_name}	Optional, two-dimensional list variable that instructs the installation script to either install or not install the optional packages designated in the list. A **1** (one) indicates that the optional packages will be installed and a **0** (zero) indicates that the optional packages will not be installed.
CFG{DONOTREMOVE}{package_name}	Optional, two-dimensional list variable that instructs the installation script to either remove the existing packages in the list and install new packages or to leave the existing packages on the system and skip installation of the new packages. A **1** (one) indicates that the existing packages will not be removed and a **0** (zero) indicates that the existing packages will be removed.
CFG{INSTALL}{AUTOSTART}	Optional, one-dimensional scalar variable that defines whether the product is to be started following installation. A **1** (one) indicates that the system will be restarted and a **0** (zero) indicates that the system will not be restarted.

Response File Variable Explanations

Response File Variable	Description
CFG{INSTALL}{SIMULTANEOUS}	Optional, one-dimensional scalar variable that defines whether the product is to be installed on systems simultaneously or consecutively. A **1** (one) indicates that the installation will be simultaneous and a **0** (zero) indicates that the installation will be consecutive.
CFG{INSTALL}{SYSTEMS}	Required, one-dimensional list variable that defines the list of systems on which the product will be installed.
CFG{INSTALL}{USESSH}	Optional, one-dimensional scalar variable that defines whether ssh and scp are configured or rsh is configured for execution of the local or remote installation. A **1** (one) indicates that ssh and scp are configured and a **0** (zero) indicates that rsh is configured.
CFG{KEYS}{*system_name*}	Optional, two-dimensional scalar variable that defines the product keys to be registered on a system. This variable is not necessary if the system already has a license key installed.
CFG{NEWNAMES_FILE}{*system_name*}	Optional, one-dimensional scalar variable that defines whether enclosure-based naming is being used or not. A **1** (one) indicates enclosure-based naming is being used and a **0** (zero) indicates that enclosure-based naming is not being used.
CFG{SFORA_USERNAME}{*system_name*} For an installsfora installation only.	An optional, two-dimensional scalar variable that defines the user name of the database administrator.
CFG{SFORA_GROUPNAME}{*system_name*} For an installsfora installation only.	An optional, two-dimensional scalar variable that defines the group name for the database administrators (DBAs).

Response File Variable Explanations

Response File Variable	Description
CFG{VM_RESTORE_CFG}{system_name}	Optional, one-dimensional scalar variable that determines whether a previously-existing configuration of VERITAS Volume Manager will be restored or not. A **1** (one) indicates that the configuration will be restored and a **0** (zero) indicates that the configuration will not be restored.
CFG{INSTALL}{SYSTEMSCONFIG}	Optional, one-dimensional list variable that defines the list of systems to be recognized for configuration when a secure environment prevents all systems from being installed simultaneously.

When you perform an interactive installation of a VERITAS Storage Foundation product using the installation script, a response file is automatically generated in the /opt/VRTS/install/logs directory. The file name is generated as installer*number*.response, where the number is random. You can use this response file for future installations on the same machine.

Note If you installed to a remote system, the response file will be generated on that system.

Sample Output   B

This appendix provides a sample of the output from an installation of VERITAS Storage Foundation.

Note Use this example for reference only—the output for each operating system version and installation environment differs slightly.

Sample Installation Output

To invoke the common installer and install the software, enter the following command after mounting the disc:

```
# cd /dvdrom
# ./installer
```

Follow the prompts to install the appropriate Storage Foundation product.

Note The following output is an example of a VERITAS Storage Foundation *for Oracle* Enterprise HA installation.

```
       VERITAS Storage Foundation and High Availability Solutions 4.1

VERITAS Product                          Version Installed   Licensed
======================================================================
Cluster Server                               no                 no
File System                                  3.5                yes
Volume Manager                               3.5                yes
Volume Replicator                            no                 no
Storage Foundation                           no                 no
Storage Foundation for Oracle                no                 no
Storage Foundation Cluster File System       no                 no
Storage Foundation for Oracle RAC            no                 no
```

```
Selection Menu:

    I) Install/Upgrade a Product    C) Configure an Installed Product
    L) License a Product            P) Perform a Preinstallation Check
    U) Uninstall a Product          D) View a Product Description
    Q) Quit                         ?) Help

Enter a Selection: [I,C,L,P,U,D,Q,?]   I

       VERITAS Storage Foundation and High Availability Solutions 4.1

    1)   VERITAS Cluster Server
    2)   VERITAS File System
    3)   VERITAS Volume Manager
    4)   VERITAS Volume Replicator
    5)   VERITAS Storage Foundation, Storage Foundation for Oracle
    6)   VERITAS Storage Foundation Cluster File System
    7)   VERITAS Storage Foundation for Oracle RAC
    B)     Back to previous menu

Select a product to install: [1-7,b,q] 5

          VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

Enter the system names separated by spaces on which to install SF:
host1

    Checking OS version on host1 ....................... HP-UX B.11.23
    Checking for patch PHKL_31500 .......................... installed
    Checking for patch PHKL_32272 .......................... installed
    Checking for patch PHKL_32425 .......................... installed
    Checking for patch PHKL_32430 .......................... installed
    Checking for patch PHKL_32431 .......................... installed
    Checking for patch PHCO_32385 .......................... installed
    Checking for patch PHCO_32387 .......................... installed
    Checking for patch PHCO_32388 .......................... installed
    Checking for patch PHCO_32389 .......................... installed
    Checking for patch PHCO_32390 .......................... installed
    Checking for patch PHCO_32391 .......................... installed
    Checking for patch PHCO_32392 .......................... installed
    Checking for patch PHCO_32393 .......................... installed
    Checking for patch PHCO_32523 .......................... installed
    Checking for patch PHCO_32524 .......................... installed
    Checking for patch PHCO_32551 .......................... installed
    Checking for patch PHCO_32552 .......................... installed
    Checking for patch PHCO_32488 .......................... installed
    Checking for patch PHCO_32596 .......................... installed
```

```
    Checking for patch PHCO_32608 ......................... installed
    Checking for patch PHCO_32609 ......................... installed
    Checking for patch PHCO_32610 ......................... installed
    Checking for patch PHCO_32611 ......................... installed
    Checking for patch DiskQuota-Enh ...................... installed
    Checking for patch FSLibEnh ........................... installed
    Checking for patch FSCmdsEnh .......................... installed

Initial system check completed successfully.


Press [Return] to continue:

            VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM


VERITAS Infrastructure package installation:


Installing VERITAS Infrastructure packages on host1:

    Checking VRTScpi package ................... version 4.1 installed
    Checking VRTSvlic package ............ version 3.02.006c installed


VERITAS Infrastructure packages installed successfully.


Press [Return] to continue:

            VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM


SF Licensing Verification:

    Checking SF license key on host1 .................... not licensed
Enter a SF license key for host1: [?] (customer must enter license key
here)
XXXX-XXXX-XXXX-XXX

Registering VERITAS Storage Foundation for Oracle PERMANENT key on
host1

Do you want to enter another license key for host1? [y,n,q,?] (n) n

SF licensing completed successfully.

Press [Return] to continue:

VERITAS software for Oracle database will be installed automatically

Press [Return] to continue:
```

```
                  VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

       installer can install the following optional SF packages:

       VRTSobgui    VERITAS Enterprise Administrator
       VRTSvmdoc    VERITAS Volume Manager Documentation
       VRTSfsdoc    VERITAS File System Documentation
       VRTSap       VERITAS Action Provider
       VRTStep      VERITAS Task Provider
       VRTSvrdoc    VERITAS Volume Replicator Documentation
       VRTSvrw      VERITAS Volume Replicator Web Console
       VRTSodm      VERITAS Oracle Disk Manager

           1)   Install all of the optional packages
           2)   Install none of the optional packages
           3)   View package descriptions and select optional packages

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

                VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

       installer will install the following SF packages:

       VRTSperl     VERITAS Perl 5.8.0 Redistribution
       VRTSob       VERITAS Enterprise Administrator Service
       VRTSobgui    VERITAS Enterprise Administrator
       VRTSvxvm     VERITAS Volume Manager Binaries
       VRTSalloc    VERITAS Volume Manager Intelligent Storage Provisioning
       VRTSvmpro    VERITAS Volume Manager Management Services Provider
       VRTSddlpr    VERITAS Device Discovery Layer Services Provider
       VRTSfspro    VERITAS File System Management Services Provider
       VRTSvmdoc    VERITAS Volume Manager Documentation
       VRTSvxfs     VERITAS File System
       VRTSfsman    VERITAS File System Manual Pages
       VRTSfsdoc    VERITAS File System Documentation
       VRTSap       VERITAS Action Provider
       VRTStep      VERITAS Task Provider
       VRTSvrdoc    VERITAS Volume Replicator Documentation
       VRTSvcsvr    VERITAS Cluster Server Agents for VVR
       VRTSvrmcsg   MC/ServiceGuard Agent for VVR
       VRTSjre      VERITAS Java Runtime Environment Redistribution
       VRTSweb      VERITAS Java Web Server

       Press [Return] to continue:
       ...continued:
```

```
VRTSvrw      VERITAS Volume Replicator Web Console
VRTSvrpro    VERITAS Volume Replicator Client Extension and Provider
             for VERITAS Enterprise Administrator
VRTSdbed     VERITAS Storage Foundation for Oracle
VRTSodm      VERITAS Oracle Disk Manager
VRTSvxmsa    VERITAS Mapping Service, Application Libraries
VRTSorgui    VERITAS Storage Foundation Graphical User Interface for
             Oracle
VRTSvail     VERITAS Array Provider


Press [Return] to continue:

         VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM


Checking system installation requirements:


Checking SF installation requirements on host1:

    Checking VRTSperl package ............... version 4.0.11 installed
    Checking VRTSob package .......... version 3.2.532.0.001 installed
    Checking VRTSobgui package ....... version 3.2.532.0.001 installed
    Checking VRTSvxvm package ........................ not installed
    Checking VRTSalloc package ................. version 4.1 installed
    Checking VRTSvmpro package .................version 4.1 installed
    Checking VRTSddlpr package ................. version 4.1 installed
    Checking VRTSfspro package ................. version 4.1 installed
    Checking VRTSvmdoc package ....................... not installed
    Checking VRTSvxfs package ........................ not installed
    Checking VRTSfsman package ................. version 4.1 installed
    Checking VRTSfsdoc package ....................... not installed
    Checking VRTSap package .......................... not installed
    Checking VRTStep package ......................... not installed
    Checking VRTSvrdoc package ....................... not installed
    Checking VRTSvcsvr package ................. version 4.1 installed
    Checking VRTSvrmcsg package ................ version 4.1 installed
    Checking VRTSjre package ................... version 1.4 installed
    Checking VRTSweb package ................... version 4.2 installed
    Checking VRTSvrw package ......................... not installed
    Checking VRTSvrpro package ................. version 4.1 installed
    Checking VRTSdbed package .................. version 4.1 installed
    Checking VRTSodm package ......................... not installed
    Checking VRTSvxmsa package ............... version 4.2.1 installed
    Checking VRTSorgui package ................. version 4.1 installed
    Checking VRTSvail package .............. version 4.2.48 installed
    Checking file system space ............ required space is available
    Checking odm driver ................................. not running
```

Installation requirement checks completed successfully.

Press [Return] to continue:

               VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

It is possible to install SF packages without performing
configuration.

It is optional to configure SF now. If you choose to configure SF
later, you can either do so manually or run the installsf
-configure command.
Are you ready to configure SF? [y,n,q] (y) **y**

               VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

Installing Storage Foundation for Oracle 4.1 on host1:

Installing VRTSvxvm 4.1%2005_03_15_unixvm/ga4_1_maint on host1 .. Done
                                                 1 of 23 steps
Installing VRTSalloc 4.1 on host1 .... Done 2 of 23 steps
Installing VRTSvmpro 4.1 on host1 .... Done 3 of 23 steps
Installing VRTSddlpr 4.1 on host1 .... Done 4 of 23 steps
Installing VRTSfspro 4.1 on host1 .... Done 5 of 23 steps
Installing VRTSvmdoc 4.1 on host1 .... Done 6 of 23 steps
Installing VRTSvxfs 4.1 on host1 .... Done 7 of 23 steps
Installing VRTSfsman 4.1 on host1 .... Done 8 of 23 steps
Installing VRTSfsdoc 4.1 on host1 .... Done 9 of 23 steps
Installing VRTSap 2.00.023 on host1 .... Done 10 of 23 steps
Installing VRTStep 1.20.028 on host1 .... Done 11 of 23 steps
Installing VRTSvrdoc 4.1 on host1 .... Done 12 of 23 steps
Installing VRTSvcsvr 4.1 on host1 .... Done 13 of 23 steps
Installing VRTSvrmcsg 4.1 on host1 .... Done 14 of 23 steps
Installing VRTSjre 1.4 on host1 .... Done 15 of 23 steps
Installing VRTSweb 4.2 on host1 .... Done 16 of 23 steps
Installing VRTSvrw 4.1 on host1 .... Done 17 of 23 steps
Installing VRTSvrpro 4.1 on host1 .... Done 18 of 23 steps
Installing VRTSdbed 4.1 on host1 .... Done 19 of 23 steps
Installing VRTSodm 4.1 on host1 .... Done 20 of 23 steps
Installing VRTSvxmsa 4.2.1 on host1 .... Done 21 of 23 steps
Installing VRTSorgui 4.1 on host1 .... Done 22 of 23 steps
Installing VRTSvail 4.2.48 on host1 .... Done 23 of 23 steps

```
Storage Foundation for Oracle installation completed successfully.

Press [Return] to continue:

          VERITAS STORAGE FOUNDATION 4.1 INSTALLATION PROGRAM

Installation of Storage Foundation for Oracle 4.1 has completed
successfully.

The installation summary is saved at:

        /opt/VRTS/install/logs/installer323140038.summary

The installer log is saved at:

        /opt/VRTS/install/logs/installer323140038.log

The installation response file is saved at:

        /opt/VRTS/install/logs/installer323140038.response

The target HP systems must be rebooted before continuing with the
installation.  Upon reboot run installsf -configure on this
host to continue.
The following HP systems must be rebooted.

        host1

Execute '/usr/sbin/shutdown -r now' to properly restart your systems.
```

VERITAS Storage Foundation Installation Guide