

Veritas Storage Foundation™ Release Notes

HP-UX 11i v3

5.1 Service Pack 1



Veritas Storage Foundation™ Release Notes

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- Version and patch level
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- Router, gateway, and IP address information
- Problem description:
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Documentation

Product guides are available on the media in PDF format. Make sure that you are using the current version of the documentation. The document version appears on page 2 of each guide. The latest product documentation is available on the Symantec Web site.

<https://sort.symantec.com/documents>

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

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<http://www.symantec.com/connect/storage-management>

Storage Foundation Release Notes

This document includes the following topics:

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About this document

This document provides important information about Veritas Storage Foundation (Storage Foundation) version for HP-UX 11i v3. Review this entire document before you install or upgrade Storage Foundation.

The information in the Release Notes supersedes the information provided in the product documents for Storage Foundation.

This is Document version: 5.1SP1.2 of the *Veritas Storage Foundation Release Notes*. Before you start, ensure that you are using the latest version of this guide. The latest product documentation is available on the Symantec Web site at:

<http://www.symantec.com/business/support/overview.jsp?pid=15107>

Component product release notes

In addition to reading this Release Notes document, review the component product release notes before installing the product.

Product guides are available at the following location in PDF formats:

/product_name/docs

Symantec recommends copying the files to the `/opt/VRTS/docs` directory on your system.

This release includes the following component product release notes:

- *Veritas Storage Foundation Cluster File System Release Notes* (5.1 SP1)
- *Veritas Cluster Server Release Notes* (5.1 SP1)

About Symantec Operations Readiness Tools

Symantec™ Operations Readiness Tools (SORT) is a set of Web-based tools and services that lets you proactively manage your Symantec enterprise products. SORT automates and simplifies administration tasks, so you can manage your data center more efficiently and get the most out of your Symantec products. SORT lets you do the following:

- Collect, analyze, and report on server configurations across UNIX or Windows environments. You can use this data to do the following:
 - Assess whether your systems are ready to install or upgrade Symantec enterprise products
 - Tune environmental parameters so you can increase performance, availability, and use
 - Analyze your current deployment and identify the Symantec products and licenses you are using
- Upload configuration data to the SORT Web site, so you can share information with coworkers, managers, and Symantec Technical Support

- Compare your configurations to one another or to a standard build, so you can determine if a configuration has "drifted"
- Search for and download the latest product patches
- Get notifications about the latest updates for:
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 - Hardware compatibility lists (HCLs)
 - Array Support Libraries (ASLs)
 - Array Policy Modules (APMs)
 - High availability agents
- Determine whether your Symantec enterprise product configurations conform to best practices
- Search and browse the latest product documentation
- Look up error code descriptions and solutions

Note: Certain features of SORT are not available for all products.

To access SORT, go to:

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Important release information

- The latest product documentation is available on the Symantec Web site at: <http://www.symantec.com/business/support/overview.jsp?pid=15107>
- For important updates regarding this release, review the Late-Breaking News TechNote on the Symantec Technical Support website: <http://www.symantec.com/docs/TECH144835>
- For the latest patches available for this release, go to: <http://sort.symantec.com/>

Changes introduced in 5.1 SP1

This section describes the changes in Veritas Storage Foundation 5.1 SP1.

Changes related to the installation and upgrades

The product installer includes the following changes.

Using the installer for Veritas Dynamic Multi-pathing (DMP)

You can use the script- or Web-based installer to install, configure, and uninstall Veritas Dynamic Multi-pathing. You can enable DMP using the DMP license or using any Storage Foundation license key.

Using the installer for Symantec Virtual Store (SVS)

You can use the script- or Web-based installer to install, configure, and uninstall Symantec VirtualStore. You can enable SVS using an SVS license.

The `installsfha` script and the `uninstallsfha` script are now available

The `installsfha` script and the `uninstallsfha` script scripts are now available in the `storage_foundation_high_availability` directory to install, uninstall, or configure the Storage Foundation and High Availability product.

See the *Veritas Storage Foundation Installation Guide*.

Unencapsulation not required for some upgrade paths

Unencapsulation is no longer required for certain upgrade paths.

See the *Veritas Storage Foundation Installation Guide*.

The new VRTSamf depot is now included in all high availability products

The new VRTSamf depot is now included in all high availability products. The asynchronous monitoring framework (AMF) allows the more intelligent monitoring of resources, lower resource consumption, and increased availability across clusters.

See the *Veritas Storage Foundation Installation Guide*.

The VRTScutil and VRTSacclib depots are no longer in use

For all high availability products, the VRTScutil and VRTSacclib depots are no longer required.

See the *Veritas Storage Foundation Installation Guide*.

Installer-related changes to configure LLT private links, detect aggregated links, and configure LLT over UDP

For all high availability products, the installer provides the following new features in this release to configure LLT private links during the configuration:

- The installer detects and lists the aggregated links that you can choose to configure as private heartbeat links.
- The installer provides an option to detect NICs on each system and network links, and sets link priority to configure LLT over Ethernet.
- The installer provides an option to configure LLT over UDP.
- The installer now supports VCS cluster configuration up to 64 nodes.

See the *Veritas Storage Foundation Installation Guide*.

Installer supports configuration of non-SCSI3 based fencing

You can now configure non-SCSI3 based fencing for VCS cluster using the installer.

See the *Veritas Storage Foundation Installation Guide*.

Web-based installer supports configuring cluster in secure mode

You can now configure the cluster in secure mode using the Web-based installer.

See the *Veritas Storage Foundation Installation Guide*.

The installer can copy CPI scripts to any given location using `-copyinstallscripts` option

The installer can copy CPI scripts to given location using `-copyinstallscripts` option. This option is used when customers install SFHA products manually and require CPI scripts stored on the system to perform product configuration, uninstallation, and licensing tasks without the product media.

See the *Veritas Storage Foundation Installation Guide*.

Web-based installer supports configuring disk-based fencing for

You can now configure disk-based fencing for the cluster using the Web-based installer.

See the *Veritas Storage Foundation Installation Guide*.

The installer can automatically detect and configure LLT links

The installer detects link connection status among all cluster nodes and chooses the most suitable links for LLT communication. It then can set the priority of the LLT private heartbeat links based on their media speed. Aggregated and bonded NICs are supported.

See the *Veritas Storage Foundation Installation Guide*.

The Web-based installer supports adding nodes

The Web-based installer has increased parity with the script-based installer. It now supports the ability to add nodes to a cluster. It also supports configuring secure clusters and fencing configuration.

The installer provides automated, password-less SSH configuration

When you use the installer, it enables SSH or RSH communication among nodes. It creates SSH keys and adds them to the authorization files. After a successful completion, the installer removes the keys and system names from the appropriate files.

When you use the installer for SSH communications, meet the following prerequisites:

- The SSH (or RSH) daemon must be running for auto-detection.
- You need the superuser passwords for the systems where you plan to install VCS.

The installer can check product versions

You can use the installer to identify the version (to the MP/RP/SP level depending on the product) on all platforms. Activate the version checker with `./installer -version system_name`.

Depending on the product, the version checker can identify versions from 3.5 onward.

Veritas extension for Oracle Disk Manager depot is installed by default for Storage Foundation and Storage Foundation Cluster File System

The Veritas extension for Oracle Disk Manager package is supported with a Storage Foundation license.

In this release, the product installer now installs the required depot for ODM by default when Storage Foundation is installed.

Changes related to Veritas Storage Foundation

Veritas Storage Foundation includes the following changes in 5.1 SP1:

Veritas Enterprise Administrator Graphical User Interface

The Veritas Enterprise Administrator (VEA) console is no longer packaged with Storage Foundation products. Symantec recommends use of Storage Foundation Manager to manage, monitor and report on Storage Foundation product environments. You can download this utility at no charge at <http://go.symantec.com/vom>. If you wish to continue using VEA, a version is available for download from <http://go.symantec.com/vom>.

SFDB supported features

The following SFDB tools will continue to be supported in 5.1 SP1:

- `dbed_update`
- **Checkpoint commands** - `dbed_ckptcreate`, `dbed_ckptdisplay`, `dbed_ckptmount`, `dbed_ckptquota`, `dbed_ckptremove`, `dbed_ckptrollback`, `dbed_clonedb`, `dbed_ckptumount`
- **Flashsnap commands** - `dbed_vmchecksnap`, `dbed_vmclonedb`, `dbed_vmsnap`
- **DBDST commands** - `dbdst_addvol`, `dbdst_admin`, `dbdst_classify`, `dbdst_convert`, `dbdst_file_move`, `dbdst_partition_move`, `dbdst_preset_policy`, `dbdst_rmvol`, `dbdst_show_fs`, `dbdst_tbs_move`, `dbdst_report`

For SFDB deprecated features:

See “Veritas Storage Foundation for Databases (SFDB) tools features which are no longer supported” on page 22.

SmartMove™ feature

SmartMove reduces the time and I/O required to attach or reattach a plex to an existing VxVM volume, in the specific case where a VxVM volume has a VxFS file system mounted on it. The SmartMove feature uses the VxFS information to detect free extents and avoid copying them.

SmartMove provides the following benefits:

- Less I/O is sent through the host, through the storage network and to the disks/LUNs
- Faster plex creation, resulting in faster array migrations
- Ability to migrate from a traditional LUN to a thinly provisioned LUN, removing unused space in the process

In this release, the feature is set to `thinonly` by default. You can also set the feature to `usefssmartmove=all` or to `usefssmartmove=none` in the `/etc/default/vxsf` file. To use the SmartMove feature, VxVM and VxFS must be version 5.0.1 or later.

See the *Veritas Storage Foundation Advanced Features Administrator's Guide* for more information.

Thin Storage Reclamation support

Thin Storage is an array vendor solution for allocating storage to applications only when the storage is truly needed, from a pool of free storage. Thin Storage attempts to solve the problem of under utilization of available array capacity.

Thin Storage Reclamation-capable arrays and LUNs allow the administrators to release once-used storage to the pool of free storage. Storage is allocated from the free pool when files are created and written to in the file system. However, this storage is not released to the free pool when files get deleted; the administrator must perform the operation of reclaiming this storage for the free pool.

Veritas File System supports reclamation of the free blocks in the file system on Veritas Volume Manager-backed file systems. The operation of reclamation can be done on a disk, LUN, full file system, or part of a file system using the `vxdisk` and `fsadm` commands, and the `vxfs_ts_reclaim` API.

See the *Veritas Storage Foundation Advanced Features Administrator's Guide* for more information.

Changes related to Veritas Volume Manager

Veritas Volume Manager (VxVM) includes the following changes in 5.1 SP1:

Support for SSD

A solid-state disk (SSD) is solid-state storage that emulates a hard disk drive (HDD) interface. Solid-state storage is a nonvolatile storage medium that employs integrated circuits rather than magnetic or optical media. The main advantage of solid-state storage is that it contains no mechanical parts. As a result, data

transfer to and from solid-state storage media takes place at a much higher speed than is possible with HDD storage.

SSD devices are supported with Veritas Volume Manager. VxVM automatically discovers SSD devices and those can be displayed using the `vxdisk` and the `vxprint` commands. In this release, we support auto detection of SSD devices for FusionIO, EMC CLARiiON, Hitachi AM/WMS series, and Hitachi USPV/USPVM arrays. In case the devices are not being auto detected, the devices can be manually flagged as SSD or HDD using the `vxdisk` command.

See the `vxdisk(1M)` manual page for details.

SSD or HDD devices can be specified for allocation of VxVM volumes and the `vxassist` command with the `mediatype` attribute can be used to allocate storage on specific devices.

See the `vxassist(1M)` manual page for details.

Since SSD devices have faster read rates when compared to HDD devices, VxVM automatically picks up SSD plexes present in a mirror for reads, unless overridden by setting preferred read policy.

Note: The disk group version should be 150 or later for VxVM support for SSD devices.

See the *Veritas Volume Manager Administrator's Guide* for more information.

The `vxdumpinq` utility renamed to the `vxscsiinq` utility

The diagnostic utility `vxdumpinq` has been renamed to the `vxscsiinq` utility.

Enclosure-based naming is now the default naming scheme

In this release, the enclosure-base naming scheme is now the default method Veritas Volume Manager uses for naming devices. The Veritas product installer no longer prompts you to select a naming scheme. If you perform a fresh installation, the naming scheme is set to enclosure-based naming.

When you upgrade from a previous release of a Storage Foundation product, the naming scheme is set to enclosure-based naming, with the following exception. If you explicitly set the naming scheme for the existing installation to operating system-based naming, the setting is preserved when you upgrade. That is, if you used the `vxddladm set namingscheme=osn` command for the existing installation, the upgraded 5.1 SP1 product retains the operating system-based naming.

To change the naming scheme after installation or upgrade, use the following command:

```
# vxddladm set namingscheme=osn|ebn [persistence=yes|no] \  
[lowercase=yes|no] [use_avid=yes|no]
```

For more information about device naming, see the *Veritas Volume Manager Administrator's Guide*.

Enhancements to the vxconfigd daemon

The `vxconfigd` daemon can now process some queries while a disk group import is in progress. This enhancement means that the user and agent scripts are able to check the status of Veritas Volume Manager objects during that time. In previous releases, such operations would block waiting for the import to finish.

In this release, the following commands may proceed in parallel with a disk group import:

- `vxctl [-c] mode`
- `vxdg list [<dgname>]`
- `vxdisk list [<daname>]`
- `vxprint [-Aqht]`

Use the following command to disable this functionality:

```
# vxctl request_threads 0
```

Handling of minor number conflicts

The volume device minor numbers in a disk group to be imported may conflict with existing volume devices. In releases of VxVM prior to 5.1, the conflicts resulted in failures; either the disk group imported failed, or the slave node failed to join for a shared disk group. When this happened, you had to run the `vxdg remminor` command manually to resolve the minor conflicts.

In this release, VxVM can automatically resolve minor number conflicts. When there exists a minor conflict when a disk group is imported, the disk group is automatically assigned a new base minor, and the volumes in the disk group are reminored based on the new base minor. You do not need to run the `vxdg remminor` command to resolve the minor conflicts.

See the *Veritas Volume Manager Administrator's Guide* for details.

Changes related to Veritas Dynamic Multi-Pathing (DMP)

The following sections describe changes in this release related to DMP.

Veritas Dynamic Multi-Pathing (DMP) support for native logical volumes

In previous Veritas releases, DMP was only available as a feature of Veritas Volume Manager (VxVM). DMP supported VxVM volumes on DMP metadevices, and Veritas File System (VxFS) file systems on those volumes. This release extends DMP metadevices to support OS native logical volume managers (LVM). You can create LVM volumes and volume groups on DMP metadevices.

In this release, Veritas Dynamic Multi-Pathing does not support Veritas File System (VxFS) on DMP devices.

DMP also supports creating single instance Oracle ASM or migrating an existing single instance of Oracle ASM onto DMP devices.

See the *Veritas Dynamic Multi-Pathing Administrator's Guide* for details.

Enhancements to DMP I/O retries

Veritas Dynamic Multi-Pathing (DMP) has a new tunable parameter, `dmp_lun_retry_timeout`. This tunable specifies a retry period for handling transient errors.

When all paths to a disk fail, there may be certain paths that have a temporary failure and are likely to be restored soon. If I/Os are not retried for a period of time, the I/Os may be failed to the application layer even though some paths are experiencing a transient failure. The DMP tunable `dmp_lun_retry_timeout` can be used for more robust handling of such transient errors by retrying the I/O for the specified period of time in spite of losing access to all the paths.

The DMP tunable `dmp_failed_io_threshold` has been deprecated.

See the `vxddmpadm(1m)` man page for more information.

Changes related to Veritas Volume Replicator

Veritas Volume Replicator includes the following changes in 5.1 SP1:

Default network protocol is now TCP/IP

The default network protocol has changed from UDP/IP to TCP/IP.

For information on setting the network protocol, see the *Veritas™ Volume Replicator Administrator's Guide*.

Checksum is disabled by default for the TCP/IP protocol

Beginning with Storage Foundation 5.1 SP1, if you specify TCP as your protocol, then by default, VVR does not calculate the checksum for each data packet it replicates. VVR relies on the TCP checksum mechanism. However, if a node in a replicated data set is using a version of VVR earlier than 5.1 SP1, VVR calculates the checksum regardless of the network protocol.

If you are using UDP/IP, checksum is enabled by default.

Improved replication performance in the presence of snapshots on the secondary site

The effect of snapshots on the secondary site is less drastic on replication performance.

SmartMove for VVR

The SmartMove for VVR feature enables VVR to leverage information from VxFS knowledge of the file system blocks in use to optimize the time and network bandwidth required for initial resync of replicated volumes.

See the *Veritas Volume Replicator Administrator's Guide* for more information on SmartMove for VVR.

Veritas Volume Replicator supports IPv6

Veritas Volume Replicator supports IPv6 in this release. IPv6 is supported only with disk group version 150 or later.

The Internet Protocol version 6 (IPv6) is the next-generation Internet Layer protocol for packet-switched networks and the Internet. IPv4 is the first version of the protocol to be widely deployed. IPv6 has a much larger address space than IPv4. This results from the use of a 128-bit address, whereas IPv4 uses only 32 bits. This expansion provides flexibility in allocating addresses and routing traffic and eliminates the primary need for network address translation (NAT). IPv6 also implemented new features that simplify aspects of address assignment and network renumbering when changing Internet connectivity providers. Network security is integrated into the design of the IPv6 architecture.

See [“IPv6 software limitations”](#) on page 53.

See the *Veritas Volume Replicator Administrator's Guide* for more information on VVR IP terminology.

See the *Veritas Storage Foundation Installation Guide* for more information on planning and upgrading VVR from a previous version of IPv4 to IPv6.

Planning and upgrading VVR to use IPv6 as connection protocol

Storage Foundation High Availability supports using IPv6 as the connection protocol.

This release supports the following configurations for VVR:

- VVR continues to support replication between IPv4-only nodes with IPv4 as the internet protocol
- VVR supports replication between IPv4-only nodes and IPv4/IPv6 dual-stack nodes with IPv4 as the internet protocol
- VVR supports replication between IPv6-only nodes and IPv4/IPv6 dual-stack nodes with IPv6 as the internet protocol
- VVR supports replication between IPv6 only nodes
- VVR supports replication to one or more IPv6 only nodes and one or more IPv4 only nodes from a IPv4/IPv6 dual-stack node
- VVR supports replication of a shared disk group only when all the nodes in the cluster that share the disk group are at IPv4 or IPv6

Changes related to Veritas File System

Veritas File System includes the following changes:

Autolog replay on mount

The `mount` command automatically runs the VxFS `fsck` command to clean up the intent log if the `mount` command detects a dirty log in the file system. This functionality is only supported on file systems mounted on a Veritas Volume Manager (VxVM) volume.

Dynamic Storage Tiering is rebranded as SmartTier

In this release, the Dynamic Storage Tiering (DST) feature is rebranded as SmartTier.

FileSnap

FileSnaps provide an ability to snapshot objects that are smaller in granularity than a file system or a volume. The ability to snapshot parts of a file system name space is required for application-based or user-based management of data stored in a file system. This is useful when a file system is shared by a set of users or applications or the data is classified into different levels of importance in the same file system.

See the *Veritas Storage Foundation Advanced Features Administrator's Guide*.

Partitioned directories

Normally, a large volume of parallel threads performing access and updates on a directory that commonly exist in a file system suffers from exponentially longer wait times for the threads. This feature creates partitioned directories to improve the directory performance of file systems. When any directory crosses the tunable threshold, this feature takes an exclusive lock on the directory inode and redistributes the entries into various respective hash directories. These hash directories are not visible in the name-space view of the user or operating system. For every new create, delete, or lookup thread, this feature performs a lookup for the respective hashed directory (depending on the target name) and performs the operation in that directory. This leaves the parent directory inode and its other hash directories unobstructed for access, which vastly improves file system performance.

See the *Veritas File System Administrator's Guide*.

SmartTier sub-file movement

In this release, the Dynamic Storage Tiering (DST) feature is rebranded as SmartTier. With the SmartTier feature, you can now manage the placement of file objects as well as entire files on individual volumes.

See the *Veritas Storage Foundation Advanced Features Administrator's Guide* and the `fsppadm(1M)` manual page.

Tuning performance optimization of inode allocation

You can now set the `delicache_enable` tunable parameter, which specifies whether performance optimization of inode allocation and reuse during a new file creation is turned on or not.

See the *Veritas File System Administrator's Guide* and the `vxtunefs(1M)` manual page.

Veritas File System is more thin friendly

You can now tune Veritas File System (VxFS) to enable or disable thin-friendly allocations.

Changes related to Storage Foundation for Databases (SFDB) tools

New features for Storage Foundation for Databases tools package for database storage management:

- Storage Foundation for Cluster File (HA) System support
- Cached Oracle Disk Manager (ODM) support, including Cached ODM for clusters
- Cached ODM Manager support
- Multiple disk group support for FlashSnap
- Sub-file storage tiering is supported for SmartTier for Oracle (previously known as Database Dynamic Storage Tiering)
- SQLite repository
- Oracle Enterprise Manager (OEM) Plugin
- Oracle 11gR2 support
- Oracle Dataguard support
- HP-UX Service Guard support for replicated environments

Commands which have changed:

- `sfua_db_config` functionality is changed: this command is no longer needed to create a SFDB repository. The functionality of `sfua_db_config` is now used to set user and group access to various SFDB directories.
- Use the `dbed_update` command to create a new SQLite SFDB repository.
- `sfua_rept_adm` was used in 5.0 to perform repository backup and restore and this command will be obsolete in 5.1 SP1.
- The `sfua_rept_util` command is used to perform SQLite repository backup and restore.
- The Database Dynamic Storage Tiering (DBDST) feature is rebranded as SmartTier for Oracle and includes expanded functionality to support management of sub-file objects.
- **Cached ODM:** functionality is expanded with Cache ODM Manager

Commands which continue to be supported:

- `dbed_update`, `dbed_rept_node`
- **Database Storage Checkpoint commands:** `dbed_ckptcreate`, `dbed_ckptdisplay`, `dbed_ckptmount`, `dbed_ckptquota`, `dbed_ckptremove`, `dbed_ckptrollback`, `dbed_clonedb`, `dbed_ckptumount`
- **Quick I/O commands:** `gio_getdbfiles`, `gio_recreate`, `gio_convertdbfiles`, `gio_recreate`, `gioadmin`, `qiostat`, `gio_convertdbfiles_ora`, `gio_getdbfiles_ora`, `gio_recreate_ora`, `qiomkfile`

- **Database Flashsnap commands:** `dbed_vmchecksnap`, `dbed_vmclonedb`, `dbed_vmsnap`
- **SmartTier for Oracle commands:** `dbdst_addvol`, `dbdst_admin`, `dbdst_classify`, `dbdst_convert`, `dbdst_file_move`, `dbdst_partition_move`, `dbdst_preset_policy`, `dbdst_rmvol`, `dbdst_show_fs`, `dbdst_tbs_move`, `dbdst_report`

New commands:

- **SmartTier for Oracle:** commands added to support storage tiering of sub-file objects: `dbdst_obj_view`, `dbdst_obj_move`
- **Cached ODM:** command added to support Cached ODM Manager: `dbed_codm_admin`

No longer supported

The following features are not supported in this release of Storage Foundation products:

- Disk layout Version 4 and 5 are deprecated. A disk layout Version 4 or 5 file system can still be mounted, but this will be disallowed in future releases. Symantec recommends that you upgrade the disk layout to the latest default disk layout version.
- Bunker replication is not supported in a Cluster Volume Manager (CVM) environment.

Veritas Storage Foundation for Databases (SFDB) tools features which are no longer supported

Commands which are no longer supported as of version 5.1:

- **ORAMAP** (`libvxoramap`)
- **Storage mapping commands** `dbed_analyzer`, `vxstorage_stats`
- **DBED providers (DBEDAgent), Java GUI, and** `dbed_dbprocli`.
The SFDB tools features can only be accessed through the command line interface. However, Veritas Operations Manager (a separately licensed product) can display Oracle database information such as tablespaces, database to LUN mapping, and tablespace to LUN mapping.
- **Storage statistics: commands** `dbdst_makelbfs`, `vxdmts_fstatssummary`, `dbdst_fiostat_collector`, `vxdmts_get_datafile_stats`
- `dbed_saveconfig`, `dbed_checkconfig`

- `dbed_ckptplan`, `dbed_ckptpolicy`
- `qio_convertdbfiles -f` option which is used to check for file fragmentation
- `dbed_scheduler`
- `sfua_rept_migrate` with `-r` and `-f` options

System requirements

This section describes the system requirements for this release.

Supported HP-UX operating systems

This release of Veritas products can only be installed on a system running HP-UX B.11.31.1009, HP-UX 11i Version 3 September 2010 Operating Environments Update Release or later on the PA-RISC or Itanium platforms.

To verify the operating system version use the `swlist` command as follows:

```
# swlist | grep HPUX11i
HPUX11i-DC-OE      B.11.31.1009    HP-UX Data Center Operating Environment
```

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.11.31        Base VxFS File System 4.1 for HP-UX
```

Hardware compatibility list (HCL)

The hardware compatibility list contains information about supported hardware and is updated regularly. Before installing or upgrading Storage Foundation and High Availability Solutions products, review the current compatibility list to confirm the compatibility of your hardware and software.

For the latest information on supported hardware, visit the following URL:

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

For information on specific HA setup requirements, see the *Veritas Cluster Server Installation Guide*.

Database requirements

Veritas Storage Foundations product features are supported for the following database environments:

Table 1-1

Veritas Storage Foundations feature	DB2	Oracle	Sybase
Oracle Disk Manager, Cached Oracle Disk Manager	No	Yes	No
Quick I/O, Cached Quick I/O	Yes	Yes	Yes
Concurrant I/O	Yes	Yes	Yes
Storage Checkpoints	Yes	Yes	Yes
Flashsnap	Yes	Yes	Yes
SmartTier	Yes	Yes	Yes
Database Storage Checkpoints	No	Yes	No
Database Flashsnap	No	Yes	No
SmartTier for Oracle	No	Yes	No

Storage Foundation for Databases (SFDB) tools Database Checkpoints, Database Flashsnap, and SmartTier for Oracle are supported only for Oracle database environments.

For the most current information on Storage Foundation products and single instance Oracle versions supported, see:

<http://entsupport.symantec.com/docs/331625>

Review the current Oracle documentation to confirm the compatibility of your hardware and software.

Veritas Storage Foundation memory requirements

A minimum of 1 GB of memory is strongly recommended.

Veritas Volume Manager naming standards

Veritas Volume Manager (VxVM) requires the following standards for the names of volumes and other VxVM objects:

- Names must be ASCII characters, and cannot contain white space, or the / character.
- VxVM does not support quoted strings or special characters in the object names.
- Object names must be null-terminated.

- The length of the object name must 31 characters or less. (32 including the null character.)

Storage Foundation for Databases supported features

Note: Storage Foundation supports running SFDB tools with Oracle databases only.

For the most current information on Storage Foundation products and single instance Oracle versions supported, see:

<http://entsupport.symantec.com/docs/331625>

Fixed issues

This section covers the incidents that are fixed in this release.

See the corresponding Release Notes for a complete list of fixed incidents related to that product.

See “[Documentation](#)” on page 54.

Fixed issues related to installation and upgrades

This section describes the incidents that are fixed related to installation and upgrades in this release.

Table 1-2 Fixed issues related to installation and upgrades

Incident	Description
1851632	The software media can now be ejected after installing, configuring, and starting any of the products that contain Veritas Volume Manager.
1852746	Installing the VRTSvxfs, VRTSdbed, and VRTSodm packages no longer fails on the second node of a cluster when only the required packages are installed.

Veritas Storage Foundation fixed issues

There are no Veritas Storage Foundation issues fixed in this release.

Storage Foundation for Databases (SFDB) tools fixed issues

This section describes the incidents that are fixed in Veritas Storage Foundation for Databases tools in this release.

Table 1-3 Veritas Storage Foundation for Databases tools fixed issues

Incident	Description
1873738	The <code>dbed_vmchecksnap</code> command may fail
1736516	Clone command fails for instant checkpoint on Logical Standby database
1789290	<code>dbed_vmclonedb -o recoverdb</code> for offhost fails for Oracle 10gr2 and prior versions
1810711	Flashsnap reverse resync command fails on offhost flashsnap cloning

Veritas File System fixed issues

This section describes the incidents that are fixed in Veritas File System in this release.

Table 1-4 Veritas File System fixed issues

Incident	Description
1537570	Fixed the cause of a hang when mounting a frozen file system.
1537588	Fixed the cause of an assertion panic.
1665456	Fixed the cause of a panic in the <code>volkio_to_kio_copy()</code> call.
1805046	Fixed an incorrect alert generation from VxFS when the file system usage threshold is set.
1828175	Fixed the cause of a system panic in <code>inctext</code> , in which <code>VTEXT</code> was not set and <code>tcount</code> was greater than 0.
1903977	Fixed an issue in which a panic could happen because of a mutex getting destroyed while the protected structure was still in use.
1922948	You can now mount deprecated disk layout versions so that they can be upgraded.

Table 1-4 Veritas File System fixed issues (*continued*)

Incident	Description
1926141	Direct I/O can now be enabled using the <code>mincache</code> and <code>convosync</code> mount options with the base VxFS license.
1935374	Storage Checkpoint creation now properly fails to assign a metadata allocation policy on a data-only volume.
1945171	Setting <code>vxfs_bc_bufhwm</code> higher than the available physical memory now reports an error.
1946063	Fixed a performance issue in <code>fsadm</code> where <code>fsadm</code> kept relocating and copying already reorganized regions of a file in subsequent passes.
1969314	Interchanged the order in which <code>fcache_vn_destroy()</code> and <code>VFS_TEARDOWN_STACK()</code> are called to avoid a panic.
2017776	The virtual memory area is no longer destroyed if there are active mappings on the vnode. Fix to during a force unmount.
2018439	The <code>fspadm</code> command no longer dumps core if a volume does not have placement tags.
2026603	Added quota support for the user "nobody".
2026625	The <code>sar -v</code> command now properly reports VxFS inode table overflows.
2026675	Fixed the cause of <code>ENOTBLK</code> being returned via the <code>async</code> driver due to <code>fdd</code> not being a block device.
2028782	Fixed an issue in which <code>Q_SETQUOTA</code> was not setting the current usage using the <code>quotactl()</code> API.
2050070	Fixed an issue in which the volume manager area was destroyed when spinlock was held.
2072121	Fixed the cause of a hang that was due to a disowned beta semaphore.
2098371	Fixed a performance issue in which write I/O performance degraded rapidly when the size of a file reached 64 MB and I/O size was not a multiple of 64 bytes.
2106668	Fixed an issue in which in some cases <code>EFBIG</code> was returned soon after resizing a file system through the <code>fsadm</code> command.

Table 1-4 Veritas File System fixed issues (*continued*)

Incident	Description
2111614	Fixed an issue in which file modification time was not updated when the <code>O_SYNC</code> and <code>nodatainlog</code> mount options were used.
2149407	Fixed an issue in which modification and access times were not getting updated through <code>mmap</code> and <code>msync</code> .
2163013	Fixed an issue in which the <code>odmstat</code> command was showing very high average IO time.

Veritas Volume Manager fixed issues

This section describes the incidents that are fixed in Veritas Volume Manager in this release. This list includes Veritas Volume Replicator and Cluster Volume Manager fixed issues.

Table 1-5 Veritas Volume Manager fixed issues

Incident	Description
150476	Add T for terabyte as a suffix for volume manager numbers
248925	If <code>vxdbg import</code> returns error, parse it
311664	<code>vxconfigd/dmp</code> hang due to a problem in the <code>dmp_reconfig_update_cur_pri()</code> function's logic
321733	Need test case to deport a disabled dg.
339282	Failed to create more than 256 config copies in one DG.
597517	Tunable to initialize EFI labeled >1tb PP devices.
1089875	Increasing <code>vol_maxspecialio</code> to 1 MB on HP-UX.
1097258	<code>vxconfigd</code> hung when an array is disconnected.
1239188	Enhance <code>vxprivutil</code> to enable, disable, and display config+log copies state.
1301991	When <code>vxconfigd</code> is restarted with <code>-k</code> option, all log messages are sent to <code>stdout</code> . <code>syslog</code> should be the default location.
1321475	Join Failure Panic Loop on <code>axe76</code> cluster.
1405756	CVM: Add support to set PFTO values cluster-wide.

Table 1-5 Veritas Volume Manager fixed issues (*continued*)

Incident	Description
1441406	'vxdisk -x list' displays wrong DGID.
1458792	After upgrade from SF5.0mp1 to SF5.0mp3, *unit_io and *pref_io was set to 32m.
1479735	CVR: I/O hang on slave if master (logowner) crashes with DCM active.
1485075	DMP sending I/O on an unopened path causing I/O to hang
1504466	VxVM: All partitions aren't created after failing original root disk and restoring from mirror.
1513385	VVR:Primary panic during autosync or dcm replay.
1528121	FMR: wrong volpagemod_max_memsz tunable value cause buffer overrun
1528160	An ioctl interrupted with EINTR causes frequent vxconfigd exits.
1586207	"vxsnap refresh" operations fail occasionally while data is replicating to secondary.
1589022	Infinite looping in DMP error handling code path because of CLARIION APM, leading to I/O hang.
1594928	Avoid unnecessary retries on error buffers when disk partition is nullified.
1662744	RVG offline hung due to I/Os pending in TCP layer
1664952	Refreshing private region structures degrades performance during "vxdisk listtag" on a setup of more than 400 disks.
1665094	Snapshot refresh causing the snapshot plex to be detached.
1713670	'vxassist -g <dg-name> maxsize' doesn't report no free space when applicable
1715204	Failure of vxsnap operations leads to orphan snap object which cannot be removed.
1766452	vradmind dumps core during collection of memory stats.
1792795	Supportability feature/messages for plex state change, DCO map clearance, usage of fast re-sync by vxplex
1825270	I/O failure causes VCS resources to fault, as dmpnode get disabled when storage processors of array are rebooted in succession
1825516	Unable to initialize and use ramdisk for VxVM use.

Table 1-5 Veritas Volume Manager fixed issues (*continued*)

Incident	Description
1826088	After pulling out the Fibre Channel cables of a local site array, plex becomes DETACHED/ACTIVE.
1829337	Array firmware reversal led to disk failure and offlined all VCS resources
1831634	CVR: Sending incorrect sibling count causes replication hang, which can result in I/O hang.
1831969	VxVM: ddl log files are created with world write permission
1835139	I/Os hung after giveback of NetApp array filer
1840673	After adding new LUNs, one of the nodes in 3 node CFS cluster hangs
1846165	Data corruption seen on cdsdisks on Solaris-x86 in several customer cases
1857558	Need to ignore jeopardy notification from GAB for SFCFS/RAC, since oracle CRS takes care of fencing in this stack
1857729	CVM master in the VVR Primary cluster panicked when rebooting the slave during VVR testing
1860892	Cache Object corruption when replaying the CRECs during recovery
1869995	VVR: Improve Replication performance in presence of SO snapshots on secondary.
1872743	Layered volumes not startable due to duplicate rid in vxrecover global volume list.
1874034	Race between modunload and an incoming IO leading to panic
1880279	Evaluate the need for intelligence in vxattachd to clear stale keys on failover/shared dg's in CVM and non CVM environment.
1881336	VVR: Primary node panicked due to race condition during replication
1884070	When running iotest on a volume, the primary node runs out of memory
1897007	vxesd core dumps on startup when the system is connected to a switch which has more than 64 ports
1899688	VVR: Every I/O on smartsync enabled volume under VVR leaks memory
1899943	CPS based fencing disks used along with CPS servers does not have coordinator flag set
1901827	vxvdg move fails silently and drops disks.

Table 1-5 Veritas Volume Manager fixed issues (*continued*)

Incident	Description
1907796	Corrupted Blocks in Oracle after Dynamic LUN expansion and vxconfigd core dump
1915356	I/O stuck in vxvm causes a cluster node panic.
1933375	Tunable value of 'voliomem_chunk_size' is not aligned to page-size granularity
1933528	During Dynamic reconfiguration vxvm disk ends up in error state after replacing physical LUN.
1936611	vxconfigd core dump while splitting a diskgroup
1938907	WWN information is not displayed due to incorrect device information returned by HBA APIs
1946941	vxsnap print shows incorrect year
1954062	vxrecover results in os crash
1956777	CVR: Cluster reconfiguration in primary site caused master node to panic due to queue corruption
1969526	Panic in voldiodone when a hung priv region I/O comes back
1972848	vxconfigd dumps core during upgradation of VxVM
1974393	Cluster hangs when the transaction client times out
1982178	vxdiskadm option "6" should not list available devices outside of source diskgroup
1982715	vxclustadm dumps core during memory re-allocation.
1992537	Memory leak in vxconfigd causing DiskGroup Agent to timeout
1992872	vxresize fails after DLE.
1993953	CVM Node unable to join in Sun Cluster environment due to wrong coordinator selection
1998447	Vxconfigd dumps core due to incorrect handling of signal
1999004	I/Os hang in VxVM on linked-based snapshot
2002703	Misleading message while opening the write protected device.
2009439	CVR: Primary cluster node panicked due to queue corruption

Table 1-5 Veritas Volume Manager fixed issues (*continued*)

Incident	Description
2010426	Tag setting and removal do not handle wrong enclosure name
2015577	VVR init scripts need to exit gracefully if VVR license not installed.
2016129	Tunable to disable OS event monitoring by vxesd
2019525	License not present message is wrongly displayed during system boot with SF5.1 and SFM2.1
2021737	vxdisk list shows HDS TrueCopy S-VOL read only devices in error state.
2025593	vx dg join hang/failure due to presence of non-allocator inforecords and when tagmeta=on
2027831	vx dg free not reporting free space correctly on CVM master. vxprint not printing DEVICE column for subdisks.
2029480	Diskgroup join failure renders source diskgroup into inconsistent state
2029735	System panic while trying to create snapshot
2034564	I/Os hung in serialization after one of the disks which formed the raid5 volume was pulled out
2036929	Renaming a volume with link object attached causes inconsistencies in the disk group configuration
2038137	System panics if voldmirbreakup() is called recursively.
2038735	Incorrect handling of duplicate objects resulting in node join failure and subsequent panic.
2040150	Existence of 32 or more keys per LUN leads to loss of SCSI3 PGR keys during cluster reconfiguration
2052203	Master vold restart can lead to DG disabled and abort of pending transactions.
2052459	CFS mount failed on slave node due to registration failure on one of the paths
2055609	Allocation specifications not being propagated for DCO during a grow operation
2060785	Primary panics while creating primary rvg
2061066	vxisforeign command fails on internal cciss devices

Table 1-5 Veritas Volume Manager fixed issues (*continued*)

Incident	Description
2061758	Need documentation on list of test suites available to evaluate CDS code path and verification of the code path.
2063348	Improve/modify error message to indicate its thin_reclaim specific
2070531	Campus cluster: Couldn't enable site consistency on a dcl volume, when trying to make the disk group and its volumes siteconsistent.
2075801	VVR: "vxnetd stop/start" panicked the system due to bad free memory
2076700	VVR: Primary panic due to NULL pointer dereference
2094685	Diskgroup corruption following an import of a cloned BCV image of a SRDF-R2 device
2097320	Events generated by dmp_update_status() are not notified to vxconfigd in all places.
2105547	Enabling tagmeta=on on a disk group no longer causes a delay in disk group split/join operations.
2105722	VVR: I/O hang on Primary with link-breakoff snapshot
2112568	System panics while attaching back two Campus Cluster sites due to incorrect DCO offset calculation
2122009	vxddladm list shows incorrect hba information after running vxconfigd -k
2126731	vxdisk -p list output is not consistent with previous versions
2131814	VVR: System panic due to corrupt sio in _VOLRPQ_REMOVE

Known issues

This section covers the known issues in this release.

See the corresponding Release Notes for a complete list of known issues related to that product.

See "[Documentation](#)" on page 54.

Issues related to installation

This section describes the known issues during installation and upgrade.

The Web-based installer does not work from the disc (2321818)

The Web-based installer fails to run.

Workarounds:

For this first workaround, you need to have about 1.7 GB of local storage available. Copy the disc to a local system and start the Web-based installer from the local copy. Symantec recommends that you use `cpio` for these operations.

If you have limited local disk space, use the second workaround.

To start the Web-based installer workaround

- 1 Create a mount point.

```
# mkdir /mnt/dvd
```

- 2 Optionally to find the specific device path (`/dev/dsk/cxtxdx`), run this command:

```
# /usr/sbin/ioscan -fnkC disk
```

- 3 Mount the disc to the mount point.

```
# mount /dev/dsk/cxtxdx /mnt/dvd
```

- 4 Create a temporary installation directory.

```
# mkdir /tmp/HXRT51SP1
```

- 5 Create a symbolic link from the disc to the temporary installation directory.

```
# ln -s /mnt/dvd/* /tmp/HXRT51SP1/
```

- 6 Remove the installer link from the temporary installation directory.

```
# rm -rf /tmp/HXRT51SP1/scripts
```

- 7 Copy the installer scripts from the disc to the temporary installation directory.

```
# cp -rf /mnt/dvd/scripts/ /tmp/HXRT51SP1/
```

- 8 Start the Web-based installer from the temporary installation directory.

```
# /tmp/HXRT51SP1/webinstaller start
```

Installation precheck can cause the installer to throw a license package warning (2320279)

If the installation precheck is attempted after another task completes (for example checking the description or requirements) the installer throws the license package warning. The warning reads:

```
VRTSvlic depot not installed on system_name
```

Workaround:

The warning is due to a software error and can be safely ignored.

While configuring authentication passwords through the Veritas product installer, the double quote character is not accepted (1245237)

The Veritas product installer prompts you to configure authentication passwords when you configure Veritas Cluster Server (VCS) as a secure cluster, or when you configure Symantec Product Authentication Service (AT) in authentication broker (AB) mode. If you use the Veritas product installer to configure authentication passwords, the double quote character (") is not accepted. Even though this special character is accepted by authentication, the installer does not correctly pass the characters through to the nodes.

Workaround: There is no workaround for this issue. When entering authentication passwords, do not use the double quote character (").

Incorrect error messages: error: failed to stat, etc. (2120567)

During installation, you may receive errors such as, "error: failed to stat /net: No such file or directory." Ignore this message. You are most likely to see this message on a node that has a mount record of /net/x.x.x.x. The /net directory, however, is unavailable at the time of installation.

EULA changes (2161557)

The locations for all EULAs have changed.

The English EULAs now appear in */product_dir/EULA/en/product_eula.pdf*

The EULAs for Japanese and Chinese now appear in those language in the following locations:

The Japanese EULAs appear in */product_dir/EULA/ja/product_eula.pdf*

The Chinese EULAs appear in */product_dir/EULA/zh/product_eula.pdf*

NetBackup 6.5 or older version is installed on a VxFS file system (2056282)

NetBackup 6.5 or older version is installed on a VxFS file system. Before upgrading to Veritas Storage Foundation (SF) 5.1 SP1, the user umounts all VxFS file systems including the one which hosts NetBackup binaries (/usr/opensv). While upgrading SF 5.1 SP1, the installer fails to check if NetBackup is installed on the same machine and uninstalls the shared infrastructure packages VRTSspb, VRTSat, and VRTSsisco, which causes NetBackup to stop working.

Workaround: Before you umount the VxFS file system which hosts NetBackup, copy the two files /usr/opensv/netbackup/bin/version and /usr/opensv/netbackup/version to /tmp directory. After you umount the NetBackup file system, manually copy these two version files from /tmp to their original path. If the path doesn't exist, make the same directory path with the command: `mkdir -p /usr/opensv/netbackup/bin` and `mkdir -p /usr/opensv/netbackup/bin`. Run the installer to finish the upgrade process. After upgrade process is done, remove the two version files and their directory paths.

How to recover systems already affected by this issue: Manually install VRTSspb, VRTSat, VRTSsisco packages after the upgrade process is done.

During product migration the installer overestimates disk space use (2088827)

The installer displays the space that all the product depots and patches needs. During migration some depots are already installed and during migration some depots are removed. This releases disk space. The installer then claims more space than it actually needs.

Workaround: Run the installer with `-nospacecheck` option if the disk space is less than that installer claims but more than actually required.

The VRTSaclib depot is deprecated (2032052)

The VRTSaclib depot is deprecated. For installation, uninstallation, and upgrades, note the following:

- Fresh installs: Do not install VRTSaclib.
- Upgrade: Ignore VRTSaclib.
- Uninstall: Ignore VRTSaclib.

The `-help` option for certain commands prints an erroneous argument list (2138046)

For `installsf`, `installat`, and the `installdmp` scripts, although the `-help` option prints the `-security`, `-fencing`, `-addnode` options as supported, they are in fact not supported. These options are only applicable for high availability products.

Web installation looks hung when `-tmppath` option is used (2160878)

If you select the `-tmppath` option on the first page of the webinstaller after installing or uninstalling is finished on the last page of webinstaller, when you click the **Finish** button, the webpage hangs. Despite the hang, the installation or the uninstallation finishes properly and you can safely close the page.

Veritas Storage Foundation known issues

This section describes the known issues in this release of Veritas Storage Foundation (SF).

The system properties wizard in the Veritas Enterprise Administrator GUI displays the VxFS and OSFS provider versions as 6.0.000.0 instead of 5.1.100.0 (2325730)

The system properties wizard in the Veritas Enterprise Administrator (VEA) GUI displays the VxFS and OSFS provider versions as 6.0.000.0 instead of 5.1.100.0.

Workarounds:

This is a cosmetic issue that has no impact on functionality.

Veritas Volume Manager known issues

The following are the Veritas Volume Manager known issues for this release.

System with Magellan I/O card hangs during boot after boot path goes offline (2285709)

When the root disk is encapsulated for Veritas Volume Manager (VxVM) on a system with a Magellan I/O card, the system may hang during boot. This behavior is seen after the boot path goes offline due to issues with the Magellan Card.

Resolution:

To avoid the hang, set the Power Fail TimeOut (PFTO) value to 60 seconds for the root disk group.

```
# vxpfto -t 60 -o pftostate=enabled -g rootdg
```

If the system is already hung, then reboot the system. After the reboot, set the PFTO to 60 seconds using the above command.

Issues with ALUA arrays that support standby Asymmetric Access State (AAS) when using EFI disks on HP 11.31 (2057649)

This issue was seen with ALUA arrays that support standby Asymmetric Access State (AAS) when Extensible Firmware Interface (EFI) disks are present on the system. The HP-UX native multipath plugin (NMP) driver does not recognize the hardware path that DMP has selected and selects the standby path for internal I/Os.

This issue causes delays with Veritas Volume Manager (VxVM) device discovery and other VxVM commands. Veritas Volume Manager does not support SAN booting with these arrays on HP-UX 11i version 3.

vxdisk -f init can overwrite some of the public region contents (1190117)

If a disk was initialized by a previous VxVM version or defined with a smaller private region than the new default of 32 MB, then the public region data will be overridden.

Workaround:

Specify explicitly the length of privoffset, puboffset, publen, and privlen while initializing the disk.

I/O fails on some paths after array connectivity is restored, due to high restore daemon interval (2091619)

If a path loses connectivity to the array, the path is marked with the NODE_SUSPECT flag. After the connectivity is restored, the restore daemon detects that the path is restored when the restore daemon probes the paths. The restore daemon clears the NODE_SUSPECT flag and makes the path available for I/O. The restore daemon probes the paths at the interval set with the tunable parameter `dmp_restore_interval`. If you set the `dmp_restore_interval` parameter to a high value, the paths are not available for I/O until the next interval.

Changes in enclosure attributes are not persistent after an upgrade to VxVM 5.1 SP1 (2082414)

The Veritas Volume Manager (VxVM) 5.1 SP1 includes several array names that differ from the array names in previous releases. Therefore, if you upgrade from

a previous release to VxVM 5.1 SP1, changes in the enclosure attributes may not remain persistent. Any enclosure attribute set for these arrays may be reset to the default value after an upgrade to VxVM 5.1 SP1. Manually reconfigure the enclosure attributes to resolve the issue.

[Table 1-6](#) shows the Hitachi arrays that have new array names.

Table 1-6 Hitachi arrays with new array names

Previous name	New name
TagmaStore-USP	Hitachi_USP
TagmaStore-NSC	Hitachi_NSC
TagmaStoreUSPV	Hitachi_USP-V
TagmaStoreUSPVM	Hitachi_USP-VM
<New Addition>	Hitachi_R700
Hitachi AMS2300 Series arrays	New array names are based on the Model Number 8x. For example, AMS_100, AMS_2100, AMS_2300, AMS_2500, etc.

In addition, the Array Support Library (ASL) for the enclosures XIV and 3PAR now converts the cabinet serial number that is reported from Hex to Decimal, to correspond with the value shown on the GUI. The persistence of the enclosure name is achieved with the `/etc/vx/array.info` file, which stores the mapping between cabinet serial number and array name. Because the cabinet serial number has changed, any enclosure attribute set for these arrays may be reset to the default value after an upgrade to VxVM 5.1 SP1. Manually reconfigure the enclosure attributes to resolve the issue.

The cabinet serial numbers are changed for the following enclosures:

- IBM XIV Series arrays
- 3PAR arrays

Enclosure name limitation when using HP-UX LVM pvcreate command on DMP device

For HP-UX LVM on a DMP device, you cannot use the `pvcreate` command if the enclosure-based name of the DMP device contains the 's' character. This is a limitation of the `pvcreate` utility on HP-UX LVM.

Work around:

Rename the enclosure to replace the 's' with some other character in the name of the enclosure before you run the `pvcreate` command. To rename the enclosure, use the following command:

```
# vxdmpadm setattr enclosure enclr_name name=new_enclr_name
```

vxdg split or join operations can fail for disks with a disk media name greater than or equal to 27 characters (2063387)

If a disk's media name is greater than or equal to 27 characters, certain operations, such as diskgroup split or join, can fail with the following error:

```
VxVM vxdg ERROR : vxdg move/join dg1 dg2 failed subdisk_name : Record already exists in disk group
```

VxVM uses disk media names to create subdisk names. If multiple subdisks are under the same disk, then the serial number, starting from 1, is generated and appended to the subdisk name so as to identify the given subdisk under the physical disk. The maximum length of the subdisk name is 31 characters. If the disk media name is long, then the name is truncated to make room for serial numbers. Therefore, two diskgroups can end up having same subdisk names due to this truncation logic, despite having unique disk media names across diskgroups. In such scenarios, the diskgroup split or join operation fails.

Workaround:

To avoid such problems, Symantec recommends that disk media name length should be less than 27 characters.

Shared disk group creation on slave fails if the naming scheme on slave is operating system native scheme with the mode as the new name (2148981)

While creating shared disk groups on slaves using the command shipping feature, the disk group creation may fail if the naming scheme on the slave where the command was issued is the operating system's native scheme with the mode as the new name.

Workaround:

You can create the shared disk group from the slave by changing the naming scheme to the operating system's native scheme while in the "Legacy" mode.

After initializing a disk for native LVM, the first instance of `vxdisk list` fails with a 'get_contents' error and errant flags are displayed (2074640)

After you initialize a disk that is under the operating system's native LVM control and not under Veritas Volume Manager (VxVM) control by using the `pvcreate path_to_physical_disk` command, the first time that you run the `vxdisk list disk_name` command, the command displays the following error:

```
VxVM vxdisk ERROR V-5-1-539 Device disk_name: get_contents failed:  
Disk device is offline
```

In addition, the `flags` field is incorrectly populated. However, in the next instantiation of the same command, VxVM does not produce an error and the flags are correctly populated with the LVM tag.

Workaround:

Issue the `vxdisk list disk_name` command a second time.

`vxconfigd` fails to allocate memory until the daemon is restarted (2112448)

Veritas Volume Manager (VxVM) utilities may fail with the following error message:

```
Memory allocation failure
```

This error implies that there is insufficient memory for the `vxconfigd` daemon. A program's data segment size is enforced by the operating system tunable `maxdsiz`. The default value of `maxdsiz` is 1 GB. With this default `maxdsiz` value, the `vxconfigd` daemon can allocate a maximum of 1 GB of memory.

Workaround:

You might need to increase the operating system `maxdsiz` tunable's value appropriately to increase the data storage segment for the programs.

See the `maxdsiz(5)` manual page for more information.

After increasing the value, you must stop and restart the `vxconfigd` daemon. Depending on the `maxdsiz` tunable value, `vxconfigd` can allocate a maximum up to 2 GB of memory on PA machines, and 4 GB of memory on IA machines.

Thin reclamation on disks with the hpdisk format is not supported (2136238)

Thin reclamation on disks with the hpdisk format is not supported. An attempt to perform reclamation on such disks automatically aborts.

Work-around:

There is no workaround for this issue.

vxdisksetup fails to give a LUN the cdsdisk format if the LUN is larger than 1 TB and the system is using Tachyon HBAs (2146340)

The `vxdisksetup` command fails to initialize a LUN to have the cdsdisk format if the LUN is larger than 1 TB and the system is using Tachyon HBAs. The `vxdisksetup` command displays the following error:

```
VxVM vxdisk ERROR V-5-1-5433 Device disk_name: init failed:  
Disk is not useable, bad format
```

Work-around:

There is no workaround for this issue.

Veritas File System known issues

This section describes the known issues in this release of Veritas File System (VxFS).

VxFS read ahead can cause stalled I/O on all write operations (1965647)

Changing the `read_ahead` parameter can lead to frozen I/O. Under heavy load, the system can take several minutes to recover from this state.

Workaround: There is no workaround for this issue.

Shrinking a file system that is larger than 1 TB takes a long time (2097673)

Shrinking a file system shrink via either the `fsadm` command or `vxresize` command can take a long time to complete in some cases, such as if the shrink size is large and some large extent of a file is overlapping with the area to be shrunk.

Workaround: One possible workaround is to use the `vxtunefs` command and set `write_pref_io` and `write_nstream` to high values, such that `write_pref_io` multiplied by `write_nstream` is around 8 MB.

Storage Checkpoints can exceed the quota limit (2102201)

Under some circumstances, Storage Checkpoints can exceed the quota limit set by the `fsckptadm setquotalimit` command. This issue can arise if all of the following conditions are met:

- The Storage Checkpoint quota has been enabled.
- The Storage Checkpoint quota is not exceeded.
- A file content modification operation, including removing a file, needs to push some or all blocks of the file to the Storage Checkpoint.
- Number of blocks that need to be pushed to the Storage Checkpoint is enough to exceed Storage Checkpoint quota hard limit.

Workaround: There is no workaround for this issue.

vxfsconvert can only convert file systems that are less than 1 TB (2108929)

The `vxfsconvert` command can only convert file systems that are less than 1 TB. If the file system is greater than 1 TB, the `vxfsconvert` command fails with the "Out of Buffer cache" error.

Panic due to null pointer de-reference in vx_unlockmap() (2059611)

A null pointer dereference in the `vx_unlockmap()` call can cause a panic. A fix for this issue will be released in a future patch.

Workaround: There is no workaround for this issue.

Veritas Volume Replicator known issues

This section describes the known issues in this release of Veritas Volume Replicator (VVR).

vradmin syncvol command compatibility with IPv6 addresses (2075307)

The `vradmin syncvol` command does not work with the compressed form of IPv6 addresses. In IPv6 environments, if you run the `vradmin syncvol` command and

identify the target host using compressed form of the IPv6 address, the command fails with following error message:

```
# vradmin -s -full syncvol vol1 fe80::221:5eff:fe49:ad10:dgl:vol1
VxVM VVR vradmin ERROR V-5-52-420 Incorrect format for syncvol.
```

Also, if you run the `vradmin addsec` command and you specify the Secondary host using the compressed IPv6 address, the `vradmin syncvol` command also fails – even if you specify the target as `hostname`.

Workaround: When you use the `vradmin addsec` and `vradmin syncvol` commands, do not specify compressed IPv6 addresses; instead, use hostnames.

RVGPrimary agent operation to start replication between the original Primary and the bunker fails during failback (2054804)

The RVGPrimary agent initiated operation to start replication between the original Primary and the bunker fails during failback – when migrating back to the original Primary after disaster recovery – with the error message:

```
VxVM VVR vxrlink ERROR V-5-1-5282 Error getting information from
remote host. Internal Error.
```

The issue applies to global clustering with a bunker configuration, where the bunker replication is configured using storage protocol. It occurs when the Primary comes back even before the bunker disk group is imported on the bunker host to initialize the bunker replay by the RVGPrimary agent in the Secondary cluster.

Workaround:

To resolve this issue

- 1 Before failback, make sure that bunker replay is either completed or aborted.
- 2 After failback, deport and import the bunker disk group on the original Primary.
- 3 Try the start replication operation from outside of VCS control.

Bunker replay did not occur when the Application Service Group was configured on some of the systems in the Primary cluster, and ClusterFailoverPolicy is set to "AUTO" (2047724)

The time that it takes for a global cluster to fail over an application service group can sometimes be smaller than the time that it takes for VVR to detect the configuration change associated with the primary fault. This can occur in a bunkered, globally clustered configuration when the value of the

`ClusterFailoverPolicy` attribute is `Auto` and the `AppGroup` is configured on a subset of nodes of the primary cluster.

This causes the `RVGPrimary` online at the failover site to fail. The following messages appear in the VCS engine log:

```
RVGPrimary:RVGPrimary:online:Diskgroup bunkerdgname could not be
imported on bunker host hostname. Operation failed with error 256
and message VxVM VVR vradmin ERROR V-5-52-901 NETWORK ERROR: Remote
server unreachable... Timestamp VCS ERROR V-16-2-13066 (hostname)
Agent is calling clean for resource(RVGPrimary) because the resource
is not up even after online completed.
```

Workaround:

To resolve this issue

- ◆ When the configuration includes a bunker node, set the value of the `OnlineRetryLimit` attribute of the `RVGPrimary` resource to a non-zero value.

Interrupting the `vradmin syncvol` command may leave volumes open (2063307)

Interrupting the `vradmin syncvol` command may leave volumes on the Secondary site in an open state.

Workaround: On the Secondary site, restart the `in.vxrsyncd` daemon. Enter the following:

```
# /etc/init.d/vxrsyncd.sh stop
# /etc/init.d/vxrsyncd.sh start
```

The `RVGPrimary` agent may fail to bring the application service group online on the new Primary site because of a previous primary-elect operation not being run or not completing successfully (2043831)

In a primary-elect configuration, the `RVGPrimary` agent may fail to bring the application service groups online on the new Primary site, due to the existence of previously-created instant snapshots. This may happen if you do not run the `ElectPrimary` command to elect the new Primary or if the previous `ElectPrimary` command did not complete successfully.

Workaround: Destroy the instant snapshots manually using the `vxrvg -g dg -P snap_prefix snapdestroy rvg` command. Clear the application service group and bring it back online manually.

Storage Foundation 5.0MP3 Rolling Patch 2 required for replication between 5.0 MP3 and 5.1 SP1 (1800600)

In order to replicate between Primary sites running Storage Foundation 5.0 MP3 and Secondary sites running Storage Foundation 5.1 SP1, or vice versa, you must install the Storage Foundation 5.0MP3 Rolling Patch 2 on the nodes using 5.0MP3. This patch resolves several outstanding issues for replicating between versions.

In an IPv6-only environment RVG, data volumes or SRL names cannot contain a colon

Issue: After upgrading VVR to an IPv6-only environment in 5.1 release, `vradmin` commands may not work when a colon is specified in the RVG, data volume(s) and/or SRL name. It is also possible that after upgrading VVR to an IPv6-only environment, `vradmin createpri` may dump core when provided with RVG, volume and/or SRL names containing a colon in it.

Workaround: Make sure that colons are not specified in the volume, SRL and RVG names in the VVR configuration

While `vradmin changeip` is running, `vradmin` may temporarily lose heart beats (2162625)

This issue occurs when you use the `vradmin changeip` command to change the host name or IP address set in the Primary and Secondary RLINKs. While the `vradmin changeip` command runs, `vradmin` may temporarily lose heart beats, and the command terminates with an error message.

Workaround:

To resolve this issue

- 1 Depending on the application I/O workload, uncomment and increase the value of the `IPM_HEARTBEAT_TIMEOUT` variable in the `/etc/vx/vras/vras_env` on all the hosts of the RDS to a higher value. The following example increases the timeout value to 120 seconds.

```
export IPM_HEARTBEAT_TIMEOUT
IPM_HEARTBEAT_TIMEOUT=120
```

- 2 Restart `vradmin` to put the new `IPM_HEARTBEAT_TIMEOUT` value into affect. Enter the following:

```
# /sbin/init.d/vras-vradmin.sh stop
# /sbin/init.d/vras-vradmin.sh start
```

If using VEA to create a replicated data set fails, messages display corrupt strings in the Japanese locale (1726499, 1377599)

When using VEA to create a replicated data set, because the volumes do not have a DCM log on all nodes, the message window displays corrupt strings and unlocalized error messages.

Workaround: There is no workaround for this issue.

vxassist layout removes the DCM (2162522)

If you perform a layout that adds a column to a striped volume that has a DCM, the DCM is removed. There is no message indicating that this has happened. To replace the DCM, enter the following:

```
#vxassist -g diskgroup addlog vol logtype=dcm
```

vxassist and vxresize operations do not work with layered volumes that are associated to an RVG (2162579)

This issue occurs when you try a resize operation on a volume that is associated to an RVG and has a striped-mirror layout.

Workaround:

To resize layered volumes that are associated to an RVG

- 1 Pause or stop the applications.
- 2 Wait for the RLINKs to be up to date. Enter the following:

```
# vxrlink -g diskgroup status rlink
```
- 3 Stop the affected RVG. Enter the following:

```
# vxrvg -g diskgroup stop rvg
```
- 4 Disassociate the volumes from the RVG. Enter the following:

```
# vxvol -g diskgroup dis vol
```
- 5 Resize the volumes. In this example, the volume is increased to 10 GB. Enter the following:

```
# vxassist -g diskgroup growto vol 10G
```

6 Associate the data volumes to the RVG. Enter the following:

```
# vxvol -g diskgroup assoc rvg vol
```

7 Start the RVG. Enter the following:

```
# vxrvg -g diskgroup start rvg
```

8 Resume or start the applications.

Cannot relayout data volumes in an RVG from concat to striped-mirror (2162537)

This issue occurs when you try a relayout operation on a data volume which is associated to an RVG, and the target layout is a striped-mirror.

Workaround:

To relayout a data volume in an RVG from concat to striped-mirror

1 Pause or stop the applications.

2 Wait for the RLINKs to be up to date. Enter the following:

```
# vxrlink -g diskgroup status rlink
```

3 Stop the affected RVG. Enter the following:

```
# vxrvg -g diskgroup stop rvg
```

4 Disassociate the volumes from the RVG. Enter the following:

```
# vxvol -g diskgroup dis vol
```

5 Relayout the volumes to striped-mirror. Enter the following:

```
# vxassist -g diskgroup relayout vol layout=stripe-mirror
```

6 Associate the data volumes to the RVG. Enter the following:

```
# vxvol -g diskgroup assoc rvg vol
```

7 Start the RVG. Enter the following:

```
# vxrvg -g diskgroup start rvg
```

8 Resume or start the applications.

Veritas Storage Foundation for Databases (SFDB) tools known issues

The following are known issues in this release of Veritas Storage Foundation products.

Upgrading Veritas Storage Foundation for Databases (SFDB) tools from 5.0MP2 to 5.1SP1 (2003131)

While upgrading from 5.0MP2 to 5.1SP1 the following error message could be seen when running `sfua_rept_migrate`:

```
# /opt/VRTSdbed/migrate/sfua_rept_migrate
Mounting SFUA Sybase ASA repository.
SFORA sfua_rept_migrate ERROR V-81-8903 Could not start repository database
/usr/lib/dld.sl: Can't find path for shared library: libcur_colr.1
/usr/lib/dld.sl: No such file or directory
sh: 3845 Abort(coredump)
Symantec DBMS 3.0.85.0 vxdbms_start_db utility
ASA failed. Sybase ASA error code: [134].
Sybase ASA Error text: {{{}}

SFORA sfua_rept_migrate ERROR V-81-9160 Failed to mount repository.
```

Workaround

To upgrade without an existing SFDB repository set up

- 1 Verify X/Open curses is installed on the system.
- 2 Create the following link: `ln -s /usr/lib/libxcurses.1 /usr/lib/libcur_colr.1`
- 3 Run:

```
# sfua_rept_migrate
```

Upgrading Veritas Storage Foundation for Databases (SFDB) tools from 5.0.x to 5.1SP1 (2184482)

When upgrading from Storage Foundation version 5.0 or 5.0.1 to Storage Foundation 5.1SP1 the `S*vxdbms3` startup script is renamed to `NO_S*vxdbms3`. The `S*vxdbms3` startup script is required by `sfua_rept_upgrade`. Thus when `sfua_rept_upgrade` is run, it is unable to find the `S*vxdbms3` startup script and gives the error message:

```
/sbin/rc3.d/S*vxdbms3 not found
SFORA sfua_rept_migrate ERROR V-81-3558 File: is missing.
SFORA sfua_rept_migrate ERROR V-81-9160 Failed to mount repository.
```

Workaround

Before running `sfua_rept_migrate`, rename the startup script `NO_S*vxdbms3` to `S*vxdbms3`.

Relinking ODM after upgrading from 5.0.x

The `VRTSodm` library path has changed from `/opt/VRTSodm/lib/libodm.sl` to `/opt/VRTSodm/lib/libodm.so`.

After upgrading to from 5.0.x you must update the ODM link for your database to the new `VRTSodm` library path `/opt/VRTSodm/lib/libodm.so`.

Upgrading in an HP Serviceguard environment (2116455)

When upgrading SFDB to 5.1SP1 from the previous release in an HP Serviceguard environment, first verify that the `cmviewc1` command can be executed by a non-root user. This permission change must be done before executing SFDB upgrade commands.

Using SFDB tools after upgrading Oracle to 11.2.0.2 (2203228)

The procedure which Oracle recommends for upgrading to Oracle 11.2.0.2 results in the database home changing. After you upgrade to Oracle 11.2.0.2, you must run the `dbed_updatecommand` with the new Oracle home provided as an argument to the `-H` option before using any SFDB tools. After this step, the SFDB tools can be used normally.

Database fails over during Flashsnap operations (1469310)

In an Storage Foundation environment, if the database fails over during Flashsnap operations such as the `dbed_vmsnap -o resync` command and various error messages appear. This issue occurs because Flashsnap commands do not create a VCS resource for the SNAP disk group. As such, when the database fails over, only the primary disk group is moved to another node.

Workaround

There is no workaround for this issue.

The error messages depend on the timing of the database failover. To fix the problem, you need to bring the FlashSnap state to `SNAP_READY`. Depending on

the failure, you may have to use base VxVM commands to reattach mirrors. After mirrors are attached, you need to wait until the mirrors are in SNAPDONE state. Re-validate the snapplan again.

Reattach command failure in a multiple disk group environment (1840672)

In a multiple disk group environment, if the snapshot operation fails then `dbed_vmsnap` fails to reattach all the volumes. This operation must be performed as root user.

Workaround

In case the reattach operation fails, use the following steps to reattach the volumes.

To reattach volumes in a multiple disk group environment if the snapshot operation fails

- 1 Join the snapshot disk groups to primary diskgroups. The snapshot disk group name is a concatenation of “SNAPSHOT_DG_PREFIX” parameter value in snapplan and primary disk group name. Use the following command to join the disk groups:

```
# vxvg join snapshot_disk_group_name  
primary_disk_group_name
```

- 2 Start all the volumes in primary disk group.

```
# vxvol -g primary_disk_group_name startall
```

- 3 Reattach the snapshot volumes with primary volumes. The snapshot volume names is a concatenation of “SNAPSHOT_VOL_PREFIX” parameter value in snapplan and primary volume name. Use the following command to reattach the volumes.

```
# vxsnap -g primary_disk_group_name reattach snapshot_volume_name  
source=primary_volume_name
```

Repeat this step for all the volumes.

Clone command fails if archive entry is spread on multiple lines (1764885)

If you have a `log_archive_dest_1` in single line in the `init.ora` file, then `dbed_vmclonedb` will work but `dbed_vmcloneb` will fail if you put in multiple lines for `log_archive_dest_1`.

Workaround

There is no workaround for this issue.

VCS agent for Oracle: Health check monitoring is not supported for Oracle database 11g R1 and 11g R2 (1985055)

Health check monitoring is not supported for Oracle database 11g R1 and 11g R2.

Workaround: Set MonitorOption attribute for Oracle resource to 0.

Software limitations

This section covers the software limitations of this release.

See [“Documentation”](#) on page 54.

Veritas Storage Foundation software limitations

There are no Veritas Storage Foundation software limitations in the 5.1 SP1 release.

Veritas Volume Manager software limitations

The following are software limitations in this release of Veritas Volume Manager.

DMP settings for NetApp storage attached environment

To minimize the path restoration window and maximize high availability in the NetApp storage attached environment, set the following DMP tunables:

Table 1-7

Parameter name	Definition	New value	Default value
dmp_restore_interval	DMP restore daemon cycle	60 seconds.	300 seconds.
dmp_path_age	DMP path aging tunable	120 seconds.	300 seconds.

The change is persistent across reboots.

To change the tunable parameters

- 1 Issue the following commands:

```
# vxdmpadm settune dmp_restore_interval=60
# vxdmpadm settune dmp_path_age=120
```

- 2 To verify the new settings, use the following commands:

```
# vxdmpadm gettune dmp_restore_interval
# vxdmpadm gettune dmp_path_age
```

Veritas Volume Replicator software limitations

The following are software limitations in this release of Veritas Volume Replicator.

Replication in a shared environment

Currently, replication support is limited to 4-node cluster applications.

IPv6 software limitations

VVR does not support the following Internet Protocol configurations:

- A replication configuration from an IPv4-only node to an IPv6-only node and from an IPv6-only node to an IPv4-only node is not supported, because the IPv6-only node has no IPv4 address configured on it and therefore VVR cannot establish communication between the two nodes.
- A replication configuration in which an IPv4 address is specified for the `local_host` attribute of a primary RLINK and an IPv6 address is specified for the `remote_host` attribute of the same RLINK.
- A replication configuration in which an IPv6 address is specified for the `local_host` attribute of a primary RLINK and an IPv4 address is specified for the `remote_host` attribute of the same RLINK.
- IPv6 is not supported in a CVM and VVR cluster where some nodes in the cluster are IPv4-only and other nodes in the same cluster are IPv6-only, or all nodes of a cluster are IPv4-only and all nodes of a remote cluster are IPv6-only.
- VVR does not support Edge and NAT-PT routers that facilitate IPv4 and IPv6 address translation.

VVR support for replicating across Storage Foundation versions

VVR supports replication between Storage Foundation 5.1SP1 and the prior major releases of Storage Foundation (5.0 MP3 and 5.1). Replication between versions is supported for disk group versions 140, 150, and 160 only. Both the Primary and Secondary hosts must be using a supported disk group version.

Veritas Storage Foundation for Databases tools software limitations

The following are software limitations in this release of Veritas Volume Manager.

Oracle Data Guard in an Oracle RAC environment

Database snapshots and Database Checkpoints are not supported in a Data Guard and Oracle RAC environment.

Upgrading if using Oracle 11.1.0.6

If you are running Oracle version 11.1.0.6 and upgrading a Storage Foundation product to 5.1SP1: upgrade the Oracle binaries and database to version 11.1.0.7 before moving to SP1.

Documentation

Product guides are available on the documentation disc in PDF formats. Symantec recommends copying pertinent information, such as installation guides and release notes, from the disc to your system's `/opt/VRTS/docs` directory for reference.

Documentation set

[Table 1-8](#) lists the documentation for Veritas Storage Foundation.

Table 1-8 Veritas Storage Foundation documentation

Document title	File name
<i>Veritas Storage Foundation Release Notes</i>	sf_notes_51sp1_hpux.pdf
<i>Veritas Storage Foundation and High Availability Installation Guide</i>	sf_install_51sp1_hpux.pdf
<i>Veritas Storage Foundation: Storage and Availability Management for Oracle Databases</i>	sf_adv_ora_51sp1_hpux.pdf

Table 1-8 Veritas Storage Foundation documentation (*continued*)

Document title	File name
<i>Veritas Storage Foundation Advanced Features Administrator's Guide</i>	sf_adv_admin_51sp1_hpux.pdf

Table 1-9 lists the documentation for Veritas Volume Manager and Veritas File System.

Table 1-9 Veritas Volume Manager and Veritas File System documentation

Document title	File name
<i>Veritas Volume Manager Administrator's Guide</i>	vxvm_admin_51sp1_hpux.pdf
<i>Veritas Volume Manager Troubleshooting Guide</i>	vxvm_tshoot_51sp1_hpux.pdf
<i>Veritas File System Administrator's Guide</i>	vxfs_admin_51sp1_hpux.pdf
<i>Veritas File System Programmer's Reference Guide</i>	vxfs_ref_51sp1_hpux.pdf

Table 1-10 lists the documentation for Veritas Volume Replicator.

Table 1-10 Veritas Volume Replicator documentation

Document title	File name
<i>Veritas Volume Replicator Administrator's Guide</i>	vvr_admin_51sp1_hpux.pdf
<i>Veritas Volume Replicator Planning and Tuning Guide</i>	vvr_planning_51sp1_hpux.pdf
<i>Veritas Volume Replicator Advisor User's Guide</i>	vvr_advisor_users_51sp1_hpux.pdf

Table 1-11 lists the documentation for Symantec Product Authentication Service (AT).

Table 1-11 Symantec Product Authentication Service documentation

Title	File name
<i>Symantec Product Authentication Service Release Notes</i>	vxat_notes.pdf
<i>Symantec Product Authentication Service Administrator's Guide</i>	vxat_admin.pdf

Manual pages

The manual pages for Veritas Storage Foundation and High Availability Solutions products are installed in the `/opt/VRTS/man` directory.

Set the `MANPATH` environment variable so the `man(1)` command can point to the Veritas Storage Foundation manual pages:

- For the Bourne or Korn shell (`sh` or `ksh`), enter the following commands:

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

- For C shell (`csh` or `tcsh`), enter the following command:

```
setenv MANPATH ${MANPATH}:/opt/VRTS/man
```

See the `man(1)` manual page.