

Veritas Storage Foundation™ for Oracle® RAC Release Notes

AIX

5.1

Veritas Storage Foundation™ for Oracle RAC Release Notes

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- Available memory, disk space, and NIC information
- Operating system

- Version and patch level
- Network topology
- Router, gateway, and IP address information
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About this release

This document includes the following topics:

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About Veritas Storage Foundation for Oracle RAC

Veritas Storage Foundation™ for Oracle® RAC (SF Oracle RAC) leverages proprietary storage management and high availability technologies to enable robust, manageable, and scalable deployment of Oracle RAC on UNIX platforms. The solution uses Veritas Cluster File System technology that provides the dual advantage of easy file system management as well as the use of familiar operating system tools and utilities in managing databases.

For the latest patches available for this release, go to:

<http://vos.symantec.com/>

The solution stack comprises the Veritas Cluster Server (VCS), Veritas Cluster Volume Manager (CVM), Veritas Cluster File System (CFS), and Veritas Storage

Foundation, which includes the base Veritas Volume Manager (VxVM) and Veritas File System (VxFS).

Benefits of SF Oracle RAC

SF Oracle RAC provides the following benefits:

- Support for file system-based management. SF Oracle RAC provides a generic clustered file system technology for storing and managing Oracle data files as well as other application data.
- Support for high-availability of cluster interconnects. The combination of LMX/LLT protocols and the PrivNIC/MultiPrivNIC agents provides maximum bandwidth as well as high availability of the cluster interconnects, including switch redundancy.
- Use of clustered file system for placement of Oracle Cluster Registry and voting disks. Clustered file system and volume management technologies provide robust shared block and raw interfaces for placement of Oracle Cluster Registry and voting disks. In the absence of SF Oracle RAC, separate LUNs need to be configured for OCR and voting disks.
- Support for a standardized approach toward application and database management. A single-vendor solution for the complete SF Oracle RAC software stack lets you devise a standardized approach toward application and database management. Further, administrators can apply existing expertise of Veritas technologies toward SF Oracle RAC.
- Increased availability and performance using dynamic multi-pathing (DMP). DMP provides wide storage array support for protection from failures and performance bottlenecks in the HBAs and SAN switches.
- Easy administration and monitoring of SF Oracle RAC clusters from a single web console.
- Support for many types of applications and databases.
- Improved file system access times using Oracle Disk Manager (ODM).
- Ability to configure ASM disk groups over CVM volumes to take advantage of dynamic multi-pathing (DMP).
- Enhanced scalability and availability with access to multiple Oracle RAC instances per database in a cluster.
- Support for backup and recovery solutions using volume-level and file system-level snapshot technologies. SF Oracle RAC enables full volume-level snapshots for off-host processing and file system-level snapshots for efficient backup and rollback.

- Ability to failover applications without downtime using clustered file system technology.
- Prevention of data corruption in split-brain scenarios with robust SCSI-3 Persistent Group Reservation (PGR) based I/O fencing or Coordination Point Server-based I/O fencing.
- Support for sharing all types of files, in addition to Oracle database files, across nodes.
- Fast disaster recovery with minimal downtime and interruption to users. Users can transition from a local high availability site to a wide-area disaster recovery environment with primary and secondary sites. If a node fails, clients that are attached to the failed node can reconnect to a surviving node and resume access to the shared database. Recovery after failure in the SF Oracle RAC environment is far quicker than recovery for a failover database.
- Verification of disaster recovery configuration using fire drill technology without affecting production systems.
- Support for a wide range of hardware replication technologies as well as block-level replication using VVR.
- Support for campus clusters with the following capabilities:
 - Consistent reattach with Site Awareness
 - Site aware reads with VxVM mirroring
 - Monitoring of Oracle resources
 - Protection against split brain

About Veritas Operations Services

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

VOS automates and simplifies administrator tasks, including:

- Determining if systems are ready to install or upgrade Veritas products
- Gathering deployment and usage information on Veritas products
- Receiving notifications about the latest updates for:
 - Patches
 - Hardware Compatibility Lists (HCLs)

- Array Support Libraries (ASLs)
- Array Policy Modules (APMs)
- Determining whether your Veritas product configurations conform to best practices
- Managing server and environmental configuration data from a single Website
- Interpreting Unified Message Identifier (UMI) codes and their solutions
- Identifying and downloading patches for Veritas products

To access VOS, go to:

<http://vos.symantec.com/>

About SF Oracle RAC Release Notes

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

http://sfdoccentral.symantec.com/sf/5.1/aix/sfrac_notes.pdf

This is document version 5.1.0.

This document provides important information regarding SF Oracle RAC 5.1.

Review this document before you install or upgrade SF Oracle RAC.

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

<http://entsupport.symantec.com/docs/334998>

For information regarding software features, limitations, fixed issues, and known issues of Veritas Cluster Server (VCS):

See *Veritas Cluster Server Release Notes (5.1)*.

For information regarding software features, limitations, fixed issues, and known issues of Storage Foundation (SF):

See *Veritas Storage Foundation Release Notes (5.1)*.

For information regarding software features, limitations, fixed issues, and known issues of Storage Foundation Cluster File System (SFCFS):

See *Veritas Storage Foundation Cluster File System Release Notes (5.1)*.

New in this release

This section describes the list of new features and changes in SF Oracle RAC 5.1.

Veritas keyless licensing

This release of the Veritas products introduces the option to install without a license key. A license key is used during the installation of a software to identify that the user has the right to use the software. Previous releases of Veritas products required that you obtain a license key prior to installation. The installer required that you enter a valid license key before the Veritas software was installed.

The keyless license strategy does not eliminate the need to obtain a license. A software license is a legal instrument governing the usage or redistribution of copyright protected software. The administrator and company representatives must ensure that a server or cluster is entitled to the license level for the products installed. Symantec reserves the right to ensure entitlement and compliance through auditing.

In this release of the Veritas products, the product installer does not require that you enter a license key. The installer prompts you to select one of the following licensing methods:

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

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

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

- Run the `vxkeyless` command to set the product level for the products you have purchased. This option also requires that you manage the server or cluster with a management server.
- Use the `vxlicinst` command to install a valid product license key for the 5.1 products you have purchased.

You can also use the above options to change the product levels to another level that you are authorized to use.

Symantec recommends updating to keyless licensing for the following reasons:

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

For information about setting or changing the product level, see the Installation Guide for your Veritas product.

See the `vxkeyless(1m)` manual page.

Changes in the SF Oracle RAC installer

This section lists the changes in the SF Oracle RAC installer.

I/O fencing configuration

You can use the `-fencing` option with the `installsfrac` program to configure I/O fencing.

Based on the fencing mechanism you want to use in the cluster, the installer provides the following options to configure I/O fencing:

- Disk-based I/O fencing - when you want to use disks as coordination points
- Server-based I/O fencing - when you want to use at least one CP server as coordination point

For more information, see the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide*.

Installer resilience

If the installation or configuration of SF Oracle RAC fails, the installer discovers the presence of an installer instance when you run the installer again. The installer provides an option to resume the installation.

NIM installations

You can install SF Oracle RAC from a central network server using Network Installation Management (NIM). The SF Oracle RAC installer can generate sample finish or configuration scripts that integrate with native installation tools. These sample scripts include all of the relevant SF Oracle RAC packages in the correct order for installation. This feature is supported only for installations.

Adding nodes to a cluster

The SF Oracle RAC installer now provides the following capabilities for adding nodes to a cluster:

- Configures SF Oracle RAC and adds nodes to an existing SF Oracle RAC cluster.
- Performs the following Oracle RAC pre-installation tasks:
 - Creates Oracle user and groups on the new node.
 - Configures the private IP addresses and the PrivNIC resource for Oracle Clusterware (only if the IP addresses on the existing cluster are configured as PrivNIC resources).
 - Configures private IP addresses and the MultiPrivNIC resource for Oracle Clusterware and Oracle UDP IPC (only if the IP addresses on the existing cluster are configured as MultiPrivNIC resources).
 - If the CFMount and CVMVolDg resources for OCR and voting disk are configured under the cvm service group, the installer brings them online after adding the node to the cluster.
 - Starts the cvm group on the new node

Options to install minimum, recommended, or all SF Oracle RAC filesets

The installer now provides the following options for installing SF Oracle RAC:

- Minimal
 - Install only the basic functionality of SF Oracle RAC.
 - To view the list of filesets for this option, use `-minpkgs` option with the installer script.
- Recommended
 - Installs SF Oracle RAC without optional filesets.
 - To view the list of filesets for this option, use `-recpkgs` option with the installer script.
- All
 - Installs all SF Oracle RAC filesets.
 - To view the list of filesets for this option, use `-allpkgs` option with the installer script.

Cross-product upgrades

If you try to perform a cross-product upgrade, the installer now gracefully exits with an error message. For example, if you choose to upgrade SFCFS 5.0 MP3 to SF Oracle RAC 5.1, the installer displays the following error message:

```
SFCFS 5.0.30.00 is installed.  
Upgrading SFCFS 5.0.30.00 directly to SF Oracle RAC 5.1 is not supported.
```

The installer does not support direct upgrade from a previous SFCFS or SFHA version to SF Oracle RAC 5.1. You must upgrade SFCFS or SFHA to version 5.1, then install SF Oracle RAC 5.1.

Simplified SF Oracle RAC configuration

SF Oracle RAC configuration is faster and simpler with reduced manual interventions. The Cluster Volume Manager and Veritas Volume Replicator configuration is automatically performed by the installer.

SF Oracle RAC cluster verification checks

The option **SF Oracle RAC Installation and Configuration Checks** is introduced in the SF Oracle RAC installer. This option enables you to verify the cluster during various stages of SF Oracle RAC deployment.

For new installations, these checks can be performed before and after Oracle RAC installation.

For existing deployments, you can perform these checks after any of the following activities to check the sanity of the cluster:

- Upgrading the operating system
- Applying operating system patch updates
- Applying Oracle patch updates
- Applying SF Oracle RAC patch updates
- Adding a node to an SF Oracle RAC cluster
- Removing a node from an SF Oracle RAC cluster
- Updating the network configuration

Oracle RAC installation

The SF Oracle RAC installer includes several enhancements for performing Oracle RAC pre-installation tasks.

[Table 1-1](#) lists the changes and new features in the SF Oracle RAC installer for Oracle tasks.

Table 1-1 Changes in the SF Oracle RAC installer for Oracle tasks

Oracle task	Description
Oracle user and group creation	<ul style="list-style-type: none"> ■ The installer checks the Oracle user and group IDs in use and suggests unused values.
OCR and voting disk configuration	<ul style="list-style-type: none"> ■ The installer creates CVM volume mirrors for OCR and voting disk ■ The installer creates the OCR and voting disk volumes and sets the ownership ■ The installer starts the volumes ■ If you choose to create the storage on CFS, the installer creates the mount point, mounts it on all the nodes, and sets the ownership for the CFS mount point ■ The installer adds the volume and mount point resources to the VCS configuration so that the resources are brought online automatically when the node starts. ■ The installer brings the resources online
PrivNIC and MultiPrivNIC configuration	<ul style="list-style-type: none"> ■ The installer no longer asks for the NIC information for the IP addresses, but uses all the available LLT links in the cluster for high availability purposes. ■ The installer provides the option to automatically update the <code>/etc/hosts</code> file during the private network configuration to include IP addresses used by PrivNIC or MultiPrivNIC resources.
Oracle Clusterware installation	<p>The installer now runs the <code>rootpre.sh</code> script during the Oracle Clusterware installation.</p>
CSSD agent configuration	<p>A new option Configure CSSD agent is introduced in the SF Oracle RAC installer that enables you to configure the CSSD agent after installing Oracle RAC.</p> <p>During the configuration, the installer creates the CSSD resource in the VCS configuration file and sets the OCR, voting disk, and IP address dependencies, such that they are online before Oracle Clusterware starts.</p>

Installation and upgrade without manual rebooting of nodes

You no longer need to reboot the nodes in the cluster manually after you install SF Oracle RAC 5.1 or upgrade from version 5.0x and later. The installer

automatically starts SF Oracle RAC 5.1 after the installation or upgrade without requiring a reboot of the nodes.

Note: Upgrades from version 4.1 or earlier require you to reboot the systems after the upgrade.

Option to start and stop SF Oracle RAC

You can use the `-start` and `-stop` options with the SF Oracle RAC installer to start and stop SF Oracle RAC.

Silent installation of Oracle RAC using response files

SF Oracle RAC supports the completion of the following Oracle RAC tasks using SF Oracle RAC response files:

- Creating Oracle user and groups
- Creating storage for OCR and voting disk
- Configuration of private IP addresses and corresponding PrivNIC/MultiPrivNIC resources
- Installation of Oracle Clusterware and Oracle database by specifying the path of the Oracle RAC response files in the appropriate response file variable definitions. For more information, see the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide*.
- Configuration of the CSSD resource
- Relinking the SF Oracle RAC libraries with Oracle RAC

Note: You can now use the SF Oracle RAC response file in tandem with the Oracle RAC response files for Oracle Clusterware and Oracle database to perform silent end-to-end installation of SF Oracle RAC and Oracle RAC.

Support to enable rolling upgrades in future releases

This release of SF Oracle RAC establishes the necessary framework to support rolling upgrades in future releases. The framework enables you to use the installer to perform a phased upgrade of your cluster with minimal application and server downtime during the upgrade process.

Installation simulator

You can use the option `-makeresponsefile` with the installer script to simulate an installation, configuration, or uninstallation activity.

Changes to I/O fencing feature

This section lists the new features and changes related to the I/O fencing feature.

Support for Coordination Point server

This release adds support for Coordination Point server (CP server). You can use CP server as a coordination point with server-based I/O fencing.

The Coordination Point server is a software solution based on the customized fencing mechanism, running on a remote system or cluster that provides arbitration functionality by allowing client cluster nodes to perform the fencing tasks.

See the *Veritas Storage Foundation for Oracle RAC Administrator's Guide* for more information.

Unique I/O fencing keys for coordinator disks

The `vxfen` driver now encodes the LLT cluster ID in the SCSI3 keys registered on the coordinator disks. If the disk is zoned to multiple clusters, the I/O fencing key allows you to identify which cluster a coordinator disk belongs to. SF Oracle RAC does not support sharing of coordinator disks across multiple clusters.

See the *Veritas Storage Foundation for Oracle RAC Administrator's Guide* for more information.

New command options for `vxfenclearpre`

The `vxfenclearpre` command now includes the following options:

- A coordinator-only disk option
- An option to clear all keys from coordinator disks
- An option to clear all keys with the VF prefix from the coordinator disks
- An option to clear only the keys from the coordinator disks you specify in the `clusterid`

New -W option for vxfenconfig command

The vxfenconfig command now has a -W option. You can use this option to display the supported and the current I/O fencing protocol versions.

New vxfen_vxfnd_tmt tunable parameter

I/O fencing introduces a new tunable parameter vxfen_vxfnd_tmt. You can use this parameter to tune the time in seconds that the I/O fencing driver VxFEN must wait for the I/O fencing daemon VXFEND to return after completing a given task.

See the *Veritas Storage Foundation for Oracle RAC Administrator's Guide* for more details.

Changes in SF Oracle RAC packaging

This section lists the changes in SF Oracle RAC packaging.

List of packages in SF Oracle RAC 5.1

The new consolidated SF Oracle RAC 5.1 package list is as follows:

VRTSvlic.bff	VRTSperl.bff	VRTSspt.bff	VRTSsob.bff
VRTSvxvm.bff	VRTSaslapm.bff	VRTSsfmh.bff	VRTSvxfb.bff
VRTSfssdk.bff	VRTSllt.bff	VRTSgab.bff	VRTSvxfen.bff
VRTSvcvcs.bff	VRTScps.bff	VRTSvcvcsag.bff	VRTScutil.bff
VRTSat.bff	VRTSvcsea.bff	VRTSdbed.bff	VRTSglm.bff
VRTScavf.bff	VRTSgms.bff	VRTSodm.bff	VRTSdbac.bff
VRTSacclib.bff	VRTSveki.bff		

Deprecated SF Oracle RAC filesets

The following filesets are deprecated in this release:

VRTSaa	VRTSweb	VRTSalloc	VRTScceg
VRTScmccc	VRTScmcs	VRTScscm	VRTScscw
VRTScsow	VRTScssim	VRTSdbcom	VRTSdbms3
VRTSdcli	VRTSddlpr	VRTSdsa	VRTSfsman

VRTSfsmnd	VRTSfspro	VRTSgapms	VRTSicsco
VRTSjre15	VRTSmh	VRTSobc33	VRTSobgui
VRTSpbx	VRTSvail	VRTSvcsmg	VRTSvcsmn
VRTSvcsor	VRTSvcsvr	VRTSvdid	VRTSvmman
VRTSvmpro	VRTSvrpro	VRTSvrw	VRTSvxmsa

Changes to SF Oracle RAC clusters running in secure mode

This section lists the changes in 5.1 for clusters running in secure mode.

Support for passwordless login for non-root users

Support is added for passwordless login for non-root users to run HA commands on secure clusters.

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

Support to enable LDAP authentication in secure clusters using AT CLIs

You can now use the `addldapdomain` and the `atldapconf` commands to enable LDAP authentication in secure clusters.

See the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide* for more details.

Changes to Storage Foundation for Databases (SFDB) functionality

The Storage Foundation for Databases (SFDB) feature for enhanced management of Oracle databases is updated as indicated in the topics below.

For information on using SFDB tools, see the *Veritas Storage Foundation: Storage and Availability Management for Oracle Databases* guide.

SFDB new features

New features in the Storage Foundation for Databases tools package for database storage management for release 5.1:

- SQLite repository
- Multiple disk group support for FlashSnap
- Mapped mount points for individual volumes for Database Flashsnap clones

- Oracle Dataguard support
- Oracle Enterprise Manager (OEM) Plugin
- Cached ODM support

SFDB feature changes

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 release 5.0 to perform repository backup and restore and this command will be obsolete in release 5.1.
- The `sfua_rept_util` command is used to perform SQLite repository backup and restore.
- The `sfua_rept_migrate` command is added for migrating the SFDB repository from the 4.x or 5.0 release to the 5.1 release.

Commands which continue to be supported:

- `dbed_update`
- **Database Storage Checkpoint commands:** `dbed_ckptcreate`, `dbed_ckptdisplay`, `dbed_ckptmount`, `dbed_ckptquota`, `dbed_ckptremove`, `dbed_ckptrollback`, `dbed_clonedb`, `dbed_ckptumount`
- **Database Flashsnap commands:** `dbed_vmchecksnap`, `dbed_vmclonedb`, `dbed_vmsnap`
- **Database Dynamic Storage Tiering 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`

SFDB features which are no longer supported

Commands which are no longer supported in release 5.1:

- ORAMAP (`libvxoramap`)
- Storage mapping commands `dbed_analyzer`, `vxstorage_stats`
- DBED providers(DBEDAgent), Java GUI, and `dbed_dbprocli`.

The SFDB Oracle features can only be accessed through the command line interface. However, Veritas Storage Foundation Manager 2.1 (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`, `vxdbs_fstatsummary`, `dbdst_fiostat_collector`, `vxdbs_get_datafile_stats`
- `dbed_saveconfig`, `dbed_checkconfig`
- `dbed_ckptplan`, `dbed_ckptpolicy`
- `dbed_scheduler`

LLT supports point-to-point unicast heartbeating mechanism

The default heartbeating mechanism in LLT is now point-to-point unicast and not broadcast heartbeating.

Support for 16 nodes in a cluster

SF Oracle RAC now supports 16 nodes in a cluster.

Support for a universally unique ID (UUID) for each cluster

This release introduces a universally unique ID for each cluster.

The VCS installer configures a UUID value for each cluster at the end of the configuration. If you manually configure a cluster, you must use the `uuidconfig.pl` utility to create a cluster UUID.

Support for load balancing in MultiPrivNIC

The MultiPrivNIC agent supports load-balanced fail over if multiple links are identified as failover targets. A new attribute `UseLoadBalance` is introduced to support load balanced fail over of links. In the event that a preferred link goes down, the IP address is failed over to a private link on which maximum number of peer nodes are visible. If multiple links see maximum nodes and if load-balancing is enabled, the agent considers the current traffic on all devices and calculates a "winner" device with lower traffic. If load balancing is not enabled, the IP address is failed over to the link with the lower network ID.

New CRSResource agent

The CRSResource agent provides an alternative mechanism for monitoring the Oracle database in the absence of the VCS Oracle agent. It is useful in scenarios

where the database is not managed by VCS and the applications need to be started using VCS after Oracle Clusterware starts the database. It checks the status of the Oracle Clusterware resources, which include the Oracle database instance, the listener, and the virtual IP address (VIP). The agent supports multiple database configurations and ensures that the Oracle database is online and available to an application when it starts.

Utility to view LMX bandwidth used for database traffic

The `lmtxdbstat` utility can be used to determine the LMX bandwidth used for database traffic for each database. The utility is located at `/sbin/lmtxdbstat`.

The utility reports the following information:

- Status of the LMX protocol
- The LMX port and buffer traffic received and transmitted at periodic intervals in packets and kilobytes for each database instance.
- The LMX port and buffer traffic received and transmitted at periodic intervals in packets and kilobytes for a database process.

For more information:

See the *Veritas Storage Foundation for Oracle RAC Administrator's Guide*.

See the `lmtxdbstat(1M)` manual page.

Enhancements to VRTSexplorer utility

The VRTSexplorer utility includes enhancements to collect more logs, including Oracle Clusterware and Oracle database log information.

Enhanced sample configuration files

This release of SF Oracle RAC includes a number of sample configuration files that illustrate various deployment scenarios. Each sample file contains a high-level description of the deployment scenario. The files are located at

`/etc/VRTSvcs/conf/sample_rac/`.

Changes in the SF Oracle RAC documentation

This section provides a high-level list of the key changes in the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide*:

- The sections "Oracle RAC 10g installation in an SF Oracle RAC environment" and "Oracle RAC 11g installation in an SF Oracle RAC environment" are now consolidated into a single section "Installing and configuring Oracle RAC".

The Oracle RAC chapters containing preparatory and installation instructions are common for Oracle RAC 10g and Oracle RAC 11g. Differences in instructions, wherever applicable, are indicated in the relevant steps.

The chapter formerly titled "Installing Oracle RAC 11g manually" is now placed in the chapter "Installing Oracle RAC" and is re-titled as follows:

- Installing Oracle Clusterware using the Oracle Universal Installer
- Installing the Oracle RAC database using the Oracle Universal Installer
- The minimum downtime upgrade procedure is revised for this release and is now termed as "phased upgrade".
- The list of SF Oracle RAC sample files that were reproduced in the appendix of the guide is now replaced by service group configuration illustrations of various scenarios and corresponding descriptions. The actual files can be referenced at `/etc/VRTSvcs/conf/sample_rac/`.

Installation requirements

Make sure that each node on which you want to install or upgrade SF Oracle RAC meets the following installation requirements:

- [Hardware requirements](#)
- [Supported AIX operating systems](#)
- [Recommended SF Oracle RAC 5.1 patch](#)
- [Supported database software](#)
- [Supported high availability, volume manager, and file system software](#)
- [License requirements](#)

Before you install SF Oracle RAC, you must read the Late Breaking News TechNote:

<http://entsupport.symantec.com/docs/282024>

Hardware requirements

Make sure that you have the correct equipment to install SF Oracle RAC:

- Review the current compatibility list to confirm compatibility of your hardware:
<http://entsupport.symantec.com/docs/283161>
- Review the Oracle documentation for additional requirements pertaining to your version of Oracle.

Depending on the type of setup planned, make sure you meet the necessary hardware requirements.

For basic clusters See [Table 1-2](#) on page 24.

For campus clusters See [Table 1-3](#) on page 25.

Table 1-2 Hardware requirements for basic clusters

Item	Description
SF Oracle RAC systems	Two to sixteen systems with two or more CPUs at 2GHz or higher.
DVD drive	A DVD drive on one of the nodes in the cluster.
Disks	SF Oracle RAC requires that all disks support SCSI-3 Persistent Reservations (PR). Note: The coordinator disk does not store data, so configure the disk as the smallest possible LUN on a disk array to avoid wasting space.
Disk space	You can evaluate your systems for available disk space by running the following command: <pre># cd /dvd_mount/sfrac</pre> <pre># ./installsfrac -precheck node_name</pre> For details on the additional space that is required for Oracle, see the Oracle documentation.
RAM	Each SF Oracle RAC system requires at least 2 GB. Symantec recommends RAM at least twice the Oracle SGA size.
Swap space	The minimum swap space requirement for Oracle RAC 10g is 4 GB. The minimum swap space requirement for Oracle RAC 11g is 8 GB. The operating system requirement for minimum swap space is two times the size of RAM. Between the minimum requirements of Oracle RAC and the operating system, make sure that you meet the minimum requirement that is higher. For example, if the operating system requirement for minimum swap space computes to 5 GB on your Oracle RAC 11g systems, make sure that you meet the minimum swap space requirement of Oracle RAC, that is 8 GB.

Table 1-2 Hardware requirements for basic clusters (*continued*)

Item	Description
Network links	<p>Two or more private links and one public link.</p> <p>Links must be 100BaseT or gigabit Ethernet directly linking each node to the other node to form a private network that handles direct inter-system communication. These links must be of the same type; you cannot mix 100BaseT and gigabit.</p> <p>Symantec recommends gigabit Ethernet using enterprise-class switches for the private links.</p> <p>You can also configure aggregated interfaces.</p>
Fibre Channel or SCSI host bus adapters	<p>At least one built-in SCSI adapter per system to access the operating system disks.</p> <p>At least one additional SCSI or Fibre Channel Host Bus Adapter per system for shared data disks.</p>

[Table 1-3](#) lists the hardware requirements for campus clusters in addition to the basic cluster requirements.

Table 1-3 Hardware requirements for campus clusters

Item	Description
Storage	<ul style="list-style-type: none"> ■ The storage switch (to which each host on a site connects) must have access to storage arrays at all the sites. ■ Volumes must be mirrored with storage allocated from both sites.
Network	<ul style="list-style-type: none"> ■ Oracle requires that all nodes use the IP addresses from the same subnet. ■ Volumes must be mirrored with storage allocated from both sites. ■ Symantec recommends two Network Interface Cards (NIC) per host for LLT heartbeats. Oracle Clusterware requires one private and one virtual IP for each host. ■ DWDM links are recommended between sites for storage links. DWDM works at the physical layer and requires multiplexer and de-multiplexer devices. ■ The storage and networks must have redundant-loop access between each node and each storage array to prevent the links from becoming a single point of failure. ■ Symantec recommends a common cross-site physical infrastructure for storage and LLT private networks.

Table 1-3 Hardware requirements for campus clusters (*continued*)

Item	Description
I/O fencing	I/O fencing requires placement of a third coordinator disk at a third site. The DWDM can be extended to the third site or the iSCSI LUN at the third site can be used as the third coordination point.

Supported AIX operating systems

This section lists the supported operating systems for this release of Veritas products.

Product installation scripts verify the required update levels. The installation process terminates if the target systems do not meet the maintenance level requirements.

For any Veritas cluster product, all nodes in the cluster must have the same operating system version and update level.

The minimum system requirements for this release are as follows:

AIX 5.3 at one of the following levels:

- TL7 with SP6
- TL8 with SP4
- or any higher TLs.

AIX 6.1 at one of the following levels:

- TL0 with SP6
- TL1 with SP2
- or any higher TLs.

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

<http://entsupport.symantec.com/docs/334998>

Recommended SF Oracle RAC 5.1 patch

Symantec strongly recommends installing the SF Oracle RAC 5.1 Patch 1 immediately after installing SF Oracle RAC 5.1.

The patch is available at the following URL:

<https://vos.symantec.com/patch/detail/2956>

Supported database software

For the latest information on supported Oracle database versions, see the following Technical Support TechNote:

<http://entsupport.symantec.com/docs/280186>

Note: SF Oracle RAC supports only 64-bit Oracle.

The following database versions are supported:

- Oracle RAC 10g Release 2
- Oracle RAC 11g Release 1

Supported high availability, volume manager, and file system software

Use only those versions of VCS, VxVM, VxFS, and VVR that are provided on the software disc. Remove other versions from your systems before you install the software from the SF Oracle RAC product disc.

Supported replication technologies for global clusters

SF Oracle RAC supports the following hardware-based replication and software-based replication technologies for global cluster configurations:

Hardware-based replication

- EMC SRDF
- Hitachi TrueCopy
- IBM Metro Mirror
- IBM SAN Volume Controller (SVC)
- EMC MirrorView

Software-based replication

- Veritas Volume Replicator
- Oracle Data Guard

License requirements

You need to obtain the appropriate licenses to install and configure SF Oracle RAC. For more information on the available licensing options and the required licenses, see the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide*.

No longer supported

This section lists software versions and features that are no longer supported. Symantec advises customers to minimize the use of these features.

SF Oracle RAC does not support the following:

- Dissimilar version upgrades of SF Oracle RAC components
For example, if you have SF Oracle RAC 4.1 installed with Oracle RAC 9i Release 2, you can not upgrade only VCS to version 5.1.
- Option `hawizard -rac` for configuring service groups
- 32-bit Oracle architectures
- Oracle RAC 9i, Oracle RAC 10g Release 1
- AIX 5.2
- ASMInst agent
The ASMInst agent is no longer supported in SF Oracle RAC environments. The ASM instances are managed by Oracle Clusterware.
- Use of crossover cables
Oracle does not support the use of crossover cables for cluster interconnects due to the possibility of data corruption and other software limitations.

Note: Crossover cables are however known to function without any issues in SF Oracle RAC. While the SF Oracle RAC Technical support team may continue to provide support on related issues for existing deployments, this support may be constrained in some respects as it is no longer a supported configuration by Oracle.

The use of crossover cables is discouraged for new deployments.

Fixed issues

This section describes the list of issues fixed in SF Oracle RAC.

See [“Issues fixed in SF Oracle RAC 5.1”](#) on page 29.

For the list of issues fixed in Veritas Cluster Server:

See *Veritas Cluster Server Release Notes (5.1)*.

For the list of issues fixed in Storage Foundation:

See *Veritas Storage Foundation Release Notes (5.1)*.

For the list of issues fixed in Storage Foundation Cluster File System:
 See *Veritas Storage Foundation Cluster File System Release Notes (5.1)*.

Issues fixed in SF Oracle RAC 5.1

[Table 1-4](#) lists the issues fixed in SF Oracle RAC 5.1.

Table 1-4 SF Oracle RAC 5.1 fixed issues

Incident number	Description
1473933	<p>Issue: The MultiPrivNIC agent may fail over IP addresses that are not configured on the preferred link.</p> <p>Resolution: The MultiPrivNIC agent now fails over the IP address only if the current active link sees less peer nodes than the node that wins the race condition.</p>
1475933	<p>Issue: The NIC resource definitions in the <i>Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide</i>, Chapter: "Configuring a global cluster using VVR", did not contain the NetworkHosts parameter.</p> <p>Resolution: The NetworkHosts parameter is now added to the NIC resource definitions in the chapter "Configuring a global cluster using VVR".</p>
1501992	<p>Issue: The uninstallation of SF Oracle RAC leaves behind a few unintended directories on the system, such as <code>/opt/VRTSvcs</code>, <code>/opt/VRTSvxfs</code>, <code>/opt/VRTSodm</code>, <code>/opt/VRTSob</code>.</p> <p>Resolution: Uninstalling SF Oracle RAC now removes all directories except the directories that contain logs and configuration information.</p> <p>The following directories are now retained:</p> <p><code>/opt/VRTS</code>, <code>/opt/VRTSperl</code>, <code>/etc/VRTSvcs</code>, <code>/var/VRTSvcs</code>, <code>/var/VRTSat_lhc</code>, <code>/var/VRTSat</code></p>
1530698	<p>Issue: The MulitPrivNIC agent fails to report error messages when the parameter <code>UseVirtualIP</code> is set to 2 and the IP addresses are configured on physical interfaces.</p> <p>Resolution: The MulitPrivNIC agent now reports error messages in the VCS engine log file <code>/var/VRTSvcs/log/engine_A.log</code> when the parameter <code>UseVirtualIP</code> is set to 2 and the IP addresses are configured on physical interfaces.</p>

Table 1-4 SF Oracle RAC 5.1 fixed issues (*continued*)

Incident number	Description
1539295	<p>Issue: If the <code>netmask</code> attribute in the PrivNIC or MultiPrivNIC resource configuration is modified when VCS is running, the netmask of the configured IP address is not updated on the system.</p> <p>Resolution: The changes to the <code>netmask</code> attribute in the PrivNIC or MultiPrivNIC resource configuration when VCS is running now apply to the netmask of the IP address configured on the system.</p>
1638350	<p>Issue: During heavy I/O load, one or more nodes may halt due to an <code>abend</code> exception with the following stack trace.</p> <pre data-bbox="552 621 1153 852">[0001AD40]abend_trap+000000 () [0007E5B8]tstart+000558 (??) [00014F50].kernel_add_gate_cstack+000030 () [F1000000A02A6044].llt_aix_timeout+0000E4 () [F1000000A02AFD64].llt_timer_handler+000470 () [F1000000A02A62F0].llt_timer_procfunc+0000A0 () [00014D70].hkey_legacy_gate+00004C () [001A2DD0]procentry+000010 (??, ??, ??, ??)</pre> <p>The LLT, GAB, and LMX internal timer implementations use <code>tstart()</code> kernel service to submit timer requests. During a race condition, if LLT, GAB, or LMX attempt to submit another timer request through <code>tstart()</code> before the previous request is completed, the previous handler's stale values may be accessed by <code>tstart()</code>, leading to <code>abend</code> exception and system panic.</p> <p>The issue was observed on AIX 6.1 TL2 and later versions.</p> <p>Resolution: The race condition is now avoided by modifying LLT, GAB, and LMX drivers to issue a timer request only after the active request is stopped.</p>
1729751	<p>Issue: Performance issues with VCS IPC results in excessive Oracle startup time.</p> <p>Resolution: The VCS IPC implementation is now modified to significantly improve Oracle startup time with VCS IPC.</p>
1826308	<p>Issue: The monitor operation of the CSSD agent degrades performance by running multiple <code>ps</code> commands.</p> <p>Resolution: The <code>cssd-monitor</code> script is now modified to use a single <code>ps</code> command with <code>-o args</code> option to improve the performance.</p>

Table 1-4 SF Oracle RAC 5.1 fixed issues (*continued*)

Incident number	Description
1301698	<p>Issue: If I/O fencing is started in disabled mode, and if you change the <code>/etc/vxfenmode</code> file later to <code>scsi3</code>, the <code>vxfen</code> driver displays the following error when you stop I/O fencing:</p> <pre>Stopping VxFEN: ERROR: failed to stop vxfen</pre> <p>However, the actual I/O fencing stop operation was successful.</p> <p>Resolution: The <code>vxfen</code> driver now no longer displays erroneous messages on starting I/O fencing in disabled mode and changing the <code>/etc/vxfenmode</code> file later to <code>scsi3</code>.</p>
857159	<p>Issue: If you configure GCO using the <code>/opt/VRTSvcs/bin/gcoconfig</code> command, the <code>gcoconfig</code> utility assigns the priority '0' to all the nodes that are in the <code>SystemList</code> attribute of the <code>ClusterService</code> group.</p> <p>Resolution: The <code>/opt/VRTSvcs/bin/gcoconfig</code> command now assigns the correct priority number to all the cluster nodes in the <code>SystemList</code> attribute of the <code>ClusterService</code> group.</p>

Known issues

This section lists the known issues in SF Oracle RAC 5.1.

For Oracle issues:

See [“Oracle issues”](#) on page 31.

For SF Oracle RAC issues:

See [“SF Oracle RAC issues”](#) on page 34.

Oracle issues

This section describes the known issues of Oracle in this release.

Asynchronous I/O error messages on executing `rootpre.sh` script on AIX 6.1

The "Install Oracle Clusterware (CRS)" option does not check for the "Asynchronous I/O" package when using `installsf rac -configure (ssh)`. [1201863]

Problem: When running the `rootpre.sh` program, messages like the following are displayed:

```
Configuring Asynchronous I/O....  
Asynchronous I/O is not installed on this system.  
You will need to install it, and either configure it yourself using  
smit aio' or rerun the Oracle root installation procedure.
```

```
Configuring POSIX Asynchronous I/O....  
Posix Asynchronous I/O is not installed on this system.  
You will need to install it, and either configure it yourself using  
smit aio' or rerun the Oracle root installation procedure.  
1.7.2.3
```

Workaround: Ignore the errors. The error message is generated because `rootpre.sh` is enabling the POSIX AIO and Legacy AIO devices for Oracle use. In AIX 6.1, Asynchronous I/O (AIO) is installed and enabled automatically and the individual AIX Asynchronous I/O devices like `aio0` and `posix_aio0` no longer exist. Therefore this is not a problem. However, users must verify that no other script failures have occurred.

For more details on the AIX 6.1 update requirement:

See Oracle Note 282036.1 from metalink.

A replacement `rootpre.sh` is available for download from Oracle MetaLink. Reference Oracle bug# 6613550 or ARU# 9638501.

Oracle VIP Configuration Assistant fails with an error message

During Oracle RAC 10g Release 2 installation, the VIP Configuration Assistant may fail with the following error message:

```
The given interface(s), "en0" is not public.  
Public interfaces should be used to configure virtual IPs.
```

This message appears only when the VIP is not from the regular public IP range (for example, 200.). [1182220]

Workaround: Invoke the `vipca` utility manually as the superuser.

```
# export DISPLAY=nebula:0.0  
# $CRS_HOME/bin/vipca
```

Oracle Cluster Verification utility displays a warning message

During the final stage of Oracle RAC 10g Release 2 installation, you may receive a warning message with the Oracle Cluster Verification utility.

For example:

```
Utility
=====
OUI-25031: Some of the configuration assistants failed. It is
strongly recommended that you retry the configuration
assistants at this time. Not successfully running any "
Recommended" assistants means your system will not be correctly
configured.
1. Check the Details panel on the Configuration Assistant Screen
to see the errors resulting in the failures.
2. Fix the errors causing these failures.
3. Select the failed assistants and click the 'Retry' button
to retry them.
=====
```

Workaround: You may safely ignore this message if the cluster is operating satisfactorily.

Using `lltconfig -u` in an Oracle RAC 10g environment may cause IP failover issues

Using `lltconfig -u` in an Oracle RAC 10g environment to unconfigure a link with Oracle's private IP address prevents the PrivNIC agent from failing over this IP address. This usage may result in a reboot of the system by Oracle Clusterware.

Workaround: Before you unconfigure the link from LLT, modify the PrivNIC configuration to remove the corresponding NIC entry from the `Device` attribute in the PrivNIC resource.

Changing the Veritas agent for Oracle error handling

The Veritas agent for Oracle provides enhanced handling of Oracle errors encountered during detailed monitoring. The agent uses the reference file, `oraerror.dat`, which provides a list of Oracle errors and actions to address the errors.

For a description of the actions:

See the *Veritas High Availability Agent for Oracle Installation and Configuration Guide*.

Currently, the file specifies the NOFAILOVER action for the following Oracle errors: ORA-00061, ORA-02726, ORA-6108, ORA-06114

The NOFAILOVER action means that the agent sets the state of the resource to OFFLINE and freezes the service group. If you want to change this behavior, you can stop the agent, edit oraerror.dat, and change the NOFAILOVER action to another action that is appropriate for your environment. The changes go into effect when you restart the agent.

SF Oracle RAC issues

This section lists the known issues in SF Oracle RAC for this release.

IP addresses failed over by MultiPrivNIC agent are unreachable for a period of time

The IP addresses failed over by the MultiPrivNIC agent are unreachable for a period of time, thus causing Oracle Clusterware to reboot the nodes in the cluster after the expiry of the CSS misscount interval. This is because the ARP (Address Resolution Protocol) table of the nodes in the cluster takes longer to refresh in AIX. As a result, the ARP table mapping continues to refer to the failed device even after the IP address migrates to a new device.

Workaround: Modify the AIX `arpt_killc` parameter as described in the following procedure to reset the ARP refresh interval.

To reset the ARP refresh interval

- 1 Log into each node in the cluster as the root user.
- 2 Check the current parameter setting:

```
# no -o arpt_killc
```

- 3 If the current setting is greater than the CSS misscount interval, reset the ARP refresh interval:

```
# no -p -o arpt_killc=NewValue
```

where *NewValue* indicates the new refresh interval in minutes. The `-p` option sets the value of the parameter permanently.

Note: Symantec recommends that the new value be lesser than the CSS misscount interval, preferably below 10 minutes.

For example, to reset the refresh interval to 5 minutes:

```
# no -p -o arpt_killc=5
```

CSSD resource configuration using SF Oracle RAC installer fails if OCR and voting disk files are not placed at the root of the file system

If you place the OCR and voting disk files on CFS, they must be placed at the root of the file system. Placing them under directories on CFS causes the CSSD resource configuration using the SF Oracle RAC installer to fail with the following error:

```
Failed to find resource(s) of type CFMount.  
See logs for more details.
```

For example, if the CFS mount point is `/ocrvote`, then the OCR and voting disk files must be located at `/ocrvote`. Placing them under a directory, for example `/ocrvote/ocrdir/`, causes the CSSD resource configuration to fail.

[1822743]

Workaround: When you enter the OCR and voting disk location during the installation of Oracle Clusterware, make sure that you place the files at the root of the file system.

Alternatively, configure the CSSD resource manually.

CSSD resource configuration using installer may fail if the `/etc/hosts` file contains commented IP address and host name entries

The SF Oracle RAC installer may fail to configure the CSSD resource if the `/etc/hosts` file contains commented IP address and host name entries.

Workaround: Remove the commented IP address and host name entries from the file and reconfigure the CSSD resource using the SF Oracle RAC installer.

For instructions on configuring the CSSD resource using the SF Oracle RAC installer, see the section "Configuring the CSSD resource" in the *Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide*.

For instructions on configuring the CSSD resource manually:

Messages scroll out of view on clusters with three or more nodes

On clusters with three or more nodes, messages scroll out of view during installation or configuration activities that print a large number of messages on screen. For example, when you run the installation and configuration checks using the **SF Oracle RAC Installation and Configuration Checks** option in the SF Oracle RAC installer menu on a three-node cluster, the messages run off the screen after the terminal window displays the first page of messages. These messages can not be viewed or retrieved.

Workaround: For any failures that may result during the checks, see the log file `/opt/VRTS/install/logs`.

Long messages run off the screen if the screen width is less than 100 characters

Messages that exceed 80 characters escape from view if the screen width of your terminal window is less than 100 characters. For example, when you run the installation and configuration checks using the **SF Oracle RAC Installation and Configuration Checks** option in the SF Oracle RAC installer menu, long messages run off the side on terminal window sizes less than 100.

Workaround: Set the terminal window size to a value greater than 100.

Deporting issues with shared disk groups

If you manually deport a shared disk group, the CVMVolDg agent does not automatically reimport it as a shared disk group. You must manually reimport it as a shared disk group.

Stopping cluster nodes configured with I/O fencing

The I/O fencing feature protects against data corruption resulting from a failed cluster interconnect or “split brain.”

For more information, see *Veritas Cluster Server User’s Guide*.

I/O fencing uses SCSI-3 Persistent Reservation keys to implement data protection. The software places keys on I/O fencing coordinator and data disks. The administrator must be aware of several operational changes needed when working with clusters protected by I/O fencing. Specific shutdown procedures ensure keys are removed from coordinator disks and data disks to prevent possible difficulties with subsequent cluster startup. Using the reboot command rather than the shutdown command bypasses shutdown scripts and can leave keys on the coordinator and data disks. Depending on the order of reboot and subsequent startup events, the cluster might warn of a possible split brain condition and fail to start up.

Workaround: Use the shutdown command instead of the reboot command to perform a graceful reboot for systems.

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

Recovering a cloned Oracle RAC database

If you clone an Oracle RAC database using the interactive mode, then the recovery of the cloned database should be performed manually by following the Oracle recovery procedure for a RAC database. [#1215075]

Stopping VCS does not unregister port f from GAB membership

In an SF Oracle RAC cluster with all the CFS resources under VCS control, when you stop VCS, all the CFS resources must go down cleanly and CFS must unregister port f from GAB membership. Oracle RAC 10g Clusterware does not clean up all its processes when it is stopped. Now, when you stop VCS, all the CFS resources go down. However, due to the left over Oracle processes, CFS does not unregister port f from GAB membership.

Workaround: Perform the following steps to bring down port f.

To bring down port f

- 1 Kill all the Oracle processes.

```
# kill -9 `ps -u oracle|awk '{print $1}'`
```

- 2 Verify that all CFS file systems are unmounted.

```
# mount | grep cluster
```

- 3 Unregister port f from GAB membership.

```
# fsclustadm cfsdeinit
```

GAB error messages on running installsfrac during an add node or install only configuration

After running the "installsfrac" utility (install only) during an add node or install only configuration, the following error messages may appear:

```
AIX Version 6
Copyright IBM Corporation, 1982, 2007.
Console login: GAB WARNING V-15-1-20115
Port d registration failed, GAB not configured
VRTS:GMS: vxgms: GAB_API_REGISTER error=161

VRTS:ODM: ODM WARNING V-41-6-5 odm_gms_api_start_msgs fails
0513-059 The ctrmc Subsystem has been started. Subsystem PID is 225394.
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
GAB ERROR V-15-1-20109 Port h registration failed, GAB not configured
^^^ NOTE: notice these error messages
```

Workaround: You may safely ignore these error messages. [1241070]

Error messages during uninstallation

When you uninstall SF Oracle RAC using the command `./uninstallsfrac -rsh`, the following message may appear on your console:

```
# /usr/lib/vxvm/bin/vxconfigbackupd[248]: 790574 Killed
```

You may safely ignore this error message. [1241070]

Storage checkpoints may fail to roll back on AIX 6.1

Sometimes, the `dbed_ckptrollback` command fails on AIX 6.1 with the following error message:

```
ERROR V-81-4804 Thread 4 pwrite error.  
SFORA rollback ERROR V-81-4818 Rollback failed for file  
/oracle/oradata/patill1/bmf.dbf
```

Workaround: Mount the checkpoint using the `'dbed_ckptmount'` command. Then, use the `'cp'` command to copy the files that failed to roll back. [1396168]

Issue with format of the last 8-bit number in private IP addresses

The PrivNIC/MultiPrivNIC resources fault if the private IP addresses have a leading 0 in any of the octets that comprise the IP address, for example `X.X.X.01` or `X.X.0X.1.` or `X.0X.X.1` or `0X.X.X.1`, where X is an octet of the IP address. [1164506]

When you configure private IP addresses for Oracle Clusterware, ensure that the IP addresses have a format as displayed in the following two-node example:

- On galaxy: 192.168.12.1
- On nebula: 192.168.12.2

Confirm the correct format by viewing the PrivNIC or MultiPrivNIC resource in the `/etc/VRTSvcs/conf/config/main.cf` file.

Global group fails to come online on the DR site with a message that it is in the middle of a group operation

When the node that runs the global group faults, VCS internally sets the `MigrateQ` attribute for the group and attempts to fail over the global group within another node in the local cluster. The `MigrateQ` attribute stores the node name on which the group was online. If the failover within the cluster does not succeed, then VCS clears the `MigrateQ` attribute for the groups. However, if the groups have dependencies which are more than one-level deep, then VCS does not clear the `MigrateQ` attribute for all the groups. [1795151]

This defect causes VCS to misinterpret that the group is in the middle of a failover operation within the local cluster and prevents the group to come online on the DR site with the following message:

```
VCS WARNING V-16-1-51042 Cannot online group global_group.  
Group is in the middle of a group operation in cluster local_cluster.
```

Workaround: Perform the following steps on a node in the local cluster which is in the RUNNING state.

To bring the global group online on the DR site

- 1 Check whether the MigrateQ attribute is set for the global group you want to bring online on the remote cluster.

```
# hagrps -display -all | grep -i migrateq
```

This command displays the name of the faulted node on which the group was online.

- 2 Flush the global group that you want to bring online on the remote cluster.

```
# hagrps -flush global_group -sys faulted_node -clus local_cluster
```

where:

- *global_group* is the group that you want to bring online on the remote cluster.
- *faulted_node* is the node in the local cluster that hosted the global group and has faulted.
- *local_cluster* is the cluster at the local site.

The flush operation clears the node name from the MigrateQ attribute.

- 3 Bring the service group online on the remote cluster.

```
# hagrps -online global_group -any -clus remote_cluster
```

When master node loses access to complete storage, detached sites remain in RECOVER state even after reattaching and recovering the sites

In a campus cluster environment, if the master node loses access to complete storage, all but one of the sites is detached and the DCO volumes may get detached if the *dgfailpolicy* is set to *dgdisable*. If the detached sites are reattached and recovered, the site still remains in RECOVER state. [1828142]

Workaround: Change the status of the site as described in the following procedure to resolve the issue.

To change the status of the site

1 Log onto the CVM master node.

2 Reattach the detached sites:

```
# vxdg -g dg_name reattachsite site_name
```

The site remains in RECOVER state.

3 Restore DCO volumes by unpreparing and preparing the volumes.

Unprepare the volumes:

```
# vxsnap -g dg_name -f unprepare vol_name
```

Prepare the volumes:

```
# vxsnap -g dg_name prepare vol_name dnl=on
```

4 Reattach the detached sites:

```
# vxdg -g dg_name reattachsite site_name
```

5 Verify that the state of the detached sites is now ACTIVE:

```
# vxprint
```

The cluster may hang if a node goes down (1835718)

The cluster may hang if a node goes down while one array is disabled or offline in a mirror=enclosure configuration.

This may occur, if a node panics or loses power while one array of a mirror=enclosure configuration is offline or disabled, then the cluster, fencing, I/O loads, and VxVM transactions hang.

There is no workaround at this time.

The CVMVolDg and CFSSMount resources may go to faulted state (1437947)

If the timezone of a system is changed on the fly where there is CVMVolDg resources already in ONLINE state with the cluster running, the CVMVolDg resources will be reported as OFFLINE in the next monitor cycle. Then in turn CVMVolDg and CFSSMount resources will go to faulted state.

Workaround

Bring down the cluster using the `hastop -all` command before changing the timezone and then start the cluster by entering `hastart` on all the nodes.

If you modify resource names, Cluster Volume Manager cannot start (1444545)

If you modify the `main.cf` configuration file, do not change the CVM or CFS resource names. These names must appear in lower case. If you change them, CVM/CFS fails to start or go online.

A Symantec technical note describes this issue in more detail.

<http://atlas.veritas.com/avf/aca-1/dispatch.exe/mynotes/lookup/309236/0>

vradmind commands might fail on non-logowner node after logowner change (1810827)

When VVR is used for replicating shared disk groups in an SFCFS or SFRAC environment consisting of three or more nodes, a logowner change event might, in rare instances, render `vradmind` commands unusable on some or all of the cluster nodes. In such instances, the following message will appear in the "Config Errors:" section of the output of the `vradmind repstatus` and `vradmind printrvg` commands:

```
vradmind not reachable on cluster peer
```

In addition, all other `vradmind` commands (except `vradmind printvol`) will fail with the error:

```
"VxVM VVR vradmind ERROR V-5-52-488 RDS has configuration error related to the master and logowner."
```

This is due to a defect in the internal communication sub-system, which will be resolved in a later release.

To workaround this issue, restart `vradmind` on all the cluster nodes using the following commands:

```
# /etc/init.d/vras-vradmind.sh stop  
# /etc/init.d/vras-vradmind.sh start
```

Veritas Storage Foundation for Databases (SFDB) tools known issues

The following are known issues with Storage Foundation for Databases (SFDB) tools.

Clone command fails on an Oracle RAC database (1399393)

The commands `dbed_vmclondb` and `dbed_clonedb` will fail on an Oracle RAC database when the clone SID name contains the primary SID name in the beginning.

For example, the following commands, which have “Prod” as the primary SID and “Prod1” as the clone SID, produce the following error message:

```
# dbed_vmclondb -S Prod -o recoverdb \  
new_sid=Prod1,server_name=srv_name -f snapplan -r relocate_path  
# dbed_vmclondb -S Prod -o mountdb \  
new_sid=Prod1,server_name=srv_name -f snapplan -r relocate_path  
# dbed_clonedb -S Prod1 -m mount_point -c ckpt_name  
ERROR V-81-4882 An error occurred while reconfiguring Oracle instance  
'clone_SID'
```

Database fails over during Flashsnap operations (1469310)

In an SFHA 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.

Storage Foundation for Databases (SFDB) tools support for using Oracle Data Guard with Oracle RAC (1801265)

Storage Foundation for Databases (SFDB) tools do not support use of Data Guard with Oracle RAC in this release.

Clone command fails for instant checkpoint on Logical Standby database (1736516)

The `dbed_clonedb` command does not work on Logical standby database when using instant checkpoint.

Flashsnap reverse resync command fails on offhost flashsnap cloning (1810711)

Performing `dbed_vmsnap -o reverse_resync_begin` fails if an off-host clone has been created on the snapshot before.

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`.

Reattach command fails in a multiple disk group environment if the snapshot operation fails (1840672)

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

DBED features are not integrated with GCO

DBED features are not integrated with Global Cluster Option (GCO). After GCO migration, be aware that DBED features will not be functional. [1241070]

Database FlashSnap snapplan creation and validation failed for standby database if standby redo log is mislocated (1873738)

Mislocated standby redo log files may cause errors during Database FlashSnap snapplan creation and validation for standby database in a Oracle Data Guard environment.

The `dbed_vmchecksnap` command may fail with the following error messages:

```
$ dbed_vmchecksnap -S stand \  
-H $ORACLE_HOME -f snp -o setdefaults -t dblxxeon02  
SFORA vxsnapadm ERROR V-81-5907 open() /snap_data11r1/FLAS11r1/redo01.log  
failed (No such file or directory).  
SFORA vxsnapadm ERROR V-81-5526 Empty or open file  
/snap_data11r1/FLAS11r1/redo01.log failed.  
Snapplan snp for stand.
```

Workaround

Create empty redo log files by using the `touch` command so that `dbed_vmchecksnap` can succeed without any errors.

For example:

```
$ touch /snap_data11r1/FLAS11r1/redo01.log  
$ touch /snap_data11r1/FLAS11r1/redo02.log  
$ touch /snap_data11r1/FLAS11r1/redo03.log
```

Software limitations

The following limitations apply to this release.

Performance recommendation for space-optimized volume snapshots

For minimal performance impact, Symantec recommends that the Space Optimized Snapshots (SOS) be created only of data volumes. A mirror breakoff snapshot should be created of the Oracle log volume. The log volumes are typically small in size and do not have significant space overhead.

Oracle Disk Manager (ODM) limitation

Oracle Disk Manager (ODM) uses the Quick I/O driver for asynchronous I/O. Do not turn off the Quick I/O mount option, which is the default.

For details on asynchronous I/O issues with AIX 6.1:

See [“Asynchronous I/O error messages on executing rootpre.sh script on AIX 6.1”](#) on page 31.

Cached ODM

You can enable Cached ODM only for files on local file systems. It can not be enabled for files on Cluster File System.

RDAC driver and FASTT array limitations for coordinator disks

For multipathing connected storage when using the AIX RDAC driver for FASTT arrays, the following points must be considered:

- Since it is an active/passive array, only the current active path is exposed to clients.
- The I/O fencing driver, vxfen, can use only a single active path and has no fore-knowledge of the passive paths to the coordinator disks on an array.

Therefore, if the single active path fails, all nodes in the cluster lose access to the coordinator disks. The loss of the path to the coordinator disks can potentially go unnoticed until a reboot, split brain, or any other reason that leads to a cluster membership change occurs. In any of these conditions, the cluster cannot form, and all nodes panic to prevent data corruption. No data loss occurs.

This limitation does not apply if DMP is used for fencing co-ordinator disks. However, if the `scsi3_disk_policy` is set to "raw," which is the default setting, this limitation still applies.

Storage Checkpoint and Database FlashSnap limitation

The following are the limitations of Storage Checkpoint and Database FlashSnap:

- You cannot create a clone database using a mounted Storage Checkpoint.
- If you create an Oracle instance using the `spfile` option, you must run the `dbed_update` command before you can successfully perform any Storage Checkpoint or Database FlashSnap functions.
- Storage Checkpoints require file system layout version 6 or version 7. Use the `vxupgrade(1M)` command to check the current layout version and to change the layout version, if necessary. When upgrading a CFS file system, issue the command from the primary node. Note that after you upgrade a system to layout version 6 or version 7, the file system is no longer compatible with the older VxFS file systems.
- When cloning a database using Database FlashSnap, the Oracle database must have at least one mandatory archive destination. For more information about Oracle parameters for archiving redo logs, see your Oracle documentation.
- Only online snapshots are supported for an Oracle RAC database, when using the `dbed_vmsnap`, `dbed_vmclonedb`, and `dbed_vmchecksnap` commands.
- After running `dbed_vmsnap -o reverse_resync_commit`, your primary database is started using a `pfile`. If your original primary database used an `spfile`, you need to shut down the database and restart it using `spfile`. Then, run `dbed_update` to update the repository.
- The Storage Checkpoint and Database FlashSnap features of SF Oracle RAC do not support the graphical user interface of the Veritas Storage Foundation for Oracle product.
- The Database FlashSnap feature does not support RAID-5 volumes.

LLT low priority heartbeat links not recommended

Symantec does not recommend using the public network as LLT low priority links for SF Oracle RAC. When all the high priority links fail, LLT uses low priority links to send data between cluster nodes. Due to high volume of data in an SF Oracle RAC environment, the public link will be flooded with SF Oracle RAC data.

Documentation

Product guides are available on the software disc in PDF format. Symantec's Veritas SF Oracle RAC documentation is also available on the Symantec website.

Symantec's Veritas SF Oracle RAC 5.1 documentation set is available at the following URL:

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

Relevant component product release notes

Read the relevant component product release notes before installing any version of Veritas Storage Foundation.

The following documents are relevant component product release notes:

- *Veritas Cluster Server Release Notes* (`vcs_notes.pdf`)
- *Veritas Storage Foundation for Oracle RAC Release Notes* (`sfrac_notes.pdf`)

Storage Foundation guides

The following manuals, along with the online help, comprise the Veritas Storage Foundation documentation set:

[Table 1-5](#) describes the guides in the Veritas Storage Foundation documentation set.

Table 1-5 Guides in Veritas Storage Foundation documentation set

Guide Title	Filename
<i>Veritas Storage Foundation and High Availability Getting Started Guide</i>	<code>getting_started.pdf</code>
<i>Veritas Storage Foundation read me first</i>	<code>readme_first.txt</code>
<i>Veritas Storage Foundation Release Notes</i>	<code>sf_notes.pdf</code>
<i>Veritas Storage Foundation Installation Guide</i>	<code>sf_install.pdf</code>
<i>Veritas File System Administrator's Guide</i>	<code>vxfs_admin.pdf</code>
<i>Veritas File System Programmer's Reference Guide</i>	<code>vxfs_ref.pdf</code>
<i>Veritas Volume Manager Administrator's Guide</i>	<code>vxvm_admin.pdf</code>
<i>Veritas Volume Manager Troubleshooting Guide</i>	<code>vxvm_tshoot.pdf</code>

Veritas Storage Foundation Cluster File System documentation

The following Veritas Storage Foundation Cluster File System documentation is available with all Veritas Storage Foundation HA product suites:

[Table 1-6](#) describes the Veritas Storage Foundation Cluster File System (CFS) documentation set.

Table 1-6 Guides in Veritas Storage Foundation Cluster File System documentation set

Guide Title	Filename
<i>Veritas Storage Foundation Cluster File System Installation Guide</i>	sfcfs_install.pdf
<i>Veritas Storage Foundation Cluster File System Administrator's Guide</i>	sfcfs_admin.pdf

Veritas Cluster Server documentation

The following Veritas Cluster Server documentation is available with all Veritas Storage Foundation HA product suites:

[Table 1-7](#) describes the Veritas Cluster Server documentation set.

Table 1-7 Guides in Veritas Cluster Server documentation set

Guide Title	Filename
<i>Veritas Cluster Server Release Notes</i>	vcs_notes.pdf
<i>Veritas Cluster Server Installation Guide</i>	vcs_install.pdf
<i>Veritas Cluster Server Agent Developer's Guide</i>	vcs_agent_dev.pdf
<i>Veritas Cluster Server Bundled Agents Reference Guide</i>	vcs_bundled_agents.pdf
<i>VCS Enterprise Agent for Oracle Installation and Configuration Guide</i>	vcs_oracle_install.pdf
<i>VCS Enterprise Agent for DB2 Installation and Configuration Guide</i>	vcs_db2_install.pdf
<i>VCS Enterprise Agent for Sybase Installation and Configuration Guide</i>	vcs_sybase_install.pdf

Veritas Volume Replicator documentation

The following Veritas Volume Replicator documentation is available with the Veritas Volume Replicator option:

[Table 1-8](#) describes the Veritas Volume Replicator documentation set.

Table 1-8 Guides in Veritas Volume Replicator documentation set

Guide Title	Filename
<i>Veritas Volume Replicator Administrator's Guide</i>	vvr_admin.pdf
<i>Veritas Volume Replicator Planning and Tuning Guide</i>	vvr_planning.pdf
<i>Veritas Volume Replicator Advisor User's Guide</i>	vvr_advisor_users.pdf

Veritas Storage Foundation for Oracle RAC documentation

The following Storage Foundation for Oracle RAC documentation is available with all Veritas Storage Foundation HA product suites:

[Table 1-9](#) describes the Storage Foundation for Oracle RAC documentation set.

Table 1-9 Guides in Storage Foundation for Oracle RAC documentation set

Guide Title	Filename
<i>Veritas Storage Foundation™ for Oracle RAC Installation and Configuration Guide</i>	sfrac_install.pdf
<i>Veritas Storage Foundation™ for Oracle RAC Release Notes</i>	sfrac_notes.pdf
<i>Veritas Storage Foundation™ for Oracle RAC Administrator's Guide</i>	sfrac_admin.pdf

Veritas Storage Foundation for Databases documentation Changes

The 5.0 release introduces changes to the documentation for Veritas Storage Foundation for Databases. The `VRTSordoc` and `VRTSd2doc` packages no longer exist. All database guides are now in one package, `VRTSdbdoc`. New guides have been created for the GUI documentation and the PDF names have changed for existing guides.

Manual Pages

The Veritas online manual pages are installed in the `/opt/VRTS/man` directory. This directory can be added to the `MANPATH` environment variable.

If the `MANPATH` environment variable does not include `/opt/VRTS/man`, you can view the desired manual page by entering the following command:

```
# man -M /opt/VRTS/man manual_page_name
```