

VERITAS Storage Foundation 4.1 *for Oracle RAC*

Release Notes

Linux

Maintenance Pack 2

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VERITAS Software Corporation
350 Ellis Street
Mountain View, CA 94043
USA
Phone 650-527-8000 Fax 650-527-2901
www.veritas.com

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Contents

1. Release Notes: VERITAS Storage Foundation <i>for Oracle RAC</i> 4.1 Maintenance Pack 2	1
New in this Release	2
End of Support	2
Installation Notes	2
Operational Notes	13
Software Limitations	17
Known Issues	17
Fixed Issues and Enhancements	26
Documentation	26
Getting Help	29
2. Applying Oracle Patchsets	31
Applying an Oracle 10g Patchset	31
Applying an Oracle9i Patchset	34
3. Installing Oracle 10g Release 2	37
Configuring Oracle 10g Release 2 Prerequisites	37
Installing Oracle 10g Release 2 CRS and Database	43
4. Migrating Databases to the Latest Installed Version of Oracle	65
Migrating from Oracle9i to Oracle 10.1.0.5 on RHEL4 32-bit	65
Migrating from Oracle9i to Oracle 10g R2 on RHEL4 32-bit	68
Migrating from Oracle 10.1.0.3 or 10.1.0.4 to Oracle 10.1.0.5 on SLES9 64-bit	70
Migrating from Oracle 10g R1 to Oracle 10g R2 on SLES9 x86_64	74



Migrating from Oracle 10g R1 to Oracle 10g R2 on RHEL4 32-bit	76
5. Configuring VCS Service Groups for Oracle 10g Release 2	81
Creating Service Groups for Oracle 10g Release 2 Using the Wizard	81
Creating Service Groups for Oracle 10g Release 2 Manually	84
Location of VCS Log Files	87
6. Adding and Removing Cluster Nodes for Oracle 10g Release 2	89
Adding a Node to an Oracle 10g Release 2 Cluster	89
Removing a Node from an Oracle 10g Release 2 Cluster	100
7. Third-Party Legal Notices	109

Release Notes: VERITAS Storage Foundation *for Oracle RAC* 4.1 Maintenance Pack 2

This document provides important information regarding Storage Foundation *for Oracle RAC* (SFRAC) version 4.1 for Red Hat Enterprise Linux 4.0 (on x86 architecture) and SUSE Linux Enterprise Server 9 (on x86_64 and IA 64 architectures). Please review this entire document before installing Storage Foundation *for Oracle RAC*.

Read the following VERITAS Technical Support TechNote for the latest information on updates, patches, and software issues regarding this release:

<http://support.veritas.com/docs/277033>

The VERITAS Storage Foundation *for Oracle RAC* software is an integrated set of software products. It enables administrators of Oracle Real Application Clusters (RAC) to operate a database in an environment of cluster systems running VERITAS Cluster Server (VCS) and the cluster features of VERITAS Volume Manager™ and VERITAS File System™, also known as CVM and CFS, respectively.

Acronyms used for VERITAS Storage Foundation *for Oracle RAC* component products:

CVM	VERITAS Volume Manager cluster functionality
CFS	VERITAS File System cluster functionality
VCS	VERITAS Cluster Server
VEA	VERITAS Enterprise Administrator graphical user interface
VxFS	VERITAS File System
VxVM	VERITAS Volume Manager

Product components are described in the VERITAS Storage Foundation *for Oracle RAC Installation and Configuration Guide*.



New in this Release

This release of Storage Foundation *for Oracle RAC* adds support for:

- ◆ Red Hat Enterprise Linux 4 Update 3
- ◆ Oracle9i Release 2 support on Red Hat Enterprise Linux 4 on x86_64

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

End of Support

VERITAS Storage Foundation *for Oracle RAC* 4.1 is the last release to support 32-bit operating systems on Linux. VERITAS Storage Foundation *for Oracle RAC* 5.0 will not support 32-bit operating systems.

Installation Notes

- ◆ [“Supported Hardware”](#) on page 2
- ◆ [“Supported Software”](#) on page 3
- ◆ [“System Requirements”](#) on page 5
- ◆ [“Storage Foundation for Oracle RAC Packages”](#) on page 5
- ◆ [“Installing 4.1 Maintenance Pack 2 \(MP2\) on Clean Systems”](#) on page 6
- ◆ [“Upgrading to 4.1 Maintenance Pack 2”](#) on page 9

Supported Hardware

Before installing or upgrading Storage Foundation *for Oracle RAC*, review the current compatibility list to confirm the compatibility of your hardware and software. See <http://support.veritas.com>.



Supported Software

Storage Foundation *for Oracle RAC* operates on the following Linux distributions and kernel binaries distributed by Red Hat and SUSE:

Operating System	Architecture	Kernel
Red Hat Enterprise Linux 4 Update 1	x86 (32-bit)	2.6.9-11EL 2.6.9-11ELsmp 2.6.9-11ELhugemem
Red Hat Enterprise Linux 4 Update 2	x86 (32-bit)	2.6.9-22EL 2.6.9-22ELsmp 2.6.9-22ELhugemem
	x86_64 (Intel Xeon, AMD Opteron)	2.6.9-22EL 2.6.9-22ELsmp
Red Hat Enterprise Linux 4 Update 3	x86 (32-bit)	2.6.9-34EL 2.6.9-34ELsmp 2.6.9-34ELhugemem
	x86_64 (Intel Xeon, AMD Opteron)	2.6.9-34EL 2.6.9-34ELsmp 2.6.9-34ELlargesmp
SUSE Linux Enterprise Server 9 Service Pack 2 with Patch 201	IA64 (Intel)	2.6.5-7.201-default
	x86_64 (Intel Xeon, AMD Opteron)	2.6.5-7.201-smp 2.6.5-7.201-default
SUSE Linux Enterprise Server 9 Service Pack 3	IA64 (Intel)	2.6.5-7.241-default or higher
	x86_64 (Intel Xeon, AMD Opteron)	2.6.5-7.244-smp or higher 2.6.5-7.244-default or higher

Note The support table is not additive to distributions supported in previous releases of Storage Foundation *for Oracle RAC*

For SLES9 SP2 installations, kernel version 2.6.5-7.201 or greater is required because versions 2.6.5-7.191 (SP2) and 2.6.5-7.193 have a bug (Incident 425945) that stops dynamic multipathing (DMP) failover from working. This is fixed in the 2.6.5-7.201 kernel version, which is available from the SUSE Linux maintenance web site. A SUSE Portal login and password are required to access this web site.



On IA64 systems, upgrading SLES 9 to SP2 removes the `sfdisk` binary, which is required by VERITAS Volume Manager. See TechNote 278873 for instructions on how to install this binary:

<http://support.veritas.com/docs/278873>

Installing Linux patches: No specific patches are required for Storage Foundation for Oracle RAC. However, Oracle9i Release 2 software on Red Hat Enterprise Linux 4.0 requires a number of patches. These patches, and other manual steps that need to be executed before installing Oracle, are available at Oracle's metalink site.

For Red Hat Enterprise Linux 4.0 on IA64 architecture, verify that you have installed the `ia32el` rpm. See the *Storage Foundation for Oracle RAC Installation and Configuration Guide* for the installation procedure.

For RHEL4, disable SELinux or Security Enhanced Linux during OS installation.

For RHEL4, disable Firewall during OS installation.

For SLES9, do not use the auditing subsystem. ODM is not compatible with the auditing subsystem on SLES 9.

VERITAS Software: Only versions of VCS, VxVM, and VxFS provided on the software CD are supported. Other versions must be removed before the software from the VERITAS Storage Foundation for Oracle RAC CD is installed.

Software combinations are supported for VERITAS Storage Foundation for Oracle RAC:

Oracle Version		RHEL 4.0 U2 or U3			SLES9 SP2 or SP3		
Base version	Latest supported version	x86_32	x86_64	IA 64	x86_32	x86_64	IA64
9.2.0.4	9.2.0.7	Yes	Yes	N/A	N/A	No	N/A
10.1.0.3	10.1.0.5	Yes	No	No	No	Yes	Yes
10.2.0.1	10.2.0.2	Yes	Yes	No	No	Yes	Yes

SUSE Linux Enterprise Server 9 on IA64 architecture requires Oracle patch #3875155.

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

System Requirements

- ◆ VERITAS Storage Foundation *for Oracle RAC* supports RAC clusters of up to eight nodes. We recommend that each system have two or more CPUs at 2GHz or higher.
- ◆ Disk space, locally: approximately 500 MB; review the installation requirements in the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.
- ◆ 1 GB or more of physical memory is recommended.
- ◆ Shared storage: The storage units used by Storage Foundation for Oracle RAC must support and be enabled for SCSI-3 Persistent Reservations (PR), a requirement for I/O fencing. Refer to “[Supported Hardware](#)” on page 2 for additional information.
- ◆ Required information for Oracle 10g installation:
 - ◆ One public base IP address (in DNS) per node
 - ◆ One public virtual IP address (in DNS) per node
 - ◆ One private IP address per node

Storage Foundation for Oracle RAC Packages

VERITAS Storage Foundation *for Oracle RAC* is a licensed product. The *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide* describes how to obtain a license that applies for VERITAS Storage Foundation for Oracle RAC, VERITAS Volume Manager, VERITAS File System, and VERITAS Cluster Server.

Infrastructure Packages Installed

The installer checks for the presence of the infrastructure packages, `VRTSvlic` (VERITAS Licensing) and `VRTScpi` (VERITAS Product Installer). If they are not present, or if they are present but not the correct version, they will be installed.

Software Installed for Storage Foundation for Oracle RAC

The software components installed by the VERITAS Storage Foundation for Oracle RAC 4.1 installation utility, `installsfrc`, include:

- ◆ VERITAS Storage Foundation for Oracle RAC 4.1
- ◆ VERITAS Cluster Server (VCS)
- ◆ VERITAS Volume Manager (VxVM)
- ◆ VERITAS Group Lock Manager
- ◆ VERITAS File System (VxFS)



- ◆ VERITAS extension for Oracle Disk Manager (ODM)
- ◆ VERITAS Cluster Server enterprise agent for Oracle

See “[Packages Upgraded for Storage Foundation for Oracle RAC 4.1 Maintenance Pack 2](#)” on page 6 for a list of the specific software packages.

Packages Upgraded for Storage Foundation *for Oracle RAC* 4.1 Maintenance Pack 2

VRTScpi - VERITAS Product Installer
VRTSvxvmcommon - VERITAS Volume Manager Common Package
VRTSvxvmplatform - VERITAS Volume Manager Platform Specific Package
VRTSvmpro - VERITAS Volume Manager Management Services Provider
VRTSfspro - VERITAS File System Management Services Provider
VRTSalloc - VERITAS Volume Manager Intelligent Storage Provisioning
VRTSddlpr - VERITAS Device Discovery Layer Services Provider
VRTSvxfscommon - VERITAS File System Common Package
VRTSvxfsplatform - VERITAS File System Platform Specific Package
VRTSfsman - VERITAS File System Manual Pages
VRTSfsdoc - VERITAS File System Documentation
VRTSfssdk - VERITAS File System Software Developer Kit
VRTSfsmnd - VERITAS File System Software Developer Kit Manual Pages
VRTSllt - VERITAS Low Latency Transport
VRTSgab - VERITAS Group Membership and Atomic Broadcast
VRTSvxfen - VERITAS I/O Fencing
VRTSvcS - VERITAS Cluster Server
VRTSvcSdr - VERITAS Cluster Server Disk Reservation Modules and Utilities
VRTScavf - VERITAS Cluster Server Agents for Cluster File System
VRTSglm - VERITAS Group Lock Manager
VRTSdbac - VERITAS Oracle Real Application Cluster Support Package
VRTSvcSor - VERITAS Cluster Server Oracle Enterprise Extension
VRTScsow - VERITAS Oracle and RAC Configuration Wizards for Linux
VRTSgms - VERITAS Group Messaging Services
VRTSodmcommon - VERITAS Oracle Disk Manager Common Package
VRTSodmplatform - VERITAS Oracle Disk Manager Platform Specific Package

Installing 4.1 Maintenance Pack 2 (MP2) on Clean Systems

If you are installing the Storage Foundation *for Oracle RAC* 4.1 MP2 software for the first time and not upgrading an existing system, read the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide* for pre-installation instructions.

Caution Existing data could be destroyed on any disks that are touched by upgrading the operating system. While upgrading, do not reconfigure any disks other than the root disk. To ensure the integrity of your data, back it up before starting the upgrade.

▼ **To install Storage Foundation *for Oracle RAC* 4.1 MP2 on a clean system**

1. Log in as root on one of the systems for installation.
2. Install the VERITAS Storage Foundation *for Oracle RAC* 4.1 GA software from the release CD as described in the *Storage Foundation for Oracle RAC Installation and Configuration Guide*, Chapters 2 and 3, but run the product installation script instead of the generic installer script. Enter the following command from the top-level directory of the mounted CD:

```
# ./installsfrac -installonly [-usersh]
```

The `-installonly` option is required to perform the installation without configuring the software. The `-usersh` option is required if you are using the remote shell (RSH) rather than the secure shell (SSH) to install the software simultaneously on several systems.

Note Provided that the remote shell (RSH) or secure shell (SSH) has been configured correctly, this command can be run on a single node of the cluster to install the software on all the cluster nodes.

3. Download Storage Foundation *for Oracle RAC* 4.1 MP2.
4. Extract the Storage Foundation *for Oracle RAC* installation files.
5. Change to the directory containing the installation program.
6. To install Storage Foundation *for Oracle RAC* 4.1 MP2, you must invoke `installmp` from one of your cluster nodes using the option that corresponds to your configuration:

- ◆ To install on the local system only:

```
# ./installmp
```

- ◆ To install on more than one system using secure shell (SSH) utilities:

```
# ./installmp galaxy nebula ...
```

- ◆ To install on more than one system using remote shell (RSH) utilities:

```
# ./installmp galaxy nebula ... -usersh
```



7. After the initial system checks are complete, press **Return** to start the requirements checks.

Note All the Storage Foundation for Oracle RAC processes are stopped before uninstalling the rpms. This includes VCS, VM, FS and VEA. While stopping these processes, you may see messages such as: "GAB /sbin/gabconfig ERROR V-15-2-25022 unknown error." These messages can be ignored safely.

8. After the requirements checks are complete, press **Return** to start upgrading the packages. If you are upgrading multiple nodes, you have the option of upgrading them simultaneously. You will be prompted after the upgrade is complete.
9. When installation is complete, note the locations of the summary, log, and response files indicated by the installer.

10. Change directories to: `/opt/VRTS/install/`

11. Run the same installation script that you used in [step 2](#), this time specifying the `-configure` option to configure the software, for example:

```
# ./installsfrac -configure [-usersh] <galaxy> <nebula>
```

Configure using the *Storage Foundation for Oracle RAC Installation and Configuration Guide 4.1*, Chapter 3, beginning on page 39.

12. Install and configure the correct version of Oracle.

▼ **To install and configure Oracle 10g Release 2 on clean systems on all architectures**

1. Install Oracle using “[Installing Oracle 10g Release 2](#)” on page 37.
2. Configure service groups for Oracle using “[Configuring VCS Service Groups for Oracle 10g Release 2](#)” on page 81.

▼ **To install and configure Oracle 10g Release 1 (10.1.0.5) for clean SLES9 x86_64 systems**

1. Install Oracle 10g R1 (10.1.0.3) using Chapter 15, “Installing Oracle 10g Software on SLES9.” on page 265 of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

Do not reboot the nodes after installation. Do not create the database or configure resources using hawizard until you have applied the 10.1.0.5 patchset.

2. Apply the patchset using “[Applying Oracle Patchsets](#)” on page 31.

3. Configure service groups for Oracle using Chapter 16, "Configuring VCS Service Groups for Oracle 10g on SLES9" on page 299 of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

▼ **To install and configure Oracle 10g Release 1 (10.1.0.5) for clean RHEL4 x86 systems**

1. Install Oracle 10g R1 (10.1.0.3) using Chapter 6, "Installing Oracle 10g Software on Red Hat" on page 95 of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

Do not reboot the nodes after installation. Do not create the database or configure resources using hawizard until you have applied the 10.1.0.5 patchset.

2. Apply the patchset using "[Applying Oracle Patchsets](#)" on page 31.
3. Configure service groups for Oracle, using Chapter 8, "Configuring VCS Service Groups for Oracle 10g on Red Hat" on page 137 of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

▼ **To install and configure Oracle9i Release 2 (9.2.0.7) for clean RHEL4 x86 or x86_64 systems**

1. Install Oracle9i R2 using Chapter 11, "Installing Oracle9i Software on Red Hat" on page 181, of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

Do not reboot the nodes after installation. Do not create the database or configure resources using hawizard until you have applied the 9.2.0.7 patchset.

2. Apply the patchset using "[Applying Oracle Patchsets](#)" on page 31.
3. Configure service groups for Oracle using Chapter 12, "Configuring VCS Service Groups for Oracle9i on Red Hat" on page 203 of the *Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

Upgrading to 4.1 Maintenance Pack 2

Upgrades that are supported:

- ◆ Storage Foundation for Oracle RAC 4.1 to 4.1 MP2
- ◆ Storage Foundation for Oracle RAC 4.1 MP1 to 4.1 MP2.

Upgrading from Storage Foundation for Oracle RAC 4.0, 4.0 MP1, or 4.0 MP2 is not supported due to the difference in operating systems.



Caution To uninstall Storage Foundation *for Oracle RAC* 4.1 MP2, you must remove all VERITAS Storage Foundation *for Oracle RAC* software packages. You cannot roll back Maintenance Pack 2 to the previously installed release.

To restore a previous version of VERITAS Storage Foundation *for Oracle RAC* on your system, you must completely remove Maintenance Pack 2, then reinstall the previous version. Before uninstalling Maintenance Pack 2, certain configuration files must be backed up to enable rollback of maintenance pack. See “[Rolling Back Storage Foundation for Oracle RAC from 4.1 MP2 to 4.1 or 4.1 MP1](#)” on page 14.

▼ **To upgrade to Storage Foundation *for Oracle RAC* 4.1 MP2**

1. Upgrade the OS on all cluster nodes:
 - ◆ For SLES9, upgrade to SLES9 SP2 with 201 kernel or upgrade to SLES9 SP3.
 - ◆ For RHEL4, upgrade to RHEL4 Update 2 or RHEL4 Update 3.
2. After the OS install reboot the nodes.

For SLES9, none of the VERITAS modules will load. For RHEL4 all the modules will load and Oracle resources will come up.
3. Stop all Oracle resources including the database on all nodes.

For Oracle 10g, stop CRS on all nodes:

```
# /etc/init.d/init.crs stop
```
4. Make sure that no processes are running which make use of mounted shared file system or shared volumes.
5. With Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP2 installed and configured, run the following command on all nodes in the Storage Foundation *for Oracle RAC* cluster:

```
# hastop -all
```
6. Download Storage Foundation *for Oracle RAC* 4.1 MP2.
7. Extract the Storage Foundation *for Oracle RAC* installation files.
8. Log in as root on one of the systems for installation.
9. Change to the directory containing the installation program.
10. Upgrade VRTSper1 rpm:

- a. Change to the directory `/storage_foundation_for_oracle_rac/rpms`.
- b. Copy the `VRTSperl rpm` on all cluster nodes in `/tmp` including the current node if it is part of the cluster.
- c. Upgrade `VRTSperl rpm` with following command:

```
# rpm -Uvh /tmp/<VRTSperl rpm>
```

11. Create a backup of the existing cluster configuration:

- a. Change to `/etc/VRTSvcs/conf/config`
- b. Create a backup of `main.cf` on all cluster nodes:

```
# cp main.cf /etc/main.cf.41
```

12. Change to the directory containing the installation program, for instance, `installmp`.

13. To install Storage Foundation *for Oracle RAC* 4.1 MP2, you must invoke `installmp` from one of your cluster nodes using the option that corresponds to your configuration:

- ◆ To install using `ssh` (default):

```
# ./installmp galaxy nebula
```
- ◆ To install using `rsh`:

```
# ./installmp -usersh galaxy nebula
```

The program begins by presenting a copyright message.

14. The installer checks that the systems are ready for installation. At the conclusion of these initial checks, and before installing any `rpms`, the installer:

- ◆ Creates a log called `installmpdate_time` on each system in the directory `/var/tmp`.
- ◆ Specifies the utilities it uses to communicate with the remote systems; typically this is `ssh -x` and `scp`.
- ◆ Lists the `rpms` that it will replace on each system
- ◆ Backs up the Maintenance Pack 2 (MP2) configuration files

After the installer has all the configuration information, it can replace the `rpms` on the cluster systems.



Storage Foundation Cluster File System and VERITAS Enterprise Administrator processes must be stopped before adding patches. When you are prompted:

Do you want to stop these processes and install patches on galaxy?
[y,n,q] (y)

Press **Enter** to continue.

Note All the Storage Foundation for Oracle RAC processes are stopped before uninstalling the rpms. This includes VCS, VM, FS and VEA. While stopping these processes, you may see messages such as: "GAB /sbin/gabconfig ERROR V-15-2-25022 unknown error." These messages can be safely ignored.

15. Choose whether to replace the rpms consecutively or simultaneously.
16. After you choose the sequence of installing the rpms, the installation process begins to uninstall the rpms that will be replaced, indicating the total number of steps required, based on the number of systems and the chosen configuration options. The installer copies replacement rpms to remote systems before installing them

Press **Enter** to continue.

When replacement of Storage Foundation *for Oracle RAC* rpms is completed successfully, a few more tasks remain before the installation is complete.

17. Press **Enter** to continue when the Cluster Server startup is confirmed as successful. The locations of the installation summary, log and response files:

- ◆ /opt/VRTS/install/logs/installmpxxxxxxxxx.summary
- ◆ /opt/VRTS/install/logs/installmpxxxxxxxxx.log
- ◆ /opt/VRTS/install/logs/installmpxxxxxxxxx.response

The summary, the log, and the response files contain the date as part of their names.

18. Restore the original main.cf on all nodes from the backup created in [step 11](#) on page 11:

```
# cd /etc/VRTSvcs/conf/config/
# cp /etc/main.cf.41 /etc/VRTSvcs/conf/config
```

19. A reboot is required after installing the Storage Foundation *for Oracle RAC* VERITAS Maintenance Pack 2 for all nodes.

```
# shutdown -r now
```


20. After reboot, all the ports will come up along with Oracle resources. Before you proceed to the Oracle upgrade process, you must shutdown these Oracle resources.

For Oracle 10g, CRS should be stopped on all nodes as follows.

```
# /etc/init.d/init.crs stop
```

21. Install and configure the correct version of Oracle.

▼ **To upgrade to Oracle 10g Release 2**

1. Install Oracle using [“Installing Oracle 10g Release 2”](#) on page 37.
2. Migrate the database using [“Migrating Databases to the Latest Installed Version of Oracle”](#) on page 65.

▼ **To upgrade to Oracle 10g Release 1 (10.1.0.5) for SLES9 x86_64**

1. Apply the patchset using [“Applying Oracle Patchsets”](#) on page 31.
2. Migrate the database using [“Migrating Databases to the Latest Installed Version of Oracle”](#) on page 65.

▼ **To upgrade to Oracle 10g Release 1 (10.1.0.5) for RHEL4 x86**

1. Apply the patchset using [“Applying Oracle Patchsets”](#) on page 31.
2. Migrate the database using [“Migrating Databases to the Latest Installed Version of Oracle”](#) on page 65.

▼ **To upgrade to Oracle9i Release 2 (9.2.0.7) for RHEL4 x86 or x86_64**

1. Apply the patchset using [“Applying Oracle Patchsets”](#) on page 31.
2. Migrate the database using [“Migrating Databases to the Latest Installed Version of Oracle”](#) on page 65.

Operational Notes

See the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide* for complete procedures.



Enabling Fencing

When the installer completes, I/O fencing will be disabled on all nodes of the cluster. I/O fencing must be configured and enabled after the installation of Storage Foundation for Oracle RAC has successfully completed. VERITAS does not support using I/O fencing in disabled mode in a Storage Foundation *for Oracle RAC* environment. See the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide* Chapter 3 for details on configuring I/O fencing in a cluster environment.

Installing and Configuring Oracle 10g Release 2

For procedures for installing and configuring Oracle 10g Release 2, see:

- ◆ [“Installing Oracle 10g Release 2”](#) on page 37
- ◆ [“Migrating Databases to the Latest Installed Version of Oracle”](#) on page 65
- ◆ [“Configuring VCS Service Groups for Oracle 10g Release 2”](#) on page 81
- ◆ [“Adding and Removing Cluster Nodes for Oracle 10g Release 2”](#) on page 89

Uninstalling Storage Foundation *for Oracle RAC* 4.1 MP2

To uninstall Storage Foundation *for Oracle RAC* 4.1 MP2, you must remove all VERITAS Storage Foundation *for Oracle RAC* software packages. You cannot roll back Maintenance Pack 2 to the previously installed release.

Uninstalling Storage Foundation *for Oracle RAC* 4.1 MP2 without Saving Your Configuration

See “Uninstalling Storage Foundation *for Oracle RAC* on Oracle 10g Systems” on page 173 of the *VERITAS Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.

Rolling Back Storage Foundation *for Oracle RAC* from 4.1 MP2 to 4.1 or 4.1 MP1

Rolling back the Storage Foundation *for Oracle RAC* 4.1 MP2 patch installation is a manual process which involves uninstalling Storage Foundation *for Oracle RAC* completely and reinstalling the previous version of Storage Foundation *for Oracle RAC*. You must:

- ◆ Save your configuration files
- ◆ Completely remove Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Reinstall the previous version of VERITAS Storage Foundation *for Oracle RAC*

- ◆ Restore your saved configuration files

▼ To save Storage Foundation *for Oracle RAC* configuration files

Back up current configuration files on each cluster node. Note that some of the files may not exist.

```
mkdir -p /var/sfrac41mp2-config-save/etc/vx/vras
mkdir -p /var/sfrac41mp2-config-save/etc/VRTSvcs/conf/config

cp -p /etc/llttab /etc/llthosts /etc/gabtab /etc/vxfendg
/etc/vxfenmode
/var/sfrac41mp2-config-save/etc/ cp -p
/etc/VRTSvcs/conf/config/main.cf
/var/sfrac41mp2-config-save/etc/VRTSvcs/conf/config/

cp -p /etc/vx/vxddl.exclude /etc/vx/darecs
/etc/vx/disk.info /etc/vx/jbod.info /etc/vx/.aascsi3
/etc/vx/.apscsi3 /etc/vx/volboot
/etc/vx/array.info /etc/vx/ddl.support /etc/vx/disks.exclude
/etc/vx/cntrls.exclude
/etc/vx/enclr.exclude /etc/vx/.newnames /etc/vx/guid.state
/etc/vx/vxvm_tunables
/etc/vx/vxdmp_tunables /etc/vx/vvrports
/var/sfrac41mp2-config-save/etc/vx

cp -p /etc/vx/vras/.rdg /etc/vx/vras/vras_env
/var/sfrac41mp2-config-save/etc/vx/vras/
```

▼ To uninstall Storage Foundation for Oracle RAC 4.1 MP2

1. Stop Oracle and CRS on each cluster node.

```
/etc/init.d/init.crs stop
```

2. Unencapsulate root disk if necessary.

```
# df /
```

The root disk is under VxVM control if /dev/vx/dsk/rootvol is listed as being mounted as the root (/) file system.

```
# vxplex -o rm dis mirrootvol-01 mirswapvol-01
# /etc/vx/bin/vxunroot
```

3. Unmount all vxfs mounts and all file systems on VxVM volumes.
4. Stop all volumes for each disk group.

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



5. Stop VCS along with all the resources. Then stop remaining resources manually.

```
# hastop -all
```

6. Uninstall SFRAC.

```
# cd /opt/VRTS/install  
# ./uninstallsfrac galaxy nebula
```

7. Uninstall all the remaining VRTS rpms manually on each cluster node.

```
rpm -qa | grep VRTS  
rpm -e <remaining VRTS RPMs>
```

For example:

```
rpm -e VRTSob VRTSvlic VRTSobgui VRTSperl VRTSgab VRTScpi
```

▼ To reinstall Storage Foundation *for Oracle RAC*

Install Storage Foundation *for Oracle RAC* using the `-installonly` option.

```
cd <4.1 install  
location>/rhel4_i686/storage_foundation_for_oracle_rac  
./installsfrac -installonly galaxy nebula
```

▼ To restore your configuration

1. Restore VCS and VxVM configuration on each cluster node.

```
cd /var/sfrac41mp2-config-save/etc/vx  
cp disk.info jbod.info .aascsi3 .apscsi3 volboot  
array.info ddl.support disks.exclude cntrls.exclude enclr.exclude  
newnames guid.state vxvm_tunables  
vxdmp_tunables /etc/vvrports /etc/vx/  
cp vras/.rdg vras/vras_env /etc/vx/vras/
```

If `vxfen` was originally configured in enabled mode:

```
rm /etc/vxfenmode ... on all nodes
```

2. Install VxVM on each cluster node. Run `vxinstall` on all nodes.
3. If necessary, re-encapsulate the root disk.
4. Reboot all nodes.

Software Limitations

Software limitations in this release:

Limitations of Volume Manager in a Shared Disk Environment (CVM)

- ◆ No support for software RAID 5
- ◆ VVR is not supported in this release

Limitations of Cluster File System (CFS)

- ◆ CFS will only support disk layout version 6.
- ◆ No support for mapping or plug-in drivers in VxMS.
- ◆ No support for QLOG.
- ◆ No direct support for QIO or Cached QIO.
- ◆ VxFS will not distribute its own versions of file utilities (such as `cpio`, `mv`, etc).
- ◆ Large file system and large file support is restricted to the limits imposed by RHEL4. Large file size is limited to 16TB for 32-bit kernel and is approximately 256TB for 64-bit kernel.
- ◆ No support for Access Control Lists.
- ◆ No support for HSM/DMAPI.
- ◆ No support for forced unmount.
- ◆ No support for Storage Checkpoint and Rollback.

Known Issues

Known issues for Storage Foundation *for Oracle RAC* 4.1 and methods for resolving them.

Kernel Warnings

The following warning messages may be displayed on the console or in the system log when VERITAS modules are loaded into the kernel.

```
Warning: loading <module name> will taint the kernel: non-GPL  
license - Proprietary. Send bug reports to support@veritas.com  
See http://www.tux.org/lkml/#export-tainted for information about  
tainted modules  
Module <module> loaded, with warnings
```



These warning messages are displayed because the VERITAS kernel modules are proprietary. They can safely be ignored.

On RHEL4 Update 2 or Update 3 Systems, the following warning messages may be displayed on the console or in the system log when VERITAS modules are loaded into the kernel.

```
kernel: vxglm : disagrees about version of the symbol struct_module
kernel: vxodm : disagrees about version of the symbol struct_module
```

These messages can safely be ignored.

Stack Overflow on Red Hat

There is a known problem in Red Hat Enterprise Linux 4 Update 1 32-bit systems that is unlikely to occur but which may result in a stack overflow. The issue was reported to Red Hat and is documented in Bugzilla incident 162257.

Installation Fails While Starting the CFS Agents

The installation of Storage Foundation *for Oracle RAC* may fail if the system names provided during installation do not match the actual host names of the cluster systems. The failure occurs while attempting to start the CFS agents.

▼ To resolve system name mismatch

1. Uninstall the Storage Foundation *for Oracle RAC* product.
2. Reinstall using the correct host names of the cluster systems.

Restarting Multiple Cluster Nodes

Rebooting multiple cluster nodes simultaneously may cause some or all of the nodes to panic.

Network Interfaces Change Their Names After Restart

On SUSE systems, network interfaces change their names after restarting even with `HOTPLUG_PCI_QUEUE_NIC_EVENTS=yes` and `MANDATORY_DEVICES=". . ."` set.

Work around: Use `PERSISTENT_NAME= ethX` where X is the interface number for all interfaces. For more details see the *Storage Foundation for Oracle RAC Installation and Configuration Guide*.

RAC Wizard Does Not Detect Pre-configured PrivNIC Resources

The VCS Oracle 10g RAC wizard does not properly detect PrivNIC resources if they are already set up. If PrivNIC is already configured, you must remove the `ora_priv` resource from `main.cf`.

Preconfiguration for RHEL4 Update 1 Beta on IA64

Before installing Storage Foundation *for Oracle RAC* on a RHEL4 Update 1 Beta for IA64 architecture where there is no previously installed VRTS rpms:

Edit the `/etc/rpm/macros` file to add:

```
%_autorelocate_path /emul/ia32-linux
```

Local Installation of Oracle 10g on IA64

Local installation of Oracle 10g CRS is not supported on IA64 for:

- ◆ RHEL4 Update 2
- ◆ RHEL4 Update 3
- ◆ SLES 9 SP2

Installer Warning about Oracle 10g Support

The installer may display a warning similar to:

"WARNING: Currently Oracle 10g Release 1 is not supported. For latest support matrix, please refer to technical notes before proceeding."

▼ To verify your installation is supported

1. For Oracle and OS support at the time of this release, see:
 ["Supported Software"](#) on page 3.
2. For late breaking news, see:
 <http://support.veritas.com/docs/277033>



Known Oracle 10g R2 Issues

Some Oracle issues that are identified as bugs in Oracle may occur during Oracle 10g R2 installation and database creation on RHEL4 U3 x86 and Storage Foundation *for Oracle* RAC4.1MP2.

Problem: An Oracle error which may occur during execution of `root.sh` on the second node while installing CRS.

Error Messages: “The given interface(s), ‘eth0’ is not public. Public interfaces should be used to configure virtual IPs.”

Work around: Run `vipca`. See Reference Note:338924.1.

Problem: Oracle errors which may occur while attempting to turn on asynchronous IO.

Error Messages:

```
make -f ins_rdbms.mk async_on
rm -f /opt/app/htoku_r2/product/10.2.0/rdbms/lib/skgai.o
cp /opt/app/htoku_r2/product/10.2.0/rdbms/lib/skgai.o
/opt/app/htoku_r2/product/10.2.0/rdbms/lib/skgai.o
cp: cannot stat
`/opt/app/htoku_r2/product/10.2.0/rdbms/lib/skgai.o': No such
file or directory
make: *** [do_async_on] Error 1
```

Work around: Do not turn AIO on for Oracle 10gR2.

Problem: An Oracle error which may occur while creating the database.

Error Message is similar to:

```
ORA-06553: PLS-213: package STANDARD not accessible
```

This issue is caused by the modification of `sqlplus/admin/glogin.sql`.

Work around: Restore to an old `sqlplus/admin/glogin.sql` file.

Using `l1tconfig -u` in an Oracle 10g RAC Environment

Using `l1tconfig -u` in an Oracle 10g RAC environment to unconfigure a link with Oracle's private IP address plumbed on it prevents the `PrivNIC` agent from failing over this IP address. This usage may result in a machine reboot by the Oracle CRS.

CVM Master Node May Require Restart After Upgrading to Oracle 10g

Problem: After upgrading Oracle 10g to 10.1.0.3, it may occur that only the CVM master node comes online while the other nodes remain in the STARTING | PARTIAL state. These nodes continue in their attempt to bring the `crs_cfsmount` resource online.

Workaround: Restart the CVM master node. This transfers the master designation to another cluster node. The cluster and all nodes then come online.

▼ To determine the CVM master

Run the following command on any node.

```
# vxddctl -c mode
master: fslnx14
```

CSSD Resource Hangs During Shutdown

Problem: Sometimes the `cssd-resource` may appear to hang while shutting down the resource, the CVM group, or VCS.

This may be due to issues in Oracle's CSSD membership configuration mechanism which cause CRS to block for 900 seconds (the value of `misscount` parameter set for CRS) before configuring new membership. Because of this 900-second block, VCS also hangs while stopping `cssd-resource`.

Work around: Set the `misscount` parameter for CRS to 120 seconds. The `cssd-resource` should not hang the next time you stop it.

▼ To reset `misscount` parameter for CRS to 120 seconds

1. Start CRS on all nodes.
2. Run the following command:


```
# $CRS_HOME/bin/crsctl set css misscount 120
```
3. Stop `cssd-resource` on all the nodes. It is important to stop `cssd-resource` one node at a time.


```
# hares -offline cssd-resource -sys <system-name>
```
4. Start `cssd-resource` on all the nodes. You can start it either simultaneously or one at a time.


```
# hares -online cssd-resource -sys <system-name>
```



CRS Resources Go into UNKNOWN State after Reboot

Problem: After reboot, CRS resources (`gsd`, `ons`, instances, listeners) may display UNKNOWN state.

This problem is identified as bug in Oracle. For further information on this bug, contact Oracle support.

Work around: Do one of the following:

- ◆ Stop and start CRS with: `/etc/init.d/init.crs`
- ◆ stop the UNKNOWN resources one by one and start them with:
`$CRS_HOME/bin/crs_start`

vcsmm unconfigure Fails Due to Leftover Oracle Processes

Problem: Occasionally `/etc/init.d/init.crs stop` leaves some `oclsmon.bin` processes running. You are not able to unconfigure `vcsmm` because these processes make use of the VERITAS membership module. Using `/etc/init.d/vcsmm stop` will not succeed.

Work around: Kill all `oclsmon` processes manually, after which you can unconfigure `vcsmm`.

Installer Unable to Back up Oracle Membership and IPC Libraries

Problem: The installer is unable to make a backup of Oracle's `libskgxn2.so` and `libskgxp10.so` libraries situated in `CRS_HOME/lib` during Oracle 10g R2 installations.

This occurs because the Oracle Universal Installer sets the permissions of `CRS_HOME` to `root`. Although the backup fails in `CRS_HOME/lib`, the backup for the same libraries is successful in `ORACLE_HOME/lib` and these libraries are same as `CRS_HOME/lib` libraries.

vxgms Service Is Disabled When Upgrading OS from Sles9 SP2 to Sles9 SP3

Problem: During the upgrade from SLES9 SP2 with Storage Foundation *for Oracle* RAC 4.1 MP2 installed to SLES9 SP3, the `vxgms` service is disabled. As a result, `vxgms` does not start after reboot, and port `d` (`vxodm` port) does not appear in GAB membership.

Work around: Restart `vxgms`.

▼ **To restart vxgms after reboot**

```
# /etc/init.d/vxodm stop
# /etc/init.d/vxgms start
# /etc/init.d/vxodm start
# chkconfig vxgms on
```

DBCA Issues in Oracle 9.2.0.7

Problem: An error may occur when creating a database using DBCA.

Error message: PRKR-1064 in DBCA.

See document 212631.1 on Metalink.

Work around: To keep datafiles on Cluster File System while creating a database using DBCA:

Invoke dbca as `dbca -datafileDestination cfs mount point`.

Problem: DBCA fails to create general purpose, data warehouse and Transaction Processing Type of database.

Error message: DBCA generates "File not found" error while creating general purpose, data warehouse and Transaction Processing Type of database.

Work around: Create a custom type database, which recreates the database and does not require backup files.

Database Startup Fails

Problem: A database startup fails with the message:

```
"Cluster interconnect IPC library is incompatible with this version of Oracle
Oracle interface version information 2.4
Cluster IPC library version information 2.3"
```

Work around: Manually copy the correct version of the IPC library in Oracle Home directory on each node.

▼ **To copy the correct version of the IPC library**

1. Stop all database instances.
2. Copy the correct version of the IPC library in Oracle Home directory on each node:

```
cp /opt/VRTSvcs/rac/lib/skgxp24/64/libskgxp9.so
$ORACLE_HOME/lib/libskgxp10.so
```



Netdump - Network console and crash dump facility

VERITAS advises that `netdump` to be installed and configured on all Red Hat and SUSE installations. This is not specifically for the VERITAS product stack, but because this is recommended as good systems administration practice.

For information on `netdump` installations for Red Hat systems, see:

<http://www.redhat.com/support/wpapers/redhat/netdump/>

For information on `netdump` installations for SUSE systems, see:

</usr/share/doc/packages/lkcdutils/README.SuSE>

Wizards Do Not Start if the `/etc/hosts` File Contains `ipv6` Entries

Problem: If the `/etc/hosts` file contains `ipv6` entries, VCS displays an error when you try to start a VCS wizard.

Error message:

Error 16-12-6 Could not connect to VCS engine. Cannot proceed

Work around: Remove the `ipv6` entries before running VCS wizards.

SCSI Reservation Errors During Bootup

Problem: If you reboot a node of a Storage Foundation *for Oracle RAC* cluster, SCSI reservation errors may be observed during bootup.

Error messages:

```
Nov 23 13:18:28 galaxy kernel: scsi3 (0,0,6) : RESERVATION CONFLICT
```

This message is printed for each disk that is a member of any shared disk group which is protected by SCSI-3 I/O fencing.

Work around: The message may be safely ignored.

Vxfs Unable to Write Reservation Keys

Problem: If you leave the product installer loop without stopping all the Storage Foundation *for Oracle RAC* components, you may encounter problems with `Vxfs`.

Work around: If `Vxfs` has problems coming up after the reboot, SCSI3 PR registration keys should be fixed using `vxfsenclearpre` command. See the *Storage Foundation for Oracle RAC Installation and Configuration Guide*, page 86.

Infinite Start Check Loop in init.cssd

Problem: Clsinfo script being called frequently from /etc/init.cssd. This problem was only observed in CRS 10.1.0.4.

Work around: Read bug 315235.1 in Oracle metalink. Patch 4554792 solves this problem.

▼ To apply Patch 4554792

1. Backup /etc/init.d/init.cssd script.
2. Apply the patch.
3. Insert the following lines in /etc/init.d/init.cssd immediately after definition of CRS_Process_Volume_Group() function:

```
# Veritas Cluster Server (Linux)
if [ -d "/opt/VRTSvcs" ]
then
    VC_UP="/opt/VRTSvcs/ops/bin/checkvcs"
    CLINFO="/opt/VRTSvcs/ops/bin/clsinfo"
    SKGXNLIB="/opt/ORCLcluster/lib/libskgx2.so"
fi
```

Uninstall Log Messages

After uninstalling Storage Foundation *for Oracle RAC 4.1*, the uninstall log may contain errors that can be safely ignored:

```
ERROR: Module vxodm does not exist in /proc/modules
ERROR: Module vxgms does not exist in /proc/modules
ERROR: Module vcsmm does not exist in /proc/modules
ERROR: Module lmx does not exist in /proc/modules
```



Fixed Issues and Enhancements

Fixed issues and software enhancement requests are referenced by VERITAS incident number and described briefly below.

Fixes and Enhancements in Storage Foundation *for Oracle RAC 4.1*

Incident Number	Description
255034	Shared DGs in VCS required manual configuration if split or joined using VEA because the <code>main.cf</code> was not getting updated. The VCS RAC wizard (<code>hawizard</code>) is supported for Oracle 10g.
293447	Machine does not reboot after panic with <code>kernel.panic</code> set. Oracle slave deregistering twice is fixed. The problem was: under heavy loads, and under rare circumstances, Oracle might deregister its slave processes twice with VCSMM. This caused all nodes of the cluster to panic.
588708	A bug that caused systems to crash while unloading LMX is fixed.

Documentation

Documentation for VERITAS Storage Foundation *for Oracle RAC* is available as Adobe Portable Document Format (PDF) files on the product disc. Documentation is also available in HTML format on the software disc included with your software purchase.

Storage Foundation *for Oracle RAC* Documentation

Storage Foundation *for Oracle RAC* components are described fully in the documents provided on the documentation disc for VERITAS Volume Manager, VERITAS File System, and VERITAS Cluster Server. These documents provide important information on the software components that support CVM, VxFS, and VCS.

VERITAS recommends copying the Storage Foundation *for Oracle RAC* installation and configuration guide and release notes from the software discs containing the product to the `/opt/VRTS/docs` directory so that they are available on your system for reference.



Storage Foundation *for Oracle RAC* Documentation Set

Guide	File Name
VERITAS Storage Foundation <i>for Oracle RAC</i>	
<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
VERITAS Cluster Server	
<i>VERITAS Cluster Server User's Guide</i>	vcs_users.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
VERITAS Cluster Server Oracle Enterprise Agent	
<i>VERITAS Cluster Server Enterprise Agent for Oracle Installation and Configuration Guide</i>	vcs_oracle_install.pdf
VERITAS Storage Foundation	
<i>VERITAS Storage Foundation Installation Guide</i>	sf_install.pdf
<i>VERITAS Volume Manager Intelligent Storage Provisioning Administrator's Guide</i>	sf_isp_admin.pdf
<i>VERITAS Volume Manager Cross-platform Data Sharing Administrator's Guide</i>	sf_cds_admin.pdf
<i>VERITAS FlashSnap Point-in-Time Copy Solutions Administrator's Guide</i>	flashsnap_admin.pdf
VERITAS Volume Manager	
<i>VERITAS Volume Manager Administrator's Guide</i>	vxvm_admin.pdf
<i>VERITAS Volume Manager 4.0 Hardware Notes</i>	vxvm_hwnotes.pdf



Guide	File Name
<i>VERITAS Volume Manager Troubleshooting Guide</i>	<code>vxvm_tshoot.pdf</code>
VERITAS File System	
<i>VERITAS File System Administrator's Guide</i>	<code>vxfs_admin.pdf</code>

VERITAS Documentation Disc

Documentation is available in HTML format on the searchable VERITAS Documentation Disc included with your software purchase.

VERITAS Documentation Online

Visit the Web site for VERITAS Storage Foundation *for Oracle RAC*:

<http://support.veritas.com/>

to download Storage Foundation *for Oracle RAC* documentation from current and previous releases.

Hard-Copy Documentation Set

Copies of VERITAS software guides are available for purchase through the VERITAS Web Store at <http://www.veritas.com/webstore>.

For Storage Foundation *for Oracle RAC* 4.1 on Linux, the *Installation and Configuration Guide* and all the component product documents listed in “[Storage Foundation for Oracle RAC Documentation](#)” on page 26 are available.

Manual Pages

The manual pages for `VRTStd`, `VRTS11t`, `VRTSgab`, and `VRTSvcS` are installed in `/opt/VRTS/man`. Set the `MANPATH` environment variable so the `man(1)` command can point to the VCS manual pages.

For Bourne or Korn shell (`sh` or `ksh`), type

```
# MANPATH=$MANPATH:/opt/VRTS/man
# export MANPATH
# LC_ALL = C export LC_ALL
```


For C shell (csh or tcsh), type:

```
# setenv MANPATH ${MANPATH}:/opt/VRTS/man
# setenv LC_ALL C
```

For more information, refer to the man(1) manual page.

Oracle Documentation

Oracle documents are not shipped with VERITAS Storage Foundation 4.1 *for Oracle RAC*. Documents that provide necessary related information for Oracle9i:

- ◆ B10110-01 *Oracle Real Application Clusters Cluster File System Release Notes*
- ◆ A95493-01 *Oracle9i Database Installation Guide*

For Oracle 10g:

- ◆ B14406-01 *Oracle Real Application Clusters Installation and Configuration 10g Release 1 (10.1.0.3) (for Linux x86-64)*
- ◆ B10766-08 *Oracle Real Application Clusters Installation and Configuration Guide (for Linux x86 and IA64)*

Getting Help

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

Additional Resources

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



Unique Message Identifiers

When contacting VERITAS Technical Services, either by telephone or by visiting the Technical Services website, be sure to provide the unique message identifier preceding the message. The identifier is an alpha-numeric string that denotes the type of message. Error messages begin with the letter “V.” For example:

```
VCS NOTICE V-16-1-10075 Invalid host name.
```

VERITAS Technical Services uses message identifiers to locate TechNotes and other information to assist in troubleshooting your case.

Diagnostic Tools

VERITAS Technical Services provides diagnostic tools to assist you in troubleshooting problems associated with the product. These tools are available on disc or can be downloaded from the VERITAS FTP site. See the VRTSspt readme file in the /support directory for details.

Applying Oracle Patchsets

Use this chapter to apply Oracle patchsets.

These installation procedures assume you have:

- ◆ Installed Storage Foundation *for Oracle RAC* 4.1
- ◆ Used “[Installation Notes](#)” on page 2 to install and configure Storage Foundation *for Oracle RAC* 4.1 MP2

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

Applying an Oracle 10g Patchset

If you are moving from Oracle 10.1.0.3 or Oracle 10.1.0.4 to Oracle 10.1.0.5, and the Oracle cluster registry is on Cluster File System, you must shift the Oracle cluster registry to a raw volume before proceeding to apply the patchset.

▼ To shift the Oracle cluster registry from Cluster Files System to a raw volume

1. Stop CRS and all the Oracle processes, if not already stopped.
2. Under the shared disk group for Oracle Cluster Registry, create a raw volume as follows. You must create a new shared disk group if sufficient space is not available in the existing disk group.

```
# vxassist -g ocrdg make ocrraw 100M
```

3. Assign ownership of the volumes using the `vxedit` command:

```
# vxedit -g ocrdg set user=oracle group=oinstall mode=660 ocrraw
```

4. Start the volume:

```
# vxvol -g ocrdg startall
```



5. Check the ocr file name and location in `/etc/oracle/ocr.loc`. The existing ocr file must be copied on the freshly created volume.

For example, if the existing ocr file is at `/OCR` with name `ocr.cfg`, copy the ocr as follows.

```
# dd if=/OCR/ocr.cfg of=/dev/vx/rdsk/ocrdg/ocrraw
```

6. Back up the existing `ocr.loc` in `/etc/oracle` on *all* cluster nodes:

```
# cp /etc/oracle/ocr.loc /etc/oracle/ocr.loc.org
```

7. Change the `ocr.loc` file to reflect the new location of ocr at `ocrconfig_loc`. In the example, the new `ocr.loc` would look similar to:

```
ocrconfig_loc=/dev/vx/rdsk/ocrdg/ocrraw
local_only=FALSE
```

8. The new ocr volume must be added in VCS configuration using the `main.cf`. The existing `ocrvote_dg`

```
CVMVolDg ocrvote_voldg (
    Critical = 0
    CVMDiskGroup = ocrvotedg
    CVMVolume = { ocrvotevol }
    CVMActivation = sw
)
```

will look like

```
CVMVolDg ocrvote_voldg (
    Critical = 0
    CVMDiskGroup = ocrvotedg
    CVMVolume = { ocrvotevol , ocrraw }
    CVMActivation = sw
)
```

▼ To apply an Oracle 10g patchset

1. Stop CRS and all the Oracle processes, if not already stopped.
2. Log in to oracle user. Go to `$ORACLE_HOME/lib`.
3. Restore the original ODM library from the Oracle installation which was replaced by the VERITAS ODM library.
 - a. Create a backup of the existing `odm` library:

```
# mv libodm10.so libodm10.so.vrts
```

b. Restore Oracle's ODM library:

```
# ln -s libodm10.so. libodm10.so
```

4. Follow the Oracle patchnote provided with the patchset to upgrade to the intended version of Oracle 10g.

If you have a database running with an earlier version, use the database upgrade procedure listed in the patchnote to upgrade your database.

5. After patchset application is complete, run:

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

6. Choose the correct relinking option for your version of Oracle:

- ◆ Relink SFRAC for Oracle 10g Release 1
- ◆ Relink SFRAC for Oracle 10g Release 2

7. If you are using SLES9 on IA64 and installing an Oracle 10.1.0.5 or higher patchset, you must manually copy the correct version of IPC library in Oracle Home directory on each node after relinking is complete.

```
cp /opt/VRTSvcs/rac/lib/skgxp24/64/libskgxp9.so
$ORACLE_HOME/lib/libskgxp10.so
```

8. You can start CRS and CRS resources using:

```
# /etc/init.d/init.crs start
```

9. Verify that all CRS resources are ONLINE.

10. After a successful application of the Oracle 10g patchset, a RAC database can be configured. Use your own tools or see “Creating a Starter Database” on page 351 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.

11. If you have just installed Storage Foundation for Oracle RAC 4.1 MP2 on clean systems, you need to bring CVM and Private NIC under VCS control. This can be achieved by:

- ◆ Using the VCS Oracle RAC Configuration wizard, see the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*:
 - “Creating an Oracle Service Group” on page 137 for RHEL4
 - “Creating an Oracle Service Group” on page 299 for SLES9



- ◆ Manually editing the VCS configuration file, see the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*:

“Configuring CVM Service Group for Oracle 10g Manually” on page 143 for RHEL4

“Configuring CVM Service Group for Oracle 10g Manually” on page 305 for SLES9

Caution If the nodes are rebooted before configuring the CVM service group, the services will not start on their own.

Applying an Oracle9i Patchset

▼ To apply an Oracle9i patchset

1. Log in as the `oracle` user.

```
# su oracle
```

2. Restore the original ODM library from the Oracle installation which was replaced by the VERITAS ODM library.

- a. Create a backup of the existing `odm` library:

```
# mv libodm9.so libodm9.so.vrts
```

- b. Restore Oracle's ODM library:

```
# ln -s libodm9.so. libodm9.so
```

3. Follow the Oracle patchnote provided with the patchset to upgrade to the intended version of Oracle9i.

If you have a database running with an earlier version, use the database upgrade procedure listed in the patchnote to upgrade your database.

4. After patchset application is complete, run:

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

5. Choose **Relink SFRAC for Oracle 9i**.

6. After a successful application of the Oracle 10g patchset, a RAC database can be configured. Use your own tools or see “Creating a Starter Database” on page 351 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.

7. If you have just installed Storage Foundation *for Oracle RAC* 4.1 MP2 on clean systems, you need to bring CVM and Private NIC under VCS control. This can be achieved by:
 - ◆ Using the VCS Oracle RAC Configuration wizard, see “Creating an Oracle Service Group Using the Wizard” on page 213 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.
 - ◆ Manually editing the VCS configuration file, see “Configuring CVM and Oracle Service Groups Manually” on page 206 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.



Installing Oracle 10g Release 2

Use this chapter to install Oracle 10g Release 2 software on clean systems. These procedures apply to all supported Linux distributions and architectures. See “[Supported Software](#)” on page 3.

These installation procedures assume:

- ◆ You have installed Storage Foundation *for Oracle RAC* 4.1
- ◆ You have used “[Installation Notes](#)” on page 2 to install and configure Storage Foundation *for Oracle RAC* 4.1 MP2

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

To install Oracle 10g Release 2, see:

- ◆ “[Configuring Oracle 10g Release 2 Prerequisites](#)” on page 37
- ◆ “[Installing Oracle 10g Release 2 CRS and Database](#)” on page 43

When you have finished installing Oracle 10g Release 2, you can create a database and configure your VCS service groups. See “[Configuring VCS Service Groups for Oracle 10g Release 2](#)” on page 81.

Configuring Oracle 10g Release 2 Prerequisites

After upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2, configure the Oracle 10g prerequisites:

- ◆ “[Creating OS Oracle User and Group](#)” on page 39
- ◆ “[Creating CRS_HOME](#)” on page 39
- ◆ “[Creating Volumes for OCR and Vote Disk](#)” on page 41
- ◆ “[Configuring Private IP Addresses on All Cluster Nodes](#)” on page 41
- ◆ “[Obtaining Public Virtual IP Addresses for Use by Oracle](#)” on page 42



Backing up Files if Upgrading

If you are upgrading from Oracle 10g R1, you must make a backup your files. For more on upgrading from Oracle 10g R1, see [“Migrating from Oracle 10g R1 to Oracle 10g R2 on SLES9 x86_64”](#) on page 74.

▼ To back up Oracle 10g R1 files

1. As `oracle`, create a dump file for the OCR registry file. This dump is used after the upgrade is completed to use the same service and resource names in Oracle 10g R2 and populate the Oracle 10g R2 OCR registry file.

```
# su - oracle
$ cd $CRS_HOME/bin
$ ./ocrdump
```

2. As root, CRS should be stopped on all nodes as follows.

```
# su - root
# /etc/init.d/init.crs stop
```

3. Make a backup of Oracle 10 R1 files/folders on all cluster nodes. During Oracle 10g R2 installation, these files will be replaced.

```
# /etc/init.d/init.crs stop
# mv /etc/oracle /etc/oracle-10gR1
# mv /etc/oraInst.loc /etc/oraInst.loc-10gR1
# mv /etc/oratab /etc/oratab-10gR1
# mv /etc -name "[SK]*init.c?s*" | xargs rm -f
# mv /etc -name "[SK]*init.evm*" | xargs rm -f
# mv /etc/init.d/init.crs etc/init.d/init.crs-10gR1
# mv /etc/init.d/init.crsd etc/init.d/init.crsd-10gR1
# mv /etc/init.d/init.cssd etc/init.d/init.cssd-10gR1
# mv /etc/init.d/init.evmd /etc/init.d/init.evmd-10gR1
# mv /etc/inittab.crs etc/inittab.crs-10gR1
```

Edit `/etc/inittab` and remove the following lines:

```
# h1:35:respawn:/etc/init.d/init.evmd run >/dev/null 2>&1
</dev/null
# h2:35:respawn:/etc/init.d/init.cssd fatal >/dev/null 2>&1
</dev/null
# h3:35:respawn:/etc/init.d/init.crsd run >/dev/null 2>&1
</dev/null
# init q
```

4. You must use new Oracle 10g R2 CRS_HOME and ORACLE_HOME for Oracle 10g R2 during the installation. You must also use new volumes for shared OCR and Vote disks.

Creating OS Oracle User and Group

On each system, create a local group and local user for Oracle. For example, create the group `oinstall` and the user `oracle`. Be sure to assign the same group ID, user ID, and home directory for the user on each system.

▼ To create OS Oracle user and group on each system

1. Create the `oinstall` group on each system:

```
# groupadd -g 1000 oinstall
# groupadd -g 1001 dba
```
2. Create the `oracle` user on each system and the oracle id should resemble the following:

```
useradd -g oinstall -u <User id> -G dba -d /oracle oracle
```
3. Enable `rsh` and key-based authentication `ssh` for the `oracle` user on all nodes.

Creating CRS_HOME

On each system in the Storage Foundation *for Oracle RAC* cluster, create a directory for `CRS_HOME`. The disk space required is 0.5 GB minimum.

▼ To create CRS_HOME on each system

1. Log in as root user on one system.

```
# su - root
```
2. Create groups and users.
 - a. Referring to the *Oracle Real Application Clusters Installation and Configuration Guide*, create the groups `oinstall` (the Oracle Inventory group) and `dba`, and the user `oracle`, assigning the primary group for `oracle` to be `oinstall` and the secondary group for `oracle` to be `dba`. Assign a password for `oracle` user.
 - b. On the original node determine the user and group IDs and use the identical IDs on each of the other nodes. Assign identical passwords for the user `oracle`.



3. On one node, create a disk group. For example:

```
# vxdg init crsdg sdc
```

For shared CRS Home on CVM master:

```
# vxdg -s init crsdg sdc
```

4. Create the volume in the group for the CRS_HOME. The volume should be a minimum of 0.5 GB:

```
# vxassist -g crsdg make crsvol 500M
```

5. Start the volume:

```
# vxvol -g crsdg startall
```

6. Create a VxFS file system on which to install CRS. For example:

```
# mkfs -t vxfs /dev/vx/rdisk/crsdg/crsvol
```

7. Create the mount point for the CRS_HOME:

```
# mkdir /oracle/crs
```

Note Make sure that CRS_HOME is a subdirectory of ORACLE_BASE.

8. Mount the file system, using the device file for the block device:

```
# mount -t vxfs /dev/vx/dsk/crsdg/crsvol /oracle/crs
```

For shared CRS Home on CVM master:

```
# mount -t vxfs -o /dev/vx/dsk/crsdg/crsvol /oracle/crs
```

9. For local mount only, edit the /etc/fstab file and list the new file system. For example:

```
/dev/vx/dsk/crsdg/crsvol /oracle/crs vxfs defaults 1 1
```

10. Set the CRS_HOME directory for the oracle user as /oracle/crs.

11. Assign ownership of the directory to oracle and the group oinstall:

```
# chown -R oracle:oinstall /oracle/crs
```

12. On each cluster, repeat [step 1](#) through [step 11](#). For shared CRS_HOME repeat [step 7](#) through [step 8](#).

Creating Volumes for OCR and Vote Disk

The OCR and Vote disk must be shared among all nodes in a cluster. You must create shared raw volumes for OCR and Vote disk, as these disks are not recognized if they are on a cluster file system. You can add them in the VCS configuration to make them highly available.

The `ORACLE_BASE` directory contains `CRS_HOME` and `ORACLE_HOME`. Create OCR and Voting disks on shared raw volumes. For Oracle 10g Release 2, it is mandatory that OCR and Voting disks are created on shared raw volumes and not on a cluster file system.

▼ To create OCR and Vote disk on raw volumes

1. Log in as root user.
2. On the CVM master node, create a shared disk group:


```
# vxldg -s init ocrdg sdz
```
3. Create volumes in the shared group for OCR and Vote disk:


```
# vxassist -g ocrdg make ocrvol 100M
# vxassist -g ocrdg make vdvol 100M
```
4. Assign ownership of the volumes using the `vxedit` command:


```
# vxedit -g ocrdg set user=oracle group=oinstall mode=660 ocrvol
# vxedit -g ocrdg set user=oracle group=oinstall mode=660 vdvol
```
5. Start the volume:


```
# vxvol -g ocrdg startall
```
6. When installing CRS, specify the following for OCR and Vote disk:


```
OCR:      /dev/vx/rdisk/ocrdg/ocrvol
VD:       /dev/vx/rdisk/ocrdg/vdvol
```

Configuring Private IP Addresses on All Cluster Nodes

The CRS daemon requires a private IP address on each system to enable communications and heartbeating. Do the following to set up the private IP addresses.



▼ To configure private IP addresses on all cluster nodes

1. On each cluster system, determine a private NIC device for which LLT is configured. Look at the file `/etc/llttab`. For example, if `eth0` is used as an LLT interconnect on one system, you can configure an available IP address for it. Example commands:

```
# ifconfig eth0 down
# ifconfig eth0 inet 192.168.1.58 netmask 255.255.255.0
# ifconfig eth0 up
```

Configure one private NIC on each node.

Note The private IP addresses of all nodes should be on the same physical network in the same IP subnet.

2. On each system, add the configured private IP addresses of all nodes to the `/etc/hosts` file, mapping them to symbolic names.

Example:

```
192.168.1.58 galaxy_priv
192.168.1.59 nebula_priv
```

3. From each system, try pinging each of the other nodes, using the symbolic system name associated with the private NIC IP address.

After configuring the IP addresses, you can edit the CVM service group and add the PrivNIC resource to make the IP addresses highly available. See:

- ◆ [“Creating Service Groups for Oracle 10g Release 2 Manually”](#) on page 84
- ◆ [“Configuring the PrivNIC Agent”](#) on page 369 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.

Obtaining Public Virtual IP Addresses for Use by Oracle

Before starting the Oracle installation, you must create virtual IP addresses for each node. An IP address and an associated host name should be registered in the domain name service (DNS) for each public network interface.

▼ To obtain public virtual IP addresses for use by Oracle

1. Obtain one virtual IP per node.
2. Add entry for the virtual IP and virtual public name in the `/etc/hosts` file, for all nodes.

3. Register with DNS.

Example:

```
10.11.12.58 galaxy_pub
10.11.12.59 nebula_pub
```

Installing Oracle 10g Release 2 CRS and Database

Supported options for installing:

- ◆ [“Installing Oracle 10g Release 2 Using the Installer”](#) on page 43
- ◆ [“Installing Oracle 10g Release 2 Manually”](#) on page 54

Installing Oracle 10g Release 2 Using the Installer

Use the appropriate preparation steps for your configuration. The procedure for installing Oracle 10g Release 2 in a VERITAS Storage Foundation 4.1 for Oracle RAC environment is identical for a shared and local disk installation.

▼ To prepare to install Oracle 10g Release 2 on a shared disk

1. Log into any system of the cluster as the root user.

```
# su - root
```

2. On the master node create a shared disk group.

a. Enter:

```
# vxdg -s init orabindg sdd
```

b. Create the volume in the shared group:

```
# vxassist -g orabindg make orabinvol 3000M
```

For the Oracle 10g binaries, make the volume 3 GB.

c. Start the volume:

```
# vxvol -g orabindg startall
```

d. On the master node, create a VxFS file system on the shared volume on which to install the Oracle 10g binaries. For example, create the file system on orabinvol:

```
# mkfs -t vxfs /dev/vx/dsk/orabindg/orabinvol
```



3. On each system, create the mount point for Oracle binaries and mount the file system.

- a. Create the mount point for the Oracle binaries if it does not already exist:

```
# mkdir /oracle/10g
```

- b. Mount the file system, using the device file for the block device:

```
# mount -t vxfs -o cluster /dev/vx/dsk/orabindg/orabinvol  
/oracle/10g
```

4. From the CVM master, execute:

```
# vxedit -g orabindg set user=oracle group=oinstall mode=660  
orabinvol
```

5. Set “oracle” to be the owner of the file system, and set “0660” as the permissions:

```
# chown oracle:oinstall /oracle
```

6. On the first system, set the following variables in root’s environment on the node from which `installsfrc -configure` will be executed.

- a. For Bourne shell (bash, sh, or ksh), enter:

```
# export ORACLE_BASE=/oracle  
# export DISPLAY=host:0.0
```

- b. For the C Shell (csh or tcsh):

```
# setenv ORACLE_BASE /oracle  
# setenv DISPLAY host:0.0
```

7. Set the X server access control:

```
# xhost + <hostname or ip address>
```

Where <hostname or ip address> is the hostname or IP address of the server to which you are displaying.

Note By default, the `installsfrc` utility uses `ssh` for remote communication. However, `rsh` can be used in place of `ssh` by using the `-user rsh` option with the `installsfrc` utility. The installation of Oracle 10g requires that `rsh` be configured on all nodes. See Oracle 10g documentation for details on configuring `rsh`.

▼ To prepare to install Oracle 10g Release 2 locally

1. Log in as root user on one system.

```
# su - root
```

2. On one node, create a disk group.

- a. Enter:

```
# vxdg init orabindg sdz
```

- b. Create the volume in the group:

```
# vxassist -g orabindg make orabinvol 5000M
```

For the Oracle 10g binaries, make the volume 5,000 MB.

- c. Start the volume:

```
# vxvol -g orabindg startall
```

- d. Create a VxFS file system on orabinvol to install the Oracle 10g binaries. For example:

```
# mkfs -t vxfs /dev/vx/dsk/orabindg/orabinvol
```

3. Create the mount point for the file system.

- a. Enter:

```
# mkdir /oracle
```

- b. Mount the file system, using the device file for the block device:

```
# mount -t vxfs /dev/vx/dsk/orabindg/orabinvol /oracle
```

- c. To mount the file system automatically across reboot, edit the `/etc/fstab` file, and add the new file system. For example:

```
/dev/vx/dsk/orabindg/orabinvol /oracle vxfs defaults 1 1
```

4. Create a local group and a local user for Oracle. For example, create the group `oinstall` and the user `oracle`. Be sure to assign the same user ID and group ID for the user on each system.
5. Set the home directory for the `oracle` user as `/oracle`.



6. Set appropriate permissions:

```
# vxedit -g orabindg set user=oracle group=oinstall mode=660  
orabinvol
```

7. Repeat [step 1](#) through [step 6](#) on the other systems.

8. Set the X server access control:

```
# xhost + <hostname or ip address>
```

Where <hostname or ip address> is the hostname or IP address of the server to which you are displaying.

Example:

```
# xhost + 192.168.1.128  
192.168.1.128 being added to access control list
```

9. On the first system, set the following variables in root's environment on the node from which `installsfrc -configure` will be executed.

- a. For Bourne shell (bash, sh, or ksh), enter:

```
# export ORACLE_BASE=/oracle  
# export DISPLAY=host:0.0
```

- b. For the C Shell (csh or tcsh):

```
# setenv ORACLE_BASE /oracle  
# setenv DISPLAY host:0.0
```

▼ To install Oracle 10g Release 2 on shared or local disk

1. Make sure that the Oracle installer is in a directory that is writable. If you are using the CD-ROM, make sure that the Oracle installation files are copied locally.
2. On the same node where you have set the environment variables, execute the following command as root:

```
# cd /opt/VRTS/install  
# ./installsfrc -configure
```

The installer will display the copyright message.

3. When the installer prompts, enter the system names separated by spaces on which to configure Storage Foundation *for Oracle* RAC. For the installation example used in this procedure:

```
# galaxy nebula
```

The installer checks both systems for communication and creates a log directory on the second system in `/var/tmp/installsfracxxxxxxxxxx`, where `xxxx` is the timestamp.

4. When the initial system check is successfully completed, press **Enter** to continue.
5. The installer proceeds to verify the license keys.
 - a. Enter additional licenses at this time if any are needed.
 - b. When the licenses are successfully verified, press **Enter** to continue.
6. The installer presents task choices for installing and configuring, depending on the operating system you are running.

Example:

```
      This program enables you to perform one of the following tasks:
1)  Install Oracle 9i.
2)  Install Oracle 10g Release 1.
3)  Install Oracle 10g Release 2.
4)  Relink SFRAC for Oracle 9i.
5)  Relink SFRAC for Oracle 10g Release 1.
6)  Relink SFRAC for Oracle 10g Release 2.
7)  Configure different components of SFRAC.

Enter your choice [1-7]: [?]
```

Select **Install Oracle 10g Release 2**. The installer proceeds to check environment settings.

7. Set Oracle directories.
 - a. When prompted, enter the directory name for `CRS_HOME` relative to the `ORACLE_BASE` directory.
 - b. When prompted, enter the directory name for `ORACLE_HOME` relative to the `ORACLE_BASE` directory. The Installer proceeds to validate `ORACLE_HOME` and check the node list.
 - c. Press **Enter** to continue.
8. Configure user accounts.



- a. Enter Oracle Unix User Account when prompted. The installer checks for the user on all systems.
 - b. Enter Oracle Inventory group when prompted. The installer checks for group existence on all systems
 - c. Press **Enter** to continue.
9. Enter the Oracle installer path for CRS when prompted. Specify the disk in your Oracle media kit where the CRS binaries reside. The installer validates the CRS installer.

Example:

```
/ <CRS_Disk> /
```

In the example, <CRS_Disk> is the disk where the CRS binaries reside.

10. Enter the oracle installer path when prompted. The installer validates the Oracle Installer, copies files, creates directories based on the information provided, and invokes the Oracle CRS Installer.

Example:

```
/DB_Disk/
```

In the example,<DB_Disk> is the disk where the Oracle binaries reside.

11. If you are installing Oracle 10g Release 2 on an x86_64 machine, you will see message something like this:

Before proceeding with Oracle 10g Release 2 installation, you need to run `/oracle/Oracle10gR2/clusterware/rootpre/rootpre.sh` on all nodes (as root user) as Oracle prerequisite. Please run this script on all the nodes and then proceed.

Press [Enter] to continue:

At this stage, you need to run `rootpre.sh` script (available inside `<CRS_DISK>/rootpre/` folder, where `<CRS_DISK>` is the disk where CRS binaries are located, on all the nodes before proceeding. This script may not be available on other nodes, so copy it from the node where it is available and run it.

12. When the Oracle CRS Installer appears, it prompts for the following:

- a. Specify the name for the install and `CRS_HOME` and click **Next**.
- b. The host name for the local node is displayed with default string (`-priv` and `-vip`) appended to its private name and virtual name.

- ◆ Modify it as needed to put the correct private and virtual name for the local node.
 - ◆ Add other cluster nodes using the **Add** option. While adding new nodes, specify private and virtual names for each. The nodes must be added in the same order in which they are configured for Storage Foundation *for Oracle* RAC (the node order present in `/etc/llthosts`), otherwise after Oracle installation, you may observe that original node ordering (present in `/etc/llthosts`) is missing.
 - ◆ After adding all the cluster nodes click **Next**.
- c. Specify the OCR shared raw volume name with an absolute path, for example the `/dev/vx/rdisk/ocrdg/ocrvol` raw volume, and click **Next**.
 - d. Specify CSS (Vote disk) shared raw volume name with an absolute path, for example the `/dev/vx/rdisk/ocrdg/vdvol` raw volume, and click **Next**. The installer proceeds with the CRS installation and sets the CRS parameters.
 - e. Choose the **external redundancy** option. Specify the OCR shared raw volume name with an absolute path, for example the `/dev/vx/rdisk/ocrdg/ocrvol` raw volume, and click **Next**.
 - f. Choose the **external redundancy** option. Specify CSS (Vote disk) shared raw volume name with an absolute path, for example the `/dev/vx/rdisk/ocrdg/vdvol` raw volume, and click **Next**. The installer proceeds with the CRS installation and sets the CRS parameters.
 - g. When prompted at the end of the CRS installation, run the `$CRS_HOME/root.sh` file on each cluster node in the same order as mentioned by Oracle CRS Installer.
Do not click OK in the `$CRS_HOME/root.sh` window until after you run the VIPCA utility.
 - h. Run the VIPCA utility in `$CRS_HOME/bin` from the first node in the cluster.
 - i. Click OK in the `$CRS_HOME/root.sh` window after you run the VIPCA utility.
 - j. Exit the CRS Installer after running `root.sh` and continue with `installsfarc -configure` for the Oracle 10g binaries installation.

13. Press `Enter` to continue.

The Oracle 10g database installer window displays.



- a. Choose the installation type.
 - b. Specify the file locations and click **Next**.
 - c. Select all nodes in the cluster and click **Next**. The installer verifies that the requirements are all met.
 - d. When prompted to create the database, select the **Install database software only** option.
 - e. Install the binaries now.
 - f. The installer prompts you to run `$ORACLE_HOME/root.sh` on each node. The installer confirms when installation is successful. Exit the Oracle 10g Installer and return to `installsrac -configure`.
14. Before replacing libraries, the CRS must be shutdown to avoid risk of nodes suddenly rebooting. You are prompted “Do you want to continue with stopping CRS? [y,n,q] (y).” If you select y (default value), the installer stops CRS on all nodes:

```
Stopping CRS on node1 using: /etc/init.d/init.crs stop ..... Done
Stopping CRS on node2 using: /etc/init.d/init.crs stop ..... Done
Checking files ..... Done
Oracle was installed successfully
```

If you select “n,” the installer skips this step:

```
Stopping CRS on node1 using: /etc/init.d/init.crs stop .... Skipped
Stopping CRS on node2 using: /etc/init.d/init.crs stop .... Skipped
Checking files ..... Done
Oracle was installed successfully
```

We recommend that you do not skip this step, because the installer tries to replace oracle libraries after this. There may be some issues with the currently running CRS (which is using these libraries), in which case nodes may be suddenly rebooted. To safeguard against this problem, it is recommended to first stop CRS and then replace the libraries.

15. The installer displays LLT and CRS node numberings:

```

Checking for node numbering differences ..... Done
NODE NAME                LLT NODE ID                CRS NODE ID
galaxy                    0                            1
nebula                    1                            2
Node numbering of LLT and CRS is different. It will be fixed. This step is
mandatory for SFRAC to function.

Press [Enter] to continue.

```

If LLT and CRS node numberings are not same, then Oracle may not detect some nodes and may detect some nodes in a wrong manner. This step ensures that the two numberings are same.

Press **Enter**. The installer continues:

```

Replacing node membership pattern in /etc/VRTSvcs/conf/config/main.cf on
all the nodes ... Done

```

```

NodeId attribute has been changed only for CVMCluster resource in
/etc/VRTSvcs/conf/config/main.cf to conform to Oracle's node numbering scheme,
but if you have any other resource which uses NodeId as an attribute, you must
change that manually in /etc/VRTSvcs/conf/config/main.cf file before starting
vcs.

```

```

Replacing node membership pattern in /etc/llthosts on all the nodes .. Done

```

```

Press [Enter] to continue:

```



16. The installer prompts you to stop the whole Storage Foundation *for Oracle RAC* stack and provides the required commands. Use the commands to stop the Storage Foundation *for Oracle RAC* stack.

Before finishing Oracle 10g Release 2 installation, the SFRAC stack needs to be shutdown on all the nodes using the following steps.

Commands to shutdown the stack :

- 1) Stop database, crs.
- 2) Unmount all VxFS mounts, stop volumes and deport diskgroups.
- 3) Stop DBAC with commands :
 /etc/init.d/vcsmm stop (Do not use vcsmmconfig -U);
 /etc/init.d/lmx stop
- 4) Stop ODM and GMS with commands :
 /etc/init.d/vxodm stop; /etc/init.d/vxgms stop
- 5) Stop VCS with command :
 /opt/VRTSvcs/bin/hastop -local
- 6) /opt/VRTS/bin/fsclustadm cfsdeinit
- 7) Stop GLM with command :
 /etc/init.d/vxglm stop
- 8) Stop/Kill the following processes if they are running :
 had, hashadow, CmdServer
- 9) Stop VXFEN with command :
 /etc/init.d/vxfen stop (Do not use vxfenconfig -U)
- 10) Stop GAB with command :
 /etc/init.d/gab stop
- 11) Stop LLT with command :
 /etc/init.d/llt stop

Press [Enter] to continue:

Please remember that you should not use "vcsmmconfig -U" and "vxfenconfig -U" for unconfiguring vcsmm and vxfen respectively. For stopping vcsmm and vxfen, please use:

```
$ /etc/init.d/vcsmm stop
$ /etc/init.d/vxfen stop
```

If the Storage Foundation *for Oracle RAC* stack does not stop, messages appear checking the status, confirming that Storage Foundation *for Oracle RAC* is not down and some components are still up. You are prompted to bring the stack down or to reboot. The required commands to bring the stack down are provided again. You are prompted:

Do you want to continue to bring down SFRAC components? [y,n,q] (y)

You can enter **N** and safely ignore the step of stopping Storage Foundation *for Oracle RAC* stack. On selecting **N**, the installer displays the following message:

You must manually reboot all the nodes at the same time for the new membership to take effect. To achieve simultaneous reboot of nodes, please shutdown all the nodes at the same time. Now start them only

after all are in shutdown state. This step is critical for avoiding those situations where some nodes are running with old membership and the rest with new membership.

WARNING: If VxFEN has problems coming up after the reboot, SCSI3 PGR registration keys should be fixed using `/opt/VRTSVcs/vxfen/bin/vxfenclearpre` command. Refer to SFRAC Installation and configuration guide page # 86 for more information.

Press [Enter] to continue:

This step ensures that all the cluster nodes start with new node IDs on next boot.

If you were able to stop SFRAC stack successfully, then you do not need to reboot the nodes to start SFRAC stack. Start the SFRAC stack on all the nodes using the following steps:

- 1) Start LLT with command :
 `/etc/init.d/llt start`
- 2) Start GAB with command :
 `/etc/init.d/gab start`
- 3) Start VXFEN with command :
 `/etc/init.d/vxfen start`
- 4) Start DBAC with commands :
 `/etc/init.d/vcsmm start; /etc/init.d/lmx start`
- 5) Start GMS and ODM with commands :
 `/etc/init.d/vxgms start; /etc/init.d/vxodm start`
- 6) Start vcs with command:
 `/etc/init.d/vcs start`
- 7) Import all previously imported diskgroups and start all volumes.
 Mount all VxFS mounts that were previously mounted.
- 8) Start crs and then start database (If any).

- 17.** In `installsfrac -configure`, press **Enter** to continue. The success of the configuration is reported. The configuration summary is saved at:
`/opt/VRTS/install/logs/installsfracxxxxxxxxxx.summary`

The `installsfrac` log is saved at:

`/opt/VRTS/install/logs/installsfracxxxxxxxxxx.log`

- 18.** After successful installation of CRS and Oracle 10g, apply the latest Oracle version patchset (10.2.0.2) using “[Applying an Oracle 10g Patchset](#)” on page 31.

A RAC database can then be configured if it is not already created. Use your own tools or see “Creating a Starter Database” on page 351 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.



19. If this is a clean install, you will need to bring CVM and Private NIC under VCS control. This step may not be needed if you are upgrading from Oracle 10g R1 and if you have already brought these resources under VCS control during installation of Oracle 10g R1. Bringing CVM and Private NIC under VCS control can be achieved by:
- ◆ Using the VCS Oracle RAC Configuration wizard. See “[Creating Service Groups for Oracle 10g Release 2 Using the Wizard](#)” on page 81.
 - ◆ Manually editing the VCS configuration file. See “[Creating Service Groups for Oracle 10g Release 2 Manually](#)” on page 84, and “Configuring the PrivNIC Agent” on page 369 of the *VERITAS Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.
 - ◆ If the nodes are rebooted before configuring the CVM service group, the services will not start on their own.

Installing Oracle 10g Release 2 Manually

VERITAS recommends using `installsfrc -configure` to install the Oracle 10g RAC binaries. However, some situations may require manual installation of the Oracle 10g RAC binaries. The following steps are required to install Oracle 10g manually:

- ◆ Patching the CRS OUI
- ◆ Pre-installation tasks
- ◆ OUI-based installation for CRS
- ◆ OUI-based installation for the database
- ◆ Post installation relinking
- ◆ Post installation configuration

▼ To patch the CRS OUI

1. Log in as oracle.

```
# su - oracle
```

The Oracle CRS installer must be patched so that it will detect the presence of VCS and use the correct cluster membership. If the OUI has been patched previously using this procedure, then proceed to the next section.

2. Search for the `ClusterQueries.jar` file inside the CRS OUI directory structure. With the current release of OUI, it may be at the following location:

```
# cp  
<installer_directory>/stage/Queries/ClusterQueries/10.2.0.2.0/1  
/tmp/jar
```

3. Unzip this file in some temporary location such as /tmp/jar. This directory should contain coe.tar under /tmp/jar/bin/linux/ directory.

```
# cp /tmp/jar/bin/linux/coe.tar /tmp/tar
```

4. Extract this file at another temporary location such as /tmp/tar.

```
# tar -xvf /tmp/tar/coe.tar
```

5. Backup the original lsnodes.sh script.

```
# cp lsnodes.sh lsnodes.sh.orig
```

6. Patch the lsnodes.sh file as follows which will create a new file lsnodes_new.sh:

```
# cat lsnodes.sh | sed -e '/CM / i #Patch to Check if something is
present in central location \
    if [ -d /opt/ORCLcluster/lib ]; then \
    CL="/opt/ORCLcluster/lib" \
    export LD_LIBRARY_PATH=\$CL:\$LD_LIBRARY_PATH \
    cd $base \
    ret=`./lsnodes` \
    if [ $? = 0 ]; then \
    echo "CL"; \
    exit; \
    fi \
fi \
' > lsnodes_new.sh
```

The lsnodes.sh file determines whether to use existing cluster membership or ask the user to input a new set of nodes that will form the cluster. This script will acknowledge existence of a cluster only if Oracle's Cluster Manager (oracm) is running. The above patch changes this behavior such that the lsnodes.sh script will acknowledge a presence of cluster if /opt/ORCLcluster/lib directory is present and lsnodes.sh executes correctly.

7. Overwrite the existing lsnodes.sh by the new lsnodes_new.sh file.

```
# cp lsnodes_new.sh lsnodes.sh
```

8. Ensure that lsnodes.sh file has permissions set to 755.

```
# chmod 755 lsnodes.sh
```

9. Backup the lsnodes_get.sh file

```
# cp lsnodes_get.sh lsnodes_get.sh.orig
```



10. Patch the `lsnodes_get.sh` as follows which will create a new file `lsnodes_get_new.sh`:

```
# cat lsnodes_get.sh | sed -e ' s_CL="/etc/ORCLcluster/oracm/lib"_\n    if [ -d /opt/ORCLcluster/lib ]; then \n        CL="/opt/ORCLcluster/lib" \n    else \n        CL="/etc/ORCLcluster/oracm/lib" \n    fi _ '> lsnodes_get_new.sh
```

The `lsnodes_get.sh` script is the one that actually queries `lsnodes` command for the cluster members. This patch sets the `CL` variable to `/opt/ORCLcluster/lib` which is exported as the `LD_LIBRARY_PATH` value. This allows our `vcsmm` to be used while determining the cluster membership.

11. Overwrite the existing `lsnodes_get.sh` by the new `lsnodes_get_new.sh` file.

```
# cp lsnodes_get_new.sh lsnodes_get.sh
```

12. Ensure that `lsnodes_get.sh` file has permissions set to 755.

```
# chmod 755 lsnodes_get.sh
```

13. Delete `lsnodes_new.sh` and `lsnodes_get_new.sh` files.

```
# rm -f lsnodes_new.sh lsnodes_get_new.sh
```

14. Re-create the `coe.tar` from the `/tmp/tar` location as follows:

```
# tar cvf /tmp/coe.tar -C /tmp/tar/ .
```

15. Overwrite the old `coe.tar` present under `/tmp/jar/bin/linux/` directory.

16. Create the jar file as follows:

```
# jar -cMf /tmp/ClusterQueries.jar -C /tmp/jar .
```

Make sure that the `-M` option is passed while creating the jar. The jar files do not require manifest file.

17. Copy this patched jar file back into the OUI location.

▼ To complete the pre-installation tasks

1. Log in as root.

```
# su - root
```

2. Execute on any one node of the cluster:

```
# $CRS_HOME/bin/crsctl set css miscount 900
```

3. Make sure the LLT and CRS node numbering agree. If LLT and CRS node numberings are not the same, then Oracle will not detect some nodes and it may detect nodes in a wrong manner.

Run the following command to get Oracle's node (CRS) numbering:

```
# $CRS_HOME/bin/olsnodes -n
```

Output may resemble:

```
nodeA    1
nodeB    2
nodeC    3
nodeD    4
```

Node names and their corresponding numberings are shown; if this node numbering is same as that of `/etc/llthosts`, you may skip [step 4](#) through [step 8](#).

4. If the node numberings differ, then you must change the node numbering (in `/etc/llthosts` and `/etc/VRTSvcs/conf/config/main.cf`) to the Oracle node numbering. Before replacing node numbering, you must stop the entire Storage Foundation *for Oracle* RAC stack.

- a. Stop database and CRS.

- b. To stop the Storage Foundation *for Oracle* RAC stack on x86, perform the following as `oracle` on all cluster nodes:

```
$ cp $ORACLE_HOME/lib/libskgxp10.so $ORACLE_HOME/lib/libskgxp10.so.orig
$ cp /opt/VRTSvcs/rac/lib/skgxp25/32/libskgxp10.so
  $ORACLE_HOME/lib/libskgxp10.so
$ cp $ORACLE_HOME/lib/libskgxn2.so $ORACLE_HOME/lib/libskgxn2.so.orig
$ cp /usr/lib/libvcsmm.so $ORACLE_HOME/lib/libskgxn2.so
$ cp $ORACLE_HOME/lib/libodm10.so $ORACLE_HOME/lib/libodm10.so.orig
$ cp /usr/lib/libodm10.so $ORACLE_HOME/lib/libodm10.so
$ cp $CRS_HOME/lib/libskgxp10.so $CRS_HOME/lib/libskgxp10.so.orig
$ cp /opt/VRTSvcs/rac/lib/skgxp25/32/libskgxp10.so
  $CRS_HOME/lib/libskgxp10.so
$ cp $CRS_HOME/lib/libskgxn2.so $CRS_HOME/lib/libskgxn2.so.orig
$ cp /usr/lib/libvcsmm.so $CRS_HOME/lib/libskgxn2.so
```

- c. To stop the Storage Foundation *for Oracle* RAC stack on x86_64, perform the following as `oracle` on all cluster nodes:

```
$ cp $ORACLE_HOME/lib/libskgxp10.so $ORACLE_HOME/lib/libskgxp10.so.orig
$ cp /opt/VRTSvcs/rac/lib/skgxp25/64/libskgxp10.so
  $ORACLE_HOME/lib/libskgxp10.so
$ cp $ORACLE_HOME/lib/libskgxn2.so $ORACLE_HOME/lib/libskgxn2.so.orig
```



```
$ cp /usr/lib64/libvcsmm.so $ORACLE_HOME/lib/libskgxn2.so
$ cp $ORACLE_HOME/lib/libodm10.so $ORACLE_HOME/lib/libodm10.so.orig
$ cp /usr/lib64/libodm10.so $ORACLE_HOME/lib/libodm10.so
$ cp $ORACLE_HOME/lib32/libskgxn2.so $ORACLE_HOME/lib32/libskgxn2.so.orig
$ cp /usr/lib/libvcsmm.so $CRS_HOME/lib32/libskgxn2.so
$ cp $CRS_HOME/lib/libskgxp10.so $CRS_HOME/lib/libskgxp10.so.orig
$ cp /opt/VRTSvcs/rac/lib/skgxp25/64/libskgxp10.so
    $CRS_HOME/lib/libskgxp10.so
$ cp $CRS_HOME/lib/libskgxn2.so $CRS_HOME/lib/libskgxn2.so.orig
$ cp /usr/lib64/libvcsmm.so $CRS_HOME/lib/libskgxn2.so
$ cp $CRS_HOME/lib32/libskgxn2.so $CRS_HOME/lib32/libskgxn2.so.orig
$ cp /usr/lib/libvcsmm.so $CRS_HOME/lib32/libskgxn2.so
```

d. Unmount all VxFS mounts, stop volumes and deport diskgroups.

e. Stop DBAC:

```
/etc/init.d/vcsmm stop (Do not use vcsmmconfig -U.)
/etc/init.d/lmx stop
```

f. Stop ODM and GMS:

```
/etc/init.d/vxodm stop; /etc/init.d/vxgms stop
```

g. Stop VCS: /opt/VRTSvcs/bin/hastop -local

h. Enter: /opt/VRTS/bin/fsclustadm cfsdeinit

i. Stop GLM: /etc/init.d/vxglm stop

j. Stop/Kill these processes if they are running: had, hashadow, CmdServer.

k. Stop VXFEN: /etc/init.d/vxfen stop (Do not use vxfenconfig -U.)

l. Stop GAB: /etc/init.d/gab stop

m. Stop LLT: /etc/init.d/llt stop

n. Do not use vcsmmconfig -U and vxfenconfig -U for unconfiguring vcsmm and vxfen respectively. To stop vcsmm and vxfen, use:

```
$ /etc/init.d/vcsmm stop
$ /etc/init.d/vxfen stop
```

5. Replace the node numberings manually, in /etc/llthosts and /etc/VRTSvcs/conf/config/main.cf, even if you could not stop the Storage Foundation for Oracle RAC stack successfully.

6. If you could not stop the Storage Foundation *for Oracle RAC* stack successfully before replacing node numberings, you must reboot all the nodes at the same time. All the cluster nodes must be shutdown at the same time and restarted. If one node reboots and comes back while other node has not rebooted and is still running with the old membership, there may be issues while starting the Storage Foundation for Oracle RAC stack on the rebooted node.
7. If `vxfen` has problems coming up after the reboot, fix the SCSI3 PR registration keys using `/opt/VRTSvcs/vxfen/bin/vxfenclearpre` command. See “Using `vxfenclearpre` Command to Clear Keys after Split Brain” on page 86 of the *VERITAS Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.
8. If you were able to stop Storage Foundation *for Oracle RAC* stack successfully, then you do not need to reboot the nodes to start Storage Foundation *for Oracle RAC* stack. Start the Storage Foundation *for Oracle RAC* stack on all the nodes using the following steps:
 - a. Start LLT: `/etc/init.d/llt start`
 - b. Start GAB: `/etc/init.d/gab start`
 - c. Start VXFEN: `/etc/init.d/vxfen start`
 - d. Start DBAC: `/etc/init.d/vcsmm start`; `/etc/init.d/lmx start`
 - e. Start GMS and ODM: `/etc/init.d/vxgms start`; `/etc/init.d/vxodm start`
 - f. Start VCS with command: `/etc/init.d/vcs start`
 - g. Import all previously imported diskgroups.
 - h. Start all volumes.
 - i. Mount all VxFS mounts that were previously mounted.
 - j. Start CRS.
 - k. Start the database (if you have any).

▼ **To use OUI-based Installation for CRS**

Execute the `./runinstaller` and follow the instructions as given in Oracle’s 10g Installation guide.



Note If the cluster node names are not displayed on the “Specify the host names” page of the OUI, verify that the CRS OUI has been patched, the pre-installation steps have been completed correctly, and `vcsmm` is configured on that cluster.

▼ To install OUI-based Installation for the Database

Install the 10g database using the OUI. No special steps are needed for an Oracle 10g database installation.

▼ To perform post-install re-linking

1. Before replacing libraries, the CRS must be shutdown to avoid risk of nodes suddenly rebooting. Run the following command:

```
# /etc/init.d/crs stop
```

Do not skip this step. Issues with the currently running CRS (which is using these libraries), may cause nodes to suddenly reboot. To prevent this problem, stop CRS before replacing the libraries.

2. Perform the following steps as oracle user on all of the cluster nodes:

```
# cp $ORACLE_HOME/lib/libskgxp10.so
$ORACLE_HOME/lib/libskgxp10.so.orig
# cp /usr/lib/libskgxp10.so $ORACLE_HOME/lib/libskgxp10.so
# cp $ORACLE_HOME/lib/libskgxn2.so
$ORACLE_HOME/lib/libskgxn2.so.orig
# cp /usr/lib/libvcsmm.so $ORACLE_HOME/lib/libskgxn2.so
# cp $ORACLE_HOME/lib/libodm10.so
$ORACLE_HOME/lib/libodm10.so.orig
# cp /usr/lib/libodm10.so $ORACLE_HOME/lib/libodm10.so
# cp $CRS_HOME/lib/libskgxn2.so $CRS_HOME/lib/libskgxn2.so.orig
# cp /usr/lib/libvcsmm.so $CRS_HOME/lib/libskgxn2.so
```

These steps must be repeated on all cluster nodes and must be done as oracle user. The libraries must not be copied as root: doing so will break Oracle.

▼ To complete post-install configuration

1. Log in as root.
2. Start CRS with the following command:

```
# /etc/init.d/crs start
```


3. Make sure the LLT and CRS node numbering agree. If LLT and CRS node numberings are not the same, then Oracle will not detect some nodes and it may detect nodes in a wrong manner.

Run the following command to get Oracle's node (CRS) numbering:

```
# $CRS_HOME/bin/olsnodes -n
```

Output may resemble:

```
nodeA    1
nodeB    2
nodeC    3
nodeD    4
```

Node names and their corresponding numberings are shown; if this node numbering is same as that of `/etc/llthosts`, you may skip [step 4](#) through [step 8](#).

4. If the node numberings differ, then you must change the node numbering (in `/etc/llthosts` and `/etc/VRTSvcs/conf/config/main.cf`) to the Oracle node numbering. Before replacing node numbering, you must stop the entire Storage Foundation *for Oracle* RAC stack.
 - a. Stop database and CRS.
 - b. Unmount all VxFS mounts, stop volumes and deport diskgroups.
 - c. Stop DBAC:


```
/etc/init.d/vcsmm stop (Do not use vcsmmconfig -U.)
/etc/init.d/lmx stop
```
 - d. Stop ODM and GMS:


```
/etc/init.d/vxodm stop; /etc/init.d/vxgms stop
```
 - e. Stop VCS: `/opt/VRTSvcs/bin/hastop -local`
 - f. Enter: `/opt/VRTS/bin/fsclustadm cfsdeinit`
 - g. Stop GLM: `/etc/init.d/vxglm stop`
 - h. Stop/Kill these processes if they are running: `had`, `hashadow`, `CmdServer`.
 - i. Stop VXFEN: `/etc/init.d/vxfen stop (Do not use vxfenconfig -U.)`
 - j. Stop GAB: `/etc/init.d/gab stop`



- k.** Stop LLT: `/etc/init.d/llt stop`
 - l.** Do not use `vcsmmconfig -U` and `vxfenconfig -U` for unconfiguring `vcsmm` and `vxfen` respectively. To stop `vcsmm` and `vxfen`, use:

```
$ /etc/init.d/vcsmm stop
$ /etc/init.d/vxfen stop
```
- 5.** Replace the node numberings manually, in `/etc/llthosts` and `/etc/VRTSvcs/conf/config/main.cf`, even if you could not stop the Storage Foundation for Oracle RAC stack successfully.
- 6.** If you could not stop the Storage Foundation for Oracle RAC stack successfully before replacing node numberings, you must reboot all the nodes at the same time. All the cluster nodes must be shutdown at the same time and restarted. If one node reboots while another node has not rebooted and is still running with the old membership, there may be issues while starting the Storage Foundation for Oracle RAC stack on the rebooted node.
- 7.** If `vxfen` has problems coming up after the reboot, fix the SCSI3 PR registration keys using `/opt/VRTSvcs/vxfen/bin/vxfenclearpre` command. See “Using vxfenclearpre Command to Clear Keys after Split Brain” on page 86 of the *VERITAS Storage Foundation for Oracle RAC 4.1 Installation and Configuration Guide*.
- 8.** If you were able to stop Storage Foundation for Oracle RAC stack successfully, then you do not need to reboot the nodes to start Storage Foundation for Oracle RAC stack. Start the Storage Foundation for Oracle RAC stack on all the nodes using the following steps:
 - a.** Start LLT: `/etc/init.d/llt start`
 - b.** Start GAB: `/etc/init.d/gab start`
 - c.** Start VXFEN: `/etc/init.d/vxfen start`
 - d.** Start DBAC: `/etc/init.d/vcsmm start; /etc/init.d/lmx start`
 - e.** Start GMS and ODM: `/etc/init.d/vxgms start; /etc/init.d/vxodm start`
 - f.** Start VCS with command: `/etc/init.d/vcs start`
 - g.** Import all previously imported diskgroups.
 - h.** Start all volumes.

- i. Mount all VxFS mounts that were previously mounted.
 - j. Start CRS.
 - k. Start the database (if you have any).
9. Execute on any one node of the cluster:
- ```
$ $CRS_HOME/bin/crsctl set css misscount 900
```
10. Stop CRS on all nodes:
- ```
# /etc/init.d/init/init.crs stop
```
11. Verify that CRS is stopped on all nodes:
- ```
ps -ef | grep ocssd
```
12. After successful installation of CRS and Oracle 10g, apply the latest Oracle version patchset (10.2.0.2) using “[Applying an Oracle 10g Patchset](#)” on page 31.
- A RAC database can then be configured if it is not already created. Use your own tools or see “Creating a Starter Database” on page 351 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*.
13. If this is a clean install, you will need to bring CVM and Private NIC under VCS control. This step may not be needed if you are upgrading from Oracle 10g R1 and if you have already brought these resources under VCS control during installation of Oracle 10g R1. Bringing CVM and Private NIC under VCS control can be achieved by:
- ◆ Using the VCS Oracle RAC Configuration wizard. See “[Creating Service Groups for Oracle 10g Release 2 Using the Wizard](#)” on page 81.
  - ◆ Manually editing the VCS configuration file. See “[Creating Service Groups for Oracle 10g Release 2 Manually](#)” on page 84.
  - ◆ If the nodes are rebooted before configuring the CVM service group, the services will not start on their own.





# Migrating Databases to the Latest Installed Version of Oracle

Use this chapter for upgrading Oracle databases:

- ◆ “[Migrating from Oracle9i to Oracle 10.1.0.5 on RHEL4 32-bit](#)” on page 65
- ◆ “[Migrating from Oracle9i to Oracle 10g R2 on RHEL4 32-bit](#)” on page 68
- ◆ “[Migrating from Oracle 10.1.0.3 or 10.1.0.4 to Oracle 10.1.0.5 on SLES9 64-bit](#)” on page 70
- ◆ “[Migrating from Oracle 10g R1 to Oracle 10g R2 on SLES9 x86\\_64](#)” on page 74
- ◆ “[Migrating from Oracle 10g R1 to Oracle 10g R2 on RHEL4 32-bit](#)” on page 76

These installation procedures assume you have installed *Storage Foundation for Oracle RAC 4.1*. If you have not already used “[Installation Notes](#)” on page 2 to install and configure *Storage Foundation for Oracle RAC 4.1 MP2*, you will need to do so during the preparation for migration procedures.

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

## Migrating from Oracle9i to Oracle 10.1.0.5 on RHEL4 32-bit

The migration procedure assumes that the beginning configuration includes the following are up and running on the cluster nodes:

- ◆ RHEL4 Update 1
- ◆ *Storage Foundation for Oracle RAC 4.1* or 4.1 MP1
- ◆ Oracle9i

Tasks for migration:

- ✓ Upgrade the OS to RHEL4 Update 2 or RHEL4 Update 3
- ✓ Upgrade *Storage Foundation for Oracle RAC* to 4.1 MP2
- ✓ Installing Oracle 10.1.0.5



- ✓ Migrate the database to Oracle 10.1.0.5

## Upgrading the OS on RHEL4

To migrate to Oracle 10.1.0.5, you must update the OS from RHEL4 Update 1 (U1) to RHEL4 Update 2 (U2) or RHEL4 Update 3 (U3).

### ▼ To upgrade the OS on RHEL4

1. Upgrade OS release from RHEL4 U1 to RHEL4 U2 or RHEL4 U3.
2. Start up with RHEL4 U2 or RHEL4 U3. Storage Foundation *for Oracle RAC* processes will start as usual, because RHEL4 U1, RHEL4 U2, and RHEL4 U3 are ABI compatible, hence old Storage Foundation *for Oracle RAC* modules work on RHEL4 U2 or RHEL4 U3 also.

You now have the following up and running:

- ◆ RHEL4 U2 or RHEL4 U3
- ◆ Storage Foundation *for Oracle RAC* 4.1
- ◆ Oracle9i database

## Upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2

To upgrade to Oracle 10.1.0.5, you must upgrade to Storage Foundation *for Oracle RAC* 4.1 MP2.

### ▼ To upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2

Follow the steps for upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2:

See “[Upgrading to 4.1 Maintenance Pack 2](#)” on page 9.

You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Oracle9i database

## Installing Oracle 10.1.0.5 on RHEL4 32-bit

After installing the correct OS and Storage Foundation *for Oracle RAC* 4.1 MP2, you can install Oracle 10.1.0.5.

▼ **To install Oracle 10.1.0.5**

1. Make backups of your Oracle9i files.
2. Configure the Oracle 10.0.1.3 prerequisites. See “Configuring Oracle 10g Release 1 Prerequisites” on page 95 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*, 4.1.
3. As root, run `installsfrc -configure` to install Oracle 10.0.1.3. See “Installing Oracle 10g CRS and Database” on page 101 of the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide*, 4.1.
4. Apply the Oracle 10.1.0.5 patchset. See “[Applying an Oracle 10g Patchset](#)” on page 31.  
You now have the following up and running:
  - ◆ RHEL4 U2 or RHEL4 U3
  - ◆ *Storage Foundation for Oracle RAC* 4.1 MP2
  - ◆ Oracle 10.1.0.5 binaries
  - ◆ Oracle9i database

## Migrating the Database from Oracle9i to Oracle 10.1.0.5 on RHEL4 32-bit

After installing the correct OS, *Storage Foundation for Oracle RAC* 4.1 MP2, and Oracle 10.1.0.5 binaries, you can migrate the database.

▼ **To migrate a database from Oracle9i to Oracle 10.1.0.5**

1. Start the Oracle9i instances on all the nodes.
2. Verify that CRS is running on all the nodes.
3. Verify the Oracle 10g Listeners on all the nodes are up and running.
4. Verify that the `/etc/oratab` file has all entries for the instances on all nodes.
5. Log in as the `oracle` user.
6. Export the display.
7. Run the `dbua` utility for the migration and refer to Oracle metalink Doc ID: Note:263809.1 for a complete checklist for manual upgrades to Oracle 10g.



You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10.1.0.5 database

## Migrating from Oracle9i to Oracle 10g R2 on RHEL4 32-bit

The migration procedure assumes that the beginning configuration includes the following are up and running on the cluster nodes:

- ◆ RHEL4 Update 1
- ◆ Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP1
- ◆ Oracle9i

Tasks for migration:

- ✓ Upgrade the OS
- ✓ Upgrade Storage Foundation *for Oracle RAC* 4.1 to 4.1 MP2
- ✓ Install Oracle 10g R2
- ✓ Migrate the database to Oracle 10g R2

## Upgrading the OS on RHEL4

To migrate to Oracle 10g R2, you must update the OS from RHEL4 Update 1 (U1) to RHEL4 Update 2 (U2) or RHEL4 Update 3 (U3).

### ▼ To upgrade the OS on RHEL4

1. Upgrade OS release from RHEL4 U1 to RHEL4 U2 or RHEL4 U3.
2. Start up with RHEL4 U2 or RHEL4 U3. Storage Foundation *for Oracle RAC* processes will start as usual, because RHEL4 U1, RHEL4 U2, and RHEL4 U3 are ABI compatible, hence old Storage Foundation *for Oracle RAC* modules work on RHEL4 U2 or RHEL4 U3 also.

You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP2
- ◆ Oracle9i database



## Upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2

Before upgrading to Oracle 10g R2, upgrade to Storage Foundation *for Oracle RAC* 4.1 MP2.

### ▼ To upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2

Follow the steps for upgrading to 4.1 MP2. See “[Upgrading to 4.1 Maintenance Pack 2](#)” on page 9.

You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle9i database

## Installing Oracle 10g R2

After installing the correct OS and Storage Foundation *for Oracle RAC* 4.1 MP2, you can install Oracle 10g R2.

### ▼ To install Oracle 10g R2

1. Make backups of your Oracle9i files. See “[Backing up Files if Upgrading](#)” on page 38.
2. Configure the Oracle 10g R2 prerequisites. See “[Configuring Oracle 10g Release 2 Prerequisites](#)” on page 37.
3. As root, run `installsfrc -configure` to install Oracle 10g R2. See “[Installing Oracle 10g Release 2 CRS and Database](#)” on page 43.

You now have the following up and running:

- ◆ RHEL4 U2 or RHEL4 U3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R2 binaries
- ◆ Oracle9i database

## Migrating the Database from Oracle9i to Oracle 10g R2 on RHEL4 32-bit

After installing the correct OS, Storage Foundation *for Oracle RAC* 4.1 MP2, and Oracle 10g R2 binaries, you can migrate the database.



▼ **To migrate the database from Oracle9i to Oracle 10g R2**

1. Start the Oracle9i instances on all the nodes.
2. Verify that CRS is running on all the nodes.
3. Verify the Oracle 10g Listeners on all the nodes are up and running.
4. Verify that the `/etc/oratab` file has all entries for the instances on all nodes.
5. Log in as the `oracle` user.  
`# su oracle`
6. Export the display.
7. Follow Oracle Metalink Note #263809.1 to manually upgrade Oracle 10.1.0.4 databases to Oracle 10g R2 or use `dbua` upgrade utility.

You now have the following up and running:

- ◆ RHEL4 U2
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R2 database

## Migrating from Oracle 10.1.0.3 or 10.1.0.4 to Oracle 10.1.0.5 on SLES9 64-bit

The migration procedure assumes that the beginning configuration includes the following are up and running on the cluster nodes:

- ◆ SLES9 SP1
- ◆ Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP1
- ◆ Oracle 10.1.0.3 or Oracle 10.1.0.4

Tasks for migration:

- ✓ Upgrade the OS
- ✓ Upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2
- ✓ Upgrade to Oracle 10.1.0.5
- ✓ Relink after upgrading to Oracle 10.1.0.5

## Upgrading the OS on SLES9

To migrate to Oracle 10.1.0.5, you must update the OS from SLES9 Service Pack 1 (SP1) to SLES9 Service Pack 2 (SP2) or SLES9 Service Pack 3 (SP3).

### ▼ To upgrade the OS on SLES9

1. Upgrade the OS from SLES9 SP1 to SLES9 SP2.
2. Start up with SLES9 SP2 or SLES9 SP3. No *Storage Foundation for Oracle RAC* processes will start, because SLES9 SP1, SP2, and SP3 are not ABI compatible, hence old *Storage Foundation for Oracle RAC* modules will not load on SLES9 SP2 or SP3. The *Storage Foundation for Oracle RAC* stack is down, but the CRS processes are waiting in loop for their dependencies (shared mount points) to become available.

## Upgrading to *Storage Foundation for Oracle RAC* 4.1 MP2

To migrate to Oracle 10.1.0.5, you must upgrade to *Storage Foundation for Oracle RAC* 4.1 MP2.

### ▼ To upgrade *Storage Foundation for Oracle RAC* to 4.1 MP2

Follow the steps for upgrading to 4.1 MP. See “[Upgrading to 4.1 Maintenance Pack 2](#)” on page 9.

As soon as *Storage Foundation for Oracle RAC* stack becomes available, CRS dependencies are satisfied and CRS processes start.

You now have the following up and running:

- ◆ SLES9 SP2 or SLES9 SP3
- ◆ *Storage Foundation for Oracle RAC* 4.1 MP2
- ◆ Oracle 10.1.0.3 or Oracle 10.1.0.4 database

## Upgrading to Oracle 10.1.0.5 on SLES9 64-bit

After installing the correct OS and *Storage Foundation for Oracle RAC* 4.1 MP2, you can upgrade to Oracle 10.1.0.5.

### ▼ To upgrade to Oracle 10.1.0.5

Follow Oracle's metalink procedure to upgrade from 10.1.0.3 or 10.1.0.4 to 10.1.0.5.



## Relinking after Upgrading from Oracle 10.1.0.3 or Oracle 10.1.0.4 to 10.1.0.5

Running `installsfrc -configure` to relink Storage Foundation *for Oracle RAC* libraries with Oracle 10g R1 (10.1.0.5) accomplishes the following:

- ◆ Replaces Oracle's libraries with Veritas libraries.
- ◆ Patches `init.cssd`, if it's not already patched.

### ▼ To relink the VERITAS libraries

1. Log in as root user.

```
su - root
```

2. Export the `ORACLE_BASE` and `ORACLE_HOME` environment variables.

3. Change directory to `/opt/VRTS/install`.

```
cd /opt/VRTS/install
```

4. Start the installer to relink:

```
./installsfrc -configure
```

5. The installer checks systems:

- a. When the installer prompts, enter the system names separated by spaces on which to configure Storage Foundation *for Oracle RAC*. For the installation example used in this procedure:

```
galaxy nebula
```

The installer checks both systems for communication and creates a log directory on the second system in `/var/tmp/installsfrcxxxxxxxxxx`.

- b. When the initial system check is successfully completed, press **Enter** to continue.

6. The installer proceeds to verify the license keys.

- a. Enter additional licenses now if any are needed.

- b. When the licenses are successfully verified, press **Enter** to continue.

7. The installer presents task choices for installing and configuring, depending on the operating system you are running.

Example:

```
 This program enables you to perform one of the following tasks:
1) Install Oracle 9i.
2) Install Oracle 10g Release 1.
3) Install Oracle 10g Release 2.
4) Relink SFRAC for Oracle 9i.
5) Relink SFRAC for Oracle 10g Release 1.
6) Relink SFRAC for Oracle 10g Release 2.
7) Configure different components of SFRAC.

Enter your choice [1-7]: [?]
```

Select **Relink SFRAC for Oracle 10g Release 1**. The installer proceeds to check environment settings.

8. Set Oracle directories.
  - a. When prompted, enter the directory name for CRS\_HOME relative to /oracle. It will be used relative to the ORACLE\_BASE directory.
  - b. When prompted, enter the directory name for ORACLE\_HOME relative to /oracle. It will be used relative to the ORACLE\_BASE directory. The Installer proceeds to validate ORACLE\_HOME and check the node list.
  - c. Press **Enter** to continue.
9. Set user accounts.
  - a. Enter Oracle Unix User Account when prompted. The installer checks for the user on all systems.
  - b. Enter Oracle Inventory group when prompted. The installer checks for group existence on all systems
  - c. Press **Enter** to continue.
10. The success of the configuration is reported. Press **Enter** to continue.

The configuration summary is saved at:  
/opt/VRTS/install/logs/installsfracxxxxxxxxxx.summary

The installsfrac log is saved at: /opt/VRTS/install/logs/installsfracxxxxxxxxxx.log
11. At this point, CRS is not running. Manually start CRS.

You now have the following up and running:



- ◆ SLES9 SP2 or SLES9 SP3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10.1.0.5 database

## Migrating from Oracle 10g R1 to Oracle 10g R2 on SLES9 x86\_64

The migration procedure assumes that the beginning configuration includes the following are up and running on the cluster nodes:

- ◆ SLES9 SP1
- ◆ Storage Foundation *for Oracle RAC* 4.1
- ◆ Oracle Oracle 10g R1 database

Tasks for migration:

- ✓ Upgrade Storage Foundation *for Oracle RAC* 4.1 to MP1
- ✓ Install Oracle 10g R2
- ✓ Migrate the database to Oracle 10g R2

## Upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2

This procedure includes a required upgrade of the OS from SLES9 SP1 to SLES9 SP2 or SLES9 SP3.

### ▼ To upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2

Follow the steps for upgrading to 4.1 MP2. See [“Upgrading to 4.1 Maintenance Pack 2”](#) on page 9.

You now have the following up and running:

- ◆ SLES9 SP2 or SLES9 SP3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R1 database

## Installing Oracle 10g R2

After installing the correct OS and Storage Foundation *for Oracle RAC* 4.1 MP2, you can install Oracle 10g R2.

### ▼ To install Oracle 10g R2

1. Make backups of your Oracle 10g R1 files. See [“Backing up Files if Upgrading”](#) on page 38.
2. You must use new Oracle 10g R1 CRS\_HOME and ORACLE\_HOME for Oracle 10g R2 during the installation. You must also use new volumes for shared OCR and Vote disks. See [“Configuring Oracle 10g Release 2 Prerequisites”](#) on page 37.
3. As root, run `installsf -configure` to install Oracle 10g R2. See [“Installing Oracle 10g Release 2 CRS and Database”](#) on page 43.

You now have the following up and running:

- ◆ SLES9 SP2 or SLES9 SP3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R2 binaries
- ◆ Oracle 10g R1 database

## Migrating the Database from Oracle 10g R1 to Oracle 10g R2 on SLES9 x86\_64

After installing the correct OS, Storage Foundation *for Oracle RAC* 4.1 MP2, and Oracle 10g R2 binaries, you can migrate the database.

### ▼ To migrate from Oracle 10g R1 to Oracle 10g R2

1. Start the Oracle 10g instances on all the nodes using Oracle 10g R1 environment variables.  

```
su - oracle
```
2. Verify that CRS are online on all the nodes.  

```
$CRS_HOME/bin/crs_stat -t
```
3. Follow Oracle Metalink Note #316889.1 to manually upgrade Oracle 10.1.0.4 databases to Oracle 10g R2 or use `dbua` upgrade utility.
4. The Oracle 10g R2 OCR will not have listener and database resources. After migration of databases is complete, perform the following actions:



- a. Stop the Oracle 10g R1 listener if it is running.
  - b. Create a new listener in Oracle 10g R2 using `netca`.
  - c. Register the database and instance resources in OCR using `crs_register`.
5. After upgrading the database, make sure the following are up and running:
  - ◆ Oracle 10g R2 CRS
  - ◆ Oracle 10g R2 database
  - ◆ Oracle 10g R2 listeners

You now have the following up and running:

- ◆ SLES9 SP2 or SLES9 SP3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ OOracle 10g R2 database

## Migrating from Oracle 10g R1 to Oracle 10g R2 on RHEL4 32-bit

The migration procedure assumes that the beginning configuration includes the following are up and running on the cluster nodes:

- ◆ RHEL4 Update 1
- ◆ Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP1
- ◆ Oracle 10g R1 database

Tasks for migration:

- ✓ Upgrade the OS
- ✓ Upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2
- ✓ Install Oracle 10g R2
- ✓ Migrate the database to Oracle 10g R2

## Upgrading the OS on RHEL4

Before migrating to Oracle 10g R2, update the OS from RHEL4 Update 1 (U1) to RHEL4 Update 2 (U2) or RHEL4 Update 3 (u3).



### ▼ To upgrade the OS on RHEL4

1. Upgrade OS release from RHEL4 U1 to RHEL4 U2 or RHEL4 U3.
2. Start up with RHEL4 U2 or RHEL4 U3. Storage Foundation *for Oracle RAC* processes will start as usual, because RHEL4 U1, RHEL4 U2, and RHEL4 U3 are ABI compatible, hence old Storage Foundation *for Oracle RAC* modules work on RHEL4 U2 or RHEL4 U3 also.

You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Storage Foundation *for Oracle RAC* 4.1 or 4.1 MP1
- ◆ Oracle 10g R1 database

## Upgrading to Storage Foundation *for Oracle RAC* 4.1 MP2

Before migrating to Oracle 10g R2, upgrade to Storage Foundation *for Oracle RAC* 4.1 MP2.

### ▼ To upgrade Storage Foundation *for Oracle RAC* to 4.1 MP2

Follow the steps for upgrading to 4.1 MP2. See “[Upgrading to 4.1 Maintenance Pack 2](#)” on page 9.

You now have the following up and running:

- ◆ RHEL4 Update 2 or RHEL4 Update 3
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R1 database

## Installing Oracle 10g R2

After installing the correct OS and Storage Foundation *for Oracle RAC* 4.1 MP2, you can install Oracle 10g R2.

### ▼ To install Oracle 10g R2

1. Make backups of your Oracle 10g R1 files. See “[Backing up Files if Upgrading](#)” on page 38.
2. You must use the new Oracle 10g R2 CRS\_HOME and ORACLE\_HOME for Oracle 10g R2 during the installation. You must also use new volumes for shared OCR and Vote disks. See “[Configuring Oracle 10g Release 2 Prerequisites](#)” on page 37.



3. As root, run `installsfrc -configure` to install Oracle 10g R2. See [“Installing Oracle 10g Release 2 CRS and Database”](#) on page 43.

You now have the following up and running:

- ◆ RHEL4 U2
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle Oracle 10g R2 binaries
- ◆ Oracle 10g R1 database

## Migrating the Database from Oracle 10g R1 to Oracle 10g R2 on RHEL4 32-bit

After installing the correct OS, Storage Foundation *for Oracle RAC* 4.1 MP2, and Oracle 10g R2 binaries, you can migrate the database.

### ▼ To migrate from Oracle 10g R1 to Oracle 10g R2

1. Start the Oracle 10g instances on all the nodes using Oracle 10g R1 environment variables.

```
su - oracle
```

2. Verify that CRS are online on all the nodes.

```
$ $CRS_HOME/bin/crs_stat -t
```

3. Follow Oracle Metalink Note #316889.1 to manually upgrade Oracle 10.1.0.4 databases to Oracle 10g R2 or use `dbua` upgrade utility.
4. The Oracle 10g R2 OCR will not have listener and database resources. After migration of databases is complete, perform the following actions:
  - a. Stop the Oracle 10g R1 listener if it is running.
  - b. Create a new listener in Oracle 10g R2 using `netca`.
  - c. Register the database and instance resources in OCR using `crs_register`.
5. After upgrading the database, make sure the following are up and running:
  - ◆ Oracle 10g R2 CRS
  - ◆ Oracle 10g R2 database

- ◆ Oracle 10g R2 listeners

You now have the following up and running:

- ◆ RHEL4 U2
- ◆ Storage Foundation *for Oracle RAC* 4.1 MP2
- ◆ Oracle 10g R2 database





## Configuring VCS Service Groups for Oracle 10g Release 2

---

After you have installed Oracle and created your database, you can set up VCS to automate the Oracle RAC environment:

- ◆ “[Creating Service Groups for Oracle 10g Release 2 Using the Wizard](#)” on page 81
- ◆ “[Creating Service Groups for Oracle 10g Release 2 Manually](#)” on page 84
- ◆ “[Location of VCS Log Files](#)” on page 87

To verify the latest information on support for Oracle database versions, see the VERITAS Technical Support TechNote:

<http://support.veritas.com/docs/277033>

## Creating Service Groups for Oracle 10g Release 2 Using the Wizard

The Oracle 10g RAC configuration wizard guides you through the modification of the existing CVM group to include CRS Application, `PrivNIC`, `CFSMount` and `CVMVolDg` resources.

Before starting the wizard, verify that your Oracle installation can be configured:

- ✓ Oracle 10g CRS must be running
- ✓ Oracle RAC instances and listeners must be running on all cluster nodes
- ✓ The database files of all instances must be on shared storage, in a cluster file system or shared raw volumes

Make sure you have available the information the wizard needs as it proceeds:

- ✓ Names of the database instances to be configured
- ✓ Private IP addresses used by Oracle 10g CRS
- ✓ 10g CRS OCR location
- ✓ Vote disk location



## Establishing Graphical Access for the Wizard

The configuration wizard requires graphical access to the VCS systems where you want to configure service groups. If your VCS systems do not have monitors, or if you want to run the wizards from a remote UNIX system, use the procedure for establishing graphical access for a remote system.

### ▼ To establish graphical access from a remote system

1. From the remote system, (`jupiter`, for example), run:

```
xhost +
```

2. Do one of the following, depending on your shell:

- ◆ For Bourne shell (`bash`, `sh`, or `ksh`), run this step on one of the systems where the wizard is to run, for example `galaxy`:

```
export DISPLAY=jupiter:0.0
```

- ◆ For C shell (`csh`), run this step

```
setenv DISPLAY jupiter:0.0
```

3. Verify that the `DISPLAY` environment variable has been updated:

```
echo $DISPLAY
jupiter:0.0
```

## Creating Service Groups Using the Configuration Wizard

The configuration wizard for Oracle 10g RAC is started at the command line.

### ▼ To create service groups using the configuration wizard

1. Log on to one of your VCS systems as `root`.
2. Start the configuration wizard.

```
/opt/VRTSvcs/bin/hawizard rac10g
```

The VCS RAC Oracle 10g Configuration wizard starts with a Welcome window that highlights the prerequisites for configuration and the information you will need to complete the configuration.

If your configuration does not meet the configuration requirements, you can stop the wizard by pressing Cancel. Take the necessary steps to meet the requirements and start the wizard again. See [step 1](#)

3. To discover the RAC configuration, press **Next** on the Welcome screen when you are ready to configure Oracle service group. The wizard begins discovering the current Oracle RAC information before proceeding to the next screen.

If the wizard does not find all databases in the cluster, it halts with an error, indicating the problem. Press Cancel, and start the wizard again after you correct the problem.

4. In the Database Selection screen, databases and their instances running on the cluster are listed and displayed. Select only one and click **Next**.
5. In the Private NIC Configuration screen, specify information for all the cluster nodes:
  - a. Configure the Private IP address that is used by Oracle 10g CRS.
  - b. Select the NIC's that should be used by the Private NIC agent to make this IP address highly available.
6. In the CRS Configuration screen, specify the OCR and Voting Disk locations (created on raw volumes).
7. In the Database Configuration screen, the wizard discovers the mount point of the database, if it is installed on a cluster file system, and displays it. If the database exists on raw volumes, the wizard discovers the volumes. If the OCR and Voting disk are on raw volumes, the wizard discovers the volumes.  
Confirm or modify the mount options displayed.
8. In the Service Group Summary screen, the wizard displays the configuration after you have configured the database and listener resources. Click **Finish** to complete the configuration.
9. In the Completing the RAC 10g Configuration screen:
  - a. Click the **Bring the service groups online** check-box to start the newly added resources after exiting the wizard.
  - b. Click **Close** to exit the wizard.

▼ **To verify the state of newly added resources**

1. Use `hargrp -state` to check status of the cvm group.
2. Use `hargrp -state` to check status of resources.



▼ **To restart the cluster nodes**

A restart is required at this stage so that CRS and Oracle RAC database instances use VERITAS libraries.

1. Stop CRS using `/etc/init.d/init.crs stop` on all nodes.
2. Stop VCS using `/opt/VRTSvcs/bin/hastop -local` on all nodes.
3. Restart all nodes.

## Creating Service Groups for Oracle 10g Release 2 Manually

This section describes how to manually edit the `main.cf` file to configure the CVM and Oracle service groups.

▼ **To configure CVM service group for Oracle 10g manually**

1. Log in to one system as `root`.
2. Save your existing configuration to prevent any changes while you modify `main.cf`:  

```
haconf -dump -makero
```
3. Make sure VCS is not running while you edit `main.cf` by using the `hastop` command to stop the VCS engine on all systems and leave the resources available:  

```
hastop -all -force
```
4. Make a backup copy of the `main.cf` file:  

```
cd /etc/VRTSvcs/conf/config
cp main.cf main.orig
```
5. Using `vi` or another text editor, edit the `main.cf` file, modifying the `cvm` service group and creating Oracle service groups using the sample `main.cf` as a guideline.

### Sample `main.cf` for Oracle 10g

```
include "vcsApacheTypes.cf"
include "types.cf"
include "CFSTypes.cf"
include "CVMTypes.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"
```



```

cluster ora_cluster (
 UserNames = { admin = dOPhOJoLPkPPnXPjOM }
 Administrators = { admin }
 HacliUserLevel = COMMANDROOT
 CounterInterval = 5
 UseFence = SCSI3
)

system galaxy (
)

system nebula (
)

group cvm (
 SystemList = { galaxy = 0, nebula = 1 }
 AutoFailOver = 0
 Parallel = 1
 AutoStartList = { galaxy, nebula }
)

CFSMount orabin_mnt (
 Critical = 0
 MountPoint = "/orabin"
 BlockDevice = "/dev/vx/dsk/orabindg/orabinvol"
)

CFSMount oradata_mnt (
 Critical = 0
 MountPoint = "/oradata"
 BlockDevice = "/dev/vx/dsk/oradatadg/oradatavol"
)

CVMVolDg oradata_voldg (
 Critical = 0
 CVMDiskGroup = oradatadg
 CVMVolume = { oradatavol }
 CVMActivation = sw
)

CVMVolDg orabin_voldg (
 Critical = 0
 CVMDiskGroup = orabindg
 CVMVolume = { orabinvol }
 CVMActivation = sw
)

CVMVolDg ocrvote_voldg (
 Critical = 0
 CVMDiskGroup = ocrvotedg
 CVMVolume = { ocrvotevol }
 CVMActivation = sw
)

```



```

CFSfsckd vxfsckd (
)

CVMCluster cvm_clus (
 CVMClustName = ora_cluster
 CVMNodeId = { galaxy = 0, nebula = 1 }
 CVMTransport = gab
 CVMTimeout = 200
)

CVMVxconfigd cvm_vxconfigd (
 Critical = 0
 CVMVxconfigdArgs = { syslog }
)

PrivNIC ora_priv (
 Critical = 0
 Device = { eth1 = 0, eth2 = 1}
 Address@galaxy = "192.11.12.58"
 Address@nebula = "192.11.12.59"
 NetMask = "255.255.255.0"
)

cvm_clus requires cvm_vxconfigd

orabin_voldg requires cvm_clus
oradata_voldg requires cvm_clus
ocrvote_voldg requires cvm_clus

ocrvote_mnt requires vxfsckd
orabin_mnt requires vxfsckd
oradata_mnt requires vxfsckd

orabin_mnt requires orabin_voldg
oradata_mnt requires oradata_voldg

```

## Saving and Checking the Configuration

When you finish configuring the CVM and Oracle service groups by editing the `main.cf` file, verify the new configuration.

### ▼ To save and check the configuration

1. Save and close the `main.cf` file.
2. Verify the syntax of the file `/etc/VRTSvcs/conf/config/main.cf`:

```

cd /etc/VRTSvcs/conf/config
hacf -verify .

```

3. Start the VCS engine on one system:

```
hastart
```

4. Type the command `hastatus`:

```
hastatus
```

5. When “LOCAL\_BUILD” is listed in the message column, start VCS on the other system:

```
hastart
```

6. Verify that the service group resources are brought online. On one system, enter:

```
hagrp -display
```

▼ **To verify the state of newly added resources**

1. Use `hagrp -state` to check status of the `cvm` group.
2. Use `hagrp -state` to check status of resources.

▼ **To restart the cluster nodes**

A restart is required to make sure that CRS and Oracle RAC database instances use VERITAS libraries.

1. Stop CRS using `/etc/init.d/init.crs stop` on all nodes.
2. Stop VCS using `/opt/VRTSvcs/bin/hastop -local` on all nodes.
3. Restart all nodes.

## Modifying the VCS Configuration

For additional information and instructions on modifying the VCS configuration by editing the `main.cf` file, refer to the *VERITAS Cluster Server User's Guide*.

## Location of VCS Log Files

On all cluster nodes, look at the following log files for any errors or status messages:

```
/var/VRTSvcs/log/engine_A.log
```



When large amounts of data are written, multiple log files may be required. For example, `engine_B.log`, `engine_C.log`, and so on, may be required. The `engine_A.log` contains the most recent data.

# Adding and Removing Cluster Nodes for Oracle 10g Release 2

---

A cluster running VERITAS *Storage Foundation for Oracle RAC* can have as many as eight systems. If you have a multi-node cluster running Oracle 10g, you can add or remove a node:

- ◆ [“Adding a Node to an Oracle 10g Release 2 Cluster”](#) on page 89
- ◆ [“Removing a Node from an Oracle 10g Release 2 Cluster”](#) on page 100

## Adding a Node to an Oracle 10g Release 2 Cluster

The examples used in these procedures describe adding one node to a two-system cluster.

- ◆ [“Checking System Requirements for New Node”](#) on page 90
- ◆ [“Physically Adding a New System to the Cluster”](#) on page 90
- ◆ [“Installing Storage Foundation for Oracle RAC on the New System”](#) on page 90
- ◆ [“Starting Volume Manager”](#) on page 92
- ◆ [“Configuring LLT, GAB, VCSMM, and VXFEN Drivers”](#) on page 92
- ◆ [“Preparing to Add a Node”](#) on page 94
- ◆ [“Configuring CVM”](#) on page 95
- ◆ [“Using the Oracle Add Node Procedure”](#) on page 96
- ◆ [“Sample main.cf for Adding an Oracle 10g Node”](#) on page 97



## Checking System Requirements for New Node

Ensure that the new systems meet all requirements for installing and using Storage Foundation *for Oracle RAC*.

- ✓ The new system must have the identical operating system and patch level as the existing systems. Refer to “[Installation Notes](#)” on page 2.
- ✓ Use a text window of 80 columns minimum by 24 lines minimum; 80 columns by 24 lines is the recommended size for the optimum display of the `installsf` script.
- ✓ Verify that the file `/etc/fstab` contains only valid entries, each of which specifies a file system that can be mounted.

## Physically Adding a New System to the Cluster

The new system must have the identical operating system and patch level as the existing systems. When you physically add the new system to the cluster, it must have private network connections to two independent switches used by the cluster and be connected to the same shared storage devices as the existing nodes. Refer to the *VERITAS Cluster Server Installation Guide*.

After installing Storage Foundation *for Oracle RAC* on the new system and starting VxVM, the new system can access the same shared storage devices. The shared storage devices, including coordinator disks, must be exactly the same among all nodes. If the new node does not see the same disks as the existing nodes, it will be unable to join the cluster, as indicated by an error from CVM on the console.

## Installing Storage Foundation *for Oracle RAC* on the New System

Read the *VERITAS Storage Foundation for Oracle RAC Installation and Configuration Guide* for pre-installation instructions.

### ▼ To install Storage Foundation *for Oracle RAC* 4.1 MP2 without configuration

4. Log in as root on one of the systems for installation.
5. Install the VERITAS Storage Foundation *for Oracle RAC* 4.1 software from the release CD as described in the *Storage Foundation for Oracle RAC Installation and Configuration Guide*, Chapters 2 and 3, but run the product installation script instead of the generic `installer` script. Enter the following command from the top-level directory of the mounted CD:

```
./installsf -installonly [-usersh]
```

The `-installonly` option is required to perform the installation without configuring the software. The `-usersh` option is required if you are using the remote shell (RSH) rather than the secure shell (SSH) to install the software simultaneously on several systems.

---

**Note** Provided that the remote shell (RSH) or secure shell (SSH) has been configured correctly, this command can be run on a single node of the cluster to install the software on all the cluster nodes.

---

6. Download Storage Foundation *for Oracle RAC 4.1 MP2*.
7. Extract the Storage Foundation *for Oracle RAC* installation files.
8. Change to the directory containing the installation program.
9. To install Storage Foundation *for Oracle RAC 4.1 MP2*, you must invoke `installmp` from one of your cluster nodes using the option that corresponds to your configuration:
  - ◆ To install on the local system only:

```
./installmp
```
  - ◆ To install on more than one system using secure shell (SSH) utilities:

```
./installmp galaxy nebula ...
```
  - ◆ To install on more than one system using remote shell (RSH) utilities:

```
./installmp galaxy nebula ... -usersh
```
10. After the initial system checks are complete, press **Return** to start the requirements checks.

---

**Note** All the Storage Foundation for Oracle RAC processes are stopped before uninstalling the `rpms`. This includes VCS, VM, FS and VEA. While stopping these processes, you may see messages such as: "GAB /sbin/gabconfig ERROR V-15-2-25022 unknown error." These messages can be ignored safely.

---

11. After the requirements checks are complete, press **Return** to start upgrading the packages. If you are upgrading multiple nodes, you have the option of upgrading them simultaneously. You will be prompted after the upgrade is complete.
12. When installation is complete, note the locations of the summary, log, and response files indicated by the installer.



**Note** Ignore the message advising that you must run `installsfrc -configure`. When adding a node to a cluster running Storage Foundation for Oracle RAC, you must manually configure the system using the following procedure.

---

## Starting Volume Manager

As you run the utility, entering **N** prompts you about licensing. You installed the appropriate license when you ran the `installsfrc` utility.

### ▼ To start Volume Manager

1. Run the installer:  

```
vxinstall
```
2. Enter the required licensing information.
3. Enter **N** when prompted to select enclosure-based naming for all disks.
4. Enter **N** to setup a disk group for the system. The installation completes.
5. Verify that the daemons are up and running. Enter the command:  

```
vxdisk list
```

The output should display the shared disks without errors.
6. Edit `/etc/sysconfig/vcs` by setting `ONENODE=no`.

## Configuring LLT, GAB, VCSMM, and VXFEN Drivers

### ▼ To configure LLT, GAB, VCSMM, and VXFEN drivers

1. On the new system, modify the file `/etc/sysctl.conf` to set the shared memory and other parameter required by Oracle; refer to the documentation: B10766-01, *Oracle 10g Installation Guide*, for details. The value of the shared memory parameter is put to effect when the system restarts.
2. Edit the file `/etc/llthosts` on the two existing systems. Using `vi` or another text editor, add the line for the new node to the file. The file should resemble:  

```
1 galaxy
2 nebula
3 saturn
```



3. Copy the `/etc/llthosts` file from one of the existing systems over to the new system. The `/etc/llthosts` file must be identical on all nodes in the cluster.

4. Create an `/etc/llttab` file on the new system. For example:

```
set-node saturn
set-cluster 7
link eth0 eth-<MAC ADDRESS FOR eth0> - ether - -
link eth1 eth-<MAC ADDRESS FOR eth1> - ether - -
```

The second line, the cluster ID, must be the same as in the existing nodes.

5. Use `vi` or another text editor to create the file `/etc/gabtab` on the new system. It should resemble the following example:

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

Where *N* represents the number of systems in the cluster. For a three-system cluster, *N* would equal 3.

6. Edit the `/etc/gabtab` file on each of the existing systems, changing the content to match the file on the new system.
7. Set up the `/etc/vcsmmtab` and `/etc/vxfendg` files on the new system by copying them from one of the other existing nodes:

```
scp galaxy:/etc/vcsmmtab /etc
scp galaxy:/etc/vxfendg /etc
```

8. Run the commands to start LLT and GAB on the new node:

```
/etc/init.d/llt start
/etc/init.d/gab start
```

9. On the new node, start the VXFEN, VCSMM, and LMX drivers. Remove the `/etc/vxfenmode` file to enable fencing. Use the commands in the order shown:

```
rm /etc/vxfenmode
/etc/init.d/vxfen start
/etc/init.d/vcsmm start
/etc/init.d/lmx start
```

10. On the new node, start the GMS and ODM drivers. Use the commands in the order shown:

```
/etc/init.d/vxgms start
/etc/init.d/vxodm start
```



11. On the new node, verify that the GAB port memberships are a, b, d, and o. Run the command:

```
/sbin/gabconfig -a
GAB Port Memberships
```

## Preparing to Add a Node

Before configuring using the Oracle Add Node procedure, you must obtain IP addresses and configure CVM.

### ▼ To prepare for installing Oracle

1. Obtain two IP addresses:
  - ◆ one for the private interconnect, which should be non-routable
  - ◆ one public IP to be plumbed as alias against the host interface, which *must* be on the same subnet as the system network interface
2. Create a local group and local user for Oracle. Be sure to assign the same group ID, user ID, and home directory as exists on the systems in the current cluster.

```
groupadd -g 1000 oinstall
groupadd -g 1001 dba
groupadd -g 1002 oper
useradd -g dba -u 1001 -d /lhome/oracle oracle
```

3. Create a password for the user oracle:

```
passwd oracle
```

4. Create the directory structure for all shared mount points as defined in the `main.cf` configuration file. Include the Oracle OCR and Vote disk mount point if on the file system, the Oracle binaries if on CFS, and the Oracle database. The directory structure must be same as defined on the systems in the current cluster.

Example of mount point for OCR and Vote disk:

```
mkdir -p /ora_crs/
```

Example of mount point for Oracle binaries

```
mkdir -p /oracle/src10g/
```

Example of mount point for Oracle database:

```
mkdir -p /oracle/src10g/app/oracle/oradata/<SID>
```

5. Change ownership and group to Oracle user.

```
chown -R oracle:dba /ora_crs
chown -R oracle:dba /oracle
```

## Configuring CVM

As root user execute the following on the CVM master node only.

### ▼ To configure the CVM group in the main.cf file

1. To determine the CVM master node, execute:

```
vxctl -c mode
```

2. Make a backup copy of the main.cf file.

```
cd /etc/VRTSvcs/conf/config
cp main.cf main.cf.2node
```

3. Use the commands to reconfigure the CVM group. Execute:

```
haconf -makerw
hasys -add saturn
hagr -modify cvm SystemList -add saturn 2
hagr -modify cvm AutoStartList -add saturn
hares -modify ora_priv Device -add eth2 0 -sys saturn
hares -modify ora_priv Device -add eth3 1 -sys saturn
hares -modify ora_priv Address "192.11.12.10" -sys saturn
hares -modify cvm_clus CVMNodeId -add saturn 3
haconf -dump -makero
```

4. Verify the syntax of main.cf file:

```
hacf -verify .
```

5. Stop the VCS engine on all systems, leaving the resources available.

```
hastop -all -force
```

6. Copy the new version of the main.cf to each system in the cluster including the newly added system.

```
rcp (or scp) main.cf nebula:/etc/VRTSvcs/conf/config
rcp (or scp) main.cf saturn:/etc/VRTSvcs/conf/config
```

In this example, galaxy is the system where the main.cf is edited and does not need a copy.

7. Start VCS on the CVM master.



```
hastart
```

8. Verify the CVM group has come online.

```
hastatus -sum
```

9. To enable the existing cluster to recognize the new node, execute on the current node:

```
/etc/vx/bin/vxclustadm -m vcs -t gab reinit
/etc/vx/bin/vxclustadm nidmap
```

10. Repeat steps 7 through 9 on each system in the existing cluster.

11. Verify whether CVM has started on the newly added node.

- a. Determine the node ID:

```
cat /etc/llthost
```

- b. Verify this host ID is seen by the GAB module.

```
gabconfig -a
```

- c. Start the VCS engine.

- ◆ If on the newly added node ports f, u, v, or w were present before **hastart**, then the newly added node must be rebooted to properly start the VCS:

```
shutdown -r now
```

- ◆ If on the newly added node ports f, u, v, or w were not present before **hastart**, then use the following command to start VCS:

```
hastart
```

12. Verify the CVM group has come online on the newly added node.

```
hastatus -sum
```

## Using the Oracle Add Node Procedure

For the Oracle procedure for adding a node, see:

Metalink Article 270512.1, Adding a Node to a 10g RAC Cluster

In this procedure, Oracle copies the CRS\_HOME and ORACLE\_HOME from an existing node in the cluster. VERITAS tests using Oracle Metalink Article 270512.1, “Adding a Node to a 10g RAC Cluster,” Last Revision Date: 14-JAN-2005, indicated some anomalies

may occur. The following notes address these anomalies by adding to the information contained in the following headings from the Oracle Metalink document. This information is intended to supplement, not replace, the Oracle document.

## Part A: Configure the OS and hardware for the new node

There are no specific issues to mention in these procedures.

## Part B: Add the node to the cluster

While running `rootaddnode.sh`, an error occurs resembling "HAS context Internal error."

### ▼ To correct the error resembling "HAS context internal error"

1. Run `rootaddnode.sh`. The error occurs.
2. Run the following without supplying the node number:  
`CRS_HOME/bin/clscfg -delete -nn newly_added_node_name`
3. Rerun `rootaddnode.sh`. The error is corrected.

## Part C: Add the Oracle Database software (with RAC option) to the new node

There are no specific issues to mention in these procedures.

## Part D: Reconfigure listeners for new node

There are no specific issues to mention in these procedures.

## Part E: Add instances via DBCA

There are no specific issues to mention in these procedures.

## Sample `main.cf` for Adding an Oracle 10g Node

Changes to the sample `main.cf` for adding a node are highlighted in red.

```
include "vcsApacheTypes.cf"
include "types.cf"
include "CFSTypes.cf"
```



```
include "CVMTypes.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster ora_cluster (
 UserNames = { admin = dOPhOJoLPkPPnXPjOM }
 Administrators = { admin }
 HacliUserLevel = COMMANDROOT
 CounterInterval = 5
 UseFence = SCSI3
)

system galaxy (
)

system nebula (
)

system saturn (
)

group cvm (
 SystemList = { galaxy = 0, nebula = 1, saturn = 2 }
 AutoFailOver = 0
 Parallel = 1
 AutoStartList = { galaxy, nebula, saturn }
)

CFSMount orabin_mnt (
 Critical = 0
 MountPoint = "/orabin"
 BlockDevice = "/dev/vx/dsk/orabindg/orabinvol"
)

CFSMount ocrvote_mnt (
 Critical = 0
 MountPoint = "/ocrvote"
 BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
)

CFSMount oradata_mnt (
 Critical = 0
 MountPoint = "/oradata"
 BlockDevice = "/dev/vx/dsk/oradatadg/oradatavol"
)

CVMVolDg oradata_voldg (
 Critical = 0
 CVMDiskGroup = oradatadg
 CVMVolume = { oradatavol }
 CVMActivation = sw
)

CVMVolDg orabin_voldg (
```

```
Critical = 0
CVMDiskGroup = orabindg
CVMVolume = { orabinvol }
CVMActivation = sw
)

CVMVoldg ocrvote_voldg (
 Critical = 0
 CVMDiskGroup = ocrvotedg
 CVMVolume = { ocrvotevol }
 CVMActivation = sw
)

CFSfsckd vxfsckd (
)

CVMCluster cvm_clus (
 CVMClustName = ora_cluster
 CVMNodeId = { galaxy = 1, nebula = 2, saturn = 3 }
 CVMTransport = gab
 CVMTimeout = 200
)

CVMVxconfigd cvm_vxconfigd (
 Critical = 0
 CVMVxconfigdArgs = { syslog }
)

PrivNIC ora_priv (
 Critical = 0
 Device = { eth1 = 0, eth2 = 1}
 Address@galaxy = "192.11.12.58"
 Address@nebula = "192.11.12.59"
 Address@saturn = "192.11.12.60"
 NetMask = "255.255.255.0"
)

cvm_clus requires cvm_vxconfigd

orabin_voldg requires cvm_clus
 oradata_voldg requires cvm_clus
 ocrvote_voldg requires cvm_clus

ocrvote_mnt requires vxfsckd
 orabin_mnt requires vxfsckd
 oradata_mnt requires vxfsckd

ocrvote_mnt requires ocrvote_voldg
 orabin_mnt requires orabin_voldg
 oradata_mnt requires oradata_voldg
```



## Removing a Node from an Oracle 10g Release 2 Cluster

The examples used in these procedures describe removing one node from a three-system cluster.

- ◆ [“Removing a Node from an Oracle 10g Release 2 Cluster”](#) on page 100
- ◆ [“Running the `uninstallsrac` Utility”](#) on page 101
- ◆ [“Removing the Infrastructure Packages”](#) on page 103
- ◆ [“Editing VCS Configuration Files on Existing Nodes”](#) on page 104
- ◆ [“Removing Licenses”](#) on page 106
- ◆ [“Sample `main.cf` for Removing an Oracle 10g Node”](#) on page 106

## Removing a Node from an Oracle 10g Release 2 Cluster

For the Oracle procedure for removing a node, see:

Metalink document ID#269320.1, Removing a Node from a 10g RAC Cluster

Follow the instructions provided by Oracle. VERITAS tests using Oracle Metalink Article 269320.1, “Removing a Node from a 10g RAC Cluster,” Last Revision Date: 06-OCT-2004 indicated some issues with the procedures. The following notes address the issues noted by adding to the information contained in the following headings from the Oracle Metalink document. This information is intended to supplement, not replace, the Oracle document.

### Part A: Remove the instance using DBCA

**Step 5:** You are asked to supply the system privilege user name and password. VERITAS uses user “sys”.

### Part B: Remove the node from the cluster

**Step 1:** The root user determines the node name and node number on each node as stored in the Cluster Registry. The command `olsnodes` requires the option `-n` to display the node number.

Example:

```
$CRS_HOME/bin/olsnodes -n
```

**Step 9:** In this step you are redefining the list of nodes which remain in the cluster. The following error occurred upon executing this command in our environment:

```
PRKC-1002 : All the submitted commands did not execute successfully
```



In the Oracle log in the \$ORACLE\_BASE/oraInventory/logs directory we found the following error as per example:

```
/oracle/src10g/app/oracle/oraInventory/logs/UpdateNodeList2005-01-25_12-59-27PM.log
Unable to read
/oracle/src10g/app/oracle/oraInventory/Contents/LibsList.ser.
Some inventory information may be lost.
```

This may be a result of the issues discussed in Metalink Article, 284949.1, CRS Home Is Only Partially Copied to Remote Node, or other installation issues. In either case, if you have a questions, please contact Oracle Support for further information.

**Step 13:** This step must be executed on the node which will be deleted.

**Step 19:** VERITAS tested extensively using a cluster of eight nodes and deleted only one of the nodes. The \$ORACLE\_BASE/oraInventory/ContentsXML/inventory.xml file was not consistent among all nodes in the cluster. VERITAS testers believe this is due to the issue described in Metalink Article 284949, referencing partial copy of the oraInventory directory structure to remote nodes. Contact Oracle Support for further assistance if needed.

## Running the uninstallsfrac Utility

You can run the script from any node in the cluster, including a node from which you are uninstalling Storage Foundation *for Oracle RAC*.

---

**Note** Prior to invoking the uninstallsfrac script, all service groups must be brought offline and VCS must be shut down.

---

For this example, Storage Foundation *for Oracle RAC* is removed from the node named saturn.

### ▼ To run the uninstallsfrac utility

1. Before starting ./uninstallsfrac, execute:
2. As root user, start the uninstallation from any node from which you are uninstalling Storage Foundation *for Oracle RAC*. Enter:

```
cd /opt/VRTS/install
./uninstallsfrac
```



3. The welcoming screen appears, followed by a notice that the utility discovers configuration files on the system. The information lists all the systems in the cluster and prompts you to indicate whether you want to uninstall from *all* systems. You must answer “N.” For example:

```
VCS configuration files exist on this system with the following
information:
```

```
Cluster Name: rac_cluster1
Cluster ID Number: 7
Systems: galaxy nebula saturn
Service Groups: cvm oradb1_grp
```

```
Do you want to uninstall SFRAC from these systems? [y,n,q] (y) n
```

---

**Caution** Be sure to answer N. Otherwise the utility begins the procedure to uninstall Storage Foundation *for Oracle RAC* from *all* systems.

---

4. The installer prompts you to specify the name of the system from which you are uninstalling Storage Foundation *for Oracle RAC*:

```
Enter the system names separated by spaces on which to uninstall
SFRAC:saturn
```

5. The uninstaller checks for Storage Foundation *for Oracle RAC* packages currently installed on your system. It also checks for dependencies between packages to determine the packages it can safely uninstall and in which order.
6. Enter “Y” when the uninstaller has completed checking.
7. When you press Enter to proceed, the uninstaller stops processes and drivers running on each system, and reports its activities.
8. When the installer begins removing packages from the systems, it indicates its progress by listing each step of the total number of steps required.
9. When the uninstaller is done, it describes the location of a summary file and a log of uninstallation activities.

```
Uninstallation of Storage Foundation for Oracle RAC has completed
successfully.
```

```
The uninstallation summary is saved at:
```

```
/opt/VRTS/install/logs/uninstallsfracdate_time.summary
```

```
The uninstallsfrac log is saved at:
```

```
/opt/VRTS/install/logs/uninstallsfracdate_time.log
```

## Removing the Infrastructure Packages

Some packages installed by `installsfrac` are not removed by `uninstallsfrac`. These are the infrastructure packages, which can be used by VERITAS products other than VERITAS Storage Foundation *for Oracle RAC*. These packages include:

- ◆ `VRTScpi`, VERITAS Cross Product/Platform Installation
- ◆ `VRTSob`, VERITAS Enterprise Administrator Service
- ◆ `VRTSobgui`, VERITAS Enterprise Administrator
- ◆ `VRTSperl`, VERITAS Perl 5.8.0 Redistribution
- ◆ `VRTSvlic`, VERITAS License Utilities

### ▼ To remove the infrastructure packages using `uninstallinfr`

1. As root user, change to the directory containing the `uninstallinfr` program.

```
cd /opt/VRTS/install
```

2. Enter the following command to start `uninstallinfr`:

```
./uninstallinfr
```

The opening screen appears, prompting you to enter the system from which you want to remove the infrastructure packages:

```
Enter the system names separated by spaces on which to uninstall
Infrastructure: saturn
```

3. The program checks the operating system on the system and sets up a log file at `/var/tmp/uninstallinfrdate_time`.
4. The program then checks the infrastructure packages on the system, determining whether or not there are dependencies upon them. Packages on which dependencies exist are not uninstalled. The packages having no dependencies can be removed. The program prompts you to continue:

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

5. The utility stops the infrastructure processes that are running, if any, and proceeds to uninstall the packages from the system. When the infrastructure packages are successfully removed, a message resembling the following is displayed:

```
Uninstallation of Infrastructure has completed successfully.
The uninstallation summary is saved at:
```

```
/opt/VRTS/install/logs/uninstallinfrdate_time.summary
```



The `uninstallinfr` log is saved at:

```
/opt/VRTS/install/logs/uninstallinfrdate_time.log
```

## Editing VCS Configuration Files on Existing Nodes

After running `uninstallsfrac` and `uninstallinfr`, modify the configuration files on the existing remaining nodes to remove references to the deleted node(s).

### Edit `/etc/llthosts`

On each of the existing nodes, using `vi` or another editor, edit the file `/etc/llthosts`, removing lines corresponding to the removed nodes. For example, if `saturn` is the node being removed from the cluster, remove the line “3 saturn” from the file:

```
1 galaxy
2 nebula
3 saturn
```

It should now resemble:

```
1 galaxy
2 nebula
```

### Edit `/etc/gabtab`

In the file `/etc/gabtab`, change the command contained in the file to reflect the number of systems after the node is removed:

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

where *N* is the number of nodes remaining. For example, with two nodes remaining, the file resembles:

```
/sbin/gabconfig -c -n2
```

## Modify the VCS Configuration to Remove a System

You can modify the VCS configuration using one of three possible methods. You can edit `/etc/VRTSvcs/conf/config/main.cf` (the VCS configuration file) directly, you can use the VCS GUI (Cluster Manager), or you can use the command line, as illustrated in the following example. Please refer to the *VERITAS Cluster Server User's Guide* for details about how to configure VCS.

At this point in the process, all Oracle binaries have been removed from the system to be deleted. The instance has been removed from the database, that is, the thread disabled, and the `spfile<SID>.ora` edited by Oracle to remove any references to this instance. The next step is to remove all references in the `main.cf` to the deleted node(s).

As root user execute the following on the CVM master node only.

#### ▼ To modify the CVM group in the `main.cf` file

1. To determine the CVM master node execute:

```
vxctl -c mode
```

2. Make a backup copy of the `main.cf` file.

```
cd /etc/VRTSvcs/conf/config
cp main.cf main.cf.3node.bak
```

3. Use the following commands to reconfigure the CVM group. Execute:

```
haconf -makerw
hagrps -modify cvm SystemList -delete saturn
hares -modify cvm_clus CVMNodeId -delete saturn
hasys -delete saturn
haconf -dump -makero
```

Example of `main.cf` file: see [“Sample main.cf for Removing an Oracle 10g Node”](#) on page 106.

4. Verify the syntax of `main.cf` file:

```
hacf -verify .
```

The `main.cf` file now should not contain entries for system saturn.

5. Stop the VCS engine on all systems, leaving the resources available.

```
hastop -all -force
```

6. Copy the new version of the `main.cf` to each system in the cluster.

```
rcp (or scp) main.cf galaxy:/etc/VRTSvcs/conf/config
rcp (or scp) main.cf nebula:/etc/VRTSvcs/conf/config
```

7. Start the VCS engine on the current system.

```
hastart
```

8. Verify the CVM group has come online.

```
hastatus -sum
```



9. Repeat commands [step 7](#) through [step 8](#) on each system in the existing cluster.

## Removing Licenses

Go to the directory `/etc/vx/licenses/lic` and remove unwanted licenses. You may rename them or move them to another directory if you do not want to remove them outright.

## Sample main.cf for Removing an Oracle 10g Node

Changes to the sample `main.cf` for removing a node are highlighted using red strike through.

```
include "vcsApacheTypes.cf"
include "types.cf"
include "CFSTypes.cf"
include "CVMTypes.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster ora_cluster (
 UserNames = { admin = dOPhOJoLPkPPnXPjOM }
 Administrators = { admin }
 HacliUserLevel = COMMANDROOT
 CounterInterval = 5
 UseFence = SCSI3
)

system galaxy (
)

system nebula (
)

system saturn (
)

group cvm (
 SystemList = { galaxy = 0, nebula = 1, saturn = 2 }
 AutoFailOver = 0
 Parallel = 1
 AutoStartList = { galaxy, nebula, saturn }
)

CFSMount orabin_mnt (
 Critical = 0
 MountPoint = "/orabin"
 BlockDevice = "/dev/vx/dsk/orabindg/orabinvol"
)
```

```

CFSMount ocrvote_mnt (
 Critical = 0
 MountPoint = "/ocrvote"
 BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
)

CFSMount oradata_mnt (
 Critical = 0
 MountPoint = "/oradata"
 BlockDevice = "/dev/vx/dsk/oradatadg/oradatavol"
)

CVMVolDg oradata_voldg (
 Critical = 0
 CVMDiskGroup = oradatadg
 CVMVolume = { oradatavol }
 CVMActivation = sw
)

CVMVolDg orabin_voldg (
 Critical = 0
 CVMDiskGroup = orabinvg
 CVMVolume = { orabinvol }
 CVMActivation = sw
)

CVMVolDg ocrvote_voldg (
 Critical = 0
 CVMDiskGroup = ocrvotedg
 CVMVolume = { ocrvotevol }
 CVMActivation = sw
)

CFSfsckd vxfsckd (
)

CVMCluster cvm_clus (
 CVMClustName = ora_cluster
 CVMNodeId = { galaxy = 1, nebula = 2, saturn = 3 }
 CVMTransport = gab
 CVMTimeout = 200
)

CVMVxconfigd cvm_vxconfigd (
 Critical = 0
 CVMVxconfigdArgs = { syslog }
)

PrivNIC ora_priv (
 Critical = 0
 Device = { eth1 = 0, eth2 = 1 }
 Address@galaxy = "192.11.12.58"
 Address@nebula = "192.11.12.59"
 Address@saturn = "192.11.12.60"
 NetMask = "255.255.255.0"
)

```







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## Digital Encryption Standard (DES) - MIT

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## Perl Compatible Regular Expressions

Philip Hazel

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PCRE is a library of functions to support regular expressions whose syntax and semantics are as close as possible to those of the Perl 5 language.

Written by: Philip Hazel <ph10@cam.ac.uk>

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## Tomcat

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## Xerces C++

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## Xerces Java

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