

# **VERITAS Database Edition™ Advanced Cluster 3.5 *for Oracle RAC***

## **Read Me**

**HP-UX**

**Update 4**

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# Read Me: VERITAS Database Edition / Advanced Cluster 3.5 for Oracle RAC Update 4

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This Read Me document accompanies the Update 4 patches for Database Edition / Advanced Cluster 3.5 for Oracle RAC. The patches in Update 4 provide fixes to known problems with DBE/AC 3.5 for Oracle RAC software, supporting Oracle 10g and Oracle9i.

The VERITAS Database Edition / Advanced Cluster 3.5 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.

## Read Me: Topics

Some of the important topics included in this document are:

- ◆ [“Getting Help”](#) on page 2
- ◆ [“Confirming Hardware and Software Compatibility”](#) on page 3
- ◆ [“Hardware Requirements”](#) on page 3
- ◆ [“Software Requirements”](#) on page 3
- ◆ [“DBE/AC 3.5 Update 4 Software Patches”](#) on page 5
- ◆ [“Documentation”](#) on page 6
- ◆ [“VERITAS DBE/AC 3.5 Update 4 Patch Installation - An Overview”](#) on page 8
- ◆ [“Configuring DBE/AC 3.5 Update 4 for Oracle 10g”](#) on page 21
- ◆ [“Adding a Node to a Cluster Running DBE/AC 3.5 Update 4”](#) on page 47 and [“Removing a Node from a DBE/AC 3.5 Update 4 Cluster”](#) on page 48
- ◆ [“Uninstalling DBE/AC Update 4 Patch Set”](#) on page 50
- ◆ [“Software Limitations and Known Problems”](#) on page 57
- ◆ [“Software Fixes and Requested Enhancements”](#) on page 62



## Getting Help

For assistance with any of the VERITAS products, contact VERITAS Technical Support:

- ◆ U.S. and Canadian Customers: 1-800-342-0652
- ◆ International: +1-650-527-8555
- ◆ Email: [support@veritas.com](mailto:support@veritas.com)

For additional information about VERITAS and VERITAS products, visit:

<http://www.veritas.com>

For software updates and additional technical support information, such as TechNotes, product alerts, and hardware compatibility lists, visit the VERITAS Technical Support at:

<http://support.veritas.com>

## Conventions

The descriptions and procedures in this document use the typographical conventions shown in the following table:

| Typeface/Font                        | Usage  |
|--------------------------------------|--|
| <b>bold</b>                          | names of screens, windows, tabs, dialogue boxes, options, buttons  |
| <i>italic</i>                        | new terms, book titles, emphasis, variables in tables or body text |
| Courier                              | computer output, command references within text                    |
| <b>Courier</b> (bold)                | command-line user input, keywords in grammar syntax                |
| <b><i>Courier</i></b> (bold, italic) | variables in a command   |
| Symbol                               | Usage  |
| #                                    | superuser prompt (for all shells)                                  |
| \$                                   | Oracle user prompt   |



## Confirming Hardware and Software Compatibility

The compatibility list contains the latest information about supported hardware and software and is updated regularly.

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**Note** Before installing or upgrading Database Edition / Advanced Cluster 3.5 *for Oracle RAC*, review the current compatibility list.

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You can find the current compatibility list on the VERITAS Support Web site: <http://support.veritas.com>.

If you don't find your hardware or software listed or if you have questions about the information in the compatibility list, please contact VERITAS Support.

## Hardware Requirements

Review the hardware compatibility information on <http://support.veritas.com> for details. The list of supported hardware items is routinely updated.

- ◆ Server systems must be one of the HP-UX host systems listed. For this release, VERITAS Database Edition / Advanced Cluster 3.5 *for Oracle RAC* supports RAC clusters of two to four system. It is recommended that each system have two CPUs.
- ◆ Disk space, locally: approximately 5.5 GB; review the installation requirements in the *VERITAS Database Edition/AC for Oracle 9i RAC Installation and Configuration Guide*.
- ◆ RAM, minimum per each server node: 2 GB
- ◆ Shared storage: the storage units used by Database Edition / Advanced Cluster 3.5 *for Oracle RAC* must support and be enabled for SCSI-3 Persistent Group Reservations (PGR), a requirement for I/O fencing. Refer to <http://support.veritas.com> for hardware compatibility information.

## Software Requirements

The VERITAS Database Edition / Advanced Cluster 3.5 *for Oracle RAC* Update 4 software contains patches for the Database Edition / Advanced Cluster 3.5 *for Oracle RAC* software.

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**Note** For the latest information on updates, patches, and software issues regarding this release, refer to the following TechNote on the VERITAS Technical Support web site: <http://seer.support.veritas.com/docs/272935>.

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## HP-UX Operating System and Patches

The systems must be running the September 2002 (also called AR0902) HP-UX 11i (11.11) Version 1.0 release for HP 9000/\* servers, 64-bit, or later.

Patches PHKL\_34986, PHKL\_30607, PHKL\_31162, and PHKL\_23337 must be applied *before* Database Edition / Advanced Cluster 3.5 for Oracle RAC Update 4 is installed.

## VERITAS Software

The cluster must be running the Database Edition / Advanced Cluster 3.5 for Oracle RAC software. Refer to “[VERITAS DBE/AC 3.5 Update 4 Patch Installation - An Overview](#)” on page 8 for information about how to install DBE/AC 3.5 for Oracle RAC and apply the Update 4 patches.

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**Note** If you have previously installed patches UNOF\_29897 and UNOF\_IR144097 for Update 2 of DBE/AC for Oracle RAC, you must uninstall them. See “[Removing Previously Installed Patches](#)” on page 13.

---

The *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle RAC Installation and Configuration Guide* and the *VERITAS Database Edition /Advanced Cluster for Oracle RAC Release Notes* contain information about the HP-UX operating system and patches.

Only versions of VCS, VxVM, VxFS provided with the VERITAS Database Edition / Advanced Cluster 3.5 for Oracle RAC software are supported. Remove other versions before installing VERITAS Database Edition / Advanced Cluster 3.5 for Oracle RAC.

## Oracle Software

Database Edition / Advanced Cluster 3.5 for Oracle RAC Update 4 supports the following Oracle RAC software:

- ◆ Oracle9i RAC, Release 2 (64-bit), Patch 6, 7, or 8
- ◆ Oracle 10g RAC Release 1 (64-bit), Patch 4 or 5.

For the latest information on Oracle 10g RAC support and required patch and certification status, please refer to VERITAS Tech Note #272935.

See <http://seer.support.veritas.com/docs/272935>.



## Changes in DBE/AC 3.5 for Oracle RAC Update 4

- ◆ The Update 4 patch release for Database Edition / Advanced Cluster 3.5 for Oracle RAC includes:
  - ◆ Support for Oracle 10.1.0.5
  - ◆ Support for Oracle 9.2.0.8
- ◆ Starting and stopping CRS must be under VCS control
- ◆ Enhancements and fixes as described in [“Software Fixes and Requested Enhancements”](#) on page 62

## DBE/AC 3.5 Update 4 Software Patches

The DBE/AC 3.5 Update 4 software patch set includes:

|            |         |   |
|------------|---------|---|
| PHCO_30700 | 1.0     | VERITAS File System Management Service Provider Patch           |
| PHCO_30730 | 1.0     | VERITAS Enterprise Administrator Service Patch                  |
| PHCO_30731 | 1.0     | VERITAS Enterprise Administrator Patch                          |
| PHCO_34199 | 1.0     | VxFS 3.5-ga15 Command Cumulative Patch 07                       |
| PHCO_34348 | 1.0     | VERITAS VM Management Service Provider Patch 05                 |
| PHCO_35291 | 1.0     | VxVM 3.5m Command Cumulative Patch 10                           |
| PHKL_34122 | 1.0     | VxFS 3.5-ga15 Kernel Cumulative Patch 14                        |
| PHKL_35292 | 1.0     | VxVM 3.5m Kernel Cumulative Patch 09                            |
| PVCO_03605 | 3.5.1.0 | VERITAS Cluster Server NetBackup Extension Patch 1              |
| PVCO_03608 | 1.0     | VVR Support for MC/ServiceGuard Patch 01                        |
| PVCO_03622 | 3.5.2   | VERITAS Cluster Server Cluster Manager-Java Console 3.5 Patch 2 |
| PVCO_03623 | 3.5.2   | VERITAS Cluster Manager 3.5 Patch 2 (Web Console)               |
| PVCO_03633 | 3.5.3   | VERITAS Database Edition Patch                                  |
| PVCO_03637 | 1.0     | VRTScavf 3.5-ga10 VxFS 3.5 Administration Model Patch 02        |



|            |       |  |
|------------|-------|--|
| PVCO_03673 | 3.5.3 | VERITAS Cluster Server 3.5 Patch 3 or Update 4   |
| PVCO_03685 | 1.0   | VRTSdbac 3.5U4 Generic and Userland files Patch  |
| PVKL_03611 | 1.0   | VERITAS Group Lock Manager 3.5-REV=ga05 Patch 01 |
| PVKL_03674 | 3.5.3 | VERITAS GAB 3.5 Patch 3 or Update 4              |
| PVKL_03675 | 3.5.3 | VERITAS LLT 3.5 Patch 3 or Update 4              |
| PVKL_03692 | 1.0   | VERITAS 3.5-ga16 ODM 3.5 Patch 08                |
| PVKL_03695 | 1.0   | s700_800 11.11 VRTSdbac 3.5U4 Kernel Patch       |

After you have installed the patches using the procedures in this document, you may obtain detailed information about them by using the command `swlist -l patch patch_ID`. For example:

```
# swlist -l patch PVKL_03611
```

## Documentation

The VERITAS software installation disc containing VERITAS Database Edition / Advanced Cluster 3.5 *for Oracle RAC* contains documentation provided as PDF files. After the installation of Database Edition / Advanced Cluster 3.5 *for Oracle RAC*, the documents for some components are installed as PDF files on each system.

To display or print a PDF document, you need the Adobe Acrobat Reader. You can use Acrobat Reader as a stand-alone application, or as a plug-in to your browser.

## Read Me for DBE/AC 3.5 Update 4 on the Software Disc

This Read Me document in PDF is available on the 3.5 Update 4 software disc in the directory:

```
/patches/README_DBEAC.pdf
```

## Documentation for DBE/AC 3.5 for Oracle RAC

For users who need to install Database Edition / Advanced Cluster 3.5 *for Oracle RAC*, use the VERITAS *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide* supplied on the VERITAS software disc containing DBE/AC 3.5 software. See "[VERITAS DBE/AC 3.5 Update 4 Patch Installation - An Overview](#)" on page 8.



- ◆ On the software disc, the PDF file for the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide* is:

`/database_ac_for_oracle9i/docs/dbac_icg.pdf`

- ◆ On the software disc, the PDF file for the *VERITAS Database Edition /Advanced Cluster 3.5 for Oracle9i RAC Release Notes* is:

`/database_ac_for_oracle9i/release_notes/dbac_relnotes.pdf`

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<http://support.veritas.com>

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Contact your Symantec sales representative for information about purchasing hard-copy software guides.



# VERITAS DBE/AC 3.5 Update 4 Patch Installation - An Overview

Select *one* of the scenarios described in the following paragraphs as it applies to you. Perform each procedure or activity in the listed sequence.

The first four scenarios apply if you are upgrading from a currently installed DBE/AC 3.5 cluster. The fifth and sixth scenarios apply if you are going to install DBE/AC 3.5 and Oracle for the first time.

## If You Are Upgrading from DBE/AC 3.5

If you currently run Database Edition / Advanced Cluster 3.5 *for Oracle RAC*, choose one of the following two scenarios to add DBE/AC 3.5 Update 4, depending on whether you want to continue running Oracle9i or to install, configure, and run Oracle 10g.

### Scenario 1: If You Want to Continue to Run Oracle9i

Use the procedures in this Read Me for the following tasks:

- ❑ [“Stopping the Cluster and Oracle”](#) on page 11
- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Enabling Oracle9i After Installing DBE/AC 3.5 Update 4 Patches”](#) on page 17

### Scenario 2: If You Want to Install and Configure Oracle 10g

Use the procedures in this Read Me for the following tasks:

- ❑ [“Stopping the Cluster and Oracle”](#) on page 11
- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Configuring DBE/AC 3.5 Update 4 for Oracle 10g”](#) on page 21
- ❑ [“Installing Oracle 10g CRS”](#) on page 29
- ❑ [“Installing Oracle 10g Binaries”](#) on page 31
- ❑ [“Linking Oracle 10g to VERITAS Libraries”](#) on page 36
- ❑ [“Creating Oracle 10g Database”](#) on page 37
- ❑ [“Editing the VCS Configuration for Oracle Binaries and Database”](#) on page 39
- ❑ [“Starting VCS for Oracle 10g Clusters”](#) on page 45





### Scenario 3: If You Want to Continue to Run Oracle 10g

Use the procedures in this Read Me for the following tasks:

- ❑ [“Stopping the Cluster and Oracle”](#) on page 11
- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Enabling Oracle 10g After Installing DBE/AC 3.5 Update 4 Patches”](#) on page 18

### Scenario 4: If You Want to Migrate from Oracle9i to Oracle 10g

Use the procedures in this Read Me for the following tasks:

- ❑ [“Stopping the Cluster and Oracle”](#) on page 11
- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Configuring DBE/AC 3.5 Update 4 for Oracle 10g”](#) on page 21
- ❑ [“Installing Oracle 10g CRS”](#) on page 29
- ❑ [“Installing Oracle 10g Binaries”](#) on page 31
- ❑ [“Enabling Oracle 10g After Installing DBE/AC 3.5 Update 4 Patches”](#) on page 18
- ❑ [“Migrating from Oracle9i to Oracle 10g Database”](#) on page 39
- ❑ [“Editing the VCS Configuration for Oracle Binaries and Database”](#) on page 39
- ❑ [“Starting VCS for Oracle 10g Clusters”](#) on page 45

## If You Have Not Yet Installed DBE/AC 3.5

If you have not yet installed Database Edition / Advanced Cluster 3.5 *for Oracle RAC*, use one of the following scenarios to install DBE/AC 3.5 and add Update 4, depending on whether you want to run Oracle9i or Oracle 10g.

### Scenario 5: If You Want to Use Oracle9i

Because you must first install and configure DBE/AC 3.5 *for Oracle RAC*, use the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide* to do the following:

- ❑ Install DBE/AC 3.5 using the procedures in chapters 2 and 3.
- ❑ Install Oracle9i Release 2 as described in chapter 4.
- ❑ Create the Oracle9i database referring to Appendix E. This is optional since you may use other tools to create the database.



- ❑ Configure Oracle as described in chapter 5.

Then, use the procedures in this README for the following tasks:

- ❑ [“Stopping the Cluster and Oracle”](#) on page 11
- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Enabling Oracle9i After Installing DBE/AC 3.5 Update 4 Patches”](#) on page 17

## Scenario 6: If You Want to Use Oracle 10g

Because you must first install and configure DBE/AC 3.5 for Oracle RAC, use the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide* to do the following:

- ❑ Install DBE/AC 3.5 using the procedures in chapters 2 and 3.

Then, use the procedures in this README for the following tasks:

- ❑ [“Installing DBE/AC Update 4 Patches”](#) on page 14
- ❑ [“Configuring DBE/AC 3.5 Update 4 for Oracle 10g”](#) on page 21
- ❑ [“Installing Oracle 10g CRS”](#) on page 29
- ❑ [“Installing Oracle 10g Binaries”](#) on page 31
- ❑ [“Enabling Oracle 10g After Installing DBE/AC 3.5 Update 4 Patches”](#) on page 18
- ❑ [“Creating Oracle 10g Database”](#) on page 37
- ❑ [“Editing the VCS Configuration for Oracle Binaries and Database”](#) on page 39
- ❑ [“Starting VCS for Oracle 10g Clusters”](#) on page 45



## Stopping the Cluster and Oracle

You must perform this task on each node in the cluster.

---

**Note** To upgrade from DBE/AC 3.5 to DBE/AC 3.5 Update 4, it is *not* possible to perform a “rolling upgrade.” During the installation of the DBE/AC 3.5 Update 4 patches, all Oracle resources and VCS must be stopped on all cluster systems. Each system must be rebooted to complete the upgrade.

---

If you are adding DBE/AC 3.5 Update 4 to a cluster where you have just installed (but not yet configured) DBE/AC 3.5, go directly to “[Installing DBE/AC Update 4 Patches](#)” on page 14.

1. Log in as root user.
2. Make a backup copy of the VCS configuration file `main.cf` file before beginning the installation of Database Edition / Advanced Cluster 3.5 for Oracle RAC Update 4 patches.

```
# cp /etc/VRTSvcs/conf/config/main.cf \
    /etc/VRTSvcs/conf/config/main.3.5
```

3. If you have Oracle 9i RAC, stop any `gsd` processes that may be started. Log in as Oracle user and enter:

```
$ $ORACLE_HOME/bin/gsdctl stop
```

4. If you have Oracle 10g RAC, run the following command on each node to stop all the CRS resources and CRS processes that are outside of VCS control.

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

See “[Stopping VCS when CRS is Outside of VCS Control](#)” on page 46.

5. Stop all applications that use cluster file systems but that are not under VCS control.
  - a. Unmount any CFS mount point for applications not under VCS control. Use the following command to check:

```
# /sbin/mount | grep cluster
```

- b. If you find any CFS that is mounted outside VCS control, do the following:

- ◆ List the processes that are using the CFS mount points:

```
# /usr/sbin/fuser -c CFS_mount_point
```



- ◆ Kill the processes that were displayed:  
`# /usr/sbin/fuser -ck CFS_mount_point`
- ◆ Unmount the file system from the secondary CFS, and then from the primary CFS.  
`# /usr/sbin/umount CFS_mount_point`

6. Determine the state of all service groups:

```
# hagrps -state
```

7. Offline the ClusterService group if it exists:

```
# hagrps -offline -force ClusterService -sys sys_name
```

8. Offline the Oracle resource on each cluster node:

```
# hares -offline oracle_res -sys system
```

Repeat this command for each Oracle resource on each system.

9. Because Oracle must be set up to run with the updated DBE/AC components, you must prevent the Oracle resources from coming online after the systems reboot. Use the following commands to make the cluster writable and to modify the Oracle resource's Enabled attribute:

```
# haconf -makerw  
# hares -modify oracle_res Enabled 0
```

Verify you have made this change:

```
# hares -display oracle_res | grep Enabled
```

If the change is made successfully, save the configuration:

```
# haconf -dump -makero
```

10. As root user, stop VCS on all cluster nodes:

```
# hastop -all
```

Wait for all service groups to go offline. You can monitor the offlining of the service groups and resources with the following command:

```
# hastatus
```

11. Verify that VCS is stopped on all cluster nodes:

```
# /usr/bin/ps -aef | grep had
```

12. Comment the CRS entries in the /etc/inittab file. For example:



```
# h1:3:respawn:/sbin/init.d/init.evmd run >/dev/null 2>&1
</dev/null
# h2:3:respawn:/sbin/init.d/init.cssd fatal >/dev/null 2>&1
</dev/null
# h3:3:respawn:/sbin/init.d/init.crsd run >/dev/null 2>&1
</dev/null
```

## Removing Previously Installed Patches

Two VERITAS patches, which you may have previously installed for DBE/AC for Oracle RAC Update 2, must be removed before you install the DBE/AC Update 4 patches.

If they are installed, remove patches UNOF\_29897 and UNOF\_IR144097 from each system in the cluster.

1. To check whether you have the patches installed, use the following command on each system:

```
# swlist -l patch | grep UNOF_29897
# swlist -l patch | grep UNOF_IR144097
```

2. If the output shows that you have not installed these patches on the systems, skip to the next section, [“Installing DBE/AC Update 4 Patches”](#) on page 14.
3. To remove the patches from the systems where they are installed, enter the command:

```
# swremove -x mount_all_filesystems=false \
-x auto_kernel_build=false UNOF_29897 UNOF_IR144097
```

---

**Note** The systems do not reboot at this time. It is essential to immediately begin the installation of the Update 4 patches, which shall cause a reboot. See the next section, [“Installing DBE/AC Update 4 Patches”](#) on page 14.

---



## Installing DBE/AC Update 4 Patches

Use the following procedure to add DBE/AC 3.5 Update 4 patches on each of the cluster systems.

1. On all nodes in the cluster, make sure that the LMX helper thread is disabled. If the LMX helper thread is not disabled, then change the lmx tunable:

```
# kmtune -s lmx_update_enabled=0
```

2. On one system, close all GAB ports by using the following sequence of commands:

```
# /usr/sbin/fsclustadm cfsdeinit
# /usr/sbin/qlogclustadm deinit
# /sbin/umount /dev/odm
# /sbin/lmxconfig -U
# /sbin/vcsmmconfig -U
# /sbin/vxfenconfig -U
```

3. Verify that the ports are closed, with the exception of GAB port a:

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

4. Unconfigure GAB and LLT, and unload all the VRTSdbac modules:

```
# /sbin/gabconfig -U
# kmadmin -U lmx vxfen vcsmm vxglm vxgms odm gab
# echo "y" | /sbin/lltconfig -U
# kmadmin -U llc
# kmadmin -s | grep llc
```

---

**Note** If you had problems while running the commands in the previous steps, see the troubleshooting section on [“If llc Does Not Unload”](#) on page 19.

---

5. As root user, check whether the VEA Service is running.

```
# /opt/VRTSob/bin/vxsvcctl status
Current state of server : NOT RUNNING
```

6. If the VEA server is running, stop it by entering the command:

```
# /opt/VRTSob/bin/vxsvcctl stop
# rm /var/vx/isis/vxisis.lock
```

Repeat [step 5](#) to verify VEA Service is stopped.



7. Insert the software disc with the VERITAS Storage Solutions 3.5 Update 4 for HP-UX patch disc into the system's CD-ROM drive, and enter the following commands:

```
# nohup /usr/sbin/pfs_mountd &  
# nohup /usr/sbin/pfsd &
```

8. If the software disc is not mounted, mount it by entering:

```
# /usr/sbin/pfs_mount -t rrip /dev/dsk/c#t#d# /cdrom
```

Where *c#t#d#* is the location of the CD-ROM drive.

9. Change to the directory containing the patches:

```
# cd /cdrom/patches
```

10. Install the patch for LLT:

```
# swinstall -x mount_all_filesystems=false \  
-x autoselect_dependencies=true -x autoreboot=true \  
-x enforce_dependencies=false -s `pwd` PVKL_03675
```

11. Issue the following commands to unload drivers and verify they are removed:

```
# kmadmin -U lmx vxfen vcsmm vxglm gab llt  
# kmadmin -s
```

The drivers must be listed as UNLOADED in the output of the `kmadmin -s` command.

12. Install the patch for GAB:

```
# swinstall -x mount_all_filesystems=false \  
-x autoselect_dependencies=true -x autoreboot=true \  
-x enforce_dependencies=false -s `pwd` PVKL_03674
```

13. Issue the following LLT commands to unload drivers and verify they are removed:

```
# kmadmin -U lmx vxfen vcsmm vxglm gab llt  
# kmadmin -s
```

The drivers must be listed as UNLOADED in the output of the `kmadmin -s` command.



14. Install the remaining patches using the following commands in the order shown:

---

**Note** If VRTScscm and VRTSvcsw are not currently installed, patches PVCO\_03622 and PVCO\_03623 are not installed.

---

```
# swinstall -x mount_all_filesystems=false \  
-x autoselect_dependencies=true -x autoreboot=true \  
-x enforce_dependencies=false -s `pwd` PHCO_30700 PHCO_30730\  
PHCO_30731 PHCO_34199 PHCO_34348 PHCO_35291 PHKL_34122 PHKL_35292\  
PVCO_03605 PVCO_03608 PVCO_03622 PVCO_03623 PVCO_03633\  
PVCO_03637 PVCO_03673 PVCO_03685 PVKL_03611 PVKL_03692 \  
PVKL_03695
```

15. After the system reboots, check for the successful installation of all patches:

```
# /opt/VRTS/bin/chk_dbac_pkgs
```

The output of the previous command shows that the check for a required package is successful by listing it and showing it as “PASSED.” If a package has already been superseded, the output lists it as “SUPERSEDED.”

16. Ensure the necessary GAB ports are configured on all cluster nodes. Enter:

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

For a two-node cluster (nodes 0 and 1), the output should resemble the following example:

```
GAB Port Memberships  
=====
```

|        |     |          |            |    |
|--------|-----|----------|------------|----|
| Port a | gen | 421fe202 | membership | 01 |
| Port b | gen | 32223a02 | membership | 01 |
| Port d | gen | dd61d602 | membership | 01 |
| Port f | gen | 76317602 | membership | 01 |
| Port h | gen | 5242e902 | membership | 01 |
| Port o | gen | fab08701 | membership | 01 |
| Port q | gen | 544c5402 | membership | 01 |
| Port v | gen | cdc6c602 | membership | 01 |
| Port w | gen | cdc1d702 | membership | 01 |

---

**Note** If port d is not displayed, go to the troubleshooting topic [“If Port d Does Not Display When Confirming GAB Port Configuration”](#) on page 20.

---

17. To verify that the CVM group is online, use the `hagrp -state` command.

```
# hagrp -state cvm
```

The output should show CVM is online on each node.





18. Check whether the VEA service is running.

```
# /opt/VRTSob/bin/vxsvcctl status
Current state of server : NOT RUNNING
```

19. If the VEA service is not running, restart it.

```
# /opt/VRTSob/bin/vxsvcctl start
```

20. Verify the status of the VEA service again:

```
# /opt/VRTSob/bin/vxsvcctl status
Current state of server : RUNNING
```

## Enabling Oracle9i After Installing DBE/AC 3.5 Update 4 Patches

If you are using Oracle9i, perform the following steps. If you plan to configure Oracle 10g, go to [“Configuring DBE/AC 3.5 Update 4 for Oracle 10g”](#) on page 21.

- The Oracle9i binary must be configured to use the DBE/AC 3.5 Update 4 components for ODM, VCSMM, and VCSIPC using the command described below.
  - If Oracle binary is installed on a local file system, run the command on each node.
  - If Oracle binary is installed on cluster file system, run the command from one cluster node.

```
# su - oracle
$ /opt/VRTSvcs/rac/bin/linkrac 9i
```

- As root user, enable Oracle and online it on all cluster nodes. The following command enables the Oracle resource that had been disabled prior to installing the DBE/AC 3.5 Update 4 patches.

```
# haconf -makerw
# hares -modify oracle_resource Enabled 1
# hares -display oracle_resource | grep Enabled
# haconf -dump -makero
# hares -online oracle_resource -sys node_name
```

Ensure that VCSIPC and VERITAS ODM messages are printed in the Oracle alert log when the Oracle database server is brought online.



## Enabling Oracle 10g After Installing DBE/AC 3.5 Update 4 Patches

If you are using Oracle 10g, perform the following steps.

1. The Oracle 10g binary must be configured to use the DBE/AC 3.5 Update 4 components for ODM, VCSMM, and VCSIPC using the command described below.
  - ◆ If Oracle binary is installed on a local file system, run the command on each node.
  - ◆ If Oracle binary is installed on cluster file system, run the command from one cluster node.

```
# su - oracle
$ /opt/VRTSvcs/rac/bin/linkrac 10gR1
```

2. As root user, enable Oracle and online it on all cluster nodes. The following command enables the Oracle resource that had been disabled prior to installing the DBE/AC 3.5 Update 4 patches.

```
# haconf -makerw
# hares -modify oracle_resource Enabled 1
# hares -display oracle_resource | grep Enabled
# haconf -dump -makero
# hares -online oracle_resource -sys node_name
```

Ensure that VCSIPC and VERITAS ODM messages are printed in the Oracle alert log when the Oracle database server is brought online.



# Troubleshooting the Patch Installation

The following troubleshooting points address problems that may occur during the installation of the DBE/AC 3.5 Update 4 patches.

## If llt Does Not Unload

1. Disable the configuration of the VERITAS DLKM module using the following commands:

```
# cd /etc
# mv gabtab gabtab.ORG
# mv vcsmmtab vcsmmtab.ORG
# mv vxfendg vxfendg.ORG
# mv vxfentab vxfentab.ORG
# mv loadmods loadmods.ORG
# mv llthosts llthosts.ORG
```

2. If the had or hashadow processes are running, enter the following command:

```
# hsttop -local -force
```

3. Disable autostart of VERITAS modules by moving the init scripts.

```
# cd /sbin/init.d
# mv gab gab.ORG
# mv llt llt.ORG
# mv vcsmm vcsmm.ORG
# mv vxfen vxfen.ORG
# mv odm odm.ORG
# mv lmx lmx.ORG
```

4. Shut down the cluster node:

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

5. After the system is rebooted, reenale the autostart of VERITAS modules:

```
# cd /sbin/init.d
# mv gab.ORG gab
# mv llt.ORG llt
# mv vcsmm.ORG vcsmm
# mv vxfen.ORG vxfen
# mv odm.ORG odm
# mv lmx.ORG lmx
```



- When the system is rebooted, re-enable the configuration of the VERITAS DLKM modules for subsequent reboots using the following commands:

```
# cd /etc
# mv gabtab.ORG gabtab
# mv vcsmmtab.ORG vcsmmtab
# mv vxfendg.ORG vxfendg
# mv vxfentab.ORG vxfentab
# mv loadmods.ORG loadmods
```

- Unmount the odm module if it is mounted:

```
# umount /dev/odm
```

- Unconfigure LMX and LLT, and unload all the VRTSdbac modules:

```
# /sbin/lmxconfig -U
# kmadm -U lmx vxfen vcsmm vxglm vxgms odm gab
# echo "y" | /sbin/lltconfig -U
# kmadm -U llt
# kmadm -s | grep llt
```

- If llt is not unloaded, stop the upgrade. Contact VERITAS Support and check for any error messages in the /etc/rc.log file.

## If Port d Does Not Display When Confirming GAB Port Configuration

- If port d is not displayed when you run /sbin/gabconfig -a after the systems reboot, perform the following steps:

```
# ls -al /sbin/rc2.d/*odm
```

The display should be:

```
/sbin/rc2.d/S980odm@ -> /sbin/init.d/odm
```

- If /sbin/rc2.d/S113odm is displayed, remove it and remount /dev/odm.

```
# rm -f /sbin/rc2.d/S113odm
# umount /dev/odm
# mount /dev/odm
```

- Ensure that “enabled” is the ODM cluster status.

```
# cat /dev/odm/cluster
cluster status: enabled
```



## Configuring DBE/AC 3.5 Update 4 for Oracle 10g

The procedures in this section apply if you have already installed Database Edition / Advanced Cluster 3.5 for Oracle RAC and added the DBE/AC 3.5 Update 4 software.

Please refer to the *Oracle Real Application Clusters Installation and Configuration Guide* for additional details regarding the Oracle 10g installation.

### Using Oracle 10g in DBE/AC Update 4 Environment - Overview

Oracle provides the Cluster Ready Services (CRS) feature with Oracle 10g. CRS includes three daemon processes: CSSD (a cluster monitoring and membership daemon); CRSD (a high-availability daemon); and EVMD (an event monitoring daemon). Because CSSD daemons on each node communicate and heartbeat to their peer daemons on other nodes, they require a private IP address.

Briefly, to use Oracle 10g in an DBE/AC environment, you must do the following:

- ❑ Create a `$CRS_HOME` directory on each cluster node and include the mount in `/etc/fstab`. The placement of `$CRS_HOME` in a local, non-shared file system is recommended.  
See [“Creating \\$CRS\\_HOME on Each System”](#) on page 22.
- ❑ Create shared raw volumes or cluster file system directories for the Cluster Ready Services OCR component and the VOTE-disk component.  
See [“Creating Volumes or Directories for CRS and VOTE-disk”](#) on page 23.
- ❑ Configure private IP addresses for the CRS daemons.  
See [“Configuring Private IP Addresses on All Cluster Nodes”](#) on page 25.
- ❑ Edit the `main.cf` file to include the PrivNIC, the OCR, and VOTE-disk resources.  
See [“Editing the VCS Configuration for PrivNIC and CRS”](#) on page 26.
- ❑ Install Oracle 10g CRS.  
See [“Installing Oracle 10g CRS”](#) on page 29.  
See [“Installing Oracle 10g Binaries”](#) on page 31.
- ❑ Prepare to install Oracle 10g binaries.  
See [“Preparing to Install Oracle 10g Binaries On Shared Storage - \(Option 1\)”](#) on page 31 or [“Preparing to Install Oracle 10g Binaries On Local Storage - \(Option 2\)”](#) on page 33, depending on where you intend to place the Oracle 10g binaries.
- ❑ Install Oracle 10g.  
See [“Installing Oracle Binaries - Running the Installer”](#) on page 35.



- ❑ Link to VERITAS libraries.  
See “[Linking Oracle 10g to VERITAS Libraries](#)” on page 36.
- ❑ Create Oracle 10g database.  
See “[Creating Oracle 10g Database](#)” on page 37.
- ❑ Configure Oracle 10g binaries and database in the configuration.  
See “[Editing the VCS Configuration for Oracle Binaries and Database](#)” on page 39.

## Creating \$CRS\_HOME on Each System

On each system in the DBE/AC cluster, create a directory for \$CRS\_HOME. The disk space required is 2 GB minimum.

1. Log in as root user on one system.
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. Assign identical users and groups on each node. 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 on storage connected locally to the node. For example:

```
# vxdg init crs_dg c1t2d2
```

4. Create the volume in the group for the CRS\_HOME. The volume should be a minimum of 700 MB:

```
# vxassist -g crs_dg make crs_vol 2G
```

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

```
# mkfs -F vxfs /dev/vx/rdisk/crs_dg/crs_vol
```

6. Create the mount point for the file system:

```
# mkdir /oracrs
```



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

```
# mount -F vxfs /dev/vx/dsk/crs_dg/crs_vol /oracrs
```

8. Assign ownership of the `oracrs` directory to `oracle` and the group `oinstall`:

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

9. Add an entry to the `/etc/fstab` file. For example:

```
/dev/vx/dsk/crs_dg/crs_vol /oracrs vxfs delaylog 0 2
```

10. Repeat [step 1](#) through [step 9](#) on the each other system.

## Creating Volumes or Directories for CRS and VOTE-disk

Create OCR and VOTE-disk shared volumes, or create OCR and VOTE-disk directories in a cluster file system. Whether you create shared volumes or shared file system directories, you can add them in the VCS configuration to make them highly available (see [“Editing the VCS Configuration for PrivNIC and CRS”](#) on page 26).

### Creating OCR and VOTE-disk Volumes

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

```
# vxdg -s init crs_oradg c1t1d2
```

3. Create volumes in the shared group for OCR and VOTE-disk:

```
# vxassist -g crs_oradg make ocrvol 200M
# vxassist -g crs_oradg make votvol 200M
```

4. Set the activation mode for the disk group:

```
# vxdg -g crs_oradg set activation=sw
```

5. Start the volumes:

```
# vxvol -g crs_oradg startall
```



6. Assign ownership of the volumes using the `vxedit(1M)` command:

```
vxedit -g disk_group set group=group user=user mode=660 volume
```

For example:

```
# vxedit -g crs_oradg set group=oinstall user=oracle mode=660 ocrvol
# vxedit -g crs_oradg set group=oinstall user=oracle mode=660 votvol
```

## Creating OCR and VOTE-disk Directories in a Cluster File System

When you want to create directories in a file system for the OCR and VOTE-disk directories instead of creating separate OCR and VOTE-disk volumes, do the following:

1. Log in as root user.

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

```
# vxdg -s init crs_oradg c1t1d2
```

3. Create a volume in the shared group:

```
# vxassist -g crs_oradg make crs_vol 512M
```

4. Set activation mode for the disk group on all cluster nodes:

```
# vxdg -g crs_oradg set activation=sw
```

5. Start the volume:

```
# vxvol -g crs_oradg startall
```

6. Create the file system:

```
# mkfs -F vxfs /dev/vx/rdisk/crs_oradg/crs_vol
```

7. On all nodes, create the file system mount points:

```
# mkdir /ora_crs
```

8. On all nodes, mount the file system:

```
# mount -F vxfs -o cluster /dev/vx/dsk/crs_oradg/crs_vol
/ora_crs
```

9. Set "oracle" to be the owner of the file system, and set "775" as the permissions:

```
# chown oracle:oinstall /ora_crs
# chmod 755 /ora_crs
```



10. As Oracle user, create the directories for CRS\_OCR and VOTE-disk:

```
$ cd /ora_crs
$ mkdir CRS_OCR
$ mkdir VOTE-disk
```

## 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.

1. On each cluster system, determine a private NIC device for which LLT is configured. Look at the file `/etc/llttab`. For example, if `lan1` is used as an LLT interconnect on one system, you can configure an available IP address for it. Example commands:

```
# ifconfig lan1 plumb
# ifconfig lan1 inet 10.11.12.58 netmask 255.255.255.0
# ifconfig lan1 up
```

Configure one private NIC on each node.

---

**Note** The private IPs 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, such as `galaxy-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 in the VCS configuration file, `main.cf` and add the PrivNIC resource to make the IP addresses highly available (see [“Editing the VCS Configuration for PrivNIC and CRS”](#) on page 26).



## Editing the VCS Configuration for PrivNIC and CRS

Refer to chapter 5 of the *VERITAS Database Edition/AC for Oracle 9i RAC Installation and Configuration Guide*, which contains a general description of how to configure the service groups for CVM and Oracle. Even though they mention only Oracle9i, some of the procedures apply to Oracle 10g as well.

This section describes the specific modifications to the CVM service group in the VCS configuration file, `main.cf`, required to:

- ◆ Configure the PrivNIC resource (which is optional, but recommended).
- ◆ Add the CVMVolDg resource for the volume you created for the cluster file system to contain the OCR and VOTE-disk directories; (you can use the same CVMVolDg resource for multiple volumes if you have chosen to create raw volumes for OCR and VOTE-disk).
- ◆ Add the resource for the shared file system containing the CRS OCR and VOTE-disk directories (this step is not needed if you created separate volumes for OCR and VOTE-disk).
- ◆ Create a CRS service group that includes an Application resource for the Oracle `cssd` process. This resource is required for monitoring the `cssd` process. Also, with this resource configured, the user must stop the CRS daemons manually. If the `cssd` process is not configured in the Application resource, the commands used to offline the shared mounts (such as `hastop -local`, `hastop -all`, or `hagrps -offline`) cause the nodes to automatically reboot.

1. Log into one of the nodes in the cluster.
2. Save the existing configuration to disk and make the configuration read only while you are make the changes:

```
# haconf -dump -makero
```

3. Ensure 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.3.5.bkup
```

5. Use `vi` or another text editor to edit the `main.cf` file, making the changes described in the following paragraphs (note that added or changed lines are bolded):

- a. At the beginning of the file, add the “include” statement for the `PrivNIC.cf` types file (the added line is bolded):

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

- b. Within the CVM service group, add the `PrivNIC` resource, specifying the NIC devices and the private IP addresses you associated with them (for more information about the `PrivNIC` resource, see “[PrivNIC Agent - Details](#)” on page 53):

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

PrivNIC ora_priv (
  Device = { lan1 = 0, lan2 = 1 }
  Address@galaxy = "10.11.12.58"
  Address@nebula = "10.11.12.59"
  NetMask = "255.255.255.0"
)
.
.
```

- c. Within the CVM service group, if you created a cluster file system for the OCR and VOTE-disk directories, add the `CFSMount` resources for the cluster file system:

```
CFSMount crs_ora_mnt (
  Critical = 0
  MountPoint = "/ora_crs"
  BlockDevice = "/dev/vx/rdisk/crsora_dg/crs_vol"
)
.
.
```



- d. Within the CVM service group, add the CVMVolDG resource for the volume (`crs_vol`) used for the OCR and VOTE-disk directories in the cluster file system:

```
CVMVolDg crs_voldg (
    Critical = 0
    CVMDiskGroup = crs_oradg
    CVMVolume = { crs_vol }
    CVMActivation = sw
)
.
```

- e. Revise the dependencies section for the CVM group. Originally, the dependencies resembled the following:

```
qlogckd requires cvm_clus
vxfsckd requires qlogckd
```

Now, you must add dependency statements. For example, add the lines:

```
crs_ora_mnt requires crs_voldg
crs_ora_mnt requires vxfsckd
crs_voldg requires cvm_clus
```

6. Create a parallel service group named `crs` for the Oracle 10g `cssd` program that uses the Application resource.
- a. Create the service group, including the cluster systems in the `SystemList` and setting the group level `AutoFailOver` attribute to 0.

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

- b. Define the Application resource for the `cssd` process.

```
Application cssd (
    Critical = 0
    StartProgram = "/opt/VRTSvcs/rac/bin/cssd-online"
    StopProgram = "/opt/VRTSvcs/rac/bin/cssd-offline"
    MonitorProgram = "/opt/VRTSvcs/rac/bin/cssd-monitor"
    CleanProgram = "/opt/VRTSvcs/rac/bin/cssd-clean"
)
```



- c. Add a line for dependencies:

```
requires group cvm online local firm
```

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

```
# hacf -verify /etc/VRTSvcs/conf/config
```
9. Copy the saved `main.cf` file to all systems in the cluster.

## Installing Oracle 10g CRS

Using the Oracle 10g RAC `runInstaller`, install the Oracle CRS component. Refer to the *Oracle Real Application Clusters Installation and Configuration Guide* for additional information. Make sure any required HP-UX patches listed in the Oracle documentation are installed before you install the CRS software.

The following procedure describes installing the Oracle 10g CRS software component. The software is installed on each node in the location created in [“Creating \\$CRS\\_HOME on Each System”](#) on page 22.

1. On the first system, insert the Oracle Cluster Ready Services Release 1 (10.1.0.2) for HP-UX disc in the CD-ROM drive, and enter the following commands:

```
# nohup /usr/sbin/pfs_mountd &  
# nohup /usr/sbin/pfsd &
```

2. If the software disc is not mounted, mount it by entering:

```
# /usr/sbin/pfs_mount -t rrip /dev/dsk/c##t##d## /cdrom
```

Where `c##t##d##` is the location of the CD-ROM drive

3. Log in as `oracle` on each system.



4. On the first system, run the Oracle 10g CRS utility `runInstaller`:

```
$ cd /cdrom
$ ./runInstaller
```

- a. When `runInstaller` prompts you to run the script `/oracle/oraInventory/orainstRoot.sh`, make sure the script exists *on each node* before proceeding. If so, skip to [step c](#).
  - b. If the script `/oracle/oraInventory/orainstRoot.sh` does not exist on each node, copy it from the first system to each of the other cluster nodes.
  - c. Run the script `/oracle/oraInventory/orainstRoot.sh` on each node.
5. As you run the installer, be prepared to provide the following information required for the installation and configuration of the CRS component:
    - ◆ The installation destination, `$CRS_HOME`, on each node (`/oracrs` in our example) and the path to `$CRS_HOME`. These are specified on the “Specify File Location” screen.
    - ◆ The names of the cluster nodes and their associated hostnames. In our example, the nodes and their associated host names are `galaxy` and `nebula`. Specify this in the “Cluster Configuration” screen.
    - ◆ The private NIC IP addresses you have set up for each node (for example, `lan1` on subnet `1.0.0.0`). Specify this on the “Private Interconnect Enforcement” screen.
    - ◆ The name of a file in the OCR directory or raw volume (for example, a file named `ocr_file` in the directory `/ora_crs/CRS_OCR`). Specify this on the “OCR Location” screen.
    - ◆ The name of a file in the VOTE-disk directory or raw volume (for example, a file named `vote_file` in the directory `/ora_crs/VOTE-disk`). Specify this on the “Voting Disk” screen.
  6. When you arrive at the “Install” screen, click Install.
  7. When installation completes, a “Setup Privileges Notice” appears. After you click OK, the installer prompts you to run the `root.sh` script. Before you run this script, you need to add the `init.cssd.patch`.
    - a. Open another window on the system where you are running the installer.
    - b. Log in as root user.



- c. Change to the directory where the patch is to be copied:

```
# cd /oracrs/css/admin
# cp /opt/VRTSvcs/rac/patch/init.cssd.patch .
```

- d. Run the following command to install the patch:

```
# patch < init.cssd.patch init.cssd
```

- e. Run the `root.sh` script on each node. For example:

```
# cd $CRS_HOME
# ./root.sh
```

This starts the CRS daemons on the node where you enter the command.

8. Repeat [step 7](#) on each cluster node.

## Installing Oracle 10g Binaries

You can install the Oracle 10g Database Binaries locally on each cluster system, or you can install them once on the shared storage. Choose one of the following procedures.

### Preparing to Install Oracle 10g Binaries On Shared Storage - (Option 1)

If you do not plan to install Oracle 10g on shared storage, go to [“Preparing to Install Oracle 10g Binaries On Local Storage - \(Option 2\)”](#) on page 33.

1. Log in as root user.
2. Add the directory path to the `jar` utility in the `PATH` environment variable. Typically, this is `/usr/bin`. Do this on both nodes.
3. On the master node, create a shared disk group:

```
# vxdg -s init ora_dg c2t3d2
```

4. Create the volume in the shared group. For the Oracle 10g binaries, make the volume 7,168 MB:

```
# vxassist -g ora_dg make orabin_vol 7168M
```

5. Set activation mode for the disk group:

```
# vxdg -g ora_dg set activation=sw
```



6. Start the volumes:

```
# vxvol -g ora_dg startall
```

7. 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 -F vxfs -o largefiles /dev/vx/rdisk/ora_dg/orabin_vol
```

8. On each system, create the mount point for the file system:

```
# mkdir /oracle
```

9. On each system, mount the file system, using the device file for the block device:

```
# mount -F vxfs -o cluster  
/dev/vx/dsk/ora_dg/orabin_vol /oracle
```

10. On one system, assign ownership of the directory `/oracle`:

```
# chown -R oracle:oinstall /oracle  
# chmod 775 /oracle
```

11. On the first system, insert the Enterprise Edition disc of the Oracle 10g discs in the CD-ROM drive, and enter the following commands:

```
# nohup /usr/sbin/pfs_mountd &  
# nohup /usr/sbin/pfsd &
```

12. If the software disc is not mounted, mount it by entering:

```
# /usr/sbin/pfs_mount -t rrip /dev/dsk/c#t#d# /cdrom
```

Where `c#t#d#` is the location of the CD-ROM drive

13. Log in as `oracle` on each system.

14. On the first system, make sure that `oracle` user can access other nodes in the cluster using `remsh`.

15. On one system, create a directory for the installation of the Oracle 10g binaries:

```
$ mkdir /oracle/VRT
```

16. On the system where you are installing Oracle 10g, set the environment variables as instructed in the *Oracle Real Application Clusters Installation and Configuration Guide*.



17. On the first system, set the DISPLAY variable.

If you use the Bourne Shell (sh or ksh):

```
$ DISPLAY=host:0.0;export DISPLAY
```

If you use the C Shell (csh or tcsh):

```
$ setenv DISPLAY host:0.0
```

18. Go to [“Installing Oracle Binaries - Running the Installer”](#) on page 35.

## Preparing to Install Oracle 10g Binaries On Local Storage - (Option 2)

Use this procedure if you do *not* plan to install Oracle 10g on shared storage.

1. Log in as root user on one system.
2. Add the directory path to the jar utility in the PATH environment variable. Typically, this is /usr/bin.

3. On one node, create a disk group in storage available local storage:

```
# vxdg init or_dg c2t2d2
```

4. Create the volume in the group. For the Oracle 10g binaries, make the volume 7 GB.

```
# vxassist -g or_dg make orbin_vol 7168M
```

5. Create a VxFS file system on orbin\_vol to install the Oracle 10g binaries. For example:

```
# mkfs -F vxfs /dev/vx/dsk/or_dg/orbin_vol
```

6. Create the mount point for the file system:

```
# mkdir /oracle
```

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

```
# mount -F vxfs /dev/vx/dsk/or_dg/orbin_vol /oracle
```

8. Create a local group and a local user for Oracle. For example, create the group dba and the user oracle. Be sure to assign the same user ID and group ID for the user on each system.

9. Assign ownership of the Oracle directory to oracle:



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

10. Repeat [step 1](#) through [step 9](#) on the other system.
11. On the first system, insert the Enterprise Edition disc of the Oracle 10g disks in the CD-ROM drive, and enter the following commands:

```
# nohup /usr/sbin/pfs_mountd &  
# nohup /usr/sbin/pfsd &
```

12. If the software disc is not mounted, mount it by entering:

```
# /usr/sbin/pfs_mount -t rrip /dev/dsk/c#t#d# /cdrom
```

Where *c#t#d#* is the location of the CD-ROM drive

13. Log in as `oracle` on each system.
14. On the first system, edit the file `.rhosts` to provide the other system access to the local system during the installation. Place a “+” character in the first line of the file. Note that you can remove this permission after installation is complete.
15. Repeat [step 14](#) on the other systems.
16. On each system, create a directory for the installation of the Oracle 10g binaries:

```
$ mkdir VRT  
$ export ORACLE_HOME=/oracle/VRT
```

17. On the first system, set the `DISPLAY` variable.

If you use the Bourne Shell (`sh` or `ksh`):

```
$ DISPLAY=host:0.0;export DISPLAY
```

If you use the C Shell (`csh` or `tcsh`):

```
$ setenv DISPLAY host:0.0
```

## Installing Oracle Binaries - Running the Installer

Refer to the *Oracle Real Application Clusters Installation and Configuration Guide* for additional information on using the Oracle 10g `runInstaller` utility. Make sure any required HP-UX patches listed in the Oracle documentation are installed before you install the Oracle software.

1. On the first system, run the Oracle 10g utility `runInstaller` as Oracle user. With the Oracle 10g Enterprise Edition CD disc in the CD-ROM drive, enter:

```
$ cd /cdrom
$ ./runInstaller
```

2. As you run the installer, be prepared to provide the following information required for the installation and configuration of the Oracle 10g binaries component:
  - a. The installation destination, for example, `$ORACLE_HOME` and the path, `/oracle/VRT`. These are specified in the Specify File Location screen. This location is either on shared storage or an identical location on each of the local cluster nodes.
  - b. The names of the cluster nodes. In our example, the nodes and their associated host names are `galaxy` and `nebula`. These are entered on the Specify Hardware Cluster Installation Mode screen.
3. When you come to the Select Database Configuration screen, you can choose *not* to have a starter database created by clicking the “Do not create a starter database” radio button. It is recommended you create a database later.
4. When you arrive at the “Install” screen, click Install. When installation completes, a “Setup Privileges Notice” appears. After clicking OK, run the `root.sh` script. Use the following sequence of commands on *each* node.

- a. As root user, set the display variable.

For Bourne Shell:

```
# DISPLAY=host:0.0;export DISPLAY
```

For C Shell:

```
# setenv DISPLAY host:0.0
```

- b. Run the script:

```
# cd $ORACLE_HOME
# ./root.sh
```



When you start the script, a VIP Configuration Assistant window appears. It prompts you for the virtual IP address you are configuring for the node on which you run `root.sh`.

## Linking Oracle 10g to VERITAS Libraries

The Oracle 10g binary must be configured to use the DBE/AC 3.5 Update 4 components for ODM, VCSMM, and VCSIPC using the steps described below. Make sure that the file system containing the Oracle binaries is mounted. Use the `mount` command to check.

- ◆ If Oracle binary is installed on a local file system, run the command on each node.
- ◆ If Oracle binary is installed on cluster file system, run the command from one cluster node.

1. Log in as Oracle user.
2. If you installed Oracle 10.1.0.4, then set the `IPC_LIB_PATH` variable as follows:

```
$ export IPC_LIB_PATH=/opt/VRTSvcs/rac/lib/pa20_64\  
/libskgxp10_ver24_64.a
```

3. Run the `linkrac` utility:

```
$ /opt/VRTSvcs/rac/bin/linkrac 10gR1
```

## Creating Oracle 10g Database

Refer to the *Oracle Real Application Clusters Installation and Configuration Guide* for instructions on how to install the Oracle 10g database. You can create the database in a shared raw volume or in a cluster file system. The following paragraphs describe creating volumes for the database tablespaces or creating a file system for the database.

### Creating Shared Raw Volume for Database Tablespaces - (Option 1)

If you plan to create the database tablespaces on a cluster file system, see “[Creating a Cluster File System for the Oracle Database - \(Option 2\)](#)” on page 38.

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

```
# vxdg -s init ora_dg
```
3. Create a volume in the shared group for *each* of the required tablespaces. (Refer to the Oracle documentation to determine the tablespace requirements.) For example:
 

```
# vxassist -g ora_dg make VRT_system1 1000M
# vxassist -g ora_dg make VRT_spfile1 10M
.
```
4. Deport and import the shared disk group to enable write access to it and to enable I/O fencing. On the CVM master node, enter:
 

```
# vxdg deport ora_dg
# vxdg -s import ora_dg
# vxvol -g ora_dg startall
# vxdg -g ora_dg set activation=sw
```
5. On each other node, enter:
 

```
# vxdg -g ora_dg set activation=sw
```
6. Define the access mode and permissions for the volumes storing the Oracle data. For *each* volume listed in `$ORACLE_HOME/raw_config`, use the `vxedit(1M)` command:
 

```
vxedit -g disk_group set group=group user=user mode=660 volume
```

 For example:
 

```
# vxedit -g ora_dg set group=dba user=oracle mode=660 VRT_system1
```



In this example, `VRT_system1` is the name of one of the volumes. Repeat the command to define access mode and permissions for each volume in the `ora_dg`.

7. You can now create the database using Oracle documentation.

## Creating a Cluster File System for the Oracle Database - (Option 2)

If you plan to use a cluster file system to store the Oracle database, you can use the following procedure to create the file system.

1. Create a disk group (for example: `rac_dg`) :

```
# vxdg -s init rac_dg c3d3d1
```

2. Create a single shared volume (for example: `rac_vol1`), large enough to contain a file system for all the tablespaces (see Oracle documentation the tablespace sizes). Assuming 6.8 GB are required for the tablespaces:

```
# vxassist -g rac_dg make rac_vol1 6800M
```

3. Deport and import the group in the shared mode to enable I/O fencing:

```
# vxdg deport rac_dg
# vxdg -s import rac_dg
```

4. Set the activation mode (`sw`) to allow shared access to the disk group:

```
# vxdg -g rac_dg set activation=sw
```

5. Start the volume in the disk group:

```
# vxvol -g rac_dg startall
```

6. Create a VxFS file system in this volume. From one node, enter:

```
# mkfs -F vxfs -o largefiles /dev/vx/rdisk/rac_dg/rac_vol1
```

7. Create a mount point for the shared file system:

```
# mkdir /rac_ts
```

8. From the same system, mount the file system:

```
# mount -F vxfs -o cluster /dev/vx/dsk/rac_dg/rac_vol1 /rac_ts
```

9. Set "oracle" to be the owner of the file system, and set "755" as the permissions:



```
# chown oracle:oinstall /rac_ts
# chmod 755 /rac_ts
```

10. On the other system(s), do [step 4](#) and [step 7](#) through [step 9](#).

You can now create the database; refer to Oracle documentation.

## Migrating from Oracle9i to Oracle 10g Database

Follow any of the methods to migrate the database to Oracle 10g R1:

- ◆ Using the database upgrade assistant utility
- ◆ Performing a manual upgrade
- ◆ Data copying using export/import utilities

Refer to the Oracle Database Upgrade Guide 10g Release 1(10.1), Part Number B10763-02 for detail on the methods to migrate. After upgrading the database, ensure Oracle is linked to Veritas libraries for Oracle 10g R1.

## Editing the VCS Configuration for Oracle Binaries and Database

Depending on the upgrade scenarios, perform the following modifications to the VCS configuration file (main.cf):

|  |  |
|--|--|
| For upgrade scenarios <b>2, 3, and 6</b> | <p>In the CVM service group:</p> <ul style="list-style-type: none"> <li>◆ Configure the CFSMount and CVMVolDg resources for the Oracle 10g binaries.</li> <li>◆ Configure the CFSMount and CVMVolDg resources for the Oracle 10g database.</li> </ul> <p>In the CRS service group:</p> <ul style="list-style-type: none"> <li>◆ Configure the CSSD resource for VCS to control CRS.</li> </ul> |
| For upgrade scenario <b>4</b>            | <p>In the CRS service group:</p> <ul style="list-style-type: none"> <li>◆ Configure the CSSD resource for VCS to control CRS.</li> </ul>   |

See “[VERITAS DBE/AC 3.5 Update 4 Patch Installation - An Overview](#)” on page 8.

Use the following procedure to modify the configuration:



1. Log into one of the nodes in the cluster.
2. Save the existing configuration to disk and make the configuration read only while you are make the changes:

```
# haconf -dump -makero
```

3. Ensure VCS is not running while you edit `main.cf` by using the `hastop -all -force` 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
```

If you upgrade from DBE/AC 3.5 U3 with Oracle 10gR1, then enter the following command:

```
# mv main.cf main.3.5.bkup
```

Else, enter the following command:

```
# cp main.cf main.3.5.bkup
```

5. Use `vi` or another text editor to edit the `main.cf` file, making the changes described in the following paragraphs (note that added or changed lines are bolded).

For upgrade scenario 4, skip to [step 6](#).

Make all changes to the CVM service group.

- a. Add CFSSMount resource for the shared volume containing the Oracle 10g binaries. For example:

```
CFSMount orabin_mnt (  

    Critical = 0  

    MountPoint = "/oracle"  

    BlockDevice = "/dev/vx/rdisk/ora_dg/orabin_vol"  

    MountOpt = "cluster"  

)
```

- b. Add the CVMVolDg resource for the shared disk group and volume containing the Oracle 10g binaries. For example:

```
CVMVolDg orabin_voldg (  

    Critical = 0  

    CVMDiskGroup = ora_dg  

    CVMVolume = { orabin_vol }  

    CVMActivation = sw
```



)

- c. Add CFSSMount resource for the shared volume containing the Oracle 10g database. For example:

```
CFSSMount oradata_mnt (
  Critical = 0
  MountPoint = "/rac_ts"
  BlockDevice = "/dev/vx/rdisk/rac_dg/rac_voll"
  MountOpt = "cluster"
)
```

- d. Add the CVMVolDg resource for the shared disk group and volume containing the Oracle 10g database. For example:

```
CVMVolDg oradata_voldg (
  Critical = 0
  CVMDiskGroup = rac_dg
  CVMVolume = { rac_voll }
  CVMActivation = sw
)
```

6. Make the following change to the CVM service group.

Modify the CVM service group to monitor the cssd program that uses the Application resource.

```
Application cssd (
  Critical = 0
  StartProgram = "/opt/VRTSvcs/rac/bin/cssd-online"
  StopProgram = "/opt/VRTSvcs/rac/bin/cssd-offline"
  MonitorProgram = "/opt/VRTSvcs/rac/bin/cssd-monitor"
  CleanProgram = "/opt/VRTSvcs/rac/bin/cssd-clean"
)
```

```
requires group cvm online local firm
```



## A Sample VCS Configuration

The following sample VCS configuration includes a CRS service group and a CVM service group modified to include a PrivNIC resource, the resources for the OCR and VOTE-disk directories, Oracle binaries, and an Oracle database.

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

cluster rac_cluster2 (
    UserNames = { admin = bopHojOlpKppNxp, vcs = GLMkLlIlI }
    Administrators = { admin, vcs }
    HacliUserLevel = COMMANDROOT
    CounterInterval = 5
)

system galaxy (
)

system nebula (
)

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

Application cssd (
    Critical = 0
    StartProgram = "/opt/VRTSvcs/rac/bin/cssd-online"
    StopProgram = "/opt/VRTSvcs/rac/bin/cssd-offline"
    MonitorProgram =
        "/opt/VRTSvcs/rac/bin/cssd-monitor"
    CleanProgram = "/opt/VRTSvcs/rac/bin/cssd-clean"
)

requires group cvm online local firm

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

```

)
CFSSMount crs_ora_mnt (
    Critical = 0
    MountPoint = "/ora_crs"
    BlockDevice = "/dev/vx/dsk/crsora_dg/crs_vol"
)

CFSSMount orabin_mnt (
    Critical = 0
    MountPoint = "/orabin"
    BlockDevice = "/dev/vx/dsk/ora_dg/orabin_vol"
)

CFSSMount oradata_mnt (
    Critical = 0
    MountPoint = "/rac_ts"
    BlockDevice = "/dev/vx/dsk/rac_dg/rac_vol1"
)

CFSQlogckd qlogckd (
    Critical = 0
)

CFSfsckd vxfsckd (
)

CVMCluster cvm_clus (
    CVMClustName = rac_cluster2
    CVMNodeId = { galaxy = 0, nebula = 1 }
    CVMTransport = gab
    CVMTimeout = 200
)

CVMVolDg orabin_voldg (
    Critical = 0
    CVMDiskGroup = ora_dg
    CVMVolume = { orabin_vol }
    CVMActivation = sw
)

CVMVolDg crs_voldg (
    Critical = 0
    CVMDiskGroup = crs_oradg
    CVMVolume = { crs_vol }
    CVMActivation = sw
)

```



```
CVMVolDg oradata_voldg (  
    Critical = 0  
    CVMDiskGroup = rac_dg  
    CVMVolume = { rac_voll }  
    CVMActivation = sw  
)  
  
PrivNIC ora_priv (  
    Critical = 0  
    Device = { lan1 = 0, lan1 = 2 }  
    Address@galaxy = "10.11.12.58"  
    Address@nebula = "10.11.12.59"  
    NetMask = "255.255.255.0"  
)  
  
crs_ora_mnt requires crs_voldg  
crs_ora_mnt requires vxfsckd  
orabin_mnt requires orabin_voldg  
orabin_mnt requires vxfsckd  
oradata_mnt requires oradata_voldg  
oradata_mnt requires vxfsckd  
orabin_voldg requires cvm_clus  
crs_voldg requires cvm_clus  
oradata_voldg requires cvm_clus  
qlogckd requires cvm_clus  
vxfsckd requires qlogckd
```



## Starting VCS for Oracle 10g Clusters

After you edit the `main.cf` file, you must perform the following procedure.

1. If you upgraded from DBE/AC 3.5 U3 with Oracle 10gR1, then do the following:

- a. Uncomment the `/etc/inittab` file for CRS entries. For example:

```
h1:3:respawn:/sbin/init.d/init.evmd run >/dev/null 2>&1
</dev/null
h2:3:respawn:/sbin/init.d/init.cssd fatal >/dev/null 2>&1
</dev/null
h3:3:respawn:/sbin/init.d/init.crsd run >/dev/null 2>&1
</dev/null
```

- b. To refresh inittab entries, enter the following command:

```
# /sbin/init q
```

2. Start VCS on each of the cluster nodes:

```
# hastart
```

## Adding Oracle 10g Patches

Refer to the *Oracle Database Patch Set Notes* for instructions on how to add patches to Oracle 10g. See “[Oracle: Known Problems](#)” on page 58.

After you apply the Oracle 10g patches, run the `linkrac` utility.

1. Log in as Oracle user.
2. Run the `linkrac` utility. If Oracle 10g is installed locally on each node, run the utility on each node. If Oracle 10g is installed on shared storage, you need only run the utility once.

```
# cd /opt/VRTSvcs/rac/bin
# ./linkrac 10gR1
```

3. Use the Oracle documents accompanying the Oracle patches to perform necessary database upgrade procedures.



## Stopping VCS when CRS is Outside of VCS Control

If you have DBE/AC earlier to version 3.5 Update 4 with Oracle 10gR1, follow this procedure to stop VCS. Note that CRS was outside of VCS control in the previous versions.

When you stop VCS in the DBE/AC cluster, be sure to stop the CRS daemon first. Use the following sequence of commands:

1. Stop the CRS daemons on each node:

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

2. After stopping the CRS daemon, stop VCS. From one node:

```
# hastop -all
```

To restart CRS, you must reboot the systems on which it is stopped.

## When Using hastop Before Stopping CRS

If you intend to stop CRS but use `hastop` before stopping CRS, the cluster enters the LEAVING state and does not stop. You can verify this using the `hastatus` command. Also, the VCS engine log contains a message that resembles:

```
TAB_E 2004/10/29 13:55:57 (galaxy) VCS:13001:Resource(cssd) :  
Output of the completed operation (offline)  
Administrator needs to shutdown CRS manually  
Note that you might need to reboot the node to restart CRS  
Edit /opt/VRTSvcs/rac/bin/cssd-offline to setup automatic shutdown  
of CRS by VCS in future
```

In this condition, use the following command to stop CRS:

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



## Adding a Node to a Cluster Running DBE/AC 3.5 Update 4

Clusters running VERITAS DBE/AC 3.5 for Oracle RAC Update 4 for HP-UX can support up to four nodes.

The following procedure, which includes references to the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*, describes how to add one node to an existing cluster.

1. Refer to chapter 7, “Adding and Removing DBE/AC Cluster Nodes,” in the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*. Follow the procedures described in phases 1 through 4 to install DBE/AC for Oracle RAC 3.5, HP-UX. Those steps include:
  - ◆ Checking that the new system meets the requirements for installation
  - ◆ Physically adding the system to the cluster
  - ◆ Installing packages for DBE/AC for Oracle RAC 3.5, HP-UX
  - ◆ Running `vxinstall`, if necessary
2. Refer to “[Installing DBE/AC Update 4 Patches](#)” on page 14 of this document and upgrade to DBE/AC for Oracle RAC 3.5, Update 4. Omit [step 2](#) through [step 4](#), [step 16](#), and [step 17](#).
3. Refer to chapter 7, “Adding and Removing DBE/AC Cluster Nodes,” in the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*. Follow the procedures described in phases 5 and 6 to join the new node to the existing cluster. Those steps include:
  - ◆ Configuring LLT, GAB, and VCSMM and VXFEN
  - ◆ Configuring CVM
4. Add the new node to the Oracle RAC configuration:
  - ◆ If you are using Oracle9i, refer to chapter 7, “Adding and Removing DBE/AC Cluster Nodes,” in the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*. Follow the procedure in phases 7 and 8 to set up or install Oracle9i and configure the new Oracle instance.Or,
  - ◆ If you are using Oracle 10g, follow the instructions in the Oracle MetaLink document, 270512.1, “Adding a Node to 10g RAC cluster.”



## Removing a Node from a DBE/AC 3.5 Update 4 Cluster

To remove a node from a cluster running VERITAS DBE/AC 3.5 for Oracle RAC Update 4 for HP-UX, you can use the following procedures. The procedures include references to the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle RAC Installation and Configuration Guide*.

### Removing a Node When You Are Running Oracle9i

1. Refer to chapter 7, “Adding and Removing DBE/AC Cluster Nodes,” in the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*. Follow the procedures in the section, “Removing a Node from a DBE/AC Cluster,” stopping before you use the procedure, “Running the uninstallDBAC Script with -selectnodes Option.” You must not run the `uninstallDBAC` script until after you have removed update 4 patches.
2. Remove DBE/AC for Oracle RAC Update 4 patches from the node you are removing. Use the procedure “[Uninstalling DBE/AC Update 4 Patch Set](#)” on page 50.
3. Remove the cumulative patches PVKL\_03611, PVKL-03612, and PVKL\_03624 from the node you are removing.

- a. To check whether you have the patches installed, use the following command on each system:

```
# swlist -l patch | grep PVKL_03611
# swlist -l patch | grep PVKL_03612
# swlist -l patch | grep PVKL_03624
```

- b. If the output shows that you have not installed these patches on the systems, skip to [step 4](#).
- c. To remove the patches from the systems where they are installed, enter the command:

```
# swremove -x mount_all_filesystems=false \  
PVKL_03611 PVKL_03612 PVKL_03624
```

The systems reboot after the patches are removed.

4. Uninstall DBE/AC 3.5 for Oracle RAC from the node you are removing. In the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*, chapter 7, follow the procedures in the section “Running the `uninstallDBAC` Script with -selectnodes Option.”





5. Follow the procedures in the remainder of chapter 7 of the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*, including the procedures to:
  - ◆ Edit the configuration files on the remaining nodes
  - ◆ Removing the VxVM and VxFS patches on the node you are removing

## Removing a Node When You Are Running Oracle 10g

This procedure includes references to the Oracle MetaLink document, 269320.1, “Removing a Node from a 10g RAC cluster” and the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*.

1. Follow the procedures in the Oracle MetaLink document, 269320.1, “Removing a Node from a 10g RAC cluster.”
2. Offline all the resources on the local system:
 

```
# hastop -local
```
3. Remove DBE/AC for Oracle RAC Update 4 patches from the node you are removing. Use the procedure “[Uninstalling DBE/AC Update 4 Patch Set](#)” on page 50.
4. Remove the cumulative patches PVKL\_03611, PVKL-03612, and PVKL\_03624 from the node you are removing.
  - a. To check whether you have the patches installed, use the following command on each system:
 

```
# swlist -l patch | grep PVKL_03611  
# swlist -l patch | grep PVKL_03612  
# swlist -l patch | grep PVKL_03624
```
  - b. If the output shows that you have not installed these patches on the systems, skip to [step 5](#).
  - c. To remove the patches from the systems where they are installed, enter the command:
 

```
# swremove -x mount_all_filesystems=false \  
PVKL_03611 PVKL_03612 PVKL_03624
```

The systems reboot after the patches are removed.



5. Uninstall DBE/AC 3.5 *for Oracle RAC* from the node you are removing. In the *VERITAS Database Edition / Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*, chapter 7, follow the procedures in the section “Running the `uninstallDBAC` Script with `-selectnodes` Option.”

## Uninstalling DBE/AC Update 4 Patch Set

The following instructions for uninstalling DBE/AC Update 4 describe how to remove patches you may have applied to a previous version of DBE/AC. After uninstalling the patches, you can use the VCS configuration file (“`main.cf.3.5`”; see [step 2](#) on page 11) you saved before adding the patches.

---

**Note** Before uninstalling, verify the supported Oracle versions for any previous DBE/AC version that you want to restore. Note that DBE/AC 3.5 supports only Oracle9i, not Oracle 10g. Refer to Oracle documentation for procedures to uninstall Oracle 10g and reinstall Oracle9i.

---

## Stopping the Cluster and Oracle

Start the removal of DBE/AC Update 4 by stopping the cluster and Oracle. See “[Stopping the Cluster and Oracle](#)” on page 11.

## Uninstalling the DBE/AC Update 4 Patches

Use the following procedure on each of the cluster systems to remove the DBE/AC 3.5 Update 4 patches.

1. Close all GAB ports by using the following sequence of commands:

```
# /usr/sbin/fsclustadm cfsdeinit
# /usr/sbin/qlogclustadm deinit
# /sbin/umount /dev/odm
# /sbin/lmxconfig -U
# /sbin/vcsmmconfig -U
# /sbin/vxfenconfig -U
```

2. Verify that the ports are closed, with the exception of GAB port a:

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

3. Unconfigure GAB and LLT, and unload all the `VRTSdbac` modules:

```
# /sbin/gabconfig -U
```

```
# kadmin -U lmx vxfen vcsmm vxglm vxgms odm gab
# echo "y" | /sbin/lltconfig -U
# kadmin -U llt
# kadmin -s | grep llt
```

---

**Note** If you had problems while running the commands in the previous steps, see the troubleshooting section on [“If llt Does Not Unload”](#) on page 19.

---

- As root user, check whether the VEA Service is running.

```
# /opt/VRTSob/bin/vxsvcctl status
Current state of server : NOT RUNNING
```

- If the VEA server is running, stop it by entering the command:

```
# /opt/VRTSob/bin/vxsvcctl stop
# rm /var/vx/isis/vxisis.lock
```

Repeat [step 4](#) to verify VEA Service is stopped.

- Uninstall the patches:

- ◆ If you upgraded from DBE/AC 3.5 U3 and if you want to go back to DBE/AC 3.5 U3, remove the following 3.5 U4 patches:

```
# swremove -x enforce_dependencies=false \
-x mount_all_filesystems=false -x autoreboot=true \
PHCO_34199 PHCO_35291 PHCO_34348 PHKL_35292 \
PHKL_34122 PVCO_03673 PVKL_03692 PVKL_03695 \
PVCO_03685
```

- ◆ If you upgraded from a DBE/AC 3.5 and you want to go back to that version, remove the following 3.5 U4 patches:

```
# swremove -x enforce_dependencies=false \
-x mount_all_filesystems=false -x autoreboot=true \
PHCO_34199 PHCO_35291 PHCO_34348 PHKL_35292 \
PHKL_34122 PVCO_03673 PVKL_03692 PVKL_03695 \
PVCO_03685 PHCO_30700 PHCO_30730 PHCO_30731 \
PVCO_03622 PVCO_03623 PVCO_03637 PVKL_03611 \
PVCO_03605
```

- After you uninstall the patches, the system reboots.

Wait for the cluster to restart.

- Verify that the cluster is running.

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



9. Stop VCS and all the Oracle resources.
- ◆ If all the resources are under VCS control, enter the following command:  

```
# hastop -all
```
  - ◆ Else, see “[Stopping the Cluster and Oracle](#)” on page 50.

10. Repeat [step 1](#) to [step 5](#) on the system.

11. Uninstall the patch for GAB:

```
# swremove -x mount_all_filesystems=false \  
-x enforce_dependencies=false \  
PVKL_03674
```

12. Uninstall the patch for LLT:

```
# swremove -x mount_all_filesystems=false \  
-x autoreboot=true \  
-x enforce_dependencies=false \  
PVKL_03675
```

13. Reboot the cluster nodes using the following commands:

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

14. After the reboot, do the following:

- ◆ Verify whether the ODM port is up.  

```
# /sbin/gabconfig -a
```
- ◆ If the ODM port is not up, start the ODM driver.  

```
# ln -s /sbin/init.d/odm /sbin/rc2.d/S980odm  
# /sbin/init.d/odm stop  
# /sbin/init.d/odm start
```

15. Optionally, after the system reboots, run the following check to verify a patch has been removed:

```
# swlist -v patch | grep patch
```

Where *patch* represents a patch you have removed.

16. If Oracle is under VCS control, do the following:

- ◆ Relink VERITAS libraries to Oracle.

For DBE/AC 3.5 U3, refer to *VERITAS Database Edition Advanced Cluster 3.5 Update 3 for Oracle RAC Read Me*.

For DBE/AC 3.5, refer to *VERITAS Database Edition/Advanced Cluster 3.5 for Oracle9i RAC Installation and Configuration Guide*.

- ◆ Enable Oracle.
 

```
# haconf -makerw
# hares -modify oracle_res Enabled 1
# haconf -dump -makero
```
- ◆ Online the Oracle resource on each cluster node:
 

```
# hares -online oracle_res -sys system
```

## PrivNIC Agent - Details

The PrivNIC resource can be used to maintain a “private IP address” that is locally highly available on LLT Ethernet interfaces. Such private IP addresses are required by the CRS daemons in Oracle 10g to provide communication.

The PrivNIC agent relies on LLT to monitor the interfaces. It queries LLT to count the number of visible nodes on each of the LLT interfaces.

### PrivNIC Agent: Monitor Entry Point

The following table describes the `monitor` entry point used by the PrivNIC agent.

| Entry Point | Description   |
|-------------|---|
| Monitor     | Queries LLT to make a list of nodes visible on every LLT network interface. It applies various filters to the list to arrive at a most desired failover decision and calculates a “winner” device on which to configure the IP address. The “winner” is compared to the currently active device where the IP is currently configured; if the active and winner device are different, the agent fails over the device. |



## PrivNIC Agent: Type Attribute Descriptions

The following table describes the user-modifiable attributes of the PrivNIC resource type

### Required Attributes: PrivNIC Agent

| Attribute | Dimension           | Description  |
|-----------|---------------------|--|
| Device    | string -association | Specifies the network interface device as shown by the "ifconfig" command and the "network-id" associated with the interface; for example: lan1=0. Network-ids of the interfaces connected to the same physical network must match. The interface with the lower network-id has the higher preference for failover. At least one interface device <i>must</i> be specified. Example:<br><pre>Device@galaxy = {lan1=0, lan2=1, lan0=2} Device@nebula = {lan1=0, lan2=1, lan0=2}</pre> |
| Address   | string-scalar       | The numerical private IP address. For example:<br><pre>Address = "192.11.12.13"</pre>  |
| NetMask   | string -association | The numerical netmask for the private IP address. For example:<br><pre>Address = "255.255.255.0"</pre>   |

## Optional Attributes: PrivNIC Agent

| Attribute     | Dimension           | Description   |
|---------------|---------------------|---|
| DeviceTag     | string -association | <p>Associates an LLT device “tag” with device via the network-id. If an LLT device tag (as specified in the <code>/etc/llttab</code> file) differs from the name of the network interface as shown in “ifconfig,” then DeviceTag must be specified for that interface.</p> <p>For example: in the common case, <code>/etc/llttab</code> contains:</p> <pre>link lan1 /dev/lan:1 - ether - - link lan2 /dev/lan:2 - ether - - link-lowpri lan0 /dev/lan:0 - ether - -</pre> <p>In the above case, DeviceTag does not need to be specified. However, if <code>/etc/llttab</code> contains:</p> <pre>link link1 /dev/lan:1 - ether - - link link2 /dev/lan:2 - ether - - link-lowpri spare /dev/lan:0 - ether - -</pre> <p>And,</p> <pre>Device@galaxy = { lan1=0, lan2=1, lan0=2 }</pre> <p>DeviceTag needs to be specified as:</p> <pre>DeviceTag@galaxy = { spare=2 }</pre> |
| GabPort       | string-scalar       | <p>A single lower-case letter specifying the name of the GAB port to be used for filtering. “o” is the default. NULL disables GAB port filtering.</p> <p>Example: <code>GabPort = "b"</code></p>  |
| UseVirtualIP  | integer-scalar      | <p>The default is 0, which specifies that the agent use the physical interface for configuring the private IP address when possible.</p> <p>The value 1 specifies that the agent always use the virtual interface for configuring the private IP address.</p> <p>The value 2 (which includes the functionality of the value 1) specifies the agent should complain if the private IP address already exists on a physical interface.</p>  |
| UseSystemList | integer-scalar      | <p>The value 1 specifies that the agent use the SystemList of the service group to filter the node list. The default is 0.</p>  |
| ExcludeNode   | integer-vector      | <p>List of nodes to be permanently excluded from calculation.</p>   |



## PrivNIC Agent: Type Definition

The following shows the content of the PrivNIC.cf file:

```
type PrivNIC (
    static str ArgList[] = { Device, DeviceTag, Address,
        NetMask, UseVirtualIP, GabPort, UseSystemList,
        ExcludeNode }
    static int OfflineMonitorInterval = 60
    static int MonitorTimeout = 300
    static str Operations = None

    str Device{}
    str DeviceTag{}
    str Address = ""
    str NetMask = ""
    int UseVirtualIP = 0
    str GabPort = "o"
    int UseSystemList = 0
    int ExcludeNode[]
)
```

## PrivNIC Agent: Sample Configuration

The following is a sample configuration using the PrivNIC agent.

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

PrivNIC ora_priv (
    Device = { lan1 = 0, lan1 = 2, lan2 = 5 }
    Address@galaxy = "192.11.12.13"
    Address@nebula = "192.11.12.14"
    NetMask = "255.255.255.0"
)
```



---

## Software Limitations and Known Problems

The following paragraphs describe known problems and approaches to solving them.

### Stopping Systems in Clusters with I/O Fencing Configured

VERITAS Database Edition / Advanced Cluster 3.5 *for Oracle RAC* uses a feature called I/O Fencing. I/O fencing provides complete protection against the possibility of data corruption resulting from a severed cluster interconnect, commonly called a “split brain.” The *VCS Users Guide* contains a section titled “VCS Communications, Membership and I/O fencing” that describes the problems a failed interconnect can create and the protection I/O fencing provides.

I/O fencing uses SCSI-3 Persistent Reserve keys to implement data protection. Keys are placed on I/O fencing coordinator disks as well as data disks. The administrator of Database Edition / Advanced Cluster 3.5 *for Oracle RAC* needs to be aware of operational changes needed when working with clusters protected by I/O fencing. Using the shutdown -r command ensures keys are removed from disks (coordinator as well as data disks) to prevent possible difficulties with subsequent cluster startup.

### Onlining CVMVolDg Resource After Stopping VCS with -force Option

If VCS is stopped with the `-force` option, CVMVolDg resources in service groups other than CVM service group do not start when VCS is restarted. Users must manually online the CVMVolDg resource using the command:

```
# hares -online cvmvoldg_resource -sys galaxy
```

Note that volume resources defined in the CVMVolDg resource in a non-CVM service group remain running after the `hastop -force` command even though the CVMVolDg resource must be onlined.

### VERITAS FlashSnap Agent for Symmetrix Not Supported

The FlashSnap Agent for Symmetrix (EMC TimeFinder) mapping functionality (package: `VRTSfas`) is not supported by Database Edition / Advanced Cluster 3.5 *for Oracle RAC*.



## **VERITAS Space-Optimized Volume Snapshots are Not Recommended**

When using the VERITAS Volume Manager volume snapshot functionality in the Database Edition / Advanced Cluster 3.5 *for Oracle RAC* environment, for performance reasons the space-optimized instant volume snapshot type is *not* recommended.

## **vxfsentsthdw Command Requires “+” in /.rhosts File**

The `vxfsentsthdw` command requires `remsh` permissions to all cluster nodes, including the one on which the command is issued. Therefore, the file `/.rhosts` must contain a “+” character in the first line.

## **The Name of the “cvm” Service Group Cannot be Changed**

During the installation of DBE/AC, a service group named “`cvm`” is created. The name of the service group is a requirement of the CVMCluster agent and it cannot be modified.

## **Oracle: Known Problems**

- ◆ Oracle 10g versions 10.1.0.2 and 10.1.0.3 exhibit the problem where CRS hangs after systems reboot.
- ◆ After upgrading Oracle 10g to patch 10.1.0.3, you may encounter the problem where the virtual IP may not start.

Please contact Oracle support for assistance.

## Example main.cf File Shows Incomplete Definitions of NIC and IP Resources

The installed example `main.cf` file, `/etc/VRTSvcs/conf/sample_rac/main.cf`, contains incomplete definitions for the NIC and IP resources in the CVM service group.

For the NIC resource, the required `NetworkHosts` attribute is not defined. A correct example of the NIC resource definition is:

```
.
NIC listener_lan0 (
  Device = lan0
  NetworkType = ether
  NetworkHosts = { "10.180.11.1", "10.180.11.2" }
)
```

For the IP resource, the `NetMask` attribute is not defined. A correct example of the IP resource is:

```
.
IP listener_ip (
  Device = lan0
  Address @sysa = "192.2.40.21"
  Address @sysb = "192.2.40.22"
  Address @sysc = "192.2.40.23"
  Address @sysd = "192.2.40.24"
  NetMask = "255.255.240.0"
)
```

If you do not define `NetMask` in your configuration, the default value, `255.0.0.0`, may not be appropriate for your environment and could cause problems.

In the *VERITAS DBE/AC Installation and Configuration Guide*, refer to the chapter on configuring VCS service groups for Oracle; see also the example file in Appendix A.



## Changing VCS Oracle Enterprise Agent Error Handling Actions

The VERITAS Oracle Enterprise Agent provides enhanced handling of Oracle errors encountered during detailed monitoring. The agent uses the reference file, `oraerror.dat`, which consists of a list of Oracle errors and the actions to be taken. Refer to the *VERITAS Cluster Server Enterprise Agent 3.5 for Oracle Installation and Configuration Guide* for description of the actions.

Currently, the file specifies that the NOFAILOVER action is taken when the following Oracle errors are encountered:

ORA-00061, ORA-02726, ORA-6108, ORA-06114

The NOFAILOVER action means that the agent sets the resource's state to OFFLINE and freezes the service group.

Users may stop the agent, edit the file, `oraerror.dat`, and change the NOFAILOVER action to another action that is appropriate for the user's environment. Once the agent is restarted, the changes go into effect.

## Oracle Datafiles Can Be Created Without “reuse” Flag

Normally, when you use the Oracle “`create tablespace name datafile`” command to create a tablespace datafile, you must use the “reuse” command to create a datafile with the same name and size as a file that had previously existed. The reuse flag for the create command is cautionary. With DBE/AC for Oracle RAC, however, you can create the same file successfully without using the reuse flag.

## uninstallDBAC Utility Must Not Be Halted

When you run the `uninstallDBAC` utility provided with VERITAS DBE/AC for Oracle RAC, version 3.5, the utility successfully removes packages from the target systems and prompts users to indicate whether or not to continue to remove packages. Because some package have already been removed, users must *not* elect to stop the uninstallation process.

## LLT Requires Proper Media Speed Settings on Private NICs

For optimal LLT (Low Latency Transport) communication among the cluster nodes, the interface cards on each node must use the same media speed settings. Also, the settings for switches or hubs used for the interconnects must match that of the interface cards. Incorrect settings can cause poor network performance or even network failure.

### Guidelines for Setting Media Speed of LLT Interconnects

- ◆ If you have hubs or switches for LLT interconnects, we recommend using the `Auto_Negotiation` media speed setting on each Ethernet card on each node.
- ◆ If you have hubs or switches for LLT interconnects and you do not use the `Auto_Negotiation` media speed setting, set the hub or switch port to the same setting as that used for the cards on each node.
- ◆ If you use directly connected Ethernet links (using crossover cables), set the media speed to the highest value common to both cards, typically `100_Full_Duplex`.
- ◆ It is *not* recommended to use dissimilar network cards for private links.

### Checking the Ethernet Media Speed

The following paragraphs describe displaying information about the settings for interface cards.

#### Displaying cards on a system to determine card number

Use the command `/usr/sbin/lanscan`. The output shows the cards currently configured on the system. Each network interface card has a number (PPA number, or Point of Physical Attachment) under the heading `Crd/In#`.

#### Displaying a card's current media settings

The cards for your private links should meet the guidelines in the paragraphs above. Use the command to check each card:

```
# /usr/sbin/lanadmin -x n
Current Config                = 100 Full-Duplex AUTONEG
```

Where *n* is the card instance (or PPA).

#### Changing the media settings for a card

If you find a discrepancy between cards and need to change settings, please contact Hewlett-Packard for information about making the changes for your configuration.



## Software Fixes and Requested Enhancements

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

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| <b>Incident Number(s)</b> | <b>Description</b>   |
|---------------------------|--|
| 138881                    | IPC polling timeout. Enhancements made to LMX and VCSIPC timing functions.                         |
| 139351                    | LMX uses incorrect message ID. Fixed.  |
| 145364                    | vxfen error messages printed when not necessary. Fixed.  |
| 148191                    | Incorrect output by lmxstat. Fixed.  |
| E-249646, -7              | modinfo command augmented to include full release information.                                     |
| E-249961                  | Improved flow control reduces excessive VCSIPC polling.  |
| E-251016                  | Addition of EMC firmware causes systems to panic. Fixed.   |
| E-251228                  | Changes to vxfen tunable parameter for the vxfen debug log did not take effect. Fixed              |
| E-253903                  | lltping command now provides userspace round trip time (RTT) information.                          |
| E-253947                  | Unnecessary LMX polling. Enhancement to VCSIPC timing.   |
| E-254303                  | Default stack size increased to 24K to provide sufficient stack size.                              |
| E-254385                  | LLT fix for waking threads results in performance enhancement.                                     |
| E-254386                  | LLT lock contention reduced.   |
| E-254862                  | Improvement to LLT unidirectional messaging.   |
| E-255259                  | LLT timer now works in <i>all</i> non-idle states.   |
| E-255834                  | LLT fastpath processing is now disabled, allowing VCS to function on HP-UX using gigabit Ethernet. |
| E-255915                  | lltstat command now provides -t option to display kernel tunable parameter values.                 |

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| <b>Incident Number(s)</b> | <b>Description</b>  |
|---------------------------|---|
| E-256184, E-257898        | ASSERTION FAILED message occasionally displays when an attempt is made to remove pre-existing keys from disk using vxfsenadm utility. Fixed.  |
| E-256232, E-266614        | lltstat command to show per-CPU statistics.   |
| E-256350                  | LLT tracing levels are now configurable.  |
| E-256431                  | Enhanced handling of dead buffers by IPC, LMX.  |
| E-259566                  | VCSMM driver memory management errors corrected.  |
| E-259861                  | Documentation enhancement: steps to add CRS service group to VCS configuration now provided with Read Me documentation. Addition of the CRS service group prevents panic of cluster nodes when user stops VCS using hastop command. |
| E-268659                  | Enhanced connect/disconnect sequence in LMX to prevent panic.   |
| B-269644                  | Oracle IPC indicates "excessive poll" message. Corrected flow control.  |

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