

Application Note: Setting up Veritas Storage Foundation™ for Oracle® RAC in a zone environment

Solaris

5.0 Maintenance Pack 3 Rolling Patch
5

Veritas Storage Foundation™ for Oracle RAC Release Notes

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Setting up SF Oracle RAC in a zone environment

This document includes the following topics:

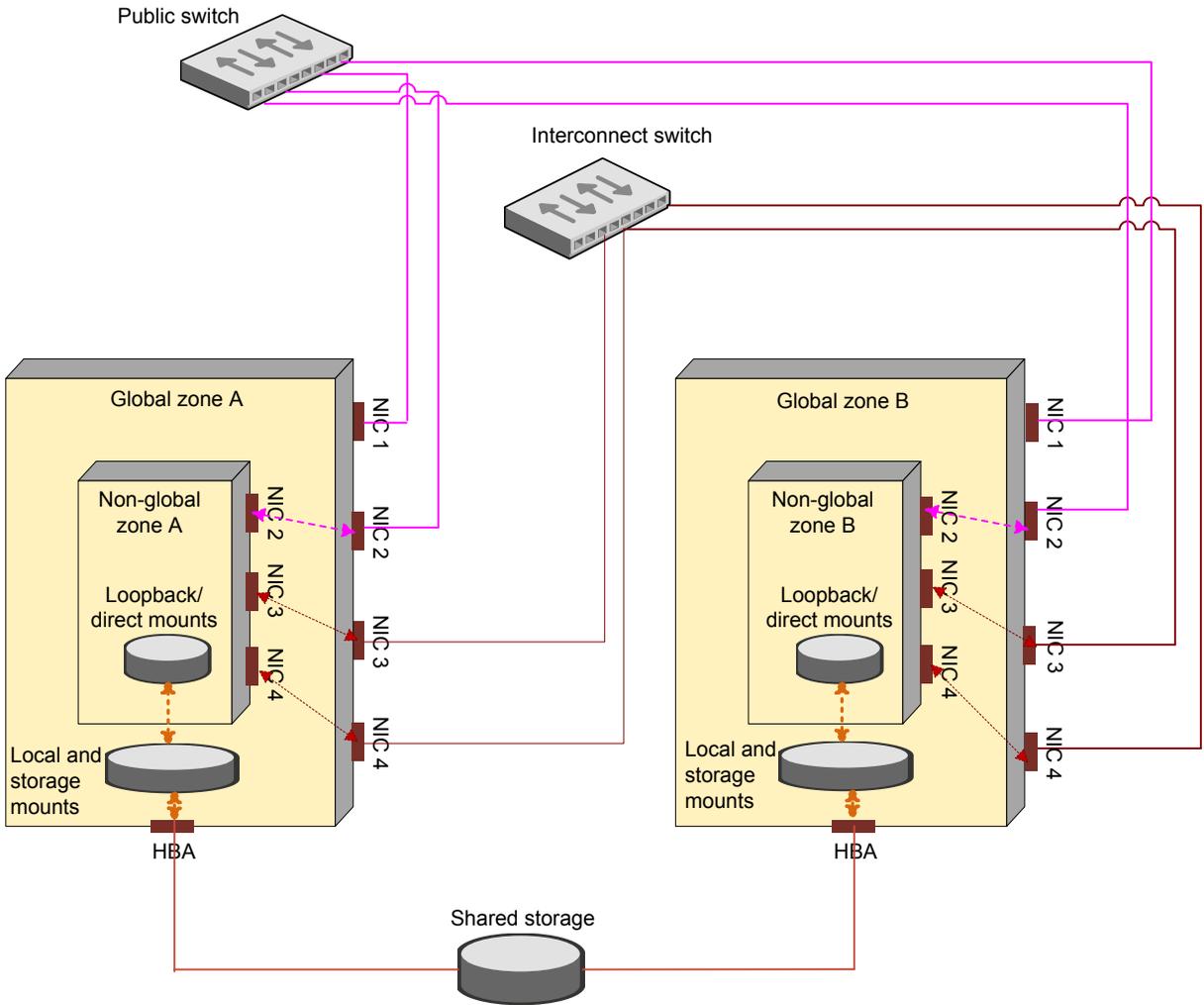
- [About Solaris Zones](#)
- [About SF Oracle RAC support for Oracle RAC in a zone environment](#)
- [Known issues](#)
- [Supported configuration](#)
- [Setting up an SF Oracle RAC cluster with Oracle RAC on non-global zones](#)
- [Sample VCS configuration with non-global zones](#)

About Solaris Zones

Solaris Zones is a software partitioning technology, which provides a means of virtualizing operating system services to create an isolated environment for running applications. This isolation prevents processes that are running in one zone from monitoring or affecting processes running in other zones.

[Figure 1-1](#) illustrates the zone configuration in a clustered environment.

Figure 1-1 Zone configuration



Legends

Public Link —————

Storage Link —————

Private Interconnect Links —————

Virtual links ⬅️⋯⋯⋯➡️

In the configuration:

- Global zones A and B are Solaris nodes that use shared storage, each having one public link.
- A non-global zone is installed in each global zone sharing storage and network resources with global zones.
- NIC1, NIC2, NIC3, and NIC4 are network interfaces on the global zones. NIC1 is a public link in global zone while NIC2, NIC3, and NIC4 are interfaces made available to the non-global zone.
- On the non-global zone, NIC2 is a public link while NIC3 and NIC4 are private links.

For more information on zones:

See the *System Administration Guide: Solaris Containers--Resource Management and Solaris Zones* document.

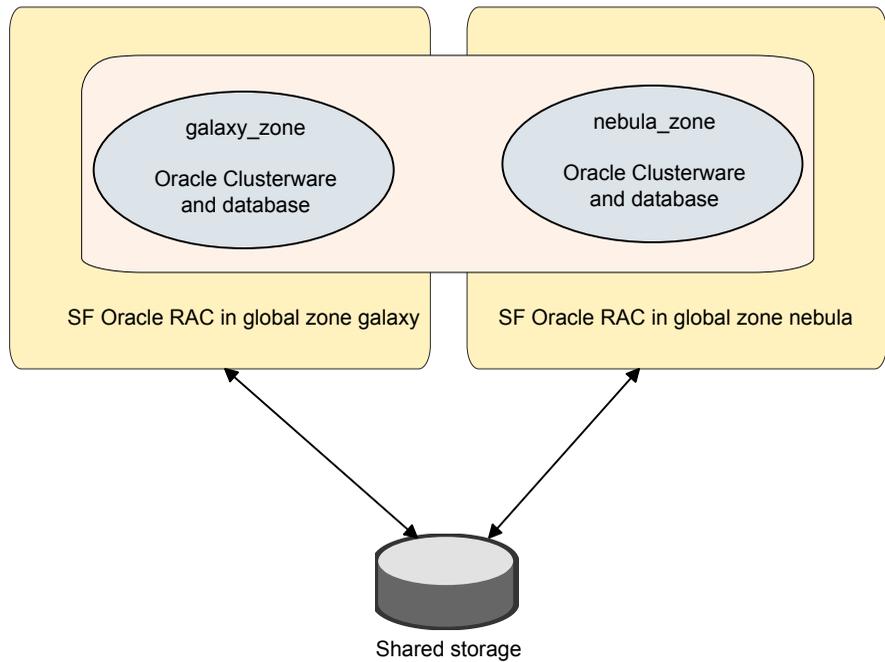
About SF Oracle RAC support for Oracle RAC in a zone environment

SF Oracle RAC and the necessary agents run in the global zone. Oracle RAC runs in the non-global zone. You can configure non-global zones with an exclusive-IP zone. The exclusive-IP zone does not share the network interface with global-zone.

Using SF Oracle RAC, you can start, stop, and monitor a non-global zone and provide high availability to Oracle RAC instances inside the non-global zone.

[Figure 1-2](#) illustrates the SF Oracle RAC configuration in a zone environment.

Figure 1-2 SF Oracle RAC with Oracle RAC in a zone environment



Known issues

This section describes the known issues in supporting SF Oracle RAC in a zone environment.

Issue with VCS agents

If the host name of the non-global zone is different from the name of the non-global zone, you may observe unexpected behavior with the VCS agents configured for the non-global zone.

Workaround: Ensure that the host name of the non-global zone is the same as the name of the non-global zone.

Issue with CSSD agent

The CSSD agent faults if the `BootState` attribute for the zone resource is not set to "multi-user-server".

After you start VCS on one of the nodes in the SF Oracle RAC cluster and the zone resource comes online, the cssd resource tries to bring Oracle Clusterware online. This causes the cssd resource to fault as multi-user services inside the non-global zone are not online after the non-global zone boots. Oracle Clusterware processes require multi user services to be online before they start.

Workaround: Set the `BootState` attribute for the zone resource to "multi-user-server" and restart the service group that contains the cssd and zone resources.

This ensures that the zone resource comes online only after the multi-user services inside the non-global zone are online.

Warning messages displayed when VCS restarts

When you restart VCS, the following warning message is displayed before the multi-user services inside a zone are started:

```
VCS WARNING V-16-10001-14056 (vcssx150)
Zone:vcszonerres:monitor:Zone is running without specified
milestone [multi-user-server] nline - returning offline.
```

You may safely ignore the message.

Supported configuration

The configuration supported by SF Oracle RAC for a zone environment is as follows:

Architecture	Solaris SPARC systems
Oracle RAC version	10.2.0.4 10.2.0.5
Operating system version	Solaris 10
Zone IP address type	Exclusive IP zone

Note: For exclusive IP zone, you need a minimum of three network interfaces for each non-global zone, one as public link and two as private links.

Note: All private interfaces inside a non-global zone must be configured under LLT as private interfaces. It is recommended that the private interfaces configured for a non-global zone be exactly the same in name and total number as those which have been used for LLT configuration in the global zone. However, if you configure a subset of LLT interfaces as private interfaces in non-global zones, Oracle Clusterware will take cluster reconfiguration decisions in the event of network partition.

Setting up an SF Oracle RAC cluster with Oracle RAC on non-global zones

Setting up an SF Oracle RAC cluster with Oracle RAC on non-global zones involves the following steps:

1. Install and configure SF Oracle RAC on global zones.
See [“Installing and configuring SF Oracle RAC on global zones”](#) on page 13.
2. Prepare to install non-global zones.
See [“Preparing to install non-global zones”](#) on page 13.
3. Install non-global zones.
See [“Installing non-global zones”](#) on page 16.
4. Create SF Oracle RAC configuration files inside non-global zones.
See [“Creating SF Oracle RAC configuration files inside non-global zones”](#) on page 17.
5. Enable Oracle Disk Manager file access from non-global zones with Veritas File System.
See [“Enabling Oracle Disk Manager file access from non-global zones with Veritas File System”](#) on page 18.
6. Configure high availability for non-global zones.
See [“Configuring high availability for non-global zones”](#) on page 18.
7. Link the Veritas Membership library.
See [“Linking the Veritas Membership library”](#) on page 20.
8. Install Oracle RAC in non-global zones.
See [“Installing Oracle RAC inside the non-global zones”](#) on page 20.
9. Relink Oracle RAC binaries with SF Oracle RAC libraries.

See [“Relinking the SF Oracle RAC libraries with Oracle RAC libraries”](#) on page 20.

10. Create the Oracle database.

See [“Creating the Oracle database”](#) on page 22.

11. Configure the CSSD agent.

See [“Configuring the CSSD agent for the non-global zone”](#) on page 22.

12. Configure the Oracle agent.

See [“Configuring the Oracle agent for the non-global zone”](#) on page 24.

Installing and configuring SF Oracle RAC on global zones

You need to install and configure SF Oracle RAC 5.0 MP3 RP5 on global zones.

For instructions, see the following documents:

Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide 5.0 Maintenance Pack 3 documentation.

Veritas Storage Foundation and High Availability Solutions Read This First 5.0 Maintenance Pack 3 Rolling Patch 5 documentation.

Preparing to install non-global zones

Note: Ensure that the host name of the non-global zone is the same as the name of the non-global zone. If this convention is violated, you may observe unexpected behavior with the VCS agents configured for the non-global zone.

Perform the following preparatory tasks:

1. Create non-global zones.

For instructions, see the *System Administration Guide: Solaris Containers - Resource Management and Solaris Zones* document.

2. Configure non-global zones to use network interfaces from global zones.

See [“Configuring non-global zones to use network interfaces from global zones”](#) on page 14.

3. Plan the storage for Oracle Cluster Registry, voting disk, and data files.

See [“Planning the storage for Oracle Cluster Registry, voting disk, and data files”](#) on page 14.

4. Configure non-global zones to use devices from global zones.

See “[Configuring non-global zones to use devices from global zones](#)” on page 15.

5. Revise the default set of privileges for non-global zones.

See “[Revising the default set of privileges for non-global zones](#)” on page 16.

Configuring non-global zones to use network interfaces from global zones

Configure the non-global zone to use the network interfaces from the global zone. This is done by adding the required network interfaces to the non-global zones. The interfaces are made available to the zone after the zone is installed and booted.

To configure non-global zones to use network interfaces from global zones

- 1 Log into each global zone as the root user.
- 2 Configure the non-global zone:

```
# zonecfg -z galaxy_zone
```

- 3 Create an exclusive IP zone:

```
# set ip-type=exclusive
```

- 4 Add the network interfaces to the non-global zone from the global zone.

The following is a sample configuration:

```
# zonecfg:galaxy_zone>add net
# zonecfg:galaxy_zone:net>set physical=bge1
# zonecfg:galaxy_zone:net>end
# zonecfg:galaxy_zone:>commit
```

Planning the storage for Oracle Cluster Registry, voting disk, and data files

There are two ways to make global zone file system visible to non-global zones:

- Loop back mount through zone configuration
- Direct mount under non-global zones root directory

[Table 1-1](#) describes the mount types.

Table 1-1 Mount types

Mount types	Description
<p>Loop back mount through zone configuration</p>	<p>A loopback file system allows mounting of directories from the global zone to a non-global zone in read-write mode. Any changes made to the directories in the non-global zone reflect on the global zone. Similarly, changes made to the directories in the global zone reflect on the non-global zone.</p> <p>Mount the following directories as loopback mounts:</p> <ul style="list-style-type: none"> ■ /opt (For accessing SF Oracle RAC binaries) ■ /ocrvote (For OCR and voting disk files) ■ /usr/local/bin (For Oracle utilities) ■ /etc/vx/licenses/lic (For licenses) <p>Oracle RAC directories must be mounted separately as needed. See the Oracle documentation for instructions.</p> <p>Note: If you want to use the database mounts from the global zone as loopback mounts in non-global zones, add them as loopback mounts.</p> <p>The following configuration steps illustrate a loopback-mounted file-system configuration:</p> <pre>galaxy#zonecfg:galaxy_zone> add fs galaxy#zonecfg:galaxy_zone:fs>set dir=/opt galaxy#zonecfg:galaxy_zone:fs>set special=/opt galaxy#zonecfg:galaxy_zone:fs>set type=lofs galaxy#zonecfg:galaxy_zone:fs>end galaxy#zonecfg:galaxy_zone>commit</pre>
<p>Direct mount under non-global zones root directory</p>	<p>Performing a direct mount of storage under the non-global zones root directory makes it available to non-global zones without adding those directories in the zone configuration.</p> <p>You can direct-mount directories such as /ocrvote and database data mounts.</p> <p>For example:</p> <pre># mount -F vxfs -o cluster /dev/vx/dsk/ocrvotedg/ocrvotevol \ /zone/galaxy_zone/root/ocrvote</pre>

Configuring non-global zones to use devices from global zones

Add the following devices from the global zone to the non-global zone:

- /dev/l1t

- /dev/odm/*
- /dev/vcsmm
- /dev/lmx
- /dev/nic_name*

where *nic_name* is the name of the network interface, for example, /dev/bge*.

For example, the steps to add the device /dev/odm/* are as follows:

```
galaxy# zonecfg:galaxy_zone>add device
galaxy# zonecfg:galaxy_zone:device>set match=/dev/odm/*
galaxy# zonecfg:galaxy_zone:device>end
galaxy# zonecfg:galaxy_zone:>commit
```

Revising the default set of privileges for non-global zones

Revise the default set of privileges for non-global zones as follows:

```
galaxy# zonecfg -z galaxy_zone set limitpriv=default,proc_prioctl
```

This setting is required for OCSSD to start in Oracle RAC versions 10.2.0.4 and later.

For more information, see the Oracle Metalink document: 420265.1

Installing non-global zones

After configuring the non-global zone, install the non-global zone.

To install non-global zones

- 1 Log into each global zone as the root user.
- 2 Run the `zoneadm` command with the `install` option:

```
# zoneadm -z galaxy_zone install
Preparing to install zone <galaxy_zone>.
Creating list of files to copy from the global zone.
Copying <2443> files to the zone.
Initializing zone product registry.
Determining zone package initialization order.
Preparing to initialize <1192> packages on the zone.
Initialized <1192> packages on zone.
Zone <galaxy_zone> is initialized.
Installation of <12> packages was skipped.
Installation of these packages generated warnings: <VRTSat>
The file </zone/galaxy_zone/root/var/sadm/system/logs/install_log>
contains a log of the zone installation.
```

You may see some warning messages. These messages can be safely ignored.

- 3 Boot the zone:

```
# zoneadm -z zone_name boot
```
- 4 Update the `/etc/hosts` file of the global and non-global zones. Both the files must contain the IP address and host name information of the global and non-global zones.

Creating SF Oracle RAC configuration files inside non-global zones

Create the `/etc/llthosts` file inside the non-global zones.

In the following example, 0 and 1 are the node IDs for the non-global zones. The node IDs must be the same as that present in the corresponding global zone file.

A sample `/etc/llthosts` file for non-global zones is as follows:

```
# cat /etc/llthosts
0 galaxy_zone
1 nebula_zone
```

A sample `/etc/llthosts` file for global zones is as follows:

```
# cat /etc/llthosts
0 galaxy
1 nebula
```

Enabling Oracle Disk Manager file access from non-global zones with Veritas File System

The ODM files in the global zone are not automatically mounted in the non-global zone after the zone is booted. Perform the following steps to enable access from non-global zones.

To enable Oracle Disk Manager file access from non-global zones with Veritas File System

- 1 Log into each global zone as the root user.
- 2 Create the `/dev/odm` directory in the non-global zone from the global zone:

```
galaxy# mkdir -p /zones/galaxy_zone/dev/odm
```

- 3 Log in to the non-global zone:

```
galaxy# zlogin galaxy_zone
```

Mount `/dev/odm` manually or run the `S92odm start` command. The `/dev/odm` directory is not automatically mounted after a zone is booted.

- Mount `/dev/odm`:

```
galaxy_zone# mount -F odm /dev/odm /dev/odm
```

- Run the `S92odm start` command as follows:

```
galaxy_zone# /etc/rc2.d/S92odm start
```

Configuring high availability for non-global zones

Configure the VCS service group and resource for non-global zones.

To configure high availability for non-global zones

- 1 Log into each global zone and set up the zone configuration:

```
# hazonesetup group_name zonereres_name zone_name \  
password 1 systems
```

where *group_name* is the name of the application service group.

zonereres_name is the name of the resource configured to monitor the zone.

zone_name is the name of the zone.

password is the password assigned to the VCS or security (Symantec Product Authentication Service) user created by the command.

1 indicates that the parallel attribute is set to 1.

systems is the list of systems on which the service group will be configured. Use this option only when you create the service group.

For example:

```
# hazonesetup vcszone vcszonereres galaxy_zone password 1 galaxy nebula
```

If the application service group does not exist, the script creates a service group with a resource of type Zone. The script adds a resource of type Zone to the application service group. It also creates a user account with group administrative privileges to enable inter-zone communication.

- 2 From one of the global zones, perform the following steps:
 - Change the cluster configuration to read-only mode, if not already so:

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

- Stop VCS:

```
# hastop -all -force
```

- Modify the VCS configuration file (`/etc/VRTSvcs/conf/config/main.cf`) and set the following attribute in the zone group as shown in the example:

```
AutoStartList = { galaxy, nebula }
```

- Save the configuration and restart VCS on the global zone where you modified the configuration file:

```
# hastart
```

- 3 Start VCS on the remaining global zones:

```
# hastart
```

Linking the Veritas Membership library

Log into each global zone and run the following command to link the Veritas Membership (VCSMM) library:

```
# ln -s /opt/VRTSvcs/rac/lib/libskgxn2_64.so \  
/opt/ORCLcluster/lib/libskgxn2.so
```

Installing Oracle RAC inside the non-global zones

After the zones boot successfully, install Oracle Clusterware and the Oracle database on non-global zones.

For instructions, see the Oracle documentation.

Relinking the SF Oracle RAC libraries with Oracle RAC libraries

Relink the following libraries:

- VCS IPC library for Oracle RAC 10g installations
See [“Linking the VCS IPC library”](#) on page 20.
- ODM library
See [“Linking the ODM library”](#) on page 21.

Linking the VCS IPC library

Perform this step only for Oracle RAC 10g installations that use VCS IPC.

Perform the steps in the procedure on each node if the Oracle libraries are on local storage. If the Oracle libraries are installed on shared storage, link the library on one node only.

To link the VCS IPC library

- 1 Log in as the Oracle user.
- 2 Change to the `$ORACLE_HOME/lib` directory:

```
$ cd $ORACLE_HOME/lib
```

- 3 Back up Oracle's `libskgxp10` library:

```
$ mv libskgxp10.so libskgxp10.so.`date +%m_%d_%y-%H_%M_%S`
```

- 4 Copy the file Veritas VCS IPC library:

```
$ cp /opt/VRTSvcs/rac/lib/libskgxp10_ver25_64.so libskgxp10.so
```

Linking the ODM library

Perform the steps in the procedure on each node if the Oracle libraries are on local storage. If the Oracle libraries are installed on shared storage, copy the libraries on one node only. Use the mount command to check that the file system containing the Oracle libraries are mounted.

To link the ODM library

- 1 Log in as the Oracle user.
- 2 Change to the `$ORACLE_HOME/lib` directory:

```
galaxy_zone$ cd $ORACLE_HOME/lib
```

- 3 Back up Oracle's ODM library:

```
galaxy_zone$ mv libodm10.so libodm10.so.`date +%m_%d_%y-%H_%M_%S`
```

- 4 Link the Veritas ODM library with Oracle's `libodm` library:

```
galaxy_zone$ ln -s /usr/lib/sparcv9/libodm.so libodm10.so
```

- 5 Confirm that the correct ODM library is used:

```
galaxy_zone$ ldd $ORACLE_HOME/bin/oracle | grep odm
```

Note: If the library is not linked correctly, no output is displayed.

- 6 Sometimes, the Oracle ODM library may not be correctly linked with the Veritas ODM library because of the presence of a static ODM library at `$ORACLE_HOME/rdbms/lib/libodm.a`. This is a known issue with Oracle. To resolve this issue, run the following commands:

```
galaxy_zone$ cd $ORACLE_HOME/rdbms/lib
galaxy_zone$ mv libodm10.a libodm10.a.backup
galaxy_zone$ /usr/ccs/bin/make -f ins_rdbms.mk ioracle
```

Verify that the correct ODM library is used:

```
galaxy_zone$ ldd $ORACLE_HOME/bin/oracle | grep odm
libodm10.so => /app/oracle/orahome/lib/libodm10.so
```

For more information, see the Oracle metalink document: 725903.1

Creating the Oracle database

Create the Oracle RAC database in the non-global zone. For information, see the Oracle RAC documentation.

Configuring the CSSD agent for the non-global zone

You must configure the CSSD agent for the non-global zones.

To configure the CSSD agent for the non-global zones

- 1 Disable Oracle Clusterware from starting automatically on all non-global zones:

```
# $CRS_HOME/bin/crsctl disable crs
```

- 2 From one of the global zones, set the `BootState` attribute for the zone resource to "multi-user-server" as follows:

```
# haconf -makerw
# hares -modify vcszoneress BootState multi-user-server
```

- 3 From one of the global zones, update the zone group and set appropriate dependencies for the CSSD agent as follows:

```
# hares -add cssd Application vcszone
Resource added. Enabled attribute must be set before agent monitors
# hares -modify cssd StartProgram /opt/VRTSvcs/rac/bin/cssd-online
# hares -modify cssd StopProgram /opt/VRTSvcs/rac/bin/cssd-offline
# hares -modify cssd MonitorProgram /opt/VRTSvcs/rac/bin/cssd-monitor
# hares -modify cssd CleanProgram /opt/VRTSvcs/rac/bin/cssd-clean
# hares -local cssd ContainerName
# hares -modify cssd ContainerName galaxy_zone -sys galaxy
# hares -modify cssd ContainerName nebula_zone -sys nebula
```

- If you use direct mount for the OCR and voting disk storage, set the following dependencies:

```
# hares -link cssd ora_priv
# hares -link cssd ocrvotemnt
```

- If you use loopback mount for the OCR and voting disk storage, set the following dependencies:

```
# hares -link cssd ora_priv
# hares -link cssd vcszoneress

# hares -modify cssd Critical 0
# hares -modify cssd Enabled 1
# haconf -dump -makero
```

For more information:

See [“Sample VCS configuration with non-global zones”](#) on page 24.

Configuring the Oracle agent for the non-global zone

Refer to the following sample configuration file to configure the Oracle agent.

See “[Sample VCS configuration with non-global zones](#)” on page 24.

Note: After you configure the Oracle agent, prevent the Oracle database from starting automatically by changing the management policy for the database to manual:

```
$ srvctl modify database -d db-name -y manual
```

Sample VCS configuration with non-global zones

This section illustrates sample VCS configurations for non-global zones.

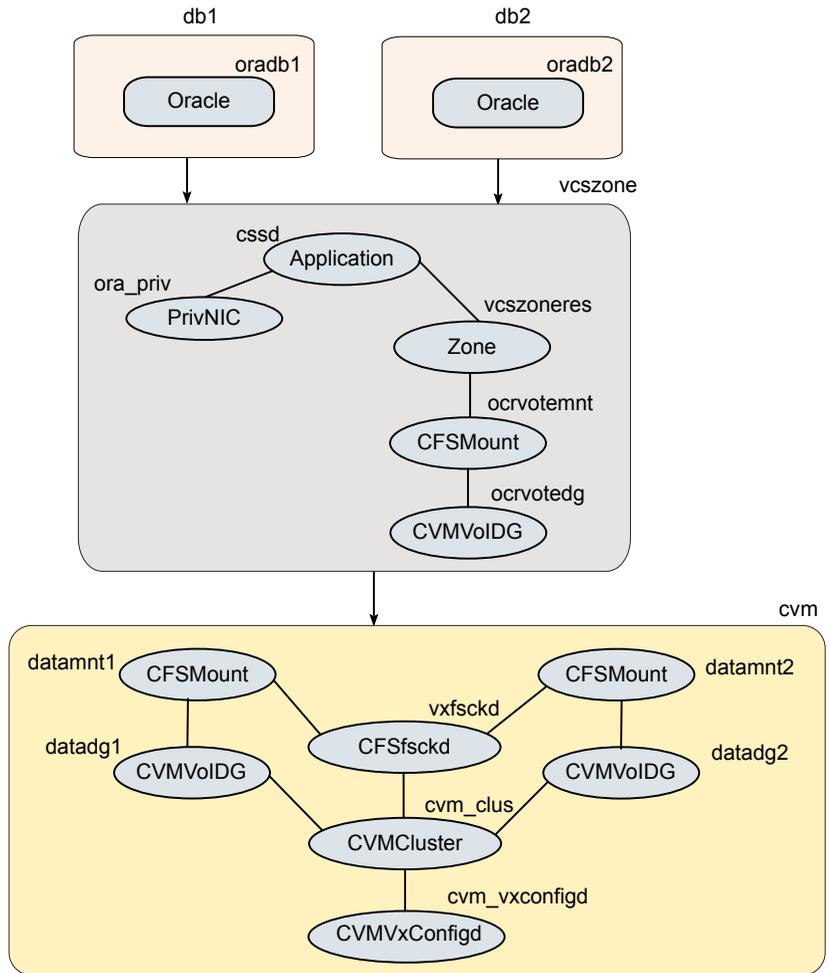
- Multiple databases with loopback data mounts
See “[Multiple databases with loopback data mounts](#)” on page 24.
- Multiple databases with direct data mounts
See “[Multiple databases with direct data mounts](#)” on page 30.

Multiple databases with loopback data mounts

Note: All the data mounts must be present when the CVM group comes online.

[Figure 1-3](#) illustrates the sample configuration for multiple databases with loopback data mounts.

Figure 1-3 Multiple databases with loopback data mounts



The sample `main.cf` file for the configuration is as follows:

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

```
cluster sf1832zn (
    UserNames = { admin = aLMeLG1IMhMMkUMgLJ,
                 z_vcszonerer_galaxy = gpmLnoMsoNojNkpLom,
                 z_vcszonerer_nebula = eLKjJiKOMkLS1OJmJQ }
    Administrators = { admin }
    UseFence = SCSI3
    HacliUserLevel = COMMANDROOT
)

system galaxy (
)

system nebula (
)

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

CFSfsckd vxfsckd (
)

CVMcluster cvm_clus (
    CVMClustName = sf1832zn
    CVMNodeId = { galaxy = 0, nebula = 1 }
    CVMTransport = gab
    CVMTimeout = 200
)

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

CFMount datamnt1 (
    Critical = 0
    MountPoint = "/datamnt1"
    BlockDevice = "/dev/vx/dsk/datadg1/datavol1"
)
```

```

CFSMount datamnt2 (
    Critical = 0
    MountPoint = "/datamnt2"
    BlockDevice = "/dev/vx/dsk/datadg2/datavol2"
)

CVMVolDg datadg1 (
    Critical = 0
    CVMDiskGroup = datadg1
    CVMVolume = { datavol1 }
    CVMActivation = sw
)

CVMVolDg datadg2 (
    Critical = 0
    CVMDiskGroup = datadg2
    CVMVolume = { datavol2 }
    CVMActivation = sw
)

cvm_clus requires cvm_vxconfigd
vxfscsd requires cvm_clus
datadg1 requires cvm_clus
datadg2 requires cvm_clus
datamnt1 requires datadg1
datamnt2 requires datadg2
datamnt1 requires vxfscsd
datamnt2 requires vxfscsd

group vcszone (
    SystemList = { galaxy = 0, nebula = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszonerer_galaxy, z_vcszonerer_nebula }
)

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

```

```
        ContainerName @galaxy = galaxy_zone
        ContainerName @nebula = nebula_zone
    )

    CFMount ocrvotemnt (
        Critical = 0
        MountPoint = "/ocrvote"
        BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
    )

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

    PrivNIC ora_priv (
        Critical = 0
        Device @galaxy = { bge2 = 0, bge3 = 1 }
        Device @nebula = { bge2 = 0, bge3 = 1 }
        Address @galaxy = "192.168.12.1"
        Address @nebula = "192.168.12.2"
        NetMask = "255.255.255.0"
        ContainerName @galaxy = galaxy_zone
        ContainerName @nebula = nebula_zone
    )

    Zone vcszonerer (
        ZoneName @galaxy = galaxy_zone
        ZoneName @nebula = nebula_zone
        BootState = multi-user-server
    )

requires group cvm online local firm
ocrvotemnt requires ocrvotedg
cssd requires ora_priv
cssd requires vcszonerer
vcszonerer requires ocrvotemnt

group db1 (
    SystemList = { galaxy = 0, nebula = 1 }
    AutoFailOver = 0
)
```

```

Parallel = 1
Administrators = { z_vcszoneres_galaxy, z_vcszoneres_nebula }
)

Oracle oradb1 (
    Critical = 0
    Sid @galaxy = zonedb1
    Sid @nebula = zonedb2
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
    MonitorOption = 1
    ContainerName @galaxy = galaxy_zone
    ContainerName @nebula = nebula_zone
)

requires group vcszone online local firm

group db2 (
    SystemList = { galaxy = 0, nebula = 1 }
    AutoFailOver = 0
    Parallel = 1
    Administrators = { z_vcszoneres_galaxy, z_vcszoneres_nebula }
)

Oracle oradb2 (
    Critical = 0
    Sid @galaxy = zonedb3
    Sid @nebula = zonedb4
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
    MonitorOption = 1
    ContainerName @galaxy = galaxy_zone
    ContainerName @nebula = nebula_zone
)

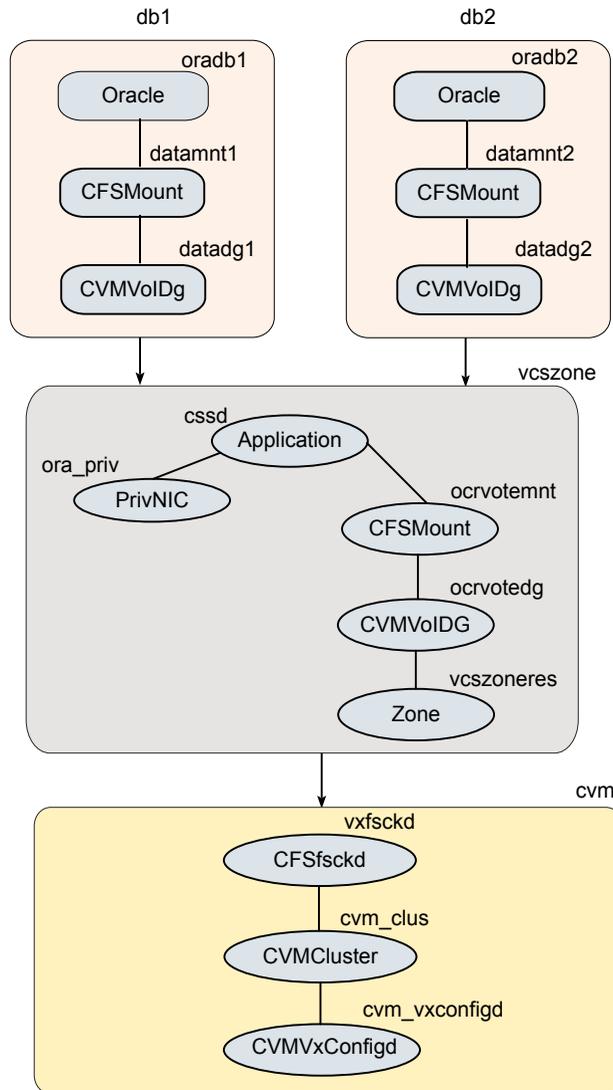
requires group vcszone online local firm

```

Multiple databases with direct data mounts

Figure 1-4 illustrates a sample configuration for multiple databases with direct data mounts.

Figure 1-4 Multiple databases with direct data mounts



The sample `main.cf` file is as follows:

```

include "OracleASMTypes.cf"
include "types.cf"
include "CFSTypes.cf"
include "CVMTypes.cf"
include "MultiPrivNIC.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster sf1832zn (
    UserNames = { admin = aLMeLG1IMhMMkUMg1J,
                  z_vcszonerer_galaxy = gpmLnoMsoNojNkpLom,
                  z_vcszonerer_nebula = eLKjJIKOMkLS1OJmJQ }
    Administrators = { admin }
    UseFence = SCSI3
    HacliUserLevel = COMMANDROOT
)

system galaxy (
)

system nebula (
)

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

CFSfsckd vxfsckd (
)

CVMcluster cvm_clus (
    CVMClustName = sf1832zn
    CVMNodeId = { galaxy = 0, nebula = 1 }
    CVMTransport = gab
    CVMTimeout = 200
)

CVMvxconfigd cvm_vxconfigd (
    Critical = 0
)

```

```
        CVMVxconfigdArgs = { syslog }
    )

cvm_clus requires cvm_vxconfigd
vxfsckd requires cvm_clus

group vcszone (
    SystemList = { galaxy = 0, nebula = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszonereres_galaxy, z_vcszonereres_nebula }
)

Application cssd (
    Critical = 0
    StartProgram = "/opt/VRTSvcs/rac/bin/cssd-online"
    StopProgram = "/opt/VRTSvcs/rac/bin/cssd-offline"
    CleanProgram = "/opt/VRTSvcs/rac/bin/cssd-clean"
    MonitorProgram = "/opt/VRTSvcs/rac/bin/cssd-monitor"
    ContainerName @galaxy = galaxy_zone
    ContainerName @nebula = nebula_zone
)

CFMount ocrvotemnt (
    Critical = 0
    MountPoint @galaxy = "/zone/galaxy_zone/root/ocrvote"
    MountPoint @nebula = "/zone/nebula_zone/root/ocrvote"
    BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
)

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

PrivNIC ora_priv (
    Critical = 0
    Device @galaxy = { bge2 = 0, bge3 = 1 }
    Device @nebula = { bge2 = 0, bge3 = 1 }
    Address @galaxy = "192.168.12.1"
```

```

        Address @nebula = "192.168.12.2"
        NetMask = "255.255.255.0"
        ContainerName @galaxy = galaxy_zone
        ContainerName @nebula = nebula_zone
    )

Zone vcszonereres (
    ZoneName @galaxy = galaxy_zone
    ZoneName @nebula = nebula_zone
    BootState = multi-user-server
)

requires group cvm online local firm
ocrvotemnt requires ocrvotedg
cssd requires ocrvotemnt
ocrvotedg requires vcszonereres
cssd requires ora_priv

group db1 (
    SystemList = { galaxy = 0, nebula = 1 }
    AutoFailOver = 0
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszonereres_galaxy, z_vcszonereres_nebula }
)

Oracle oradb1 (
    Critical = 0
    Sid @galaxy = zonedb1
    Sid @nebula = zonedb2
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
    ContainerName @galaxy = galaxy_zone
    ContainerName @nebula = nebula_zone
)

CFSMount datamnt1 (
    Critical = 0
    MountPoint @galaxy = "/zone/galaxy_zone/root/datamnt1"
    MountPoint @nebula = "/zone/nebula_zone/root/datamnt1"
    BlockDevice = "/dev/vx/dsk/datadg1/datavol1"
)

```

```
CVMVolDg datadg1 (
    Critical = 0
    CVMDiskGroup = datadg1
    CVMVolume = { datavol1 }
    CVMActivation = sw
)

requires group vcszone online local firm
oradb1 requires datamnt1
datamnt1 requires datadg1

group db2 (
    SystemList = { galaxy = 0, nebula = 1 }
    AutoFailOver = 0
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszonerres_galaxy, z_vcszonerres_nebula }
)

Oracle oradb2 (
    Critical = 0
    Sid @galaxy = zonedb1
    Sid @nebula = zonedb2
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
    ContainerName @galaxy = galaxy_zone
    ContainerName @nebula = nebula_zone
)

CFSMount datamnt2 (
    Critical = 0
    MountPoint @galaxy = "/zone/galaxy_zone/root/datamnt2"
    MountPoint @nebula = "/zone/nebula_zone/root/datamnt2"
    BlockDevice = "/dev/vx/dsk/datadg2/datavol2"
)

CVMVolDg datadg2 (
    Critical = 0
    CVMDiskGroup = datadg2
```

```
CVMVolume = { datavol2 }  
CVMActivation = sw  
)
```

```
requires group vcszone online local firm  
datamnt2 requires datadg2  
oradb2 requires datamnt2
```

