

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

Solaris

5.1 Service Pack 1 Rolling Patch 2

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

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Setting up SF Oracle RAC in a zone environment

This document includes the following topics:

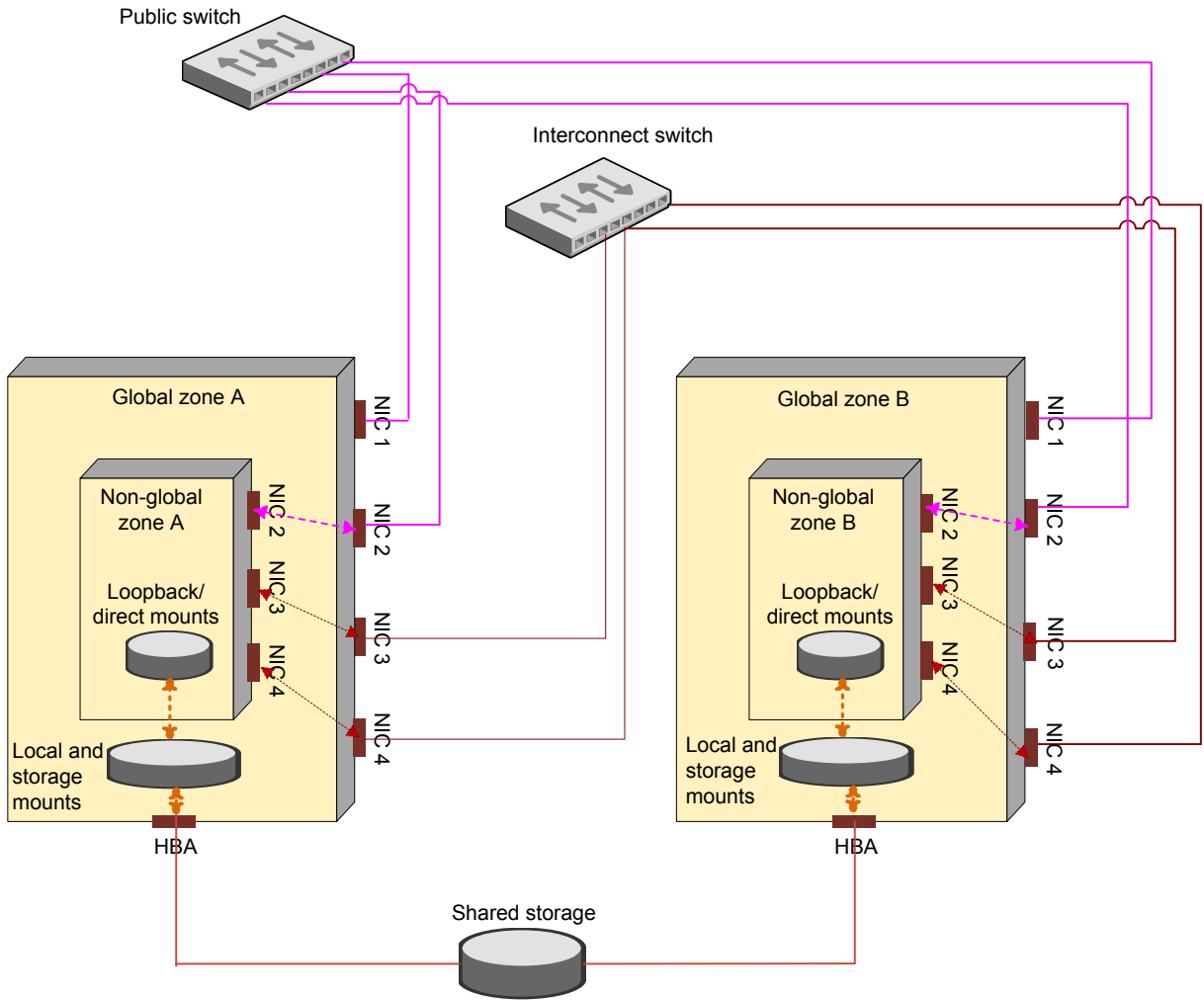
- [About Solaris Zones](#)
- [About SF Oracle RAC support for Oracle RAC in a zone environment](#)
- [Known issues](#)
- [Supported configuration](#)
- [Setting up an SF Oracle RAC cluster with Oracle RAC on non-global zones](#)
- [Sample VCS configuration with non-global zones](#)

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 each non-global zone, at least one public network interface and two private network interfaces are required.

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

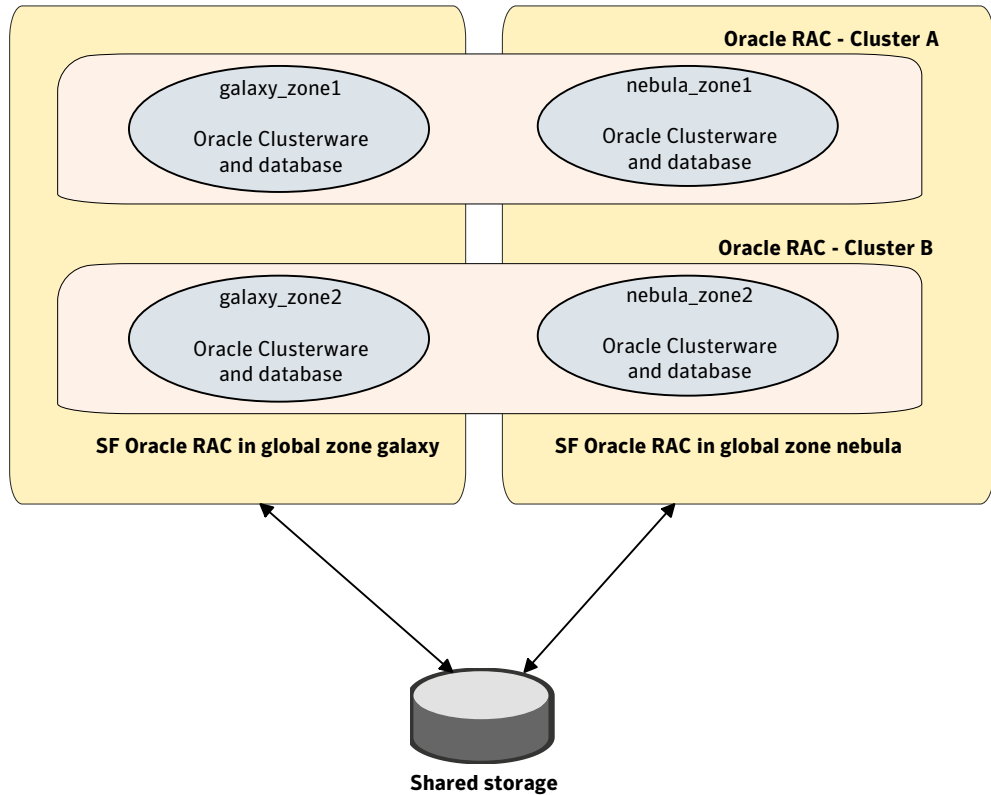
This release supports the installation and configuration of two non-global zones in each global zone.

SF Oracle RAC and the necessary agents run in the global zone. Oracle RAC runs in the non-global zone. You must 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 CFS mounts

Attempts to mount the CFS mounts on a global zone, after they are unmounted using the `hares` or `umount` command, fail with the following error if the CFS mounts on the global zone are mounted on a non-global zone as an lofs file system:

```
VCS WARNING V-16-20011-5508 (galaxy)
CFSMount:ocrvote_mnt:online:Mount Error :
UX:vxfs mount: ERROR: V-3-21264:
/dev/vx/dsk/ocrvotedg/ocrvotevol is already mounted,
/ocrvote is busy,allowable number
of mount points exceeded
```

Workaround:

Perform the following steps to resolve the issue:

1. Log into the global zone as the root user.
2. View the CFS and lofs mounts that are unmounted on the global zone:

```
# cat /etc/mnttab |grep mount_point
```

For example:

```
# cat /etc/mnttab |grep ocrvote/ocrvote \
/zonevol/galaxy_zone/root/ocrvote lofs \
dev=53859d8 12971587943
```

3. Unmount the CFS and lofs mounts:

```
# umount /zonevol/galaxy_zone/root/mount_point
```

4. Check if there are any active CFS and lofs mounts:

```
# cat /etc/mnttab |grep mount_point
```

5. Mount the CFS and lofs mounts in one of the following ways on the global zone.

Using `hares` command:

```
# hares -online res_name -sys sys_name
```

Manually:

```
# mount -F vxfs -o cluster /dev/vx/dsk/\
dg_name/vol_name /mount_point
```

6. Verify if the CFS mounts are mounted successfully:

```
# cat /etc/mnttab |grep mount_point
```

For example:

```
# cat /etc/mnttab |grep ocrvote/dev/vx/dsk/ocrvotedg/ocrvotevol \  
/ocrvote vxfsrw,suid,delaylog,largefiles,qio,cluster,\  
ioerror=mdisable,crw,dev=53859d8 1297159501
```

Stopping non-global zones configured with direct-mount file systems from outside VCS causes the corresponding zone resource to fault or go offline

Stopping non-global zones, which are configured with direct-mount file systems, from outside VCS causes the corresponding zone resource to fault or to go offline. The status of the zone shows `down` and the corresponding zone resource faults or goes offline. As a result, VCS cannot bring the zone resource online.

Workaround:

1. Log into the global zone as the root user.
2. Unmount the CFS mount points that were in use by the zone and are still mounted:

```
# umount -o mntunlock=VCS /mount_point
```

3. Stop the zone:

```
# zoneadm -z zone_name halt
```

This changes the status of the non-global zone to `installed` or `configured`.

MultiPrivNIC agent reports error messages in the VCS engine log files when a non-global zone goes down

When a non-global zone goes down, the MultiPrivNIC agent fails to get active device information. The agent prints a corresponding message without specifying the message ID. As a result, the following warning message is displayed:

```
VCS WARNING V-16-1-11328 Invalid message ID specified
```

You may ignore this message.

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 (galaxy)
Zone:vcszonereres:monitor:Zone is running without specified
milestone [multi-user-server] nline - returning offline.
```

You may safely ignore the message.

Error message displayed for PrivNIC resource if zone is not running

If the PrivNIC resource is configured for a zone in a non-global zone environment and the respective zone is not running, the following error message is displayed in the VCS engine log file `/var/VRTSvcs/log/engine_*.log`:

```
VCS ERROR V-16-20035-0 (galaxy)
PrivNIC:ora_priv:monitor:Zone [zone1] not running.
```

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 11.2.0.1
Operating system version	Solaris 10 Update 6, Update 7, Update 8, and Update 9
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. If you plan to have only one non-global zone cluster across global zones, 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 15.
2. Prepare to install non-global zones.
See [“Preparing to install non-global zones”](#) on page 15.
3. Install non-global zones.
See [“Installing non-global zones”](#) on page 20.
4. Create SF Oracle RAC configuration files inside non-global zones.
See [“Creating SF Oracle RAC configuration files inside non-global zones”](#) on page 21.
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 21.
6. Configure high availability for non-global zones.
See [“Configuring high availability for non-global zones”](#) on page 22.
7. Configure the cluster name for clustering non-global zones.
See [“Configure the cluster name for clustering non-global zones”](#) on page 23.
8. Install Oracle RAC in non-global zones.
See [“Installing Oracle RAC inside the non-global zones”](#) on page 23.
9. Relink Oracle RAC binaries with SF Oracle RAC libraries.

See [“Relinking the SF Oracle RAC libraries with Oracle RAC libraries”](#) on page 24.

10. Create the Oracle database.

See [“Creating the Oracle database”](#) on page 26.

11. Configure the non-global zones under VCS.

See [“Configuring non-global zones under VCS”](#) on page 26.

Installing and configuring SF Oracle RAC on global zones

You need to install and configure SF Oracle RAC 5.1 SP1 RP2 on global zones.

For instructions, see the following documents:

Veritas Storage Foundation for Oracle RAC Installation and Configuration Guide 5.1 Service Pack 1 documentation.

Veritas Storage Foundation and High Availability Solutions Read This First 5.1 Service Pack 1 Rolling Patch 2 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. After creating non-global zones, set the zone path.

For example:

```
# zonecfg -z galaxy_zone
zonecfg:galaxy_zone> set zonepath=/zone/galaxy_zone
zonecfg:galaxy_zone> commit
```

where `galaxy_zone` is the name of the non-global zone and `/zone/galaxy_zone` is the zone path.

3. Update the file system configuration for non-global zones by adding the following SF Oracle RAC directories as loop-back mounts:

```
/opt (For accessing SF Oracle RAC binaries)
/usr/local/bin ( For Oracle utilities)
/etc/vx/licenses/lic (For SF Oracle RAC licenses)
```

For example:

```
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
```

4. 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 16.
5. 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 17.
6. Configure non-global zones to use devices from global zones.
See [“Configuring non-global zones to use devices from global zones”](#) on page 19.
7. Revise the default set of privileges for non-global zones.
See [“Revising the default set of privileges for non-global zones”](#) on page 19.

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.

Note: If you have installed two non-global zones in each global zone, ensure that you do not use the same interface on both non-global zones.

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=bgel
# 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
Loop back mount through zone configuration	<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"> ■ /ocrvote (For OCR and voting disk files) ■ /oradata (For data files) <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 for /ocrvote:</p> <pre>galaxy#zonecfg:galaxy_zone> add fs galaxy#zonecfg:galaxy_zone:fs>set dir=/ocrvote galaxy#zonecfg:galaxy_zone:fs>set special=/ocrvote galaxy#zonecfg:galaxy_zone:fs>set type=lofs galaxy#zonecfg:galaxy_zone:fs>end galaxy#zonecfg:galaxy_zone>commit</pre>
Direct mount under non-global zones root directory	<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, /oradata 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>

Note: Set the CVMVolDg resource attribute `CVMDeactivateOnOffline` to 1 for the shared disk groups that are created for data files.

For example:

```
# haconf -makerw# hares -modify ocrvote_voldg CVMDeactivateOnOffline
1# haconf -dump -makero
```

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/bge1`.

Ensure that you include all the public and private network interfaces configured for each non-global zone.

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:

1. For Oracle RAC 10g Release 2: The following setting is required for OCSSD to start in Oracle RAC versions 10.2.0.4 and later.

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

2. For Oracle RAC 11.2.0.1: The following setting is required for Oracle Grid Infrastructure CTSSD to start:

```
galaxy# zonecfg -z galaxy_zone set limitpriv="default, \
proc_prioctl,proc_clock_highres,sys_time"
```

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 related to the VRTS packages. 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.

- 5 Configure the non-global zone to run in multi-user mode.

After the non-global zone boots up, log in to the non-global zone console and configure all the required services. The following services are mandatory for SF Oracle RAC to function:

```
multi-user  
multi-user-server
```

Use the following command to log in to the non-global zone console:

```
# zlogin -C galaxy_zone
```

To configure the required services, see the *System Administration Guide: Solaris Containers - Resource Management and Solaris Zones* document.

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. The `/dev/odm` directory is not automatically mounted after a zone is booted. Perform this operation after each reboot of the non-global zone otherwise the Oracle database fails to start after the system boots up.

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

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

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

```
# hazonesetup group_name zonerres_name zone_name \  
password autostart parallel systems
```

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

zonerres_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.

autostart is the value for the AutoStart attribute. Set the value to 1.

parallel is the value for the Parallel attribute. Set the value 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 vcszonerres galaxy_zone password 1 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.

Configure the cluster name for clustering non-global zones

Create the `/etc/cluster_name` file and provide a unique cluster name. Use this unique cluster name when you are prompted to provide the name of the cluster during Oracle Clusterware installation.

Note: This is a critical file that must be created for supporting multiple non-global zones on a global zone. Issues may be observed if the cluster name is not provided while configuring a non-global zone.

Installing Oracle RAC inside the non-global zones

Install Oracle Clusterware and the Oracle database on non-global zones.

For instructions, see the Oracle documentation.

Note: Do not create the database at this stage.

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 24.
- ODM library
See “[Linking the ODM library](#)” on page 24.

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.

For Oracle RAC 10g:

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

For Oracle RAC 11g:

```
galaxy_zone$ mv libodm11.so libodm11.so.`date +%m_%d_%y-%H_%M_%S`
```

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

For Oracle RAC 10g:

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

For Oracle RAC 11g:

```
galaxy_zone$ ln -s /usr/lib/sparcv9/libodm.so libodm11.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 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<version>.a`, where `<version>` is the Oracle database version. 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 non-global zones under VCS

Configure the non-global zones to be managed by VCS.

To configure the non-global zones under VCS

- 1 Stop VCS:

```
# hastop -all force
```

- 2 Update the existing configuration file on one of the nodes.

Refer to the following sample configuration file to update the Oracle `main.cf` file.

See “[Sample VCS configuration with non-global zones](#)” on page 27.

- 3 Start VCS on the same node:

```
# hastart
```

- 4 Start VCS on the remaining nodes:

```
# hastart
```

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

```
# clus_home/bin/crsctl disable crs
```

where *clus_home* is the full path to the \$CRS_HOME or \$GRID_HOME directory depending on the Oracle RAC version.

- 6 If the database is configured under VCS control, change the management policy for the database from automatic to manual to prevent the Oracle database from starting automatically:

```
# $ORACLE_HOME/bin/srvctl modify database -d db_name -y manual
```

- 7 Set the attribute `Critical` to `1` for the `cssd` resource and the `oracle` resource:

```
# haconf -makerw  
# hares -modify resource_name Critical 1  
# haconf -dump -makero
```

If you have two or more zones running on a system, set the attribute to 1 for each `cssd` and `Oracle` resource.

Sample VCS configuration with non-global zones

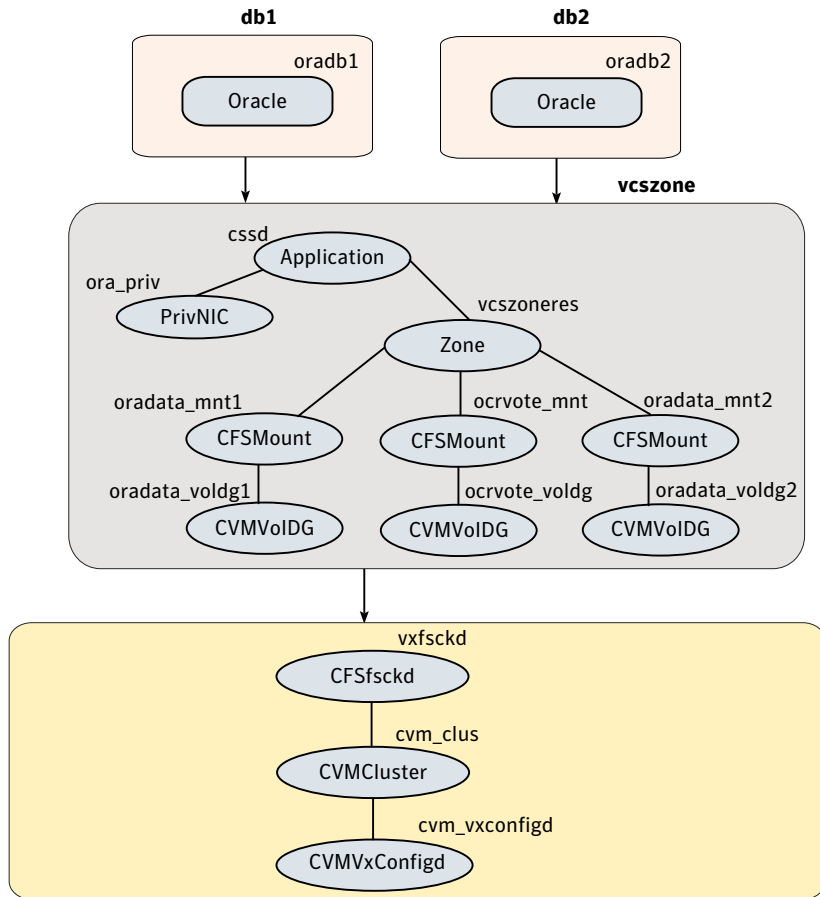
This section illustrates sample VCS configurations for non-global zones.

- Multiple databases with loopback data mounts
See [“Multiple databases with loopback data mounts”](#) on page 28.
- Multiple databases with direct data mounts
See [“Multiple databases with direct data mounts”](#) on page 33.
- Multiple databases with loopback and direct data mounts
See [“Multiple databases on multiple non-global zones”](#) on page 38.

Multiple databases with loopback data mounts

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 "CRSResource.cf"
include "CVMTypes.cf"
include "MultiPrivNIC.cf"
```

```
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster sfraczone (
    UserNames = { admin = aLMeLGlIMhMMkUMgLJ,
                  z_vcszonereres_galaxy = INOmNKnK,
                  z_vcszonereres_nebula = aPQoPMpM }
    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 = sfraczone
    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 db1 (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula}
    Administrators = { z_vcszoneres_galaxy, z_vcszoneres_nebula }
)

Oracle oradb1 (
    Critical = 1
    Sid @galaxy = db11
    Sid @nebula = db12
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone online local firm

group db2 (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula}
    Administrators = { z_vcszoneres_galaxy, z_vcszoneres_nebula }
)

Oracle oradb2 (
    Critical = 1
    Sid @galaxy = db21
    Sid @nebula = db22
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone online local firm

group vcszone (
```

```

SystemList = { galaxy = 0, nebula = 1 }
ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
Parallel = 1
AutoStartList = { galaxy, nebula }
Administrators = { z_vcszonereres_galaxy, z_vcszonereres_nebula }
)

Application cssd (
    Critical = 1
    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"
)

CFSMount ocrvote_mnt (
    Critical = 0
    MountPoint @galaxy = "/ocrvote"
    MountPoint @nebula = "/ocrvote"
    BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
    MountOpt = "mincache=direct"
)

CVMVolDg ocrvote_voldg (
    Critical = 0
    CVMDiskGroup = ocrvotedg
    CVMVolume = { ocrvotevol }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

CFSMount oradata_mnt1 (
    Critical = 0
    MountPoint @galaxy = "/db1"
    MountPoint @nebula = "/db1"
    BlockDevice = "/dev/vx/dsk/db1dg/db1vol"
)

CVMVolDg oradata_voldg1 (
    Critical = 0

```

```
        CVMDiskGroup = dbldg
        CVMVolume = { dblv01 }
        CVMActivation = sw
        CVMDeactivateOnOffline = 1
    )

CFMount oradata_mnt2 (
    Critical = 0
    MountPoint @galaxy = "/db2"
    MountPoint @nebula = "/db2"
    BlockDevice = "/dev/vx/dsk/db2dg/db2v01"
)

CVMVolDg oradata_voldg2 (
    Critical = 0
    CVMDiskGroup = db2dg
    CVMVolume = { db2v01 }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

PrivNIC ora_priv (
    Critical = 0
    Device @galaxy = { bge2 = 0, bge3 = 1 }
    Device @nebula = { bge2 = 0, bge3 = 1 }
    Address @galaxy = "192.168.1.12"
    Address @nebula = "192.168.1.13"
    NetMask = "255.255.255.0"
)

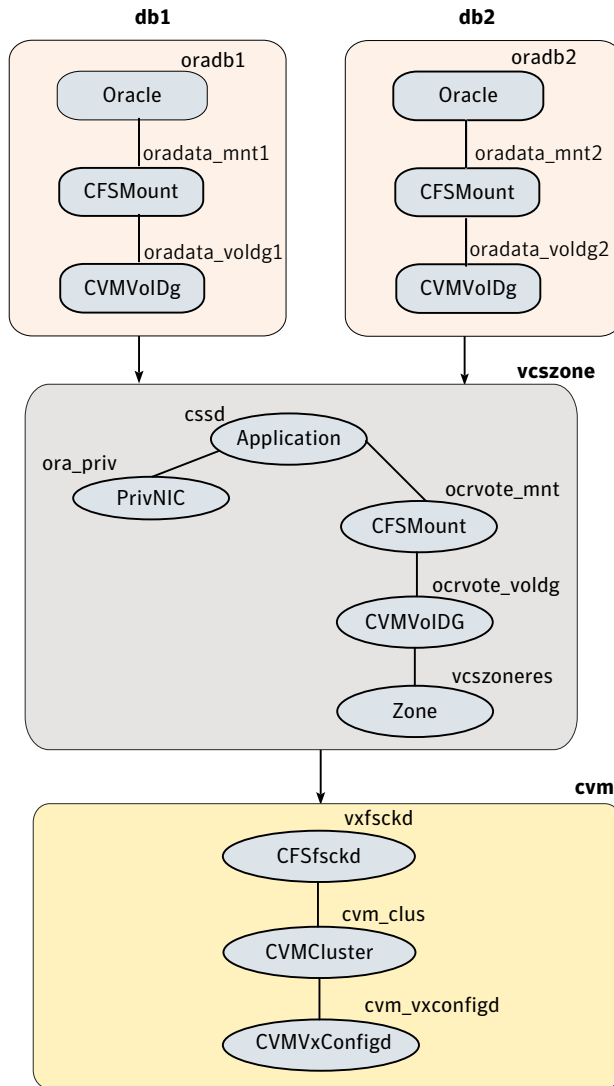
Zone vcszoner (
)

requires group cvm online local firm
cssd requires ora_priv
cssd requires vcszoner
ocrvote_mnt requires ocrvote_voldg
oradata_mnt1 requires oradata_voldg1
oradata_mnt2 requires oradata_voldg2
vcszoner requires ocrvote_mnt
vcszoner requires oradata_mnt1
vcszoner requires oradata_mnt2
```


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 "CRSResource.cf"
include "CVMTypes.cf"
include "MultiPrivNIC.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster sfraczone (
    UserNames = { admin = aLMeLGlIMhMMkUMgLJ,
                  z_vcszonereres_galaxy = INOmNKnK,
                  z_vcszonereres_nebula = aPQoPMpM }
    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 = sfraczone
    CVMNodeId = { galaxy = 0, nebula = 1 }
    CVMTransport = gab
    CVMTimeout = 200
)

CVMVxconfigd cvm_vxconfigd (
    Critical = 0
)
```

```

        CVMVxconfigdArgs = { syslog }
    )

cvm_clus requires cvm_vxconfigd
vxfscsd requires cvm_clus

group db1 (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszonereres_galaxy, z_vcszonereres_nebula }
)

CFSSMount oradata_mnt1 (
    Critical = 0
    MountPoint @galaxy = "/zones/galaxy_zone/root/db1"
    MountPoint @nebula = "/zones/nebula_zone/root/db1"
    BlockDevice = "/dev/vx/dsk/db1dg/db1vol"
)

CVMVolDg oradata_voldg1 (
    Critical = 0
    CVMDiskGroup = db1dg
    CVMVolume = { db1vol }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

Oracle oradb1 (
    Critical = 1
    Sid @galaxy = db11
    Sid @nebula = db12
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone online local firm
oradata_mnt1 requires oradata_voldg1

```

```
oradb1 requires oradata_mnt1

group db2 (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula }
    Administrators = { z_vcszoneres_galaxy, z_vcszoneres_nebula }
)

CFSMount oradata_mnt2 (
    Critical = 0
    MountPoint @galaxy = "/zones/galaxy_zone/root/db2"
    MountPoint @nebula = "/zones/nebula_zone/root/db2"
    BlockDevice = "/dev/vx/dsk/db2dg/db2vol"
)

CVMVolDg oradata_voldg2 (
    Critical = 0
    CVMDiskGroup = db2dg
    CVMVolume = { db2vol }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

Oracle oradb2 (
    Critical = 1
    Sid @galaxy = db21
    Sid @nebula = db22
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone online local firm
oradata_mnt2 requires oradata_voldg2
oradb2 requires oradata_mnt2

group vcszone (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone, Type = Zone, Enabled = 1 }
```

```

ContainerInfo @nebula = { Name = nebula_zone, Type = Zone, Enabled = 1 }
Parallel = 1
AutoStartList = { galaxy, nebula }
Administrators = { z_vcszonereres_galaxy, z_vcszonereres_nebula }
)

Application cssd (
    Critical = 1
    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"
)

CFSMount ocrvote_mnt (
    Critical = 0
    MountPoint @galaxy = "/zones/galaxy_zone/root/ocrvote"
    MountPoint @nebula = "/zones/nebula_zone/root/ocrvote"
    BlockDevice = "/dev/vx/dsk/ocrvotedg/ocrvotevol"
    MountOpt = "mincache=direct"
)

CVMVolDg ocrvote_voldg (
    Critical = 0
    CVMDiskGroup = ocrvotedg
    CVMVolume = { ocrvotevol }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

PrivNIC ora_priv (
    Critical = 0
    Device @galaxy = { bge0 = 0, bge1 = 1 }
    Device @nebula = { bge0 = 0, bge1 = 1 }
    Address @galaxy = "192.168.1.7"
    Address @nebula = "192.168.1.8"
    NetMask = "255.255.255.0"
)

Zone vcszonereres (
)

requires group cvm online local firm

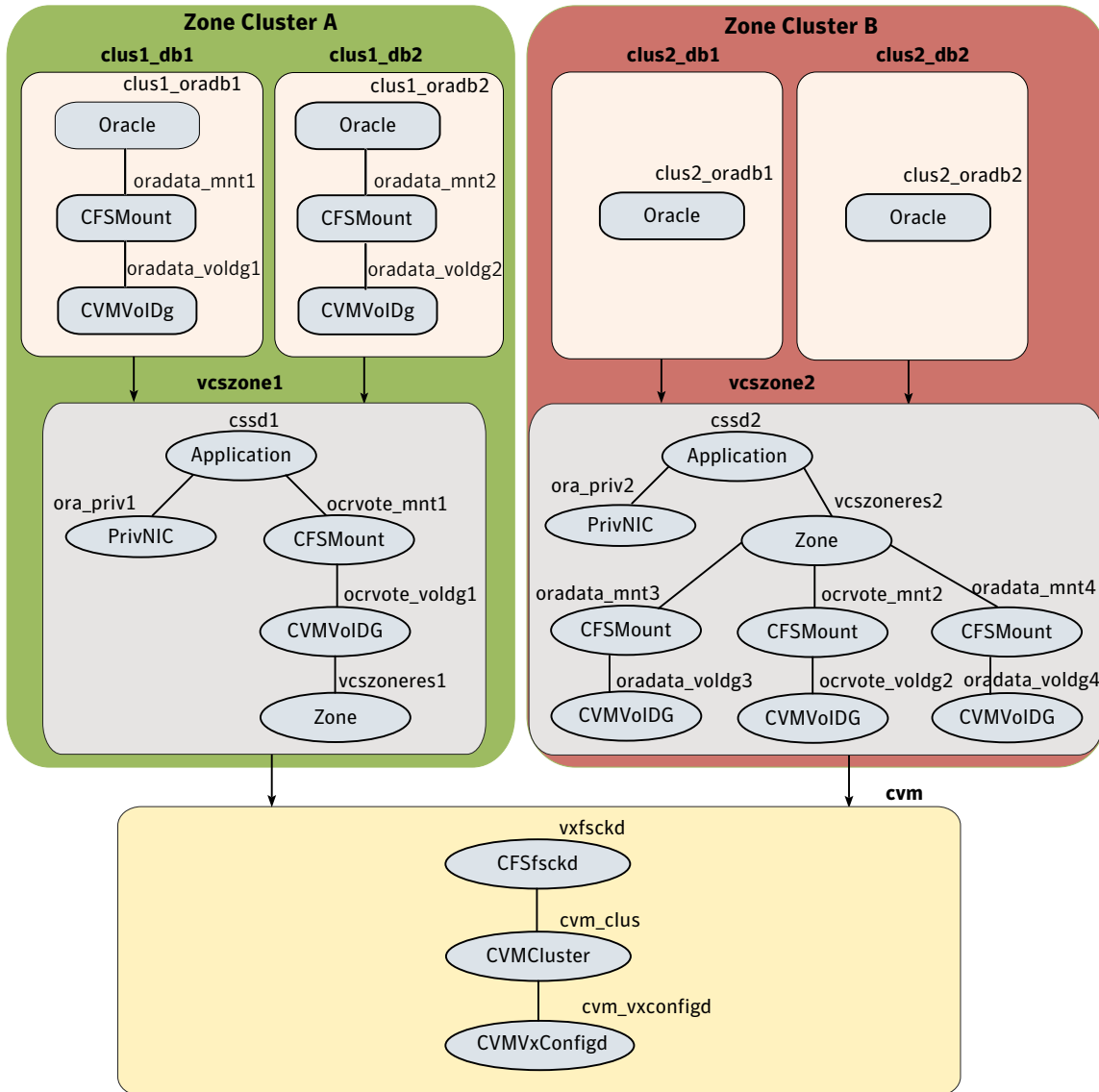
```

```
cssd requires ocrvote_mnt  
cssd requires ora_priv  
ocrvote_mnt requires ocrvote_voldg  
ocrvote_voldg requires vcszoner
```

Multiple databases on multiple non-global zones

[Figure 1-5](#) illustrates a sample configuration for multiple databases on multiple non-global zones with loopback and direct data mounts.

Figure 1-5 Multiple databases on multiple non-global zones



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

```
include "OracleASMTypes.cf"
include "types.cf"
include "CFSTypes.cf"
```

```
include "CRSResource.cf"
include "CVMTypes.cf"
include "MultiPrivNIC.cf"
include "OracleTypes.cf"
include "PrivNIC.cf"

cluster sfraczone (
    UserNames = { admin = aLMeLG1IMhMMkUMgLJ,
        z_vcszonereres1_galaxy = aPQoPMpM,
        z_vcszonereres1_nebula = fIJhIFiF,
        z_vcszonereres2_galaxy = HIJhIFiF,
        z_vcszonereres2_nebula = dqrPqnQn }
    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 = sfraczone
    CVMNodeId = { galaxy = 0, nebula = 1 }
    CVMTransport = gab
    CVMTimeout = 200
)

CVMvxconfigd cvm_vxconfigd (
    Critical = 0
)
```



```

    CVMVxconfigdArgs = { syslog }
)

cvm_clus requires cvm_vxconfigd
vxfscsd requires cvm_clus

group clus1_db1_grp (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone1, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone1, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula}
    Administrators = { z_vcszonerel1_galaxy, z_vcszonerel1_nebula}
)

CFSMount oradata_mnt1 (
    Critical = 0
    MountPoint @galaxy = "/zones/galaxy_zone1/root/db1"
    MountPoint @nebula = "/zones/nebula_zone1/root/db1"
    BlockDevice = "/dev/vx/dsk/clus1_db1dg/clus1_db1vol1"
)

CVMVolDg oradata_voldg1 (
    Critical = 0
    CVMDiskGroup = clus1_db1dg
    CVMVolume = { clus1_db1vol1 }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

Oracle clus1_oradb1 (
    Critical = 1
    Sid @galaxy = clus1_db11
    Sid @nebula = clus1_db12
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone1 online local firm
oradata_mnt1 requires oradata_voldg1

```

```
clus1_oradb1 requires oradata_mnt1

group clus1_db2_grp (
    SystemList = { galaxy = 0, nebula = 1 }
    ContainerInfo @galaxy = { Name = galaxy_zone1, Type = Zone, Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone1, Type = Zone, Enabled = 1 }
    Parallel = 1
    AutoStartList = { galaxy, nebula}
    Administrators = { z_vcszonerres1_galaxy, z_vcszonerres1_nebula}
)

CFMount oradata_mnt2 (
    Critical = 0
    MountPoint @galaxy = "/zones/galaxy_zone1/root/db2"
    MountPoint @nebula = "/zones/nebula_zone1/root/db2"
    BlockDevice = "/dev/vx/dsk/clus1_db2dg/clus1_db2vol1"
)

CVMVolDg oradata_voldg2 (
    Critical = 0
    CVMDiskGroup = clus1_db2dg
    CVMVolume = { clus1_db2vol }
    CVMActivation = sw
    CVMDeactivateOnOffline = 1
)

Oracle clus1_oradb2 (
    Critical = 1
    Sid @galaxy = clus1_db21
    Sid @nebula = clus1_db22
    Owner = o racle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone1 online local firm
oradata_mnt2 requires oradata_voldg2
clus1_oradb2 requires oradata_mnt2

group vcszone1 (
    SystemList = { galaxy = 0, nebula = 1 }
```

```

ContainerInfo @galaxy = { Name = galaxy_zone1, Type = Zone,
                          Enabled = 1 }
ContainerInfo @nebula = { Name = nebula_zone1, Type = Zone,
                          Enabled = 1 }

Parallel = 1
AutoStartList = { galaxy, nebula}
Administrators = { z_vcszonerel_galaxy, z_vcszonerel_nebula}
)

Application cssdl (
  Critical = 1
  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"
)

CFMount ocrvote_mnt1 (
  Critical = 0
  MountPoint @galaxy = "/zones/galaxy_zone1/root/ocrvote"
  MountPoint @nebula = "/zones/nebula_zone1/root/ocrvote"
  BlockDevice = "/dev/vx/dsk/ocrvotedg1/ocrvotevol1"
  MountOpt = "mincache=direct"
)

CVMVolDg ocrvote_voldg1 (
  Critical = 0
  CVMDiskGroup = ocrvotedg1
  CVMVolume = { ocrvotevol1 }
  CVMActivation = sw
  CVMDeactivateOnOffline = 1
)

PrivNIC ora_priv1 (
  Critical = 0
  Device @galaxy = { bge0 = 0, bge1 = 1 }
  Device @nebula = { bge0 = 0, bge1 = 1 }
  Address @galaxy = "192.168.1.7"
  Address @nebula = "192.168.1.8"
  NetMask = "255.255.255.0"
)

Zone vcszonerel (

```

```
)

requires group cvm online local firm
cssdl requires ocrvote_mnt1
cssdl requires ora_priv1
ocrvote_mnt1 requires ocrvote_voldg1
ocrvote_voldg1 requires vcszonerel

group clus2_db1_grp (
  SystemList = { galaxy = 0, nebula = 1 }
  ContainerInfo @galaxy = { Name = galaxy_zone2, Type = Zone,
                           Enabled = 1 }
  ContainerInfo @nebula = { Name = nebula_zone2, Type = Zone,
                           Enabled = 1 }

  Parallel = 1
  AutoStartList = { galaxy, nebula }
  Administrators = { z_vcszonerel2_galaxy, z_vcszonerel2_nebula}
)

Oracle clus2_oradb1 (
  Critical = 1
  Sid @galaxy = clus2_db11
  Sid @nebula = clus2_db12
  Owner = oracle
  Home = "/oracle/10g/dbhome"
  StartUpOpt = SRVCTLSTART
  ShutDownOpt = SRVCTLSTOP
)

requires group vcszone2 online local firm

group clus2_db2_grp (
  SystemList = { galaxy = 0, nebula = 1 }
  ContainerInfo @galaxy = { Name = galaxy_zone2, Type = Zone,
                           Enabled = 1 }
  ContainerInfo @nebula = { Name = nebula_zone2, Type = Zone,
                           Enabled = 1 }

  Parallel = 1
  AutoStartList = { galaxy, nebula }
  Administrators = { z_vcszonerel2_galaxy, z_vcszonerel2_nebula}
)
```

```

Oracle clus2_oradb2 (
    Critical = 1
    Sid @galaxy = clus2_db21
    Sid @nebula = clus2_db22
    Owner = oracle
    Home = "/oracle/10g/dbhome"
    StartUpOpt = SRVCTLSTART
    ShutDownOpt = SRVCTLSTOP
)

requires group vcszone2 online local firm

group vcszone2 (
    SystemList = { galaxy = 0, nebula = 1}
    ContainerInfo @galaxy = { Name = galaxy_zone2, Type = Zone,
                              Enabled = 1 }
    ContainerInfo @nebula = { Name = nebula_zone2, Type = Zone,
                              Enabled = 1 }

    Parallel = 1
    AutoStartList = { galaxy, nebula}
    Administrators = { z_vcszonerres2_galaxy, z_vcszonerres2_nebula}
)

Application cssd2 (
    Critical = 1
    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"
)

CFMount ocrvote_mnt2 (
    Critical = 0
    MountPoint @galaxy = "/ocrvote"
    MountPoint @nebula = "/ocrvote"
    BlockDevice = "/dev/vx/dsk/ocrvotedg2/ocrvotevol2"
    MountOpt = "mincache=direct"
)

CVMVolDg ocrvote_voldg2 (
    Critical = 0
    CVMDiskGroup = ocrvotedg2
    CVMVolume = { ocrvotevol2 }
)

```

```
CVMActivation = sw
CVMDeactivateOnOffline = 1
)

CFSMount oradata_mnt3 (
  Critical = 0
  MountPoint @galaxy = "/db1"
  MountPoint @nebula = "/db1"
  BlockDevice = "/dev/vx/dsk/clus2_db1dg/clus2_db1vol"
)

CVMVolDg oradata_voldg3 (
  Critical = 0
  CVMDiskGroup = clus2_db1dg
  CVMVolume = { clus2_db1vol }
  CVMActivation = sw
  CVMDeactivateOnOffline = 1
)

CFSMount oradata_mnt4 (
  Critical = 0
  MountPoint @galaxy = "/db2"
  MountPoint @nebula = "/db2"
  BlockDevice = "/dev/vx/dsk/clus2_db2dg/clus2_db2vol"
)

CVMVolDg oradata_voldg4 (
  Critical = 0
  CVMDiskGroup = clus2_db2dg
  CVMVolume = { clus2_db2vol }
  CVMActivation = sw
  CVMDeactivateOnOffline = 1
)

PrivNIC ora_priv2 (
  Critical = 0
  Device @galaxy = { bge2 = 0, bge3 = 1 }
  Device @nebula = { bge2 = 0, bge3 = 1 }
  Address @galaxy = "192.168.1.12"
  Address @nebula = "192.168.1.13"
  NetMask = "255.255.255.0"
)
```

```
Zone vcszonerres2 (  
)  
  
requires group cvm online local firm  
cssd2 requires ora_priv2  
cssd2 requires vcszonerres2  
ocrvote_mnt2 requires ocrvote_voldg2  
vcszonerres2 requires ocrvote_mnt2  
vcszonerres2 requires oradata_mnt3  
vcszonerres2 requires oradata_mnt4  
oradata_mnt3 requires oradata_voldg3  
oradata_mnt4 requires oradata_voldg4
```

