Veritas™ Cluster Server Agent for Oracle Installation and Configuration Guide

AIX

5.2



Veritas Cluster Server Agent for Oracle Installation and Configuration Guide

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Chapter 1

Introducing the Veritas Cluster Server agent for Oracle

This chapter includes the following topics:

- About the Veritas Cluster Server agent for Oracle
- What's new in this release
- Supported software
- How the agent makes Oracle highly available
- About Veritas Cluster Server agent for Oracle agent functions
- Typical Oracle configuration in a VCS cluster
- About setting up Oracle in a VCS cluster

About the Veritas Cluster Server agent for Oracle

The Veritas Cluster Server agent for Oracle provides high availability for Oracle.

Veritas high availability agents do the following:

- Monitor specific resources within an enterprise application.
- Determine the status of these resources.
- Start or stop the resources according to external events.

The agents include resource type declarations and agent executables. The agent for Oracle monitors the Oracle and listener processes, brings them online, and takes them offline.

The agent package for Oracle contains the following agents that work together to make Oracle highly available:

- The Oracle agent monitors the Oracle database processes.
- The Netlsnr agent monitors the listener process.

About the agent for Oracle ASM

The Veritas Cluster Server agent suite for Oracle provides high availability agents for the Oracle 10g R2 or later databases that use Automatic Storage Management (ASM). The agents for Oracle ASM monitor the Oracle ASM instance and ASM disk groups.

The agent package for Oracle also contains the following agents for Oracle ASM:

- The ASMInst agent monitors the Oracle ASM instance.
- The ASMDG agent monitors the Oracle ASM disk groups.

What's new in this release

The Veritas Cluster Server agent for Oracle includes the following new or enhanced features:

- The agent provides high availability for the Oracle ASM instance and the disk groups on Oracle 10g R2 and later
  The Veritas Cluster Server agent for Oracle has introduced two new agents to keep the Oracle ASM instance and ASM disk groups highly available.
  See "How the agent makes Oracle ASM instance highly available" on page 14.
- The agent supports Oracle 11g.
- The agent detects intentional offline.
  The Oracle agent has a new IntentionalOffline attribute with the default value as 1. If you enable Health check monitoring option, the agent detects graceful shutdown for Oracle 10g and later.
  See "Oracle attribute definitions" on page 104.
- The agent supports CUSTOM as one of the start up options when you use Hot backup feature of Oracle.
  See "Hot backup of Oracle database in VCS environment" on page 34.
- The agent supports a new action entry point pfile.vfd.

See "Action entry point" on page 21.

- The agent also supports csh and tcsh shell when Health check monitoring is enabled.

Supported software

The Veritas Cluster Server agent for Oracle 5.2 supports the following software versions in a Veritas Cluster Server (VCS) environment:

Oracle	Oracle9i, Oracle 10g R1, Oracle 10g R2, and Oracle 11g R1 (including 64-bit versions) **Note:** Veritas Cluster Server agent for Oracle supports the specified Oracle versions on AIX if Oracle supports that version on AIX. Refer to the *Veritas Cluster Server Release Notes* for more details.
VCS	VCS 5.0 MP3 on AIX
AIX	AIX 5.3 and 6.1 Refer to the *Veritas Cluster Server Release Notes* for more details. **Note:** The agent does not support WPAR for AIX 6.1.

How the agent makes Oracle highly available

The Veritas Cluster Server agent for Oracle continuously monitors the Oracle database and listener processes to verify they function properly.

See "About Veritas Cluster Server agent for Oracle agent functions" on page 14.

The agent provides the following levels of application monitoring:

- Primary or Basic monitoring
  This mode has Process check and Health check monitoring options. With the default Process check option, the agent verifies that the Oracle and listener processes are present in the process table. Process check cannot detect whether processes are in a hung or stopped states.
  The Oracle agent provides functionality to detect whether the Oracle resource was intentionally taken offline. The agent detects graceful shutdown for Oracle 10g and later. When an administrator brings down Oracle gracefully, the agent does not trigger a resource fault even though Oracle is down. The value of the type-level attribute IntentionalOffline attribute and the value of the MonitorOption attribute must be set to 1 to enable Oracle agent's intentional offline functionality.

- Secondary or Detail monitoring
  In this mode, the agent runs a perl script that executes commands against the database and listener to verify their status.

The agent detects application failure if the monitoring routine reports an improper function of the Oracle or listener processes. When this application failure occurs, the Oracle service group fails over to another node in the cluster. Thus the agent ensures high availability for the Oracle services and the database.

How the agent makes Oracle ASM instance highly available

Oracle 10g and later provides ASM feature to store and manage the Oracle data that includes data files, control files, and log files. These Oracle data files that are stored in ASM disk groups are called ASM files.

For ASM-managed databases, you must start an ASM instance before you start the database instance. The ASM instance mounts ASM disk groups and makes ASM files available to database instances.

ASM requires Cluster Synchronization Services to enable synchronization between an ASM instance and a database instance.

See Oracle documentation.

The Veritas Cluster Server agent for Oracle has the following agents to keep the Oracle ASM instance and ASM disk groups highly available:

- ASMInst agent
  See "ASMInst agent functions" on page 24.
- ASMDG agent
  See "ASMDG agent functions" on page 25.

The Veritas high availability agent for Oracle continuously monitors the ASM instance and ASM disk groups to verify they function properly.

About Veritas Cluster Server agent for Oracle agent functions

The functions an agent performs are called entry points. Review the functions for the following agents that are part of the Veritas Cluster Server agent suite for Oracle:

- Oracle agent functions
  See "Oracle agent functions" on page 15.
- Netlsnr agent functions

See "Netlsnr agent functions" on page 23.

- ASMInst agent functions
  See "ASMInst agent functions" on page 24.
- ASMDG agent functions
  See "ASMDG agent functions" on page 25.

Oracle agent functions

The Oracle agent monitors the database processes.

Table 1-1 lists the Oracle agent operations.

Table 1-1 Oracle agent operations

Agent operation	Description
Online	Starts the Oracle database by using the following `svrmgrl` or `sqlplus` command: `startup force pfile=$PFile` The default Startup option is STARTUP_FORCE. You can also configure the agent to start the database using different Startup options for Oracle. See "Startup and shutdown options" on page 16.
Offline	Stops the Oracle database with the specified options by using the following `svrmgrl` or `sqlplus` command: `shutdown immediate` The default Shutdown option is IMMEDIATE. You can also configure the agent to stop the database using different Shutdown options for Oracle. See "Startup and shutdown options" on page 16.
Monitor	Verifies the status of the Oracle processes. The Oracle agent provides two levels of monitoring: basic and detail. See "Monitor options for Oracle agent" on page 18.

Table 1-1 Oracle agent operations *(continued)*

Agent operation	Description
Clean	Forcibly stops the Oracle database by using the following `svrmgrl` or `sqlplus` command: `shutdown abort` If the process does not respond to the `shutdown` command, then the agent does the following: ■ Scans the process table for the processes that are associated with the configured instance ■ Kills the processes that are associated with the configured instance
Info	Provides the static and dynamic information about the state of the database. See "Info entry point" on page 20.
Action	Performs the predefined actions on a resource. See "Action entry point" on page 21.

Startup and shutdown options

You can specify Startup and Shutdown options for the Oracle instances that are configured.

Table 1-2 lists the startup options that the agent supports.

Table 1-2 Startup options

Option	Description
STARTUP_FORCE (Default)	Runs the command `startup force pfile='location_of_pfile'` if the pfile is configured. If the pfile is not configured, the agent runs `startup force`. It picks up the default parameter files from their default locations.
STARTUP	Runs the command `startup pfile='location_of_pfile'` if the pfile is configured. If the pfile is not configured, the agent picks up the default parameter files from their default locations and runs `startup`.
RESTRICTED	Starts the database in the RESTRICTED mode.
RECOVERDB	Performs a database recovery on instance startup.

Table 1-2 Startup options *(continued)*

Option	Description

CUSTOM	Uses a predefined SQL script (`start_custom_$SID.sql`) and runs custom startup options. The script must be in the /opt/VRTSagents/ha/bin/Oracle directory and must have access to the Oracle Owner OS user. If the file is not present, the agent logs an error message.
	With a custom script, the agent takes the following action:
	`sqlplus /nolog <<!`
	`connect / as sysdba;`
	`@start_custom_$SID.sql`
	`exit;`
	`!`

SRVCTLSTART	Uses the `srvctl` utility to start an instance of the database. For RAC clusters, you must manually set the default startup option as SRVCTLSTART.

Table 1-3 lists the shutdown options that the agent supports.

Table 1-3 Shutdown options

Option	Description
IMMEDIATE (Default)	Shuts down the Oracle instance by running `shutdown immediate`.
TRANSACTIONAL	Runs the `shutdown transactional` command. This option is valid only for the database versions that support this option.
CUSTOM	Uses a predefined SQL script (`shut_custom_$SID.sql`) and runs custom shutdown options. The script must be in the /opt/VRTSagents/ha/bin/Oracle directory and must have access to the Oracle Owner OS user. If the file is not present, the agent shuts the agent down with the default option.
SRVCTLSTOP	Uses the `srvctl` utility to stop an instance of the database. For RAC clusters, you must manually set the default option as SRVCTLSTOP.

Monitor options for Oracle agent

The Oracle agent provides two levels of monitoring: basic and detail. By default, the agent does a basic monitoring.

The basic monitoring mode has the following options:

- Process check
- Health check

The MonitorOption attribute of the Oracle resource determines whether the the agent must perform basic monitoring in Process check or Health check mode.

Table 1-4 describes the basic monitoring options.

Table 1-4 Basic monitoring options

Option	Description
0 (Default)	Process check The agent scans the process table for the ora_dbw, ora_smon, ora_pmon, and ora_lgwr processes to verify that Oracle is running.
1	Health check (supported on Oracle 10g and later) The agent uses the Health Check APIs from Oracle to monitor the SGA and retrieve the information about the instance. If you want to use the Oracle agent's intentional offline functionality, you must enable Health check monitoring. See "How the agent makes Oracle highly available" on page 13.

Review the following considerations if you want to configure basic monitoring:

- Basic monitoring of Oracle processes is user-specific. As a result, an Oracle instance started under the context of another user cannot be detected as online. For example, if an Oracle instance is started under the user "oraVRT" and the agent is configured for a user "oracle", the agent will not detect the instance started by "oraVRT" as online.
  This could lead to situations where issuing a command to online a resource on a node might online an already running instance on that node (or any other node).
  So, Symantec recommends that instances started outside VCS control be configured with the correct Owner attribute corresponding to the OS user for that instance.
- Within a failover service group, when the administrator onlines an Oracle resource on a node and if the Oracle instance is online on any other node within a cluster, the instance would come up. However, the database does not get

mounted. In such circumstances, this failure is detected only by health check monitoring option of basic monitoring or detail monitoring. Detail monitoring updates the database table after detecting a failure whereas health check monitoring does not.
If health check monitoring option of basic monitoring or detail monitoring is not configured, then such a conflict would go undetected.

In the detail monitoring mode, the agent performs a transaction on a test table in the database to ensure that Oracle functions properly. The DetailMonitor attribute of the Oracle resource determines whether the the agent must perform detail monitoring.

See "How the agent handles Oracle error codes during detail monitoring" on page 19.

See "Setting up detail monitoring" on page 83.

How the agent handles Oracle error codes during detail monitoring

The Veritas Cluster Server agent for Oracle handles Oracle errors during detail monitoring. The agent classifies Oracle errors according to their severity and associates predefined actions with each error code.

The agent includes a reference file oraerror.dat, which lists Oracle errors and the action to be taken when the error is encountered.

The file stores information in the following format:

```
Oracle_error_string:action_to_be_taken
```

For example:

```
01035:WARN
01034:FAILOVER
```

Table 1-5 lists the predefined actions that the agent takes when an Oracle error is encountered.

Table 1-5 Predefined agent actions for Oracle errors

Action	Description
IGNORE	Ignores the error. When the Veritas agent for Oracle encounters an error, the agent matches the error code in the oraerror.dat file. If the error does not have a matching error code in the file, then the agent ignores the error.

Table 1-5 Predefined agent actions for Oracle errors *(continued)*

Action	Description
UNKNOWN	Marks the resource state as UNKNOWN and sends a notification if the Notifier resource is configured. See the *Veritas Cluster Server User's Guide* for more information about VCS notification. This action is typically associated with configuration errors or program interface errors.
WARN	Marks the resource state as ONLINE and sends a notification if the Notifier resource is configured. This action is typically associated with errors due to exceeded quota limits, session limits/restricted sessions so on.
FAILOVER (Default)	Marks the resource state as OFFLINE. This faults the service group by default, which fails over to the next available system. If the file oraerror.dat is not available, the agent assumes this default behavior for every Oracle error encountered.
NOFAILOVER	Freezes the service group temporarily and marks the resource state as OFFLINE. The agent also sends a notification if the Notifier resource is configured. This action is typically associated with the errors that are not system-specific. For example, if a database does not open from a node due to corrupt Oracle files, failing it over to another node does not help.

Info entry point

The Veritas Cluster Server agent for Oracle supports the Info entry point, which provides static and dynamic information about the state of the database.

To invoke the Info entry point, type the following command:

```
# hares -value resource ResourceInfo [system]\
 [-clus cluster | -localclus]
```

The entry point retrieves the following static information:

- Version
- InstanceNo
- InstanceName
- DatabaseName
- HostName
- StartupTime
- Parallel
- Thread
- InstanceRole

The entry point retrieves the following dynamic information:

- InstanceStatus
- Logins
- OpenMode
- LogMode
- ShutdownPending
- DatabaseStatus
- Shared Pool Percent free
- Buffer Hits Percent

You can add additional attributes by adding sql statements to the file /opt/VRTSagents/ha/bin/Oracle/resinfo.sql. For example:

```
select 'static:HostName:'||host_name from v$instance;
select 'dynamic:ShutdownPending:'||shutdown_pending from
v$instance;
```

The format of the selected record must be as follows:

```
attribute_type:userkey_name:userkey_value
```

The variable *attribute_type* can take the value static and/or dynamic.

Action entry point

The Veritas Cluster Server agent for Oracle supports the Action entry point, which enables you to perform predefined actions on a resource.

To perform an action on a resource, type the following command:

```
# hares -action res token [-actionargs arg1 ...] \
[-sys system] [-clus cluster]
```

You can also add custom actions for the agent.

For further information, refer to the *Veritas Cluster Server Agent Developer's Guide*.

See Table 1-7 on page 22.

Table 1-6 describes the agent's predefined actions.

Table 1-6 Predefined agent actions

Action	Description
VRTS_GetInstanceName	Retrieves the name of the configured instance. You can use this option for the Oracle and the Netlsnr resources.

Table 1-6 Predefined agent actions *(continued)*

Action	Description
VRTS_GetRunningServices	Retrieves the list of processes that the agent monitors. You can use this option for the Oracle and the Netlsnr resources.
DBRestrict	Changes the database session to enable the RESTRICTED mode.
DBUndoRestrict	Changes the database session to disable the RESTRICTED mode.
DBSuspend	Suspends a database.
DBResume	Resumes a suspended database.
DBTbspBackup	Backs up a tablespace; `actionargs` contains name of the tablespace to be backed up.

Table 1-7 lists the virtual fire drill actions of the Veritas Cluster Server agent for Oracle lets you run infrastructure checks and fix specific errors.

Table 1-7 Predefined virtual fire drill actions

Virtual fire drill action	Description
getid (Oracle agent)	Verifies that the Oracle Owner exists on the node.
home.vfd (Oracle agent)	Verifies the following: ■ ORACLE_HOME is mounted on the node and corresponding entry is in the fstab. If the ORACLE_HOME is not mounted, the action entry point checks if any other resource has already mounted ORACLE_HOME. ■ Pfile is provided and it exists on the node. ■ Password file from $ORACLE_HOME/dbs/orapw[SID] is present.
owner.vfd (Oracle agent)	Verifies the uid and gid of the Oracle Owner attribute. Checks if uid and gid of Owner attribute is the same on the node where the Oracle resource is currently ONLINE.

Table 1-7 Predefined virtual fire drill actions *(continued)*

Virtual fire drill action	Description
pfile.vfd (Oracle agent)	Checks for the presence of pfile or spfile on the local disk. If both pfile and spfile are not present, the agent function exits. If the Oracle resource is online in the cluster, the agent function logs a message that the spfile must be on the shared storage because the Oracle resource is online.
tnsadmin.vfd (Netlsnr agent)	Checks if listener.ora file is present. If listener.ora file, it checks if ORACLE_HOME is mounted and displays appropriate messages.

Netlsnr agent functions

The listener is a server process that listens to incoming client connection requests and manages traffic to the database. The Netlsnr agent brings the listener services online, monitors their status, and takes them offline.

Table 1-8 lists the Netlsnr agent operations.

Table 1-8 Netlsnr agent operations

Agent operation	Description
Online	Starts the listener process by using the following command: `lsnrctl start $LISTENER`
Offline	Stops the listener process by using the following command: `lsnrctl stop $LISTENER` If the listener is configured with a password, the agent uses the password to stop the listener.
Monitor	Verifies the status of the listener process. The Netlsnr agent provides two levels of monitoring, basic and detail: ■ In the basic monitoring mode, the agent scans the process table for the `tnslsnr` process to verify that the listener process is running. ■ In the detail monitoring mode, the agent uses the `lsnrctl status $LISTENER` command to verify the status of the Listener process. (Default)
Clean	Scans the process table for `tnslsnr $Listener` and kills it.

Table 1-8 NetIsnr agent operations *(continued)*

Agent operation	Description
Action	Performs the predefined actions on a resource. See "Action entry point" on page 21.

ASMInst agent functions

The ASMInst agent monitors the processes of ASM instance.

Table 1-9 lists the ASMInst agent operations.

Table 1-9 ASMInst agent operations

Agent operation	Description
Online	Starts the Oracle ASM instance by using the following SQL command: `startup nomount` The Online operation starts the ASM instance without mounting any disk groups.
Offline	Stops the Oracle ASM instance by using the following SQL command: `shutdown immediate`
Monitor	Verifies the status of the ASM instance. The ASMInst agent monitors the ASM instance using the Health check monitoring method. If the Health check monitoring fails, the agent does Process check monitoring. The agent also checks if the ocssd.bin process is running. The agent returns offline for the following conditions: ■ The process is not running. ■ The process is restarted. **Note:** Make sure that the OCSSD process is running. The ASMInst agent only monitors the OCSSD process. The agent does not start or stop the process.

Table 1-9 ASMInst agent operations *(continued)*

Agent operation	Description
Clean	Forcibly stops the Oracle ASM instance by using the following SQL command: `shutdown abort` If the process does not respond to the `shutdown` command, the agent kills the process using the `SIGTERM` or `SIGKILL` commands.

ASMDG agent functions

The ASMDG agent mounts the ASM disk groups that the Oracle databases use, monitors the status, unmounts the ASM disk groups.

You must have specified the disk group names in the DiskGroup attribute of the ASMDG agent.

Table 1-10 lists the ASMDG agent operations.

Table 1-10 ASMInst agent operations

Agent operation	Description
Online	Mounts the specified Oracle ASM disk groups to an ASM instance by using the following SQL command: `alter diskgroup dg_name1, dg_name2 mount`
Offline	Unmounts the specified Oracle ASM disk groups from an ASM instance by using the following SQL command: `alter diskgroup dg_name1, dg_name2 dismount` **Note:** The following Oracle message appears in the VCS log when an ASM instance with no ASM disk groups mounted is shut down: ORA-15100: invalid or missing diskgroup name

Table 1-10 ASMInst agent operations *(continued)*

Agent operation	Description
Monitor	Verifies the status of the specified ASM disk groups. The disk groups can be in one of the following states: ■ mounted ■ dismounted ■ unknown ■ broken ■ connected If multiple ASM disk groups are configured for a resource, then the ASMDG agent returns the resource state considering the status of all the specified ASM disk groups.
Clean	Forcibly unmounts the Oracle ASM disk groups by using the following SQL command: `alter diskgroup dg_name1, dg_name2 dismount force`

Typical Oracle configuration in a VCS cluster

A typical Oracle configuration in a VCS cluster has the following characteristics:

- VCS is configured in a two-node cluster.
- The Oracle data is installed on shared storage.
- The Oracle binaries are installed locally on both nodes or on shared disks.

  If you use Oracle ASM feature, then the characteristics are as follows:

  - The Oracle binaries are installed locally on both the nodes.
  - The database files are installed on the ASM disk groups.

  Review the typical cluster setup illustration for ASM-managed database.
  See Figure 1-2 on page 27.
- The Veritas Cluster Server agent for Oracle is installed on both nodes.
  For ASM, ASMInst and ASMDG agents are installed on both nodes.

Figure 1-1 depicts a configuration where Oracle binaries and data are installed completely on shared disks.

Figure 1-1 Oracle binaries and data on shared disks

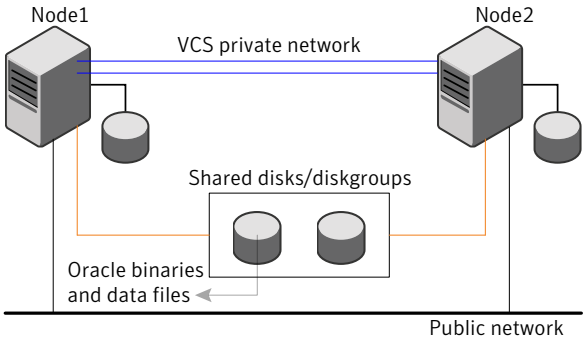
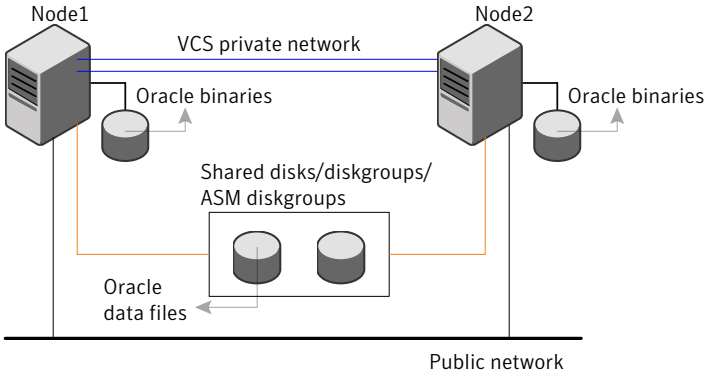


Figure 1-2 depicts a configuration where Oracle binaries are installed locally on each node and Oracle data is installed on shared disks.

Figure 1-2 Oracle binaries on local disk and Oracle data on shared disk



About setting up Oracle in a VCS cluster

Tasks involved in setting up Oracle in a VCS environment include:

- Setting up a VCS cluster
  Refer to *Veritas Cluster Server Installation Guide* for more information on installing and configuring VCS.
- Installing and configuring Oracle
  See "About installing Oracle in a VCS environment" on page 29.
- Installing the Veritas Cluster Server agent for Oracle
  See "Before you install or upgrade the agent for Oracle" on page 51.

- Configuring VCS service groups for Oracle
  See "About configuring a service group for Oracle" on page 57.

Chapter 2

Installing and configuring Oracle

This chapter includes the following topics:

- About installing Oracle in a VCS environment
- Before you install Oracle
- About VCS requirements for installing Oracle
- About Oracle installation tasks for VCS
- Installing Oracle binaries
- Configuring the Oracle ASM
- Configuring the Oracle database
- Copying the $ORACLE_BASE/admin/SID directory
- Copying the ASM initialization parameter file
- Verifying access to the database

About installing Oracle in a VCS environment

The strategy for installing Oracle into a VCS cluster is aimed at ensuring that installations on all nodes in the cluster are uniform.

See the Oracle documentation on AIX.

You can install Oracle in the following ways in a VCS environment:

$ORACLE_HOME on the shared disk	Oracle binaries and Oracle data are installed on shared disks.
$ORACLE_HOME on the local disk	Oracle binaries are installed locally on each node and Oracle data is installed on shared disks.

Note: To use ASM for Oracle database storage, you must install $ORACLE_HOME on the local disks of all nodes in the cluster.

See "About Oracle installation tasks for VCS" on page 35.

Note that Oracle data includes the datafiles, control files, redo log files, and archive log files.

When installing Oracle, ensure that the login_id, id_name, group_id, and group_name for the Oracle owner is the same on all the nodes. The user oracle and the group dba must be local and not Network Information Service (NIS and NIS+) users.

Before you install Oracle

Make sure you meet the following prerequisites:

- Verify that VCS is installed on all nodes in the cluster.
- Verify that all nodes in the cluster have adequate resources to run Oracle and VCS.
- Verify that the network supports the TCP/IP protocol.
- Make sure that you meet the VCS requirements to install Oracle.
  See "About VCS requirements for installing Oracle" on page 30.

About VCS requirements for installing Oracle

Review the requirements before you install Oracle in a VCS cluster and make sure that you meet the requirements.

Kernel parameter configuration

Make sure you meet the following configuration requirements for each node on which you want to install Oracle:

- Disk partitions
- Shared memory

- Swap size
- Semaphores
- File handles

See Oracle documentation for the corresponding operating system.

Location of the $ORACLE_HOME

You can place the Oracle home directory ($ORACLE_HOME), which contains the Oracle binaries and configuration files, locally on each server's disk. Alternatively, you can place the Oracle home directory on the shared storage. The correct location for Oracle binaries depends on your environment. The following points discuss the advantages of each approach.

If you want to use Oracle ASM, then you must place the Oracle home directory only on the local disks of each node. You can install Oracle ASM on the same Oracle home as Oracle Database, or you can install Oracle ASM on a different Oracle home directory.

See Oracle documentation.

$ORACLE_HOME directory on shared disks

You can install the Oracle Database Server ($ORACLE_HOME) on shared disks. Each node in the cluster must have the same mount point directory for the shared file system. Placing the Oracle binaries on shared storage simplifies setting up a given node in a cluster to run an instance. Each database service group is self-contained. An instance can be moved to a new node in the cluster that shares the storage.

For example, in a cluster with four nodes, you can have three database instances or service groups, each at a different Oracle version. If the Oracle binaries are placed on shared storage, three copies of Oracle, that is, one per version are required on shared storage. By contrast, placing the Oracle binaries on local storage, would require as many as 12 copies of the binaries (three versions on four nodes).

The disadvantage of this approach is that a rolling upgrade of Oracle binaries on shared storage is not possible.

$ORACLE_HOME directory on the local disk

You can install the Oracle Database Server ($ORACLE_HOME) on the local disk. The advantage is that you can upgrade the Oracle database binaries on an offline node while the database server runs on another node. The database server can

later be switched to the upgraded node (provided the database is compatible), permitting a minimum amount of downtime.

The disadvantage of this approach is that with a large number of nodes, it becomes difficult to maintain the various Oracle installations.

Multiple Oracle instances (SIDs)

You can have multiple Oracle instances that are defined in a single cluster configuration. In such cases, the parameter file for each instance must be accessible on all the nodes in the service group's SystemList attribute.

Note: If you installed multiple versions of Oracle on the same system, make sure that the SIDs are unique.

Location of database tablespaces

If the tablespaces are created using regular (UFS or VxFS) files, the file systems containing these files must be located on shared disks. Create the same file system mount points on each node.

If you use raw devices on shared disks for Oracle tablespaces, do one of the following:

- Change the ownership to Oracle dba user and the permissions.
- Change the access mode to 660 on the raw devices storing the Oracle data.

For example, if you use Veritas Volume Manager, type:

```
# vxedit -g diskgroup_name set group=dba \
user=oracle mode=660 volume_name
```

Note: The user `oracle` and the group `dba` must be local and not Network Information Service (NIS and NIS+) users

Transparent listener failover

You can enable Oracle Server clients to reconnect after a node switch without reconfiguring. For such reconnections you must include at least one IP resource in the service group for the Oracle resource. The hostname mapping the IP address of this resource must be used for the Host field in the file $TNS_ADMIN/listener.ora.

If you use the TCP/IP protocol for Oracle client/server communication, verify that the file /etc/services contains the service name of the Oracle Net Service. You must verify this file on each node that is defined in the service group's SystemList attribute.

Listener authentication in VCS environment

The Netlsnr agent supports OS authentication as well as password authentication for the listener process. If you use Oracle 10g or later, Symantec recommends you to configure OS authentication. If you want to configure a listener password, make sure that you configure the password correctly. A misconfigured password can cause the listener to fault.

See "Encrypting passwords " on page 81.

Refer to the Oracle documentation for details on configuring the listener authentication.

Long pathname limitation for $ORACLE_HOME

The AIX process table limits process pathnames to 79 characters.

The full pathname of processes in $ORACLE_HOME can possibly have 80 characters or more. In this case, you can create a soft link to the $ORACLE_HOME directory. You can then use the soft link in place of the long filename in the Home attribute in the main.cf file.

Replacing the long pathnames in the attributes

You must create the soft link on each of the nodes in the cluster.

To replace the long pathnames

1 Create a soft link to the long pathname. For example:

```
# ln -s /opt/apps/oracle/home/directory/is/longer/than\
/eighty/characters/oracle /opt/link_to_longpath
```

2 In the file /etc/VRTSvcs/conf/config/main.cf, modify the Home and Pfile attributes for both the Oracle resource type and the Netlsnr resource type.

See "About the sample configurations for Oracle enterprise agent" on page 119.

For example:

```
Home = "/opt/link_to_longpath"
Pfile = "/opt/link_to_longpath/dbs/initVRT.ora"
```

Defining NLS information

You can define NLS information by defining the appropriate parameters in the Oracle parameter file or by defining the appropriate environment variables in the EnvFile.

See "About the resource type and attribute definitions" on page 103.

Defining the parameters in the Oracle parameters file affects NLS settings for the Oracle server. Defining the environment variables affects the NLS input and output of client utilities.

Hot backup of Oracle database in VCS environment

The hot backup of Oracle database is enabled by default in VCS environment.

A node can fail while running a hot backup of an Oracle database. During such failures, the failover to another node can succeed only if the Oracle resource attribute AutoEndBkup is set to a non-zero value. So, the AutoEndBkup attribute value is set to 1 by default.

Otherwise, the agent cannot open the database in the backup mode on the failover node, and VCS cannot online the Oracle resource group.

The following errors are displayed to indicate this condition:

```
$ ORA-1110 "data file %s: '%s'"
```

or

```
$ ORA-1113 "file %s needs media recovery"
```

Before VCS can bring the Oracle resource group online on the failover node, you must take the datafiles in the database out of the backup mode. Then, you must shut down the database so that the agent can reopen the database.

Refer to the Oracle documentation for instructions on how to change the state of the database files.

However, if you want to use the hot backup feature in a VCS environment, you must meet the following requirements:

- The AutoEndBkup attribute value must be set to 1.
  See "About the resource type and attribute definitions" on page 103.
- The Startup option of Oracle agent must be STARTUP, STARTUP_FORCE, or CUSTOM.
  See "Startup and shutdown options" on page 16.

- If you set the AutoEndBkup attribute value to 0, then you must set the DetailMonitor attribute value to 1.
  See "Setting up detail monitoring" on page 83.

Storage devices for Oracle ASM configurations in VCS

You can choose one of the following storage devices for Oracle ASM:

- ASM disks as raw disks
  If you use raw disks, then make sure that the disks have the persistent permissions that are specified for ASM $ORACLE_HOME.
- ASM disks as Veritas Volume Manager volumes
  If you use VxVM volumes, then make sure that the disks have persistent permissions across reboots. The permissions must be the same as that of ASM $ORACLE_HOME.
  See Veritas Volume Manager documentation.
- ASM disks as Veritas Cluster Volume Manager volumes
  If you use CVM volumes, then make sure that the disks have persistent permissions across reboots. The permissions must be the same as that of ASM $ORACLE_HOME.
  See Veritas Volume Manager documentation.

If you want to configure mirroring for ASM disks that use VxVM or CVM volumes, then you must configure VxVM mirroring and not configure ASM mirroring.

See "Sample Oracle ASM configurations" on page 138.

About Oracle installation tasks for VCS

Tasks to complete Oracle installation in a VCS cluster depend on whether you want the $ORACLE_HOME on shared disk or local disk.

See "Installation tasks for $ORACLE_HOME on shared disks" on page 36.

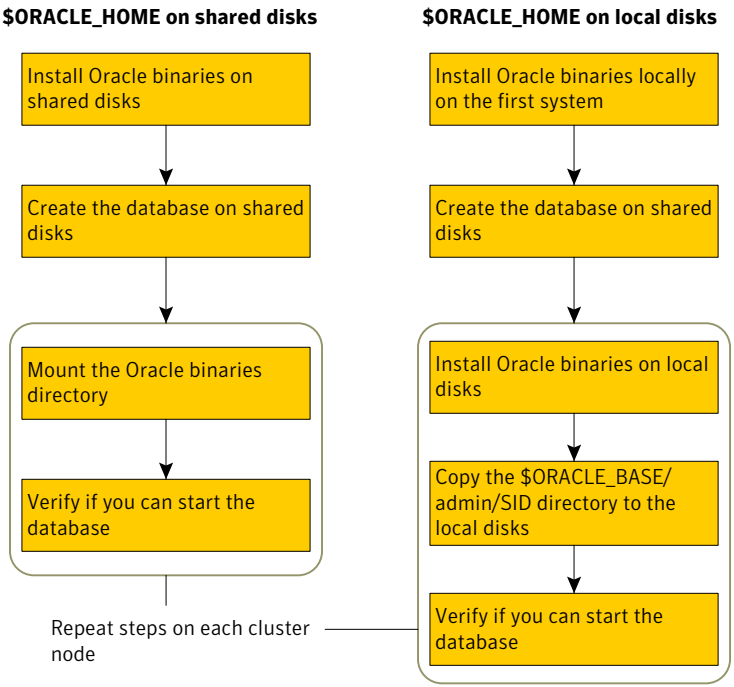
See "Installation tasks for $ORACLE_HOME on local disks" on page 37.

For ASM, you must install $ORACLE_HOME on local disks and configure the Oracle ASM.

See "Installation tasks for Oracle using ASM" on page 37.

Figure 2-1 illustrates the flow of the installation when the $ORACLE_HOME is on shared disk and on local disk.

Figure 2-1 Comparison of the installation flow



Installation tasks for $ORACLE_HOME on shared disks

The methodology is to install the Oracle binaries and to create the Oracle database on shared disks during the first installation. Mount the Oracle binaries directory and verify that the database can be started from all nodes.

Table 2-1 lists the tasks to install Oracle such that $ORACLE_HOME is on shared disks.

Table 2-1 Installation tasks for $ORACLE_HOME on shared disks

Task	Reference
From any node in the cluster, install Oracle binaries on shared disks. Disable the Oracle clustering daemon for Oracle 10g and later.	See "Installing Oracle binaries" on page 39. See "Disabling the clustering daemon for Oracle 10g or later" on page 42.
From the node where you installed Oracle, create the database on shared disks.	See "Configuring the Oracle database" on page 44.

Table 2-1 Installation tasks for $ORACLE_HOME on shared disks *(continued)*

Task	Reference
From each node that would be a part of the Oracle cluster, verify access to the database on shared disks.	See "Verifying access to the database" on page 47.

Installation tasks for $ORACLE_HOME on local disks

The methodology is to install the Oracle binaries on the local disk and to create the Oracle database on shared disks during the first installation. Then, install the Oracle binaries on local disks of other nodes. This methodology ensures that all Oracle installations are identical and access the database from the same location on the shared disk.

Table 2-2 lists the tasks to install Oracle such that $ORACLE_HOME is on local disks.

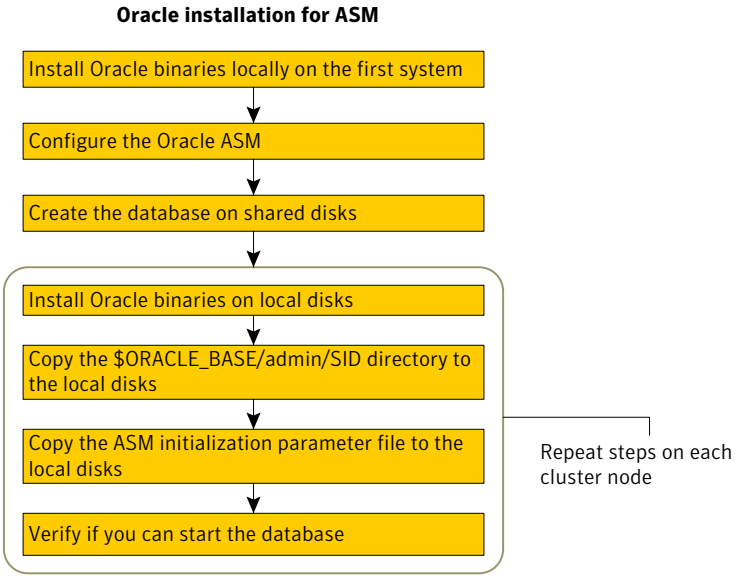
Table 2-2 Installation tasks for $ORACLE_HOME on local disks

Task	Reference
On the first node in the cluster, install Oracle binaries on the local disk.	See "Installing Oracle binaries" on page 39.
From the first node where you installed Oracle, create the database on shared disks.	See "Configuring the Oracle database" on page 44.
On each node in the cluster, perform the following tasks: ■ Install Oracle binaries on the local disk. ■ Copy the $ORACLE_BASE/admin/SID directory to the local disk. ■ Verify if you can start the database.	■ See "Installing Oracle binaries" on page 39. ■ See "Copying the $ORACLE_BASE/admin/SID directory" on page 46. ■ See "Verifying access to the database" on page 47.

Installation tasks for Oracle using ASM

Figure 2-2 illustrates the flow of the installation when you want to use ASM for the Oracle database.

Figure 2-2 Installation flow for Oracle ASM



The methodology is to perform the following:

- Install the Oracle binaries on the local disk, configure the ASM, and to create the Oracle database on ASM disk groups during the first installation.
- Then, install the Oracle binaries on local disks of other nodes.

This methodology ensures that all Oracle installations are identical and access the database from the same location.

Table 2-3 lists the tasks to install Oracle such that $ORACLE_HOME is on local disks.

Table 2-3 Installation tasks for $ORACLE_HOME on local disks

Task	Reference
On the first node in the cluster, install Oracle binaries on the local disk. Enable the Oracle clustering daemon for Oracle 10g and later.	See "Installing Oracle binaries" on page 39. See "Enabling the clustering daemon for ASM-managed database" on page 44.
From the first node where you installed Oracle, configure the Oracle ASM.	See "Configuring the Oracle ASM" on page 43.

Table 2-3 Installation tasks for $ORACLE_HOME on local disks *(continued)*

Task	Reference
From the first node where you installed Oracle, create the database on ASM disk groups.	See "Configuring the Oracle database" on page 44.
On each node in the cluster, perform the following tasks: ■ Install Oracle binaries on the local disk. ■ Copy the $ORACLE_BASE/admin/SID directory to the local disk. ■ Copy the ASM initialization parameter file to the local disk. ■ Verify if you can start the database.	Refer the following topics: ■ See "Installing Oracle binaries" on page 39. ■ See "Copying the $ORACLE_BASE/admin/SID directory" on page 46. ■ See "Copying the ASM initialization parameter file" on page 47. ■ See "Verifying access to the database" on page 47.

Installing Oracle binaries

Install a version of Oracle that the Veritas Cluster Server agent for Oracle supports.

Note: If you want to use Oracle ASM feature, do not disable the Cluster Synchronization Services.

To install Oracle9i for VCS

1. Insert the Oracle CD.
2. Set the *DISPLAY* variable, mount the CD drive, and run the Oracle installer as Oracle User.

   ```
   # /mnt/cdrom/runInstaller
   ```

3. Read the Welcome screen and click **Next**.
4. If you perform the Oracle installation for the first time, the Inventory Location dialog box is displayed. Specify the location of your base directory and click **OK**.
   - If you plan the $ORACLE_HOME to be on local disks in your installation, specify a location on the local disk.
   - If you plan the $ORACLE_HOME to be on shared disks in your installation, specify a location on the shared disk.

5 On the UNIX Group Name dialog box, enter the name of a UNIX group that has permissions to update the Oracle software and click **Next**.

6 The Oracle installer displays a message asking you to run the script `/tmp/orainstRoot.sh`. Run the script and click **Continue** to return to the Oracle installer.

7 On the File Locations dialog box, enter or select a name and a path for the Oracle Home and click **Next**.

8 On the Available Products dialog box, select the **Oracle9i Database** option and click **Next**.

9 On the Installation Types dialog box, select your installation type and click **Next**.

10 On the Database Configuration dialog box, select the **Software Only** option and click **Next**.

11 On the Summary dialog box, review your selections. Click **Back** to make changes. Otherwise click **Install**.

12 Click **Next** after the installation is complete.

13 On the End of Installation dialog box, click **Exit**.

14 Proceed to configure the database on shared disks.

See "Configuring the Oracle database" on page 44.

To install Oracle 10g for VCS

1 Insert the Oracle CD.

2 Set the *DISPLAY* variable, mount the CD drive, and run the Oracle installer as Oracle User.

```
# /mnt/cdrom/runInstaller
```

3 Read the Welcome screen and click **Next**.

4 If you perform the Oracle installation for the first time, the Inventory Location dialog box is displayed. Specify the location of your base directory and click **OK**. Do one of the following:

- If you plan the $ORACLE_HOME to be on local disks in your installation, specify a location on the local disk.
- If you plan the $ORACLE_HOME to be on shared disks in your installation, specify a location on the shared disk.

5 The Oracle installer displays a message asking you to run the script /tmp/orainstRoot.sh. Run the script and click **Continue** to return to the Oracle installer.

6 In the File Locations dialog box, enter or select a name and a path for the Oracle Home and click **Next**.

7 In the Installation Types dialog box, select your installation type and click **Next**.

8 In the Select Database Configuration dialog box, select the **Do not create a starter database** option and click **Next**.

9 In the Summary dialog box, review your selections. Click **Back** to make changes. Otherwise click **Install**.

10 Click **Next** after the installation is complete.

11 In the End of Installation dialog box, click **Exit**.

12 Disable the Oracle clustering daemon.

See "Disabling the clustering daemon for Oracle 10g or later" on page 42.

If you want to use ASM, skip this step and proceed to configuring the Oracle ASM.

See "Configuring the Oracle ASM" on page 43.

13 Proceed to configure the database on shared disks.

See "Configuring the Oracle database" on page 44.

To install Oracle 11g for VCS

1 Insert the Oracle CD.

2 Set the *DISPLAY* variable, mount the CD drive, and run the Oracle installer as Oracle User.

```
# /mnt/cdrom/runInstaller
```

3 In the Select Installation Method dialog box, choose the **Advanced Installation** method and click **Next**.

4 If you perform the Oracle installation for the first time, the Specify Inventory directory and credentials dialog box is displayed. Specify the location of your inventory directory and click **Next**. Do one of the following:

- If you plan the $ORACLE_HOME to be on local disks in your installation, specify a location on the local disk.
- If you plan the $ORACLE_HOME to be on shared disks in your installation, specify a location on the shared disk.

5 Follow the wizard instructions and select other options

6 In the Create Database dialog box, choose **Install database Software only**.

7 In the Summary dialog box, review your selections. Click **Back** to make changes. Otherwise click **Install**.

8 During the installation, the Oracle installer displays a message asking you to run some configuration scripts. Run the scripts and click **OK** to return to the Oracle installer.

9 Click **Next** after the installation is complete.

10 In the End of Installation dialog box, click **Exit**.

11 Disable the Oracle clustering daemon.

See "Disabling the clustering daemon for Oracle 10g or later" on page 42.

If you want to use ASM, skip this step and proceed to configuring the Oracle ASM.

See "Configuring the Oracle ASM" on page 43.

12 Proceed to configure the database on shared disks.

See "Configuring the Oracle database" on page 44.

Disabling the clustering daemon for Oracle 10g or later

If you installed Oracle binaries for Oracle versions 10g or later on shared disks, you must disable the Oracle clustering daemon.

Warning: If you want to use ASM feature, then do not disable the Oracle clustering daemon.

Oracle versions 10g and later provide a clustering daemon called Oracle Cluster Synchronization Service Daemon (CSSD). If the Oracle binary files are on a shared storage, the `init` command to start the daemon may result in an error. Because a VCS cluster for Oracle does not require this daemon, Symantec recommends you to disable the daemon.

To disable the daemon on AIX

- Remove the following line from the /etc/inittab file on the node from where you ran the Oracle installation wizard:

```
h1:23:respawn:/etc/init.d/init.cssd run >/dev/null 2>&1 >
</dev/null
```

Configuring the Oracle ASM

If you want to use ASM feature of Oracle 10g or later, then configure the Oracle ASM using the Database Configuration Assistant. You need to configure the ASM only once, from the node on which you installed Oracle first.

Review the procedure to configure ASM for Oracle database.

To configure ASM for the Oracle 10g or Oracle 11g database

1. Set the *DISPLAY* variable and start the Oracle Database Configuration Assistant as Oracle User.

   ```
   # dbca
   ```

2. Read the Welcome screen, click **Next**.
3. In the Operations dialog box, select the **Configure Automatic Storage Management** option and click **Next**.
4. In the Database Templates dialog box, select a template to create the database and click **Next**.
5. In the Database Identification dialog box, enter or select a unique name and SID for the global database and click **Next**.
6. Follow the wizard instructions and select other options.
7. In the Storage Options dialog box, select the **Automatic Storage Option** and click **Next**.
8. Review the warning message and click **OK**. Make sure that the Oracle clustering daemon is running.

   See "Enabling the clustering daemon for ASM-managed database" on page 44.
9. In the Create ASM Instance dialog box, specify the ASM SYS user password and click **Next**.
10. Click **OK** in the message box that appears.
11. In the ASM Disk Groups dialog box, choose to create a new disk group or add disks to an existing disk group.
12. In the Change Disk Discovery Path dialog box, enter the path name.

    Depending on the disk device you want to use for ASM, enter the disk discovery path.

    See "Storage devices for Oracle ASM configurations in VCS" on page 35.
13. In the Create Disk Group dialog box, do the following:
    - Choose one of the Redundancy options.

- In the Select Member Disks area, choose the **Show Candidates** option.
- Select the disks against the **Disk Path** from the list to create the ASM disk group.
- Click **OK**.

14 Follow the wizard instructions and complete configuring the Oracle ASM.

Enabling the clustering daemon for ASM-managed database

If your database is ASM-managed, then you must make sure that the Oracle clustering daemon is enabled in each node of the cluster. If the CSSD is not enabled, perform the following procedure.

To enable the clustering daemon for ASM-managed database

1 Log in as superuser.

2 Run the following command to configure and start the clustering daemon.

```
# $ORACLE_HOME/bin/localconfig add
```

3 Make sure the node has only one Oracle CSSD process running.

Configuring the Oracle database

Configure an Oracle database on shared disks using the Database Configuration Assistant. You need to configure the database only once, from the node on which you installed Oracle first.

If you configured ASM for Oracle database storage, configure the Oracle database on ASM disk groups.

To configure the Oracle9i database

1 Set the *DISPLAY* variable and start the Oracle Database Configuration Assistant as Oracle User.

```
# dbca
```

2 Read the Welcome screen, click **Next**.

3 On the Operations dialog box, select the **Create a database** option and click **Next**.

4 On the Database Templates dialog box, select a template to create the database and click **Next**.

5 On the Database Identification dialog box, enter or select a unique name and SID for the global database and click **Next**.

6 On the Database Connection Options dialog box, select the **Dedicated Server Mode** or the **Shared Server Mode** and click **Next**.

7 On the Initialization Parameters dialog box, specify the locations of the archive logs and the initialization parameter files:

- If you want to enable archive logs for the database, click the **Archive** tab and select the **Archive Log Mode** check box. In the Archive Log Destination(s) list, enter a path on the shared disk to ensure that the Archive Log is created on the shared disk.
- Click the **File Locations** tab.
- If installing Oracle locally on all systems, make sure that the initialization parameter file and the trace file directories are on the local disk.
- Modify other parameters, if desired.
- Click **Next**.

8 On the Database Storage dialog box, specify the locations of the Control, Data, and Redo log files:

- In the left pane, expand the **Storage** folder by clicking the + next to it.
- Click **Controlfile** and click the **General** tab in the right pane.
- In the **File Directory** field, enter a path on the shared disk for each control file.
- Expand the **Datafiles** folder by clicking the + next to it.
- Select the datafile in the left pane and click the **General** tab in the right pane. In the **Name** field, enter a path on the shared disk for each datafile.
- Expand the **Redo Log Groups** folder by clicking the + next to it.
- Select the Redo Log file in the left pane. In the **File Directory** field in the right pane, enter the path of a directory on the shared disk for each Redo Log file. Specify file sizes for the Redo Log files, if desired.
- Click **Next**.

9 On the Creation Options dialog box, select the **Create Database** check box and click **Finish**.

10 On the Summary dialog box, review your selections and click **OK**.

To configure the Oracle 10g or Oracle 11g database

1. Set the *DISPLAY* variable and start the Oracle Database Configuration Assistant as Oracle User.

   ```
   # dbca
   ```

2. Read the Welcome screen, click **Next**.
3. In the Operations dialog box, select the **Create a database** option and click **Next**.
4. In the Database Templates dialog box, select a template to create the database and click **Next**.
5. In the Database Identification dialog box, enter or select a unique name and SID for the global database and click **Next**.
6. Follow the wizard instructions and select other options.
7. In the Storage Options dialog box, select the **File System** or **Raw Devices** option and click **Next**.

   If you configured ASM, select **Automatic Storage Option (ASM)** and click **Next**.
8. If you configured ASM, in the ASM Disk Groups dialog box, select the ASM disk group for the Oracle database storage and click **Next**.
9. In the Database File Locations dialog box, specify a location on the shared disk for the database files to be created and click **Next**.

   If you configured ASM, choose **Use Oracle-Managed Files**, specify the database area, and click **Next**.
10. In the Recovery Configuration dialog box, specify the **Flash Recovery Area** on the shared disk and click **Next**.

    If you configured ASM, specify the appropriate **Flash Recovery Area** location and click **Next**.
11. If you use Oracle 11g, in the Security Settings dialog box, choose the recommended security setting. Choose the **Keep the enhanced 11g default security settings** option and click **Next**.
12. Follow the wizard instructions and complete creating the database.

Copying the $ORACLE_BASE/admin/SID directory

Follow the instruction on each node in the cluster, only if the $ORACLE_HOME is on local disks.

To copy the $ORACLE_BASE/admin/SID directory

- Copy the directory $ORACLE_BASE/admin/*SID* from the shared disk to the local disk.

  The variable *SID* represents the database instance.

  Refer to Oracle's documentation on OFA Structure for more information.

Copying the ASM initialization parameter file

If your Oracle is ASM-managed, then perform the procedure on each node in the cluster.

To copy the ASM initialization parameter file

- Copy the init*SID*.ora file from the $ORACLE_HOME/dbs directory on the node where you first installed Oracle ASM to the local node.

  where *SID* is the ASM instance identifier.

Verifying access to the database

You can verify access to the database by running an SQL query.

Depending on the location of your $ORACLE_HOME, perform one of the procedures to start the database.

See "Starting the database when your $ORACLE_HOME is on shared disks" on page 47.

See "Starting the database when your $ORACLE_HOME is on local disks" on page 48.

For ASM, the $ORACLE_HOME is on local disks and the database is configured on ASM disk groups.

See "Starting the ASM-managed database" on page 48.

Upon completion, the Oracle database is started from the node in the cluster that you last performed this procedure.

Starting the database when your $ORACLE_HOME is on shared disks

Verify that you can access the shared database from each node. Perform the steps from each node that would be a part of the Oracle cluster.

To start the database when $ORACLE_HOME is on shared disks

1. If the Oracle binaries are mounted on any other node, unmount it.
2. If the data files on shared disk are mounted on any node, unmount it.

3 Mount the Oracle binaries and data files.

4 Start the database.

Starting the database when your $ORACLE_HOME is on local disks

Verify that you can access the database individually on each node that would be a part of the Oracle cluster.

To start the database when $ORACLE_HOME is on local disks

1 Make sure you have installed Oracle binaries on the node.

2 If the data files on shared disk are mounted on any node, unmount it.

3 Mount the data files.

4 Start the database.

Starting the ASM-managed database

Verify that you can access the database individually on each node that would be a part of the Oracle cluster.

To start the ASM-managed database

1 Make sure you have installed Oracle binaries on the node.

2 If you use VxVM disks as ASM disks, do the following:

- If the ASM disk groups are mounted on any node, do the following:
  - Unmount the ASM disk groups from the ASM instance.
  - Stop the ASM instance.
  - Stop the VxVM volumes.
  - Deport the VxVM disk groups.
- Import the VxVM disk groups on this node and start the volumes.
- Start the ASM instance.
- Mount the ASM disk groups.

3 If you use CVM volumes for ASM, do the following:

- Unmount the ASM disk group from the ASM instance on the node where the disk group is mounted.
- Mount the ASM disk groups on the other node.

4 If you use raw disks as ASM disks, do the following:

- If the ASM disk groups are mounted on any node, unmount it.
- If the ASM instance is not running on this node, then start the ASM instance.
- Mount the ASM disk groups.

5 Start the database.

Chapter 3

Installing and removing the agent for Oracle

This chapter includes the following topics:

- Before you install or upgrade the agent for Oracle
- Installing the agent software
- Upgrading the agent
- Disabling the Veritas Cluster Server agent for Oracle
- Removing the Veritas Cluster Server agent for Oracle

Before you install or upgrade the agent for Oracle

Meet the following prerequisites to install or upgrade the Veritas Cluster Server agent for Oracle:

- Make sure that VCS is installed in the cluster.
  Symantec recommends installing the VCS graphical user interface. Refer to the *Veritas Cluster Server Installation Guide*.
- Verify that the Oracle Server for AIX and the add-on Listener are installed and configured.
  See Oracle documentation.
  See "About installing Oracle in a VCS environment" on page 29.

Installing the agent software

You can install the Veritas Cluster Server agent for Oracle from the product disc. You must install the Oracle enterprise agent on all nodes that will host the Oracle service group.

To install the agent on an AIX node

1. Log in as superuser.
2. Determine the device access name of the disc drive. For example, enter:

   ```
   # cd /dev
   # lsdev -C -c cdrom
   ```

   The output might resemble:

   ```
   cd0 Available 10-60-00-4,0 16 Bit SCSI Multimedia CD-ROM Drive
   ```

   In this example, cd0 is the disc's device access name.
3. Insert the disc with the VCS software into a drive that is connected to the node.
4. Mount the software disc using the device access name that you found in step 2:

   ```
   # mkdir -p /cdrom
   # mount -V cdrfs -o ro /dev/cd0 /cdrom
   # cd /cdrom
   ```

5. Install the Oracle agent software.

   ```
   # installp -ac -d /cdrom/VRTSvcsor.rte.bff VRTSvcsor.rte
   # installp -ac -d /cdrom/VRTScsocw.rte.bff VRTScsocw.rte
   ```

   These filesets include the following:

   - VRTSvcsor—the agent binaries for Oracle, Netlsnr, ASMInst, and ASMDG agents
   - VRTScsocw—the agent configuration wizard
6. Repeat step 1 through step 5 on each node that will become part of the Oracle service group.

Upgrading the agent

Before you upgrade the agent, make sure you meet the prerequisites to upgrade the Veritas Cluster Server agent for Oracle.

See "Before you install or upgrade the agent for Oracle" on page 51.

You can upgrade Veritas Cluster Server agent for Oracle from versions 3.5, 4.0, and 5.0 in a VCS cluster.

See "Supported software" on page 13.

To upgrade VCS agent for Oracle to version 5.2

1 Save the VCS configuration and stop the VCS engine.

```
# haconf -dump -makero
# hastop -all -force
```

2 On all nodes on which the Oracle agent was installed, do the following:

- Remove the Oracle agent.

  ```
  # installp -u VRTSvcsor
  ```

  If you upgrade the agent from version 4.0 or later to 5.2, you must also remove the VRTScsocw fileset.

  ```
  # installp -u VRTScsocw
  ```

- Delete the file /etc/VRTSvcs/conf/config/OracleTypes.cf.
- Install the VCS agent 5.2 for Oracle.
  See "Installing the agent software" on page 52.

3 Copy the file OracleTypes.cf from the directory /etc/VRTSagents/ha/conf/Oracle to the /etc/VRTSvcs/conf/config directory.

4 For Oracle 10g or later, if you use ASM for database storage, then copy the file OracleASMTypes.cf from the directory /etc/VRTSagents/ha/conf/OracleASM to /etc/VRTSvcs/conf/config directory.

5 From a node in the cluster, edit your configuration file /etc/VRTSvcs/conf/config/main.cf.

Replace all resources of type Sqlnet with resources of type Netlsnr.

See "About the resource type and attribute definitions" on page 103.

6 Verify the configuration.

```
# hacf -verify config
```

7 Start VCS on local node first.

8 Start VCS on other nodes.

Disabling the Veritas Cluster Server agent for Oracle

To disable the Veritas Cluster Server agent for Oracle, you must change the Oracle service group to an OFFLINE state. You can stop the application completely or switch the agent to another system.

To disable the agent

1 To remove a system from the service group's SystemList, check if the service group is online:

```
# hagrp -state service_group -sys system_name
```

2 If the service group is online, take it offline. Use one of the following commands:

- To take the service group offline on one node and online it on another node, you can use the -switch option:

```
# hagrp -switch service_group -to system_name
```

- To take the service group offline without bringing it online on any other node in the cluster, enter:

```
# hagrp -offline service_group -sys system_name
```

3 Stop the agent on the node:

```
# haagent -stop Oracle -sys system_name
```

4 When you get the message "`Please look for messages in the log file`," check the file /var/VRTSvcs/log/engine_A.log for a message confirming the agent has stopped.

   You can also use the `ps` command to confirm the agent is stopped.

5 You can now remove the service group, the resource type, or both from the VCS configuration after disabling the agent on all nodes.

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

Removing the Veritas Cluster Server agent for Oracle

Removing the agent involves removing the agent configuration wizard and the agent files from each system. Perform the procedure to remove the agents on each node in the cluster.

To remove the agent on a node

1 Remove the agent configuration wizard.

```
# installp -u VRTScsocw
```

2 Remove the agent. Answer prompts accordingly.

```
# installp -u VRTSvcsor
```

Chapter 4

Configuring VCS service groups for Oracle

This chapter includes the following topics:

- About configuring a service group for Oracle
- Configuring Oracle instances in VCS
- Before you configure the service group
- Configuring the service group
- Setting up detail monitoring

About configuring a service group for Oracle

Configuring the Oracle service group involves creating the Oracle service group, its resources, and defining attribute values for the configured resources. You must have administrator privileges to create and configure a service group.

You can configure VCS enterprise agent for Oracle using one of the following:

- The agent configuration wizard
- The Cluster Manager (Java console)
- The command-line

See "Configuring the service group" on page 67.

Note: If you use Oracle ASM feature, you must also configure ASMInst resources and ASMDG resources to keep the ASM instance highly available. You must use the command-line to configure these resources.

Configuring Oracle instances in VCS

You can set up Oracle in different ways in a VCS environment. Configuring Oracle for VCS involves configuring the Oracle files listener.ora and tnsnames.ora as per VCS requirements.

Table 4-1 lists the different Oracle configurations you can set up in a VCS environment for high availability.

Table 4-1 Oracle configurations in VCS

Configuration type	Reference
Single Oracle instance configuration	See "Configuring single Oracle instance in VCS" on page 58.
Multiple Oracle instances (single listener) configuration	See "Configuring multiple Oracle instances (single listener) in VCS" on page 60.
Multiple Oracle instances (multiple listeners) configuration	See "Configuring multiple Oracle instances (multiple listeners) in VCS" on page 61.
Configuration with shared server support	See "Configuring Oracle instance with shared server support in VCS" on page 63.

See "Best practices for multiple Oracle instance configurations" on page 151.

Configuring single Oracle instance in VCS

Review the resource dependency graph and sample configuration of service groups involving a single Oracle instance.

See "Sample single Oracle instance configuration" on page 120.

To configure an Oracle instance in VCS

1 Review the Oracle and Netlsnr resource types and their attribute definitions.

See "About the resource type and attribute definitions" on page 103.

2 Configure the Oracle file tnsnames.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

For clients to connect to the failover instance, in the file tnsnames.ora located at $TNS_ADMIN, change the host name for all TCP protocol address databases to the virtual IP address for the service group.

The following example assumes that the host name for the database is set to oraprod, which represents the virtual IP address for the service group.

```
prod =
  (DESCRIPTION =
   (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
   )
   (CONNECT_DATA =
    (SERVICE_NAME = prod)
   )
  )
```

3 Configure the Oracle file listener.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

In the file listener.ora located at $TNS_ADMIN, edit the "Host=" line in the ADDRESS_LIST section and add the name of the high availability address for the service group, in this case, oraprod.

```
LISTENER_PROD =
  (DESCRIPTION_LIST =
  (DESCRIPTION =
   (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
   )
  )
```

4 Create the Oracle service groups using the agent configuration wizard, Cluster Manager (Java Console), or the command-line.

See "Configuring the service group" on page 67.

5 Bring the Oracle service group online.

See "Bringing the service group online" on page 89.

Configuring multiple Oracle instances (single listener) in VCS

Review the resource dependency graph and sample configuration of a service group involving multiple Oracle instances.

See "Sample multiple Oracle instances (single listener) configuration" on page 123.

To configure multiple Oracle instances (single listener)

1. Review the Oracle and Netlsnr resource types and their attribute definitions.

   See "About the resource type and attribute definitions" on page 103.

2. Configure the Oracle file tnsnames.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

   For clients to connect to the failover instance, in the file tnsnames.ora located at $TNS_ADMIN, change the host name for all TCP protocol address databases to the virtual IP address for the service group.

   The following example assumes that the host name for the database is set to oraprod, which represents the virtual IP address for the service group.

```
prod =
  (DESCRIPTION =
   (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
   )
   (CONNECT_DATA =
    (SERVICE_NAME = prod)
   )
  )
 mktg =
  (DESCRIPTION =
   (ADDRESS_LIST =
    (ADDRESS = (PROTOCOL = TCP)(HOST = oramktg)(PORT = 1522))
   )
   (CONNECT_DATA =
    (SERVICE_NAME = mktg)
   )
  )
```

3 Configure the Oracle file listener.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

In the file listener.ora located at $TNS_ADMIN, edit the "Host=" line in the ADDRESS_LIST section and add the name of the high availability address for the service group, in this case, oraprod.

```
LISTENER_ORACLE =
 (DESCRIPTION_LIST =
 (DESCRIPTION =
 (ADDRESS_LIST =
  (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
  (ADDRESS = (PROTOCOL = TCP)(HOST = oramktg)(PORT = 1522))
 )
```

4 Create the Oracle and Listener service groups using Cluster Manager (Java Console.) You can also use the command-line to create the service group.

See "Configuring the service group" on page 67.

5 Bring the Oracle service group online.

See "Bringing the service group online" on page 89.

Configuring multiple Oracle instances (multiple listeners) in VCS

Review the resource dependency graph and sample configuration of a service group involving multiple Oracle instance.

See "Sample multiple instance (multiple listeners) configuration" on page 130.

To configure multiple Oracle instances (multiple listeners)

1. Review the Oracle and Netlsnr resource types and their attribute definitions.

   See "About the resource type and attribute definitions" on page 103.

2. Configure the Oracle file tnsnames.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

   For clients to connect to the failover instance, in the file tnsnames.ora located at $TNS_ADMIN, change the host name for all TCP protocol address databases to the virtual IP address for the service group.

```
prod =
  (DESCRIPTION =
  (ADDRESS_LIST =
   (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
  )
  (CONNECT_DATA =
   (SERVICE_NAME = prod)
  )
 )
 mktg =
  (DESCRIPTION =
  (ADDRESS_LIST =
   (ADDRESS = (PROTOCOL = TCP)(HOST = oramktg)(PORT = 1522))
  )
  (CONNECT_DATA =
   (SERVICE_NAME = mktg)
  )
 )
```

3 Configure the Oracle file listener.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

In the file listener.ora, create independent configurations for each listener.

```
LISTENER_PROD =
  (DESCRIPTION_LIST =
  (DESCRIPTION =
  (ADDRESS_LIST =
   (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
  )
 )

 LISTENER_MKTG =
  (DESCRIPTION_LIST =
  (DESCRIPTION =
  (ADDRESS_LIST =
   (ADDRESS = (PROTOCOL = TCP)(HOST = oramktg)(PORT = 1522))
  )
 )
```

4 Create the Oracle service groups using the agent configuration wizard, Cluster Manager (Java Console,) or the command-line.

See "Configuring the service group" on page 67.

5 Bring the Oracle service group online.

See "Bringing the service group online" on page 89.

Configuring Oracle instance with shared server support in VCS

Review the resource dependency graph and sample configuration.

See "Sample Oracle configuration with shared server support" on page 135.

To configure Oracle with shared server support

1. Review the Oracle and Netlsnr resource types and their attribute definitions.

   See "About the resource type and attribute definitions" on page 103.

2. Configure the Oracle file tnsnames.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

   For clients to connect to the failover instance, in the file tnsnames.ora located at $TNS_ADMIN, change the host name for all TCP protocol address databases to the virtual IP address for the service group.

   The following example assumes that the host name for the database is set to oraprod, which represents the virtual IP address for the service group.

   ```
   prod =
     (DESCRIPTION =
     (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1521))
     )
     (CONNECT_DATA =
      (SERVICE_NAME = prod)
     )
    )
   ```

3. Configure the Oracle file listener.ora as per VCS requirements. The changes required in the file depends on your Oracle configuration.

   In the file listener.ora located at $TNS_ADMIN, edit the "Host=" line in the ADDRESS_LIST section and add the name of the high availability address for the service group, in this case, oraprod.

   ```
   LISTENER_PROD =
     (DESCRIPTION_LIST =
     (DESCRIPTION =
     (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = oraprod)(PORT = 1522))
     )
    )
   ```

4 In the initialization parameter file, for the dispatchers parameter, set the host name for all TCP protocol address dispatchers to the virtual IP address for the service group.

In the following example, the host name for the dispatcher is set to oraprod.

```
dispatchers =
    "(ADDRESS = (PROTOCOL = TCP)(HOST = oraprod))
    (MUL=ON)(TICK=15)(POOL=true)"
```

5 In the initialization parameter file, set the LOCAL_LISTENER attribute to a listener alias, so that the Oracle PMON process registers information with the listener.

```
local_listener=listener_alias
```

This listener alias gets appended by the default domain set in the file sqlnet.ora.

6 In the file tnsnames.ora, create an entry for the listener alias to resolve the address information. In the address parameter, set the host name to the virtual IP address for the service group, without the CONNECT_DATA portion of the connect descriptor.

In the following example, the listener *listener_alias* uses TCP/IP port 1521 and the virtual IP address for the service group is oraprod.

```
listener_alias=
    (address = (PROTOCOL = TCP)(HOST = oraprod)
    (PORT= 1521))
```

7 Create the Oracle service groups using the agent configuration wizard, Cluster Manager (Java Console,) or the command-line.

See "Configuring the service group" on page 67.

8 Bring the Oracle service group online.

See "Bringing the service group online" on page 89.

Before you configure the service group

Before you configure the Oracle service group, you must:

- Verify that VCS is installed and configured on all nodes in the cluster where you will configure the service group.
  Refer to the *Veritas Cluster Server Installation Guide* for more information.

- Verify that Oracle is installed and configured identically on all nodes in the cluster.
  See "About installing Oracle in a VCS environment" on page 29.
- Verify that the Veritas Cluster Server agent for Oracle is installed on all nodes in the cluster.
  If the Oracle database is ASM-managed, verify that the ASM agent binaries are also installed.
  See "Before you install or upgrade the agent for Oracle" on page 51.
- Verify that the type definition for Veritas Cluster Server agent for Oracle is imported into the VCS engine.
  See "Importing the type definition files" on page 66.
- If the Oracle database is ASM-managed, make sure that the Oracle clustering daemon is enabled. Else, the OCSSD daemon must be disabled.

Importing the type definition files

Before configuring the Veritas Cluster Server agent for Oracle, you must import the OracleTypes.cf file to the VCS engine.

If you want to configure the ASM agents, you must import the OracleASMTypes.cf file. Import the OracleASMTypes.cf file using the command-line.

To import using the Cluster Manager

1. Start Cluster Manager and log on to the cluster.
2. From the Cluster Explorer's **File** menu, choose **Import Types**.
3. In the Import Types dialog box, select the /etc/VRTSagents/ha/conf/Oracle/OracleTypes.cf file.
4. Click **Import**.
5. Save the configuration.

To import using the command line

1. Log in to sysa as superuser.
2. Ensure that all changes to the existing configuration have been saved and that further changes are prevented while you modify main.cf:

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

3 To ensure that VCS is not running while you edit main.cf, stop the VCS engine on all nodes 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.cf.orig
```

5 Copy the Oracle types configuration file into place:

```
# cp  /etc/VRTSagents/ha/conf/Oracle/OracleTypes.cf \
/etc/VRTSvcs/conf/config/OracleTypes.cf
```

If you want to configure the ASM agents, do the following:

```
# cp /etc/VRTSagents/ha/conf/OracleASM/OracleASMTypes.cf \
/etc/VRTSvcs/conf/config/OracleASMTypes.cf
```

6 Edit the main.cf file to include the OracleTypes.cf file:

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

If you want to configure the ASM agents, you must also include the OracleASMTypes.cf file:

```
include "OracleASMTypes.cf"
```

Configuring the service group

You can configure Oracle in a VCS environment in one of the ways that VCS supports.

See "Configuring Oracle instances in VCS" on page 58.

You can configure VCS agent for Oracle using one of the following:

The agent configuration wizard	See "Configuring the service group using the agent configuration wizard" on page 68. **Note:** You can use the wizard to configure the service group for Oracle in VCS environment. Use the Cluster Manager or the command-line for SF HA environments.

The Cluster Manager (Java console)	See "Configuring the service group using Cluster Manager (Java console)" on page 77.
The command-line	See "Configuring the service group using the command-line" on page 79.

Review the following to configure the service group:

- Sample configuration files and resource dependency graphs of the Oracle service group.
  See "About the sample configurations for Oracle enterprise agent" on page 119.
- Resource type and the attribute definitions of the Oracle and Netlsnr agents.
  For ASM, resource type and the attribute definitions of the ASMInst and ASMDG agents.
  See "About the resource type and attribute definitions" on page 103.

Configuring the service group using the agent configuration wizard

VCS provides an agent configuration wizard that guides you through the process of configuring the agent in a VCS environment. The wizard creates and modifies Oracle service groups. You can also modify an existing service group.

See "Modifying the service group configuration" on page 91.

Make sure that you meet the following requirements:

- The Oracle instances and listeners to be configured must be running. All listeners to be configured must listen to the same virtual IP address.

  Note: For the default listener, the configuration wizard requires the listener parameter file, listener.ora, to reside in $ORACLE_HOME/network/admin. No such condition applies for non-default listeners.

- The Oracle files (control, data, redo-log, and archive files) must be on shared disks.
- The IP addresses and host names specified in the files listener.ora and tnsnames.ora must be the same.
- If detail monitoring is to be used for a database instance, the table used for detail monitoring must be set up, with user and password assigned.
  See "Setting up detail monitoring" on page 83.

To configure the service group using the agent configuration wizard

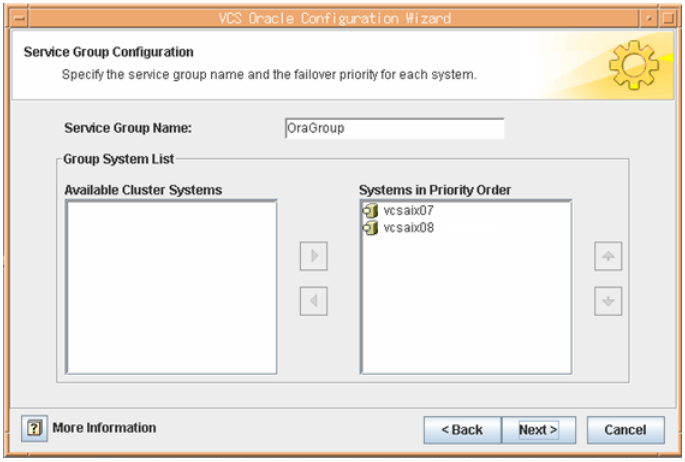
1 Set the *DISPLAY* variable, start the VCS Oracle configuration wizard as `root`.

```
# hawizard oracle
```

2 Read the information on the Welcome screen and click **Next**.

3 In the Wizard Options dialog box, select the **Create Oracle Service Group** option and click **Next**.

4 In the Service Group Configuration dialog box, specify information about the service group.



Specify the following information:

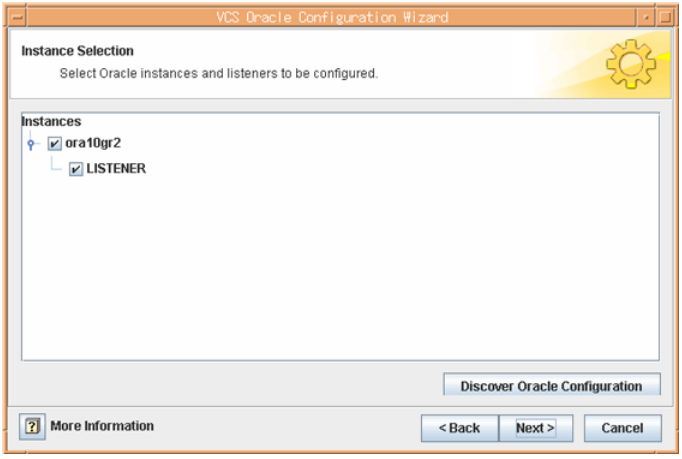
Service Group Name	Enter a name for the Oracle service group.
Available Cluster Systems	Select the systems on which to configure the service group and click the right-arrow icon to move the systems to the service group's system list.

Systems in Priority Order

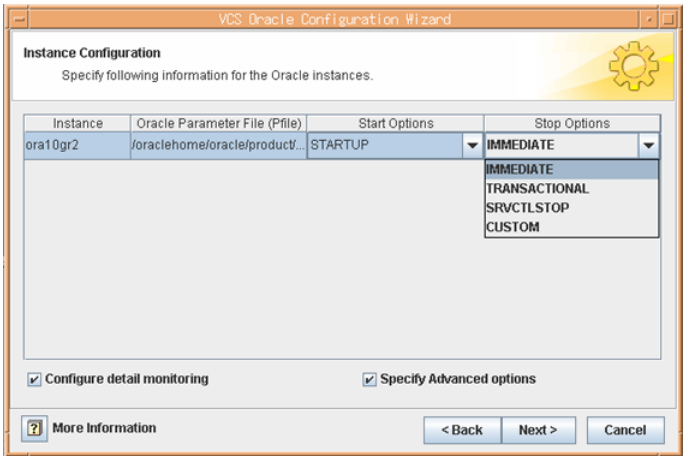
- To remove a system from the service group's system list, select the system in the **Systems in Priority Order** box and click the left arrow icon.
- To change a system's priority in the service group's system list, select the system in the **Systems in Priority Order** box and click the buttons with the up and down arrow icons. The system at the top of the list has the highest priority while the system at the bottom of the list has the lowest priority.

5 Click **Next**.

6 In the Instance Selection dialog box, select the Oracle instances to be configured along with their listeners. Click **Discover Oracle Configuration**, if required.



7 In the Instance Configuration dialog box, specify information for all selected instances.

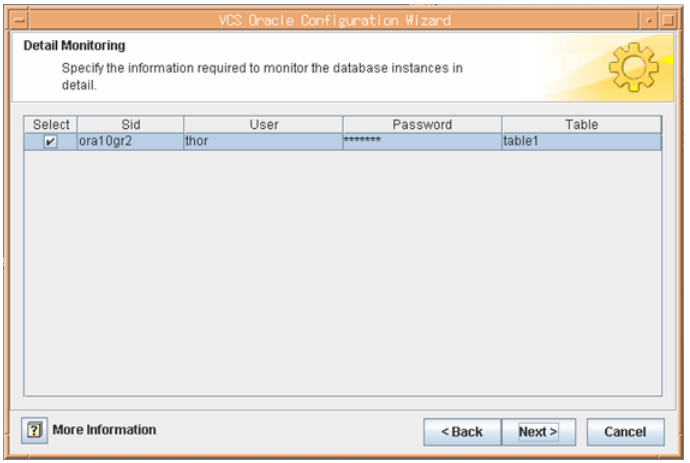


Specify the following information for the Oracle instances that you selected:

Oracle Parameter File (Pfile)	Verify the location of the Oracle Parameter File.
Start Options	Choose the Start options, if desired. Default is STARTUP_FORCE. See "Startup and shutdown options" on page 16.
Stop Options	Choose the Stop options, if desired. Default is IMMEDIATE. See "Startup and shutdown options" on page 16.
Configure detail monitoring	Select the check box if you want to monitor the database in detail. See "Monitor options for Oracle agent" on page 18.
Specify Advanced Options	Select the check box to enter advanced configuration information for the database instances.

8 Click **Next**.

9 If you chose to monitor the database in detail, the Detail Monitoring dialog box is displayed.



Specify the following information for the database instances that you want the agent to monitor in detail and click **Next**:

Select Select the check box corresponding to the database to be monitored in detail.

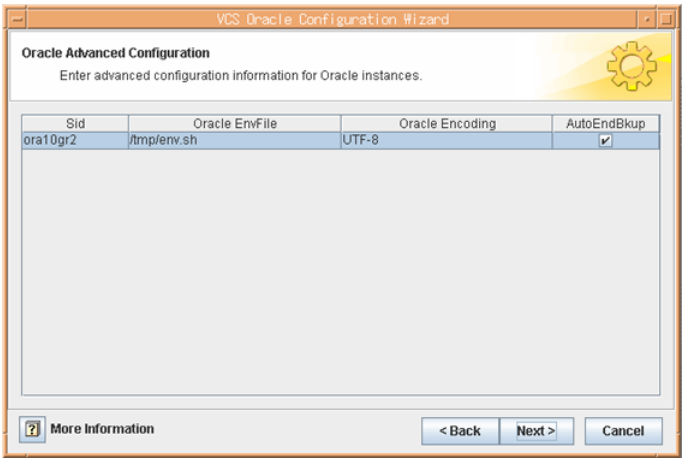
User Enter a valid user name for the database.

Password Enter a valid password for the database user.

Do not encrypt passwords when entering them through the Agent Configuration Wizard; the wizard takes care of encrypting passwords.

Table Enter the name of a table that will be queried to validate the status of the database.

10 If you chose to specify advanced options, the Oracle Advanced Configuration dialog box is displayed.



Specify the following information for the Oracle instances and click **Next**:

Oracle EnvFile Enter the location of the Oracle Envfile.

Oracle Encoding Enter the encoding.

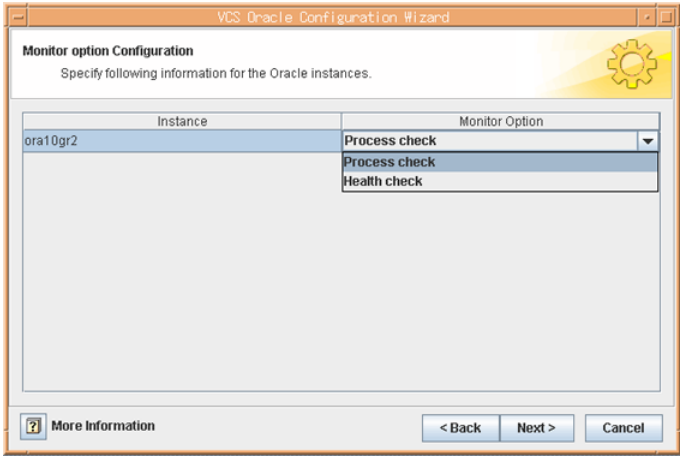
AutoEndBkup Select the check box, if desired.

See "Hot backup of Oracle database in VCS environment" on page 34.

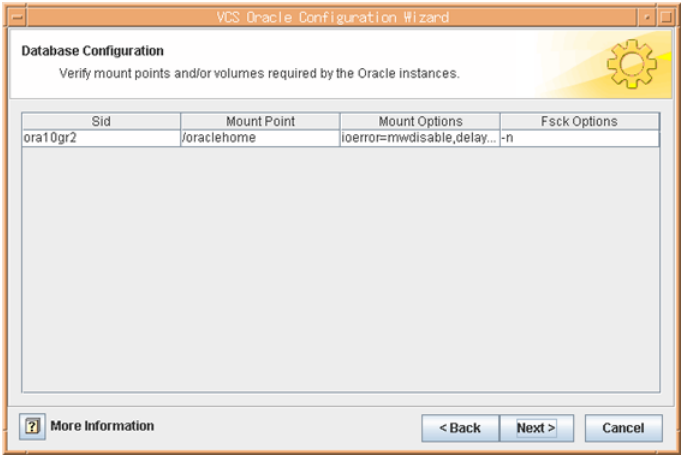
11 In the Monitor option Configuration dialog box, specify the monitor option for the Oracle instances, and click **Next**.

The default monitor option is **Process check**.

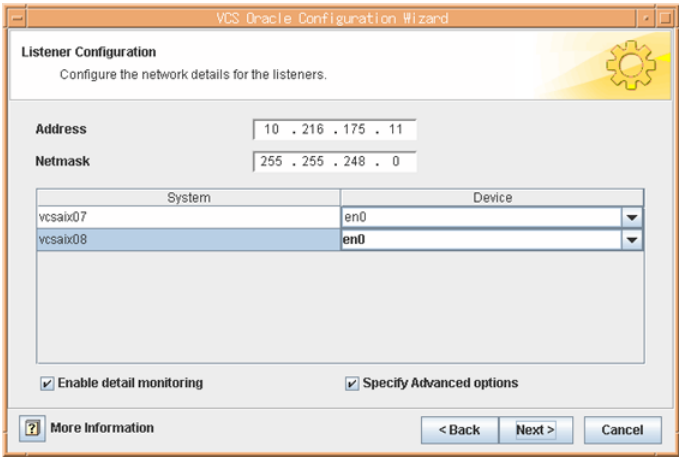
See "Monitor options for Oracle agent" on page 18.



12 In the Database Configuration dialog box, verify the mount points required by each database, specify the Mount and Fsck options, and click **Next**.



13 In the Listener Configuration dialog box, configure the listeners for the databases.

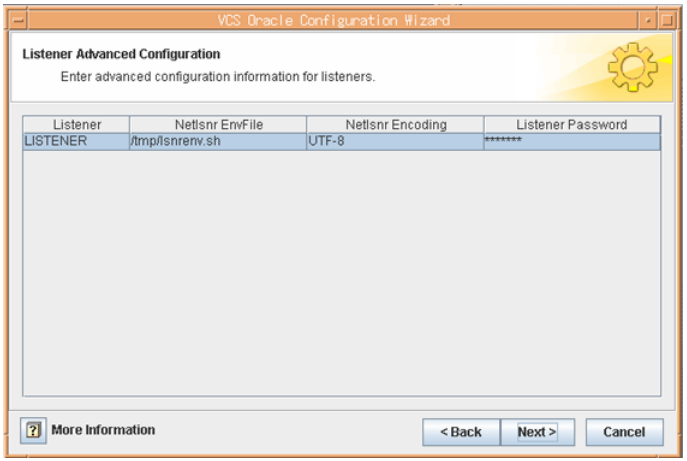


Specify the following information for the listeners:

Address	Verify the virtual IP address.
Netmask	Verify the Netmask.
Device	For each system, select a device.
Enable detail monitoring	Select the check box to enable detail monitoring.
Specify Advanced Options	Select the check box to enter advanced configuration information for the listeners.

14 Click **Next**.

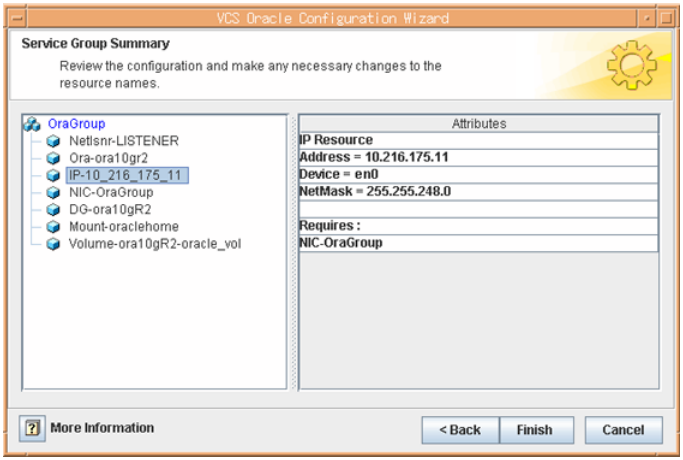
15 If you chose to specify advanced options for the listeners, the Listener Advanced Configuration dialog box is displayed.



Specify the following information for each listener and click **Next**:

Netlsnr EnvFile	Enter the path of the listener Envfile.
Netlsnr Encoding	Enter the encoding.
Listener Password	Enter a valid password for the listener. Do not encrypt passwords when entering them through the agent configuration wizard; the wizard takes care of encrypting passwords.

16 In the Service Group Summary dialog, review your configuration.



Click on a resource to view its attributes and their configured values in the Attributes box.

- Change names of resources, if desired; the wizard assigns unique names to resources based on their respective name rules.

  To edit a resource name, select the resource name and click on it, press Enter after editing each attribute.
- Review your configuration and click **Finish**.

The wizard starts running commands to create the Oracle service group. Various messages indicate the status of these commands.

17 In the Completing the Oracle Configuration wizard dialog box, select the **Bring the service group online** check box to bring the service group online on the local system.

18 Click **Close**.

The Oracle service group is created in your cluster.

Configuring the service group using Cluster Manager (Java console)

A template for the Oracle resource groups is automatically installed when you install the Oracle enterprise agent. Using the VCS Cluster Manager, you can view the template, which displays the Oracle service group, its resources and their attributes. You can dynamically modify the attribute values as necessary for your configuration.

Configuration tasks involve:

- Creating a new service group

- Editing the resource attributes

To create a new service group

1. Make sure that the Oracle type definition file OracleTypes.cf is imported in your configuration.
2. Launch the Cluster Configuration wizard. Do one of the following:
   - From the Cluster Explorer menu, select **Tools > Configuration Wizard**.
   - If no service groups exist on the system, **Cluster Explorer** prompts you to launch the **Cluster Configuration wizard**. Click **Yes** when prompted.

   The Loading Templates Information window appears, and launches the wizard.
3. Read the information on the Welcome screen and click **Next**.
4. Specify the name of the service group and the target systems on which it is to be configured.
   - Enter the name of the service group.
   - On the **Available Systems** box, select the systems on which to configure the service group.
   - Click the right arrow to move the selected systems to the **Systems for Service Group** box. To remove a system from the box, select the system and click the left arrow.
   - Indicate the order in which the systems will fail over (priority). System priority is numbered sequentially, with 1 denoting the system that starts first following a failover.
   - Click **Next**.
5. In the Would you like to use a template to configure the service group? dialog box, click **Next**.
6. In the Select a template to configure the service group dialog box, select the OracleGroup template on which to base the service group.

   If applicable, a window opens notifying you that names of some resources within the new service group are already in use. This window also includes a list of alternative names. You can select an alternative name, or modify the name. Click **Next** after resolving the name clashes.

7 Click **Next** to create the service group based on the selected template.

A window opens indicating that commands are being sent to add the group, its resources, and the attributes and dependencies specified in the template.

A progress indicator displays the percentage of the commands fired.

The actual commands are displayed at the top of the indicator.

8 Click **Next** when prompted that the service group has been successfully created.

A window opens listing the service group's resources and their associated attributes.

9 Click **Finish** to accept the default values and complete the configuration.

You can modify the default values of the resources according to your specific configuration requirements, as instructed in the following section.

To edit the resource attributes

1 Select the resource from the list on the left pane.

The resource's attributes appear in the right pane.

2 Select the attribute to be modified.

See "About the resource type and attribute definitions" on page 103.

3 Click the edit icon in the **Edit** column.

4 In the Edit Attribute dialog box, enter the attribute values. To modify the scope of the attribute, click the option buttons for **Global** or **Local**.

5 Click **OK**.

6 Repeat the procedure for each resource and its attributes and click **Finish**. Edit the attributes for all the resources according to your configuration.

7 Follow the wizard instructions to complete the configuration.

8 Click **Finish** to quit the wizard.

Configuring the service group using the command-line

The Veritas Cluster Server agent for Oracle comes with a sample configuration file that can be used as reference to directly modify your present configuration file. When you use this method, you must stop and restart VCS to implement the configuration.

The Veritas Cluster Server agent for Oracle also includes sample configuration files for ASM configurations in a VCS environment.

See "About the sample configurations for Oracle enterprise agent" on page 119.

To configure the service group using the sample configuration file

1. Log in to sysa as superuser.
2. Ensure that all changes to the existing configuration have been saved and that further changes are prevented while you modify main.cf:

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

3. To ensure that VCS is not running while you edit main.cf, issue the following 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.cf.orig
   ```

5. Edit the main.cf file.

   You can use the file /etc/VRTSagents/ha/conf/Oracle/sample_main.cf for reference.

   For ASM, you can refer to the examples shown in the file /etc/VRTSagents/ha/conf/OracleASM/sample_main.cf.asm.

   Do the following:

   - Create the Oracle and Netlsnr resources.
     For ASM instances and disk groups, create the ASMInst and ASMDG resources.
   - Edit the default attributes to match the parameters in your configuration.
     See "About the resource type and attribute definitions" on page 103.
   - Assign dependencies to the newly created resources.
     See "About the sample configurations for Oracle enterprise agent" on page 119.
     See the *Veritas Cluster Server User's Guide* for more information on assigning dependencies.

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

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

8 Start the VCS engine:

```
# hastart
```

9 Verify that all Oracle service group resources are brought online:

```
# hagrp -state
```

10 Take the service group offline and verify that all resources are stopped:

```
# hagrp -offline service_group -sys system_name
# hagrp -state
```

11 Bring the service group online again and verify that all resources are available:

```
# hagrp -online service_group -sys system_name
# hagrp -state
```

12 Start the VCS engine on sysb:

```
# hastart
```

13 Switch the Oracle service group to sysb:

```
# hagrp -switch service_group -to sysb
```

14 Verify that all Oracle service group resources are brought online on sysb:

```
# hagrp -state
```

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

```
/var/VRTSvcs/log/engine_A.log
/var/VRTSvcs/log/Oracle_A.log
/var/VRTSvcs/log/Netlsnr_A.log

/var/VRTSvcs/log/ASMInst_A.log/
var/VRTSvcs/log/ASMDG_A.log
```

Encrypting passwords

VCS provides a utility to encrypt database user passwords and listener passwords. You must encrypt the Pword attribute in the Oracle agent and the LsnrPwd attribute in the Netlsnr agent before you configure these attributes.

See "Listener authentication in VCS environment" on page 33.

The vcsencrypt utility also allows you to encrypt the agent passwords using a security key.

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

Note: You need not encrypt passwords when using the configuration wizard or the VCS Cluster Manager (Java Console) to configure attributes. The user passwords that are used for detail monitoring of the Oracle database are encrypted. The listener password that is considered for querying the status of the listener and stopping the listener is also encrypted.

Oracle provides the option of storing the listener password in the listener.ora file, in both clear text and encrypted formats. Irrespective of the format in which the password is stored in Oracle, you must encrypt the password using the vcsencrypt utility before you configure the LsnrPwd attribute.

If you encrypted the listener password using the Oracle lsnrctl utility, make sure that you pass the encrypted password to the vcsencrypt utility.

For example, if the password after you encrypt using the Oracle lsnrctl utility is as follows:

```
PASSWORDS_LISTENER = 652C5971EE3A8DF9
```

You must pass the Oracle-encrypted password to the vcsencrypt utility. For example:

```
# vcsencrypt  -agent 652C5971EE3A8DF9
```

The vcsencrypt utility displays the encrypted password. For example:
ciiIhiEkfIhiLijIdkHkhIfkDikKgkIil

To encrypt passwords

1 From the path $VCS_HOME/bin/, run the vcsencrypt utility.

- Type the following command:

  ```
  # vcsencrypt  -agent
  ```

- Enter the password and confirm it by entering it again. Press Enter.

```
# Enter New Password:
# Enter Again:
```

2 Review as the utility encrypts the password and displays the encrypted password.

3 Enter this encrypted password as the value for the attribute.

4 Copy the encrypted password for future reference.

Setting up detail monitoring

The Veritas Cluster Server agent for Oracle provides two levels of application monitoring: primary (basic monitoring) and secondary (detail monitoring).

- In the basic monitoring mode, the agent monitors the Oracle processes to verify that they are continuously active.

  Note: The agent for Oracle ASM does only basic monitoring for ASM instances.

- In the detail monitoring mode, the agent executes the script defined in the attribute MonScript of the Oracle and Netlsnr resources. If the script successfully executes, the agent considers the resource available. You can customize the default script according to your configuration.

See "Monitor options for Oracle agent" on page 18.

You can use the agent's detail monitoring capability to monitor the status of a database and listener and increase the confidence in their availability. Before setting up detail monitoring, you must have the agent running satisfactorily at the basic level of monitoring.

Note: Disable detail monitoring before undertaking any database maintenance that involves disabling database access to external users.

Setting up detail monitoring for Oracle

Detail monitoring for an Oracle resource verifies whether a database is ready for transactions by performing an update transaction against a table within the database. The update action is taken by the two scripts, `SqlTest.pl` and `SimpleTest.pl`, provided with the Veritas Cluster Server agent for Oracle. The scripts are available under the directory /opt/VRTSagents/ha/bin/Oracle/. Both scripts update the timestamp to monitor the database.

The `SqlTest.pl` script checks whether the database is open before updating the timestamp. If the database is found to be in restricted mode, quiesced mode, or suspended mode, the monitor returns success. In such a case, only basic monitoring occurs. The `SimpleTest.pl` script does not perform database checks but only issues update statements against the table.

Before enabling detail monitoring for Oracle, you must create a test table (with a timestamp) in the Oracle database. The detail monitor script, `MonScript`, must exist and have execute permission for root. You can use a custom monitor script, or the scripts provided with the agent. In the monitor script, the return code 100 indicates failure. Return codes from 101 to 110 indicate success.

The example to set up detail monitoring, based on the use of the supplied script, shows how to create and test a table for use by detail monitoring, and how to enable detail monitoring.

To set up detail monitoring for Oracle

1 Make the VCS configuration writable:

```
haconf -makerw
```

2 Freeze the service group to avoid automated actions by VCS caused by an incomplete reconfiguration:

```
hagrp -freeze service_group
```

3 Log on as an Oracle user.

```
su - <Owner>
```

4 Set the environment variables for ORACLE_HOME and ORACLE_SID.

```
export ORACLE_HOME=<Home>
export ORACLE_SID=<Sid>
```

5 Start the `svrmgrl` or `sqlplus` utility to set up a database table:

```
$ORACLE_HOME/bin/svrmgrl
```

or

```
$ORACLE_HOME/bin/sqlplus /nolog
```

6 As the database administrator, issue the following statements at the `svrmgrl` or `sqlplus` prompt to create the test table:

```
connect / as sysdba

create user  <User>
identified by <Pword>
default tablespace USERS

temporary tablespace TEMP
quota 100K on USERS;

grant create  session to <User>;

create table <User>.<Table> (  tstamp date );
insert into <User>.<Table> (tstamp) values  (SYSDATE);
```

7 To test the database table for use, do the following:

```
disconnect
connect  <User>/<Pword>
update <User>.<Table> set (  tstamp ) = SYSDATE;

select TO_CHAR(tstamp, 'MON DD, YYYY HH:MI:SS  AM')
from <User>.<Table>;
exit
```

8 Enable the detail monitoring for the Oracle resource using the following VCS commands:

```
hares -modify OracleResource User User
hares -modify OracleResource Pword Pword
hares -modify OracleResource Table Table
hares -modify OracleResource MonScript  "./bin/Oracle/SqlTest.pl"
hares -modify OracleResource DetailMonitor 1

haconf -dump  -makero

hagrp -unfreeze service_group
```

You can also use Cluster Manager (Java Console) to set these attributes.

Enabling and disabling detail monitoring for Oracle

Review the instructions to enable or disable detail monitoring.

To enable detail monitoring

- Set the DetailMonitor attribute to 1.

```
hares -modify OracleResource DetailMonitor 1
```

To disable detail monitoring

- Set the DetailMonitor attribute to 0.

```
hares -modify OracleResource DetailMonitor 0
```

Setting up detail monitoring for Netlsnr

For Netlsnr agent, the detail monitoring is enabled by default to monitor the listener process.

You can disable detail monitoring by setting the value of the attribute MonScript to an empty string.

You can enable detail monitoring for Netlsnr by specifying a value for the MonScript attribute. The example to set up detail monitoring uses the supplied monitor script for Netlsnr, /opt/VRTSagents/ha/bin/Netlsnr/LsnrTest.pl. The detail monitoring script for the Netlsnr resource uses the Listener command `lsnrctl status $Listener` to test the Listener process.

To disable detail monitoring for Netlsnr

- Disable detail monitoring by setting the MonScript attribute to an empty string:

```
haconf -makerw
hagrp -freeze service_group
hares -modify SqlResource MonScript ""
haconf -dump -makero
hagrp -unfreeze
```

To set up detail monitoring for Netlsnr

1 Make the VCS configuration writable:

```
haconf -makerw
```

2 Freeze the service group to avoid automated actions by VCS caused by an incomplete reconfiguration:

```
hagrp -freeze service_group
```

3 Enable detail monitoring by entering the following commands:

```
hares -modify LsnrResource MonScript "./bin/Netlsnr/LsnrTest.pl"

haconf -dump -makero

hagrp -unfreeze service_group
```

Chapter 5

Administering VCS service groups for Oracle

This chapter includes the following topics:

- About administering VCS service groups
- Bringing the service group online
- Taking the service group offline
- Switching the service group
- Modifying the service group configuration

About administering VCS service groups

You can administer service groups in Cluster Server using the Cluster Manager or command-line. Review the procedures to administer the service groups using the Cluster Manager.

See *Veritas Cluster Server User's Guide*.

Bringing the service group online

Perform the following steps to bring the service group online.

To bring a service group online

1. In the Cluster Explorer configuration tree, select the newly created service group.
2. Right-click the service group name, and select **Enable Resources** to enable all resources in the service group.

3 Right-click the service group name, and select the systems on which to enable the service group (Right-click>Enable>*system_name* or Right-click>Enable>All).

4 Save your configuration (File>Close Configuration).

5 Right-click the service group and select to online the service group on the system (Right-click>Online>*system_name*).

Taking the service group offline

Perform the following steps to take the service group offline.

To take a service group offline

1 In the **Service Groups** tab of the Cluster Explorer configuration tree, right-click the service group.

or

Select the cluster in the Cluster Explorer configuration tree, select the **Service Groups** tab, and right-click the service group icon in the view panel.

2 Choose **Offline**, and choose the appropriate system from the pop-up menu (Right-click>Offline>*system_name*).

Switching the service group

The process of switching a service group involves taking it offline on its current system and bringing it online on another system.

To switch a service group

1 In the **Service Groups** tab of the Cluster Explorer configuration tree, right-click the service group.

or

Select the cluster in the Cluster Explorer configuration tree, select the **Service Groups** tab, and right-click the service group icon in the view panel.

2 Choose **Switch To**, and choose the appropriate system from the pop-up menu (Right-click>Switch To>*system_name*).

Modifying the service group configuration

You can dynamically configure the Veritas Cluster Server agent for Oracle in several ways. You can use the following to configure the Veritas Cluster Server agent for Oracle:

- Configuration wizard
- Command-line interface
- Cluster Manager Java Console
- Veritas Cluster Server Management Console

Refer to the *Veritas Cluster Server User's Guide* for more information.

To modify an Oracle service group using the cluster configuration wizard

1. Start the Oracle Configuration wizard.

   ```
   # hawizard oracle
   ```

2. Read the information on the Welcome screen and click **Next**.
3. On the Wizard Options dialog box, select the **Modify service group** option, select the service group to be modified, and click **Next**.
4. Follow the wizard instructions and make modifications as per your configuration.

   See "Configuring the service group using the agent configuration wizard" on page 68.

Chapter 6

Troubleshooting Veritas Cluster Server agent for Oracle

This chapter includes the following topics:

- About troubleshooting Veritas Cluster Server agent for Oracle
- Error messages common to the Oracle and Netlsnr agents
- Error messages specific to the Oracle agent
- Error messages specific to the Netlsnr agent
- Error messages specific to the ASMInst agent
- Error messages specific to the ASMDG agent
- Issues specific to Oracle

About troubleshooting Veritas Cluster Server agent for Oracle

Review the information on the error logs that you must access:

- To check the Oracle installation error log, you must access:

  `$ORACLE_BASE/oraInventory/logs/installActionsdate_time.log`

  This file contains the errors that occurred during installation. It clarifies the nature of the error and at exactly which point it occurred during the

installation. If there are any installation problems, you must send this file to Tech Support for debugging the issue.

- To check the Veritas log file, you must access:

```
/var/VRTSvcs/log/engine_A.log
/var/VRTSvcs/log/Oracle_A.log
/var/VRTSvcs/log/Netlsnr_A.log

/var/VRTSvcs/log/ASMInst_A.log
/var/VRTSvcs/log/ASMDG_A.log
```

These files contain all the actions that the VCS engine and other agents for Oracle perform.

Review the description of the error messages for the following agents and the possible solutions:

- Oracle agent
- Netlsnr agent
- ASMInst agent
- ASMDG agent

Error messages common to the Oracle and Netlsnr agents

Table 6-1 lists the Veritas Cluster Server agent for Oracle error messages with the description and a recommended solution, if available.

Table 6-1 Veritas Cluster Server agent for Oracle error messages

Message	Description and solution
No ORACLE_HOME specified	The Home attribute in the Oracle or Netlsnr type has not been set. Solution: Set the Home attribute value to the correct full path name of the Oracle home.
Oracle home directory %s does not exist	The string that is specified for the Home attribute in the Oracle or Netlsnr type is incorrect. Solution: Set the Home attribute value to the correct full path name of the Oracle home.

Table 6-1 Veritas Cluster Server agent for Oracle error messages *(continued)*

Message	Description and solution
File %s is not a valid text file	The file that the EnvFile attribute specifies for sourcing the environment variables is not present, not readable, or is not a text file. Solution: Set the EnvFile attribute value to the correct full path name. Ensure that the file format is valid.
VCSAgExec returned failure when trying to execute in-depth test	Internal error. Solution: Contact Technical Support for further assistance.
Unable to open pipe from %s	Internal error. Solution: Contact Technical Support for further assistance.
Process %s restarted	Warning message to indicate that the PID for the Oracle process that is specified is different than the one registered by the previous monitor cycle.
Monitor procedure %s returned %s	MonScript failed to execute correctly. Solution: Debug MonScript to assess the exact cause of failure.
Monitor procedure %s did not exit, return value is %s	Internal error while executing MonScript. Solution: Contact Technical Support for further assistance.
No owner for Oracle executables was specified	The Owner attribute in the Oracle type has not been set. Solution: Set the Owner attribute value to the correct owner of the database binaries.
Invalid owner %s for Oracle executables was specified	The Operating System user that the Owner attribute specifies is invalid. Solution: Set the Owner attribute value to the correct owner of the database binaries.
Access to Monscript %s denied. Detail Monitoring will not be enabled!! Please specify a valid file.	The file that the MonScript attribute specifies is not accessible or not found. Solution: Make sure that the file name indicates a valid and accessible file.

Table 6-1 Veritas Cluster Server agent for Oracle error messages *(continued)*

Message	Description and solution
Encountered errors while decrypting password!	The agent cannot decrypt the password you specified. Solution: Use vcsencrypt utility to create a new encrypted password and supply the password.

Error messages specific to the Oracle agent

Table 6-2 lists the error messages for the VCS agent for Oracle with the description and a recommended solution, if available.

Table 6-2 Oracle agent error messages

Message	Description and solution
No SID specified	The Sid attribute in the Oracle type has not been set. Solution: Set the Sid attribute value to the correct database instance.
sqlplus/svrmgrl not found in %s/bin	The client utilities svrmgrl or sqlplus are not found in the $ORACLE_HOME/bin directory. Solution: Verify that the Oracle home has been correctly specified and that these executables are present.
srvctl not found in %s/bin	The client utility srvctl is not found in the $ORACLE_HOME/bin directory. Solution: Verify that the Oracle home has been correctly specified and that this executable is present.
Oracle %s failed to stop	Warning message to indicate that the following commands were not successful in closing the Oracle instance in the clean or offline entry point: ■ Shutdown immediate ■ Shutdown abort

Table 6-2 Oracle agent error messages *(continued)*

Message	Description and solution
Oracle database %s not running	Warning message to indicate that the database instance was not running even before the clean or offline entry points were executed. Solution: No action required.
Oracle (%s) kill TERM %s	Warning message to indicate that the Oracle processes would be signaled with SIGTERM. Solution: No action required.
Oracle (%s) kill KILL %s	Warning message to indicate that the Oracle processes would be signaled with SIGKILL. Solution: No action required.
Database in QUIESCING/QUIESCED mode	Warning message to indicate that database is in QUIESCING or QUIESCED mode.
Database in RESTRICTED mode	Warning message to indicate that database is in RESTRICTED mode.
Database in SUSPENDED state	Warning message to indicate that database is in SUSPENDED state.
Resource %s - monitor procedure did not complete within the expected time.	Refer to Oracle's alert log for more information. When a monitor times out as many times as the value specified, the corresponding resource is brought down by calling the clean entry point. The resource is then marked FAULTED, or it is restarted, depending on the RestartLimit attribute value. Solution: Set the FaultOnMonitorTimeouts attribute value to 0 so that the monitor failures are not considered indicative of a resource fault. Another possible reason could be that automatic archiving was not enabled while setting up the database. Solution: Archive the database manually. If automatic archival is enabled, set the LOG_ARCHIVE_START parameter value in the file init.ora to TRUE.

Table 6-2 Oracle agent error messages *(continued)*

Message	Description and solution
Custom script /opt/VRTSagents/ha/bin/Oracle/start_custom_%s.sql does not exist. Will not be able to start the database.	The agent could not find the custom script at the specified location to start the database. Solution: Make sure the custom file exists at the specified location and has valid permissions.
Custom script /opt/VRTSagents/ha/bin/Oracle/shut_custom_%s.sql does not exist. Using default shutdown option.	The agent could not find the custom script at the specified location to stop the database. Solution: Make sure the custom file exists and the specified location and has valid permissions.
oraerror.dat did not have records that could be parsed	The file oraerror.dat is not present or has records in an unsupported format. Solution: Make sure the file exists and has data in the supported format.
Incorrect Monitor Option	The MonitorOption value is less than 0 or greater than 1. Solution: Set the MonitorOption attribute value to 0 or 1.
MonitorOption value not applicable for this Oracle Version	The health check monitoring option is selected when Oracle version is not Oracle 10g or later. Solution: Set the MonitorOption value to 0 to select the process check monitoring option.
VCSAgExec returned failure when trying to execute health check monitor test	Internal error. Solution: Contact Technical Support for further assistance.
VCSAgExec returned failure while trying to find Oracle version	Internal error. Solution: Contact Technical Support for further assistance.
One or more of the attributes User:Pword:Table:MonScript are not set correctly. Detail monitoring will not be enabled!! Unset the DetailMonitor attribute if you want to disable DetailMonitoring.	Detail Monitoring has been enabled but the necessary attributes for detail monitoring have not been set correctly. Solution: Set the values of the required attributes for detail monitoring correctly or set DetailMonitor attribute value to 0 to disable detail monitoring.

Error messages specific to the Netlsnr agent

Table 6-3 lists the Netlsnr agent error messages with the description and a recommended solution, if available.

Table 6-3 Netlsnr agent error messages

Message	Description and solution
Cannot open process directory.	The agent could not process the /proc entries in the particular monitor cycle. Solution: No action required.
Listener process %s not running	Warning message to indicate that the Listener process was not running even before the clean or offline entry points were executed. Solution: No action required.
Listener %s kill TERM %s	Warning message to indicate that the Listener process would be signaled with SIGTERM. Solution: No action required.
Listener %s kill KILL %s	Warning message to indicate that the Listener process would be signaled with SIGKILL. Solution: No action required.
lsnrctl not found in %s/bin	The client utility lsnrctl is not found in the $ORACLE_HOME/bin directory. Solution: Verify that the Oracle home has been correctly specified and that this executable is present.
lsnrctl operation timed out	The tnslsnr process does not respond. Solution: Verify the underlying network protocol.

Error messages specific to the ASMInst agent

Table 6-4 lists the ASMInst agent error messages with the description and a recommended solution, if available.

Table 6-4 ASMInst agent error messages

Message	Description and solution
Attribute Home cannot have multiple tokens.	The Home attribute of the ASMInst agent has multiple tokens. Solution: Correct the value of the Home attribute.
Cluster Synchronization Service process is not running.	The Oracle CSSD process is not running. Solution: Enable the CSSD process. See "Enabling the clustering daemon for ASM-managed database" on page 44.
Cluster Synchronization Service died or is restarted.	The Oracle CSSD process has died. Solution: Enable the CSSD process. See "Enabling the clustering daemon for ASM-managed database" on page 44.

Error messages specific to the ASMDG agent

Table 6-5 lists the ASMInst agent error messages with the description and a recommended solution, if available.

Table 6-5 ASMDG agent error messages

Message	Description and solution
No ASM Diskgroup name specified, or is null.	The DiskGroups attribute value for ASMDG agent is not specified. Solution: Specify the value of the Diskgroup attribute.
Agent unable to identify state of the ASMDG resource. The asm_diskstring parameter is not set correctly in the ASM initialization parameter file.	The ASM initialization parameter file does not have the correct value for ASM instance to search the ASM disk groups. Solution: Specify the correct value for the asm_diskstring parameter in the ASM initialization parameter file.
Agent unable to identify state of the resource.	The ASMDG agent cannot identify the state of the resource. Solution: Contact Technical Support for further assistance.

Issues specific to Oracle

Table 6-6 lists an Oracle issue and the solution.

Table 6-6 Oracle common issue

Message	Description and solution
ORA-15097: Cannot SHUTDOWN ASM instance with connected RDBMS instance.	This message appears for ASM-managed database if you try to offline the Oracle service group within 2-3 minutes after you brought the service group online. Refer to Oracle bug 5045309 for more information.

Appendix A

Resource type definitions

This appendix includes the following topics:

- About the resource type and attribute definitions
- Oracle resource type
- Netlsnr resource type
- ASMInst resource type
- ASMDG resource type

About the resource type and attribute definitions

The resource type represents the VCS configuration definition of the agent and specifies how the agent is defined in the configuration file main.cf. The Attribute Definitions explain the attributes associated with the agent. The Required attributes explain the attributes that must be configured for the agent to function properly.

Oracle resource type

The Oracle agent of the Veritas Cluster Server agent for Oracle is represented by the Oracle resource type in VCS.

```
type Oracle (

    static str AgentDirectory = "/opt/VRTSagents/ha/bin/Oracle"

static keylist SupportedActions = { VRTS_GetInstanceName,
        VRTS_GetRunningServices, DBRestrict, DBUndoRestrict,
        DBResume, DBSuspend, DBTbspBackup,
        "home.vfd", "owner.vfd", "getid", "pfile.vfd" }
```

```
static str ArgList[] = { Sid, Owner, Home, Pfile, StartUpOpt,
        ShutDownOpt, EnvFile, AutoEndBkup, DetailMonitor,
        User, Pword, Table, MonScript, AgentDebug, Encoding,
        MonitorOption }
    str Sid
    str Owner
    str Home
    str Pfile
    str StartUpOpt = STARTUP_FORCE
    str ShutDownOpt = IMMEDIATE
    str EnvFile
    boolean AutoEndBkup = 1
    int DetailMonitor = 0
    str MonScript = "./bin/Oracle/SqlTest.pl"
    str User
    str Pword
    str Table
    boolean AgentDebug = 0
    str Encoding
    int MonitorOption = 0
    static int IntentionalOffline = 1

)
```

Oracle attribute definitions

Review the description of the Oracle agent attributes. The agent attributes are classified as required, optional, and internal.

Table A-1 lists the required attributes. You must assign values to the required attributes.

Table A-1 Required attributes for Oracle agent

Required attributes	Type and dimension	Definition
Sid	string-scalar	The variable $ORACLE_SID that represents the Oracle instance. The Sid is considered case-sensitive by the Oracle agent and by the Oracle database server.
Owner	string-scalar	The Oracle user, as the defined owner of executables and database files in /etc/passwd.

Table A-1 Required attributes for Oracle agent *(continued)*

Required attributes	Type and dimension	Definition
Home	string-scalar	The $ORACLE_HOME path to Oracle binaries and configuration files. For example, you could specify the path as /opt/ora_home. **Note:** Do not append a slash (/) at the end of the path.

Table A-2 lists the optional attributes for Oracle agent. You can configure the optional attributes if necessary.

Table A-2 Optional attributes for Oracle agent

Optional Attributes	Type and Dimension	Definition
StartUpOpt	string-scalar	Startup options for the Oracle instance. This attribute can take the following values: ■ STARTUP ■ STARTUP_FORCE ■ RESTRICTED ■ RECOVERDB ■ SRVCTLSTART ■ CUSTOM Default is STARTUP_FORCE. See "Startup and shutdown options" on page 16.
ShutDownOpt	string-scalar	Shut down options for the Oracle instance. This attribute can take the following values: ■ IMMEDIATE ■ TRANSACTIONAL ■ SRVCTLSTOP ■ CUSTOM Default is IMMEDIATE. See "Startup and shutdown options" on page 16.

Table A-2 Optional attributes for Oracle agent *(continued)*

Optional Attributes	Type and Dimension	Definition
EnvFile	string-scalar	The full path name of the file that is sourced by the entry point scripts. This file contains the environment variables set by the user for the Oracle database server environment such as LD_LIBRARY_PATH, NLS_DATE_FORMAT, and so on. The syntax for the contents of the file depends on the login shell of Owner. File must be readable by Owner. The file must not contain any prompts for user input.
Pfile	string-scalar	The name of the initialization parameter file with the complete path of the startup profile. You can also use the server parameter file. Create a one-line text initialization parameter file that contains only the SPFILE parameter. See the Oracle documentation for more information. See "Using the SPFILE in a VCS cluster" on page 154.
AutoEndBkup	integer-scalar	Setting the AutoEndBkup attribute to a non-zero value takes the datafiles in the database out of the backup mode, during Online. Default = 1 See "Hot backup of Oracle database in VCS environment" on page 34.

Table A-2 Optional attributes for Oracle agent *(continued)*

Optional Attributes	Type and Dimension	Definition
MonitorOption	integer-scalar	Monitor options for the Oracle instance. This attribute can take values 0 or 1. ■ 0 - Process check monitoring (recommended) ■ 1 - Health check monitoring You must the set the value of this attribute as 1 to use the intentional offline functionality of the agent. Default = 0 See "Monitor options for Oracle agent" on page 18.
DetailMonitor	integer-scalar	Setting this flag to a non-zero enables detail monitoring for Oracle. The value indicates the number of monitor cycles after which the agent will monitor Oracle in detail. For example, the value 5 indicates that the agent will monitor Oracle in detail every five monitor intervals. **Note:** If you set the AutoEndBkup attribute value to 0, then you must set the DetailMonitor attribute value to 1. Default = 0

Table A-2 Optional attributes for Oracle agent *(continued)*

Optional Attributes	Type and Dimension	Definition
MonScript	string-scalar	Pathname to the script provided for detail monitoring. The default (basic monitoring) is to monitor the database PIDs only. **Note:** Detail monitoring is disabled if the value of the attribute MonScript is invalid or is set to an empty string. The pathname to the supplied detail monitor script is /opt/VRTSagents/ha/bin/Oracle/SqlTest.pl. MonScript also accepts a pathname relative to /opt/VRTSagents/ha. A relative pathname should start with "./", as in the path ./bin/Oracle/SqlTest.pl.
User	string-scalar	Internal database user. Connects to the database for detail monitoring.
Pword	string-scalar	Encrypted password for internal database-user authentication. Encrypt passwords only when entering them using the command-line. Passwords must be encrypted using the VCS Encrypt utility. See "Encrypting passwords " on page 81.
Table	string-scalar	Table for update by `User/Pword`.
Encoding	string-scalar	Specifies operating system encoding that corresponds to Oracle encoding for the displayed Oracle output. Default is "".

Table A-2 Optional attributes for Oracle agent *(continued)*

Optional Attributes	Type and Dimension	Definition
IntentionalOffline	static-int	Defines how VCS reacts when Oracle is intentionally stopped outside of VCS control. If you stop Oracle out of VCS control, the agent behavior is as follows: ■ 0—the Oracle agent registers a fault and initiates the failover of the service group. ■ 1—the Oracle agent takes the Oracle resource offline when Health check monitoring is enabled. If Health check monitoring is not enabled, the agent registers a fault and initiates the failover of the service group. **Note:** If you want to use the intentional offline functionality of the agent, you must set the value of the MonitorOption attribute as 1 to enable Health check monitoring. Default = 1 See *Veritas Cluster Server User's Guide*.
AgentDebug	boolean-scalar	Additional debug messages are logged when this flag is set. Default = 0

Table A-3 lists the internal attribute for Oracle agent. This attribute is for internal use only. Symantec recommends not to modify the value of this attribute.

Table A-3 Internal attributes for Oracle agent

Optional Attributes	Type and Dimension	Definition
AgentDirectory	static-string	Specifies the location of binaries, scripts, and other files related to the Oracle agent. Default is /opt/VRTSagents/ha/bin/Oracle.

Netlsnr resource type

The Netlsnr agent of the Veritas Cluster Server agent for Oracle is represented by the Netlsnr resource type in VCS.

```
type Netlsnr (

    static str AgentDirectory = "/opt/VRTSagents/ha/bin/Netlsnr"

    static keylist SupportedActions = { VRTS_GetInstanceName,
        VRTS_GetRunningServices, "tnsadmin.vfd" }
    static str ArgList[] = { Owner, Home, TnsAdmin, Listener,
        EnvFile, MonScript, LsnrPwd, AgentDebug, Encoding }
    str Owner
    str Home
    str TnsAdmin
    str Listener
    str EnvFile
    str MonScript = "./bin/Netlsnr/LsnrTest.pl"
    str LsnrPwd
    boolean AgentDebug = 0
    str Encoding
    static int IntentionalOffline = 0

)
```

Netlsnr attribute definitions

Review the description of the Netlsnr agent attributes. The agent attributes are classified as required, optional, and internal.

Table A-4 lists the required attributes for Netlsnr agent. You must assign values to the required attributes.

Table A-4 Required attributes for Netlsnr agent

Required attributes	Type and dimension	Definition
Owner	string-scalar	Oracle user, as the defined owner of executables and database files in /etc/passwd.
Home	string-scalar	The $ORACLE_HOME path to Oracle binaries and configuration files. For example, you could specify the path as /opt/ora_home. Do not append a slash (/) at the end of the path.

Table A-5 lists the optional attributes for Netlsnr agent. You can configure the optional attributes if necessary.

Table A-5 Optional attributes for Netlsnr agent

Optional attributes	Type and dimension	Definition
TnsAdmin	string-scalar	The $TNS_ADMIN path to directory in which the Listener configuration file resides (listener.ora). Default is /var/opt/oracle.
Listener	string-scalar	Name of Listener. The name for Listener is considered case-insensitive by the Netlsnr agent and the Oracle database server. Default is LISTENER.

Table A-5 Optional attributes for Netlsnr agent *(continued)*

Optional attributes	Type and dimension	Definition
LsnrPwd	string-scalar	The VCS encrypted password used to stop and monitor the listener. This password is set in the Listener configuration file. Encrypt passwords only when entering them using the command-line. Passwords must be encrypted using the VCS Encrypt utility. See "Listener authentication in VCS environment" on page 33. See "Encrypting passwords " on page 81.
EnvFile	string-scalar	Specifies the full path name of the file that is sourced by the entry point scripts. This file contains the environment variables set by the user for the Oracle listener environment such as LD_LIBRARY_PATH and so on. The syntax for the contents of the file depends on the login shell of Owner. This file must readable by Owner. The file must not contain any prompts for user input.

Table A-5 Optional attributes for Netlsnr agent *(continued)*

Optional attributes	Type and dimension	Definition
MonScript	string-scalar	Pathname to the script provided for detail monitoring. By default, the detail monitoring is enabled to monitor the listerner process. **Note:** If the value of the attribute MonScript is set to an empty string, the agent disables detail monitoring. The pathname to the supplied detail monitoring script is /opt/VRTSagents/ha/bin/Netlsnr/LsnrTest.pl. MonScript also accepts a pathname relative to /opt/VRTSagents/ha. A relative pathname should start with "./", as in the path ./bin/Netlsnr/LsnrTest.pl.
Encoding	string-scalar	Specifies operating system encoding that corresponds to Oracle encoding for the displayed Oracle output. Default is "".
IntentionalOffline	static-int	For future use. Do not change the value of this attribute. Default = 0
AgentDebug	boolean	Additional debug messages are logged when this flag is set. Default = 0

Table A-6 lists the internal attribute for Netlsnr agent. This attribute is for internal use only. Symantec recommends not to modify the value of this attribute.

Table A-6 Internal attributes for Netlsnr agent

Optional Attributes	Type and Dimension	Definition
AgentDirectory	static-string	Specifies the location of binaries, scripts, and other files related to the Netlsnr agent. Default is /opt/VRTSagents/ha/bin/Netlsnr.

ASMInst resource type

The ASMInst agent of the Veritas Cluster Server agent for Oracle is represented by the ASMInst resource type in VCS.

```
type ASMInst (
    static str AgentDirectory = "/opt/VRTSagents/ha/bin/ASMInst"
    static str ArgList[] = { Sid, Owner, Home, Pfile,
    EnvFile, Encoding }
    str Sid
    str Owner
    str Home
    str Pfile
    str EnvFile
    str Encoding
    )
```

ASMInst attribute definitions

Review the description of the ASMInst agent attributes. The agent attributes are classified as required, optional, and internal.

Table A-7 lists the required attributes. You must assign values to the required attributes.

Table A-7 Required attributes for ASMInst agent

Required attributes	Type and dimension	Definition
Sid	string-scalar	The variable $ORACLE_SID that represents the ASM instance. The Sid is considered case-sensitive by the ASMInst agent.

Table A-7 Required attributes for ASMInst agent *(continued)*

Required attributes	Type and dimension	Definition
Owner	string-scalar	The Oracle user, as the defined owner of $ORACLE_HOME of ASM instance and in /etc/passwd.
Home	string-scalar	The $ORACLE_HOME path to Oracle ASM binaries and configuration files. For example, you could specify the path as /opt/ora_home. **Note:** Do not append a slash (/) at the end of the path.

Table A-8 lists the optional attributes for ASMInst agent. You can configure the optional attributes if necessary.

Table A-8 Optional attributes for ASMInst agent

Optional Attributes	Type and Dimension	Definition
EnvFile	string-scalar	The full path name of the file that is sourced by the entry point scripts. This file contains the environment variables set by the user for the Oracle database server environment such as LD_LIBRARY_PATH, NLS_DATE_FORMAT, and so on. The syntax for the contents of the file depends on the login shell of Owner. File must be readable by Owner. The file must not contain any prompts for user input.

Table A-8 Optional attributes for ASMInst agent *(continued)*

Optional Attributes	Type and Dimension	Definition
Pfile	string-scalar	The name of the initialization parameter file of ASM instance with the complete path of the startup profile. You can also use the server parameter file. Create a one-line text initialization parameter file that contains only the SPFILE parameter. See the Oracle documentation for more information. See "Using the SPFILE in a VCS cluster" on page 154.
Encoding	string-scalar	Specifies operating system encoding that corresponds to Oracle encoding for the displayed Oracle output. Default is "".

Table A-9 lists the internal attribute for ASMInst agent. This attribute is for internal use only. Symantec recommends not to modify the value of this attribute.

Table A-9 Internal attributes for ASMInst agent

Optional Attributes	Type and Dimension	Definition
AgentDirectory	static-string	Specifies the location of binaries, scripts, and other files related to the ASMInst agent. Default is /opt/VRTSagents/ha/bin/ASMInst.

ASMDG resource type

The ASMDG agent of the Veritas Cluster Server agent for Oracle is represented by the ASMDG resource type in VCS.

```
type ASMDG (
    static str AgentDirectory = "/opt/VRTSagents/ha/bin/ASMDG"
    static str ArgList[] = { Sid, Owner, Home, DiskGroups,
    EnvFile, Encoding }
```

```
str Sid
str Owner
str Home
keylist DiskGroups
str EnvFile
str Encoding
)
```

ASMDG attribute definitions

Review the description of the ASMDG agent attributes. The agent attributes are classified as required, optional, and internal.

Table A-10 lists the required attributes. You must assign values to the required attributes.

Table A-10 Required attributes for ASMDG agent

Required attributes	Type and dimension	Definition
DiskGroups	keylist	The ASM disk groups, where you store the Oracle database files.
Sid	string-scalar	The variable $ORACLE_SID that represents the ASM instance. The Sid is considered case-sensitive by the ASMInst agent.
Owner	string-scalar	The Oracle user, as the defined owner of $ORACLE_HOME of ASM instance and in /etc/passwd.
Home	string-scalar	The $ORACLE_HOME path to Oracle ASM binaries and configuration files. For example, you could specify the path as /opt/ora_home. **Note:** Do not append a slash (/) at the end of the path.

Table A-11 lists the optional attributes for ASMDG agent. You can configure the optional attributes if necessary.

Table A-11 Optional attributes for ASMDG agent

Optional Attributes	Type and Dimension	Definition
EnvFile	string-scalar	The full path name of the file that is sourced by the entry point scripts. This file contains the environment variables set by the user for the Oracle database server environment such as LD_LIBRARY_PATH, NLS_DATE_FORMAT, and so on. The syntax for the contents of the file depends on the login shell of Owner. File must be readable by Owner. The file must not contain any prompts for user input.
Encoding	string-scalar	Specifies operating system encoding that corresponds to Oracle encoding for the displayed Oracle output. Default is "".

Table A-12 lists the internal attribute for ASMDG agent. This attribute is for internal use only. Symantec recommends not to modify the value of this attribute.

Table A-12 Internal attributes for ASMDG agent

Optional Attributes	Type and Dimension	Definition
AgentDirectory	static-string	Specifies the location of binaries, scripts, and other files related to the ASMDG agent. Default is /opt/VRTSagents/ha/bin/ASMDG.

Appendix B

Sample configurations

This appendix includes the following topics:

- About the sample configurations for Oracle enterprise agent
- Sample single Oracle instance configuration
- Sample multiple Oracle instances (single listener) configuration
- Sample multiple instance (multiple listeners) configuration
- Sample Oracle configuration with shared server support
- Sample Oracle ASM configurations

About the sample configurations for Oracle enterprise agent

The sample configuration include descriptions for typical service groups that are configured to monitor the state of Oracle in a VCS cluster.

See "Configuring Oracle instances in VCS" on page 58.

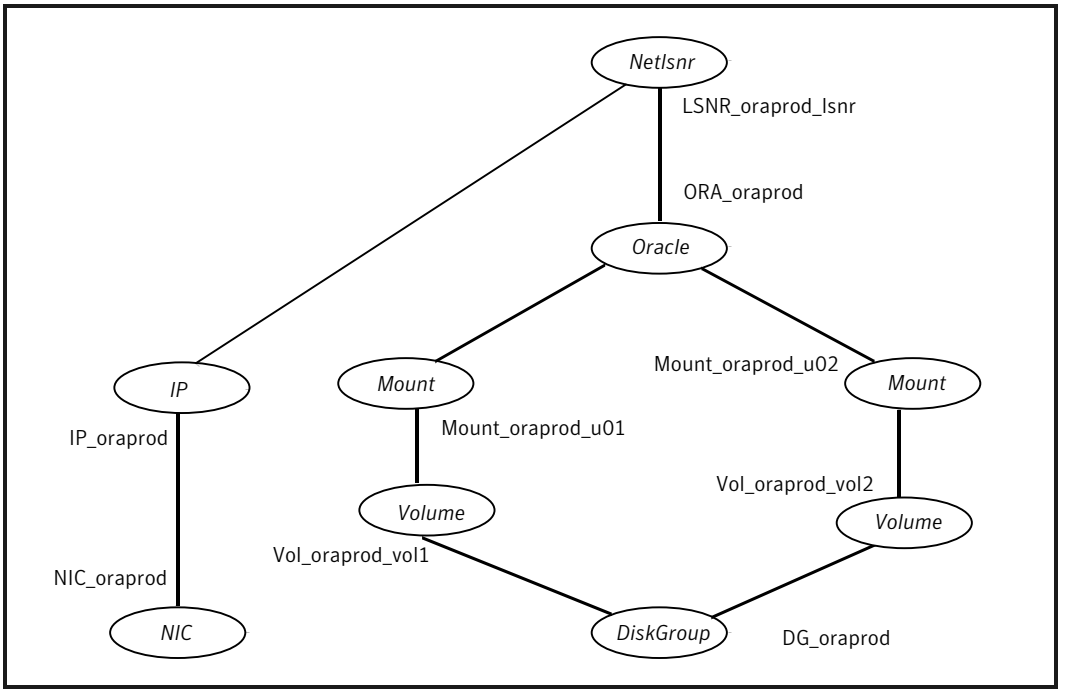
The sample dependency graphs depict the resource types, resources, and resource dependencies within the service group. The sample configuration file (main.cf) is also included for your reference.

Review these dependencies carefully before configuring the agent. For more information about VCS resource types, see the *Veritas Cluster Server Bundled Agents Reference Guide*.

Sample single Oracle instance configuration

Figure B-1 describes a typical service group configured to monitor the state of an Oracle instance in a VCS cluster.

Figure B-1 Dependency graph for single Oracle instance



The shared disk groups and volumes in the cluster are configured as resources of type DiskGroup and Volume respectively. The volumes are mounted using the Mount agent. The virtual IP address for the service group is configured using the IP and NIC resource types. The Oracle server can be started after each of these resources is brought online.

If your configuration does not use Veritas Volume Manager, use the DiskReservation resource type to configure shared storage instead of the DiskGroup and Volume resource types.

Sample configuration file for single Oracle instance

Review the sample configuration with a resource of type Oracle that is configured as follows in main.cf file:

```
include "types.cf"
include "OracleTypes.cf"

cluster vcs (
)

system vcsaix1 (

)

system vcsaix2 (

)

group ORA_PROD_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)
DiskGroup DG_oraprod (
        DiskGroup = ora_prod_dg
        StartVolumes = 0
        StopVolumes = 0
    )

    IP IP_oraprod (

        Device = en0

        Address = "10.212.102.13"
    )

    Mount Mount_oraprod_u01 (
        MountPoint = "/prod/u01"
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u01-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    Mount Mount_oraprod_u02 (
        MountPoint = "/prod/u02"
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u02-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )
```

```
    NIC NIC_oraprod (

        Device = en0

)

    Netlsnr LSNR_oraprod_lsnr (
        Owner = oraprod

        Home = "/orahome/Oracle"
        TnsAdmin = "/orahome/Oracle/network/admin"
        Listener = LISTENER_PROD
        MonScript = "./bin/Netlsnr/LsnrTest.pl"
        LsnrPwd = cqfOdoOolOo
    )

    Oracle ORA_oraprod (
        Sid = PROD
        Owner = oraprod

        Home = "/orahome/Oracle"
        EnvFile = "/tmp/env.sh"
        DetailMonitor = 1
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
        MonitorOption = 0
    )

    Volume Vol_oraprod_vol1 (
        Volume = u01-vol
        DiskGroup = ora_prod_dg
    )

Volume Vol_oraprod_vol2 (
        Volume = u02-vol
        DiskGroup = ora_prod_dg
    )

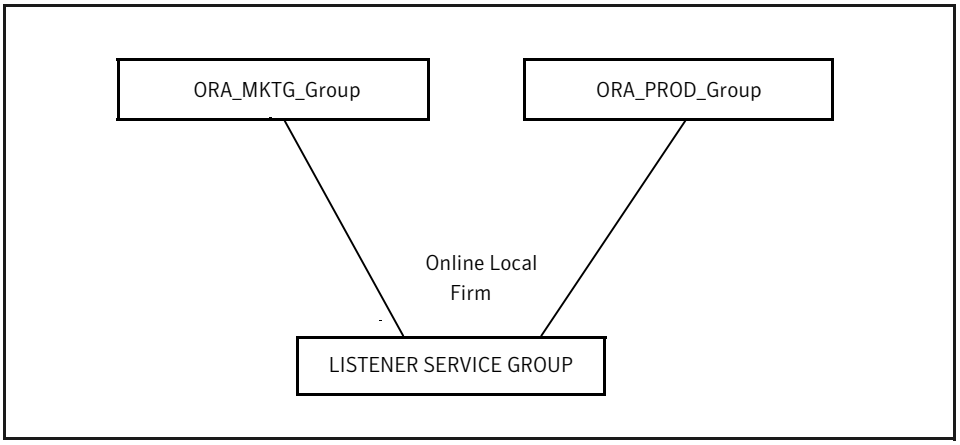
    IP_oraprod requires NIC_oraprod
    LSNR_oraprod_lsnr requires IP_oraprod
    LSNR_oraprod_lsnr requires ORA_oraprod
```

```
Mount_oraprod_u01 requires Vol_oraprod_vol1
Mount_oraprod_u02 requires Vol_oraprod_vol2
ORA_oraprod requires Mount_oraprod_u01
ORA_oraprod requires Mount_oraprod_u02
Vol_oraprod_vol1 requires DG_oraprod
Vol_oraprod_vol2 requires DG_oraprod
```

Sample multiple Oracle instances (single listener) configuration

Figure B-2 describes a typical VCS configuration to monitor two Oracle instances sharing a listener. This configuration has a service group for each Oracle instance. The Listener too is configured in a separate service group.

Figure B-2 Two Oracle instances sharing a listener



The Oracle service groups are made dependent on the Listener service group using an Online Local Firm dependency.

Figure B-3 shows the dependency graph for one of the Oracle instances in the VCS configuration. In the Oracle service group, the shared disk groups and volumes in the cluster are configured as resources of type DiskGroup and Volume respectively. The volumes are mounted using the Mount agent.

Figure B-3 Dependency graph for one of the Oracle instances

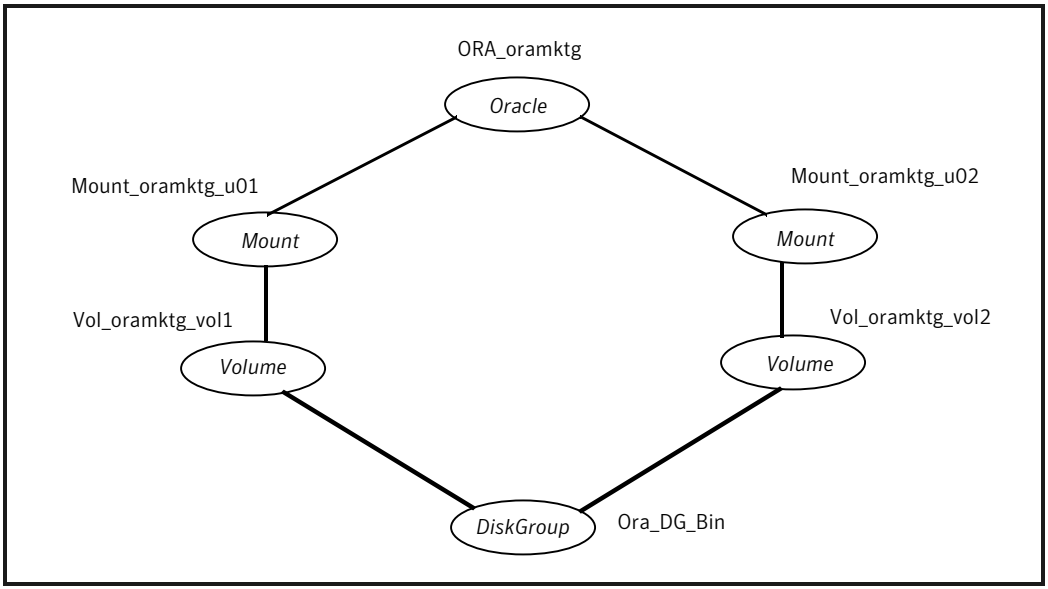
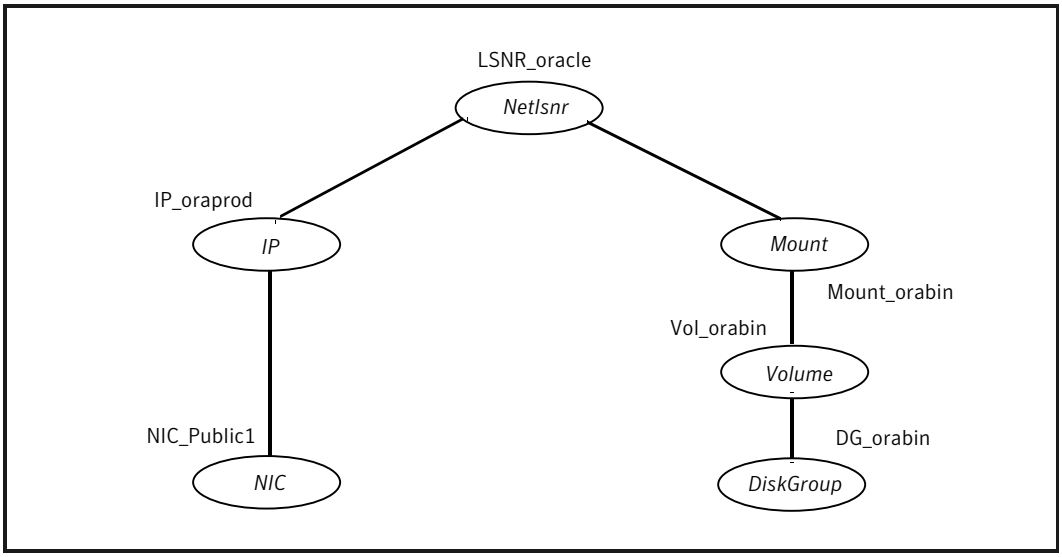


Figure B-4 shows the dependency graph for the listener that the two Oracle instances share in the VCS configuration. In the Listener service group, the virtual IP address is configured using the IP and NIC resource types. The Listener can be started after the IP and NIC resources are brought online.

Figure B-4 Dependency graph for the single listener



The Oracle server can be started after the Listener service group and the resources in the Oracle service group are brought online.

If your configuration does not use Veritas Volume Manager, use the DiskReservation resource type to configure shared storage instead of the DiskGroup and Volume resource types.

Note: In this case, make sure you have modified all proper system files, such as /etc/system, /etc/passwd, /etc/group, and /etc/shadow to support multiple databases. Pay particular attention to system requirements like physical memory and shared memory segment availability. Also ensure a single system is capable of sustaining a multiple instance load in the event of a server failure and extended operation on the backup server.

Sample configuration file for multiple Oracle instances (single listener)

Review the sample configuration file for multiple Oracle instances.

```
include "types.cf"
include "OracleTypes.cf"

cluster vcs (
)
```

```
system vcsaix1 (

)

system vcsaix2 (

)

group ORA_MKTG_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)
    DiskGroup DG_oramktg (
        DiskGroup = ora_mktg_dg
        StartVolumes = 0
        StopVolumes = 0
    )

    Mount Mount_oramktg_u01 (
        MountPoint = "/mktg/u01"
        BlockDevice = "/dev/vx/dsk/ora_mktg_dg/u01-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    Mount Mount_oramktg_u02 (
        MountPoint = "/mktg/u02"
        BlockDevice = "/dev/vx/dsk/ora_mktg_dg/u02-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    Oracle ORA_oramktg (
        Sid = MKTG
        Owner = oramktg

        Home = "/orahome/Oracle"
        EnvFile = "/tmp/env.sh"
        DetailMonitor = 1
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
```

```
        MonitorOption = 0
    )

    Volume Vol_oramktg_vol1 (
        Volume = u01-vol
        DiskGroup = ora_mktg_dg
    )

    Volume Vol_oramktg_vol2 (
        Volume = u02-vol
        DiskGroup = ora_mktg_dg
    )

    requires group Common_Service online  firm
    Mount_oramktg_u01 requires Vol_oramktg_vol1
    Mount_oramktg_u02 requires Vol_oramktg_vol2
    ORA_oramktg requires Mount_oramktg_u01
    ORA_oramktg requires Mount_oramktg_u02
    Vol_oramktg_vol1 requires DG_oramktg
    Vol_oramktg_vol2 requires DG_oramktg


group ORA_PROD_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)

    DiskGroup DG_oraprod (
        DiskGroup = ora_prod_dg
        StartVolumes = 0
        StopVolumes = 0
    )

    Mount Mount_oraprod_u01 (
        MountPoint = "/prod/u01"
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u01-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    Mount Mount_oraprod_u02 (
        MountPoint = "/prod/u02"
```

```
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u02-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    Oracle ORA_oraprod (
        Sid = PROD
        Owner = oraprod
        Home = "/orahome/Oracle"

        EnvFile = "/tmp/env.sh"
        DetailMonitor = 1
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
        MonitorOption = 0
    )

    Volume Vol_oraprod_vol1 (
        Volume = u01-vol
        DiskGroup = ora_prod_dg
    )

    Volume Vol_oraprod_vol2 (
        Volume = u02-vol
        DiskGroup = ora_prod_dg
    )

    requires group Common_Service online  firm
    Mount_oraprod_u01 requires Vol_oraprod_vol1
    Mount_oraprod_u02 requires Vol_oraprod_vol2
    ORA_oraprod requires Mount_oraprod_u01
    ORA_oraprod requires Mount_oraprod_u02
    Vol_oraprod_vol1 requires DG_oraprod
    Vol_oraprod_vol2 requires DG_oraprod


group Common_Service (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }
```

```
)

    DiskGroup DG_orabin (
        DiskGroup = ora_bin_dg
        StartVolumes = 0
        StopVolumes = 0
    )

    IP IP_oraprod (

        Device = en0

        Address = "10.212.102.13"
    )

    Mount Mount_orabin (

        MountPoint = "/orahome/Oracle"
        BlockDevice = "/dev/vx/dsk/ora_bin_dg/u01-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    NIC NIC_Public1 (

        Device = en0

    )

    Netlsnr LSNR_oracle (
        Owner = oracle

        Home = "/orahome/Oracle"
        TnsAdmin = "/orahome/Oracle/network/admin"
        Listener = LISTENER_ORACLE
        MonScript = "./bin/Netlsnr/LsnrTest.pl"
    )

    Volume Vol_orabin (
        Volume = u01-vol
        DiskGroup = ora_bin_dg
    )

    IP_oraprod requires NIC_Public1
    LSNR_oracle requires IP_oraprod
```

```
LSNR_oracle requires Mount_orabin
Mount_orabin requires Vol_orabin
Vol_orabin requires DG_orabin
```

Sample multiple instance (multiple listeners) configuration

This configuration has several single-instance configurations. Each Oracle instance is configured in a separate service group. The resource dependencies are similar to the single Oracle instance configuration.

See "Sample single Oracle instance configuration" on page 120.

Sample configuration file

Review the sample configuration file for the multiple Oracle instances that have multiple listeners.

```
include "types.cf"
include "OracleTypes.cf"

cluster vcs (
)

system vcsaix1 (

)

system vcsaix2 (

)

group ORA_MKTG_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)

    DiskGroup DG_oramktg (
        DiskGroup = ora_mktg_dg
        StartVolumes = 0
        StopVolumes = 0
    )
```

```
IP IP_oramktg (

    Device = en0

    Address = "10.212.102.14"
)

Mount Mount_oramktg_u01 (
    MountPoint = "/mktg/u01"
    BlockDevice = "/dev/vx/dsk/ora_mktg_dg/u01-vol"
    FSType = vxfs
    FsckOpt = "-n"
)

Mount Mount_oramktg_u02 (
    MountPoint = "/mktg/u02"
    BlockDevice = "/dev/vx/dsk/ora_mktg_dg/u02-vol"
    FSType = vxfs
    FsckOpt = "-n"
)

    Netlsnr LSNR_oramktg_lsnr (
    Owner = oramktg

    Home = "/mktg/u01/oracle/product/8.1.5"
    TnsAdmin = "/mktg/u01/oracle/network/admin"

    Home = "/orahome/Oracle"
    TnsAdmin = "/orahome/Oracle/network/admin"
    Listener = LISTENER_MKTG
    MonScript = "./bin/Netlsnr/LsnrTest.pl"
    LsnrPwd = cqfOdoOolOo
)

Oracle ORA_oramktg (
    Sid = MKTG
    Owner = oramktg
    Home = "/orahome/Oracle"

    Home = "/mktg/u01/oracle/product/8.1.5"
    Pfile = "/mktg/u01/oracle/admin/pfile/initMKTG.ora"

    EnvFile = "/tmp/env.sh"
    DetailMonitor = 1
```

```
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
        MonitorOption = 0
    )

    Proxy NICProxy_oramktg (
        TargetResName = NIC_Public1
    )

    Volume Vol_oramktg_vol1 (
        Volume = u01-vol
        DiskGroup = ora_mktg_dg
    )

    Volume Vol_oramktg_vol2 (
        Volume = u02-vol
        DiskGroup = ora_mktg_dg
    )

    IP_oramktg requires NICProxy_oramktg
    LSNR_oramktg_lsnr requires IP_oramktg
    LSNR_oramktg_lsnr requires ORA_oramktg
    Mount_oramktg_u01 requires Vol_oramktg_vol1
    Mount_oramktg_u02 requires Vol_oramktg_vol2
    ORA_oramktg requires Mount_oramktg_u01
    ORA_oramktg requires Mount_oramktg_u02
    Vol_oramktg_vol1 requires DG_oramktg
    Vol_oramktg_vol2 requires DG_oramktg


group ORA_PROD_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)
    DiskGroup DG_oraprod (
        DiskGroup = ora_prod_dg
        StartVolumes = 0
        StopVolumes = 0
    )
```

```
IP IP_oraprod (

    Device = en0

    Address = "10.212.102.13"
)

Mount Mount_oraprod_u01 (
    MountPoint = "/prod/u01"
    BlockDevice = "/dev/vx/dsk/ora_prod_dg/u01-vol"
    FSType = vxfs
    FsckOpt = "-n"
)

Mount Mount_oraprod_u02 (
    MountPoint = "/prod/u02"
    BlockDevice = "/dev/vx/dsk/ora_prod_dg/u02-vol"
    FSType = vxfs
    FsckOpt = "-n"
)

Netlsnr LSNR_oraprod_lsnr (
    Owner = oraprod

    Home = "/orahome/Oracle"
    TnsAdmin = "/orahome/Oracle/network/admin"
    Listener = LISTENER_PROD
    MonScript = "./bin/Netlsnr/LsnrTest.pl"
    LsnrPwd = cqfOdoOolOo
)

Oracle ORA_oraprod (
    Sid = PROD
    Owner = oraprod
    Home = "/orahome/Oracle"

    EnvFile = "/tmp/env.sh"
    DetailMonitor = 1
    MonScript = "./bin/Oracle/SqlTest.pl"
    User = thor
    Pword = hvlTptWvj
    Table = thor
    MonitorOption = 0
```

```
    )

    Proxy NICProxy_oraprod (
        TargetResName = NIC_Public1
    )

    Volume Vol_oraprod_vol1 (
        Volume = u01-vol
        DiskGroup = ora_prod_dg
    )

    Volume Vol_oraprod_vol2 (
        Volume = u02-vol
        DiskGroup = ora_prod_dg
    )

    IP_oraprod requires NICProxy_oraprod
    LSNR_oraprod_lsnr requires IP_oraprod
    LSNR_oraprod_lsnr requires ORA_oraprod
    Mount_oraprod_u01 requires Vol_oraprod_vol1
    Mount_oraprod_u02 requires Vol_oraprod_vol2
    ORA_oraprod requires Mount_oraprod_u01
    ORA_oraprod requires Mount_oraprod_u02
    Vol_oraprod_vol1 requires DG_oraprod
    Vol_oraprod_vol2 requires DG_oraprod


group Parallel_Service (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }

    Parallel = 1

    AutoStartList = { vcsaix1 }

)

    NIC NIC_Public1 (

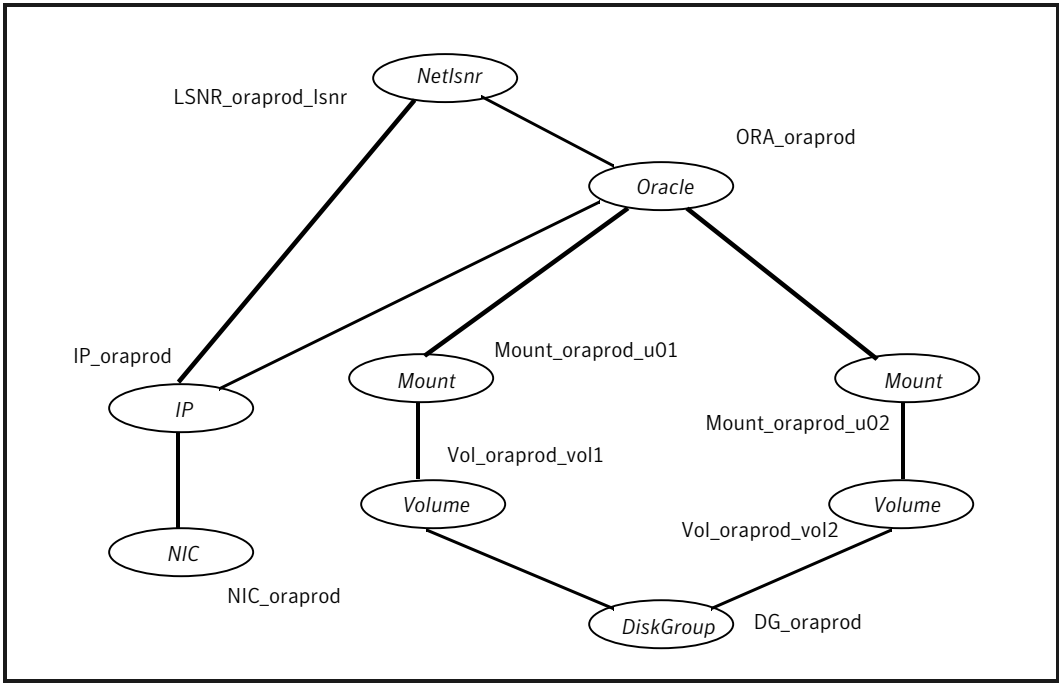
        Device = en0

    )
```

Sample Oracle configuration with shared server support

Figure B-5 describes a typical service group configured to monitor Oracle with shared server support.

Figure B-5 Dependency for Oracle configured with shared server support



The shared disk groups and volumes in the cluster are configured as resources of type DiskGroup and Volume respectively. The volumes are mounted using the Mount agent. The virtual IP address for the service group is configured using the IP and NIC resource types. The Oracle server can be started after each of these resources is brought online.

If your configuration does not use Veritas Volume Manager, use the DiskReservation resource type to configure shared storage instead of the DiskGroup and Volume resource types.

Sample configuration file for Oracle instance configured with shared server support

Review the configuration file for an Oracle instance that is configured with shared server support.

```
include "types.cf"
include "OracleTypes.cf"

cluster vcs (
)

system vcsaix1 (

)

system vcsaix2 (

)

group ORA_PROD_Group (

    SystemList = { vcsaix1 = 0, vcsaix2 = 1 }
    AutoStartList = { vcsaix1 }

)

    DiskGroup DG_oraprod (
        DiskGroup = ora_prod_dg
        StartVolumes = 0
        StopVolumes = 0
    )

    IP IP_oraprod (

        Device = en0

        Address = "10.212.102.13"
    )

    Mount Mount_oraprod_u01 (
        MountPoint = "/prod/u01"
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u01-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )
```

```
    Mount Mount_oraprod_u02 (
        MountPoint = "/prod/u02"
        BlockDevice = "/dev/vx/dsk/ora_prod_dg/u02-vol"
        FSType = vxfs
        FsckOpt = "-n"
    )

    NIC NIC_ORAPROD (

        Device = en0

)

    Netlsnr LSNR_oraprod_lsnr (
        Owner = oraprod

        Home = "/orahome/Oracle"
        TnsAdmin = "/orahome/Oracle/network/admin"

        Listener = LISTENER_PROD
        MonScript = "./bin/Netlsnr/LsnrTest.pl"
        LsnrPwd = cqfOdoOolOo
)
    Oracle ORA_oraprod (
        Sid = PROD
        Owner = oraprod
        Home = "/orahome/Oracle"

        EnvFile = "/tmp/env.sh"
        DetailMonitor = 1
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
        MonitorOption = 0
    )

    Volume Vol_oraprod_vol1 (
        Volume = u01-vol
        DiskGroup = ora_prod_dg
    )

    Volume Vol_oraprod_vol2 (
        Volume = u02-vol
```

```
    DiskGroup = ora_prod_dg
)

IP_oraprod requires NIC_ORAPROD
LSNR_oraprod_lsnr requires IP_oraprod
Mount_oraprod_u01 requires Vol_oraprod_vol1
Mount_oraprod_u02 requires Vol_oraprod_vol2
ORA_oraprod requires IP_oraprod
ORA_oraprod requires Mount_oraprod_u01
ORA_oraprod requires Mount_oraprod_u02
Vol_oraprod_vol1 requires DG_oraprod
Vol_oraprod_vol2 requires DG_oraprod
```

Sample Oracle ASM configurations

Review the dependency graphs for the service group configured to monitor the state of an Oracle instance that is ASM-managed in a VCS cluster. You can have the following Oracle ASM configurations in a VCS environment:

- ASM disks as raw disks
- ASM disks as Veritas Volume Manager volumes
- ASM disks as Veritas Cluster Volume Manager volumes

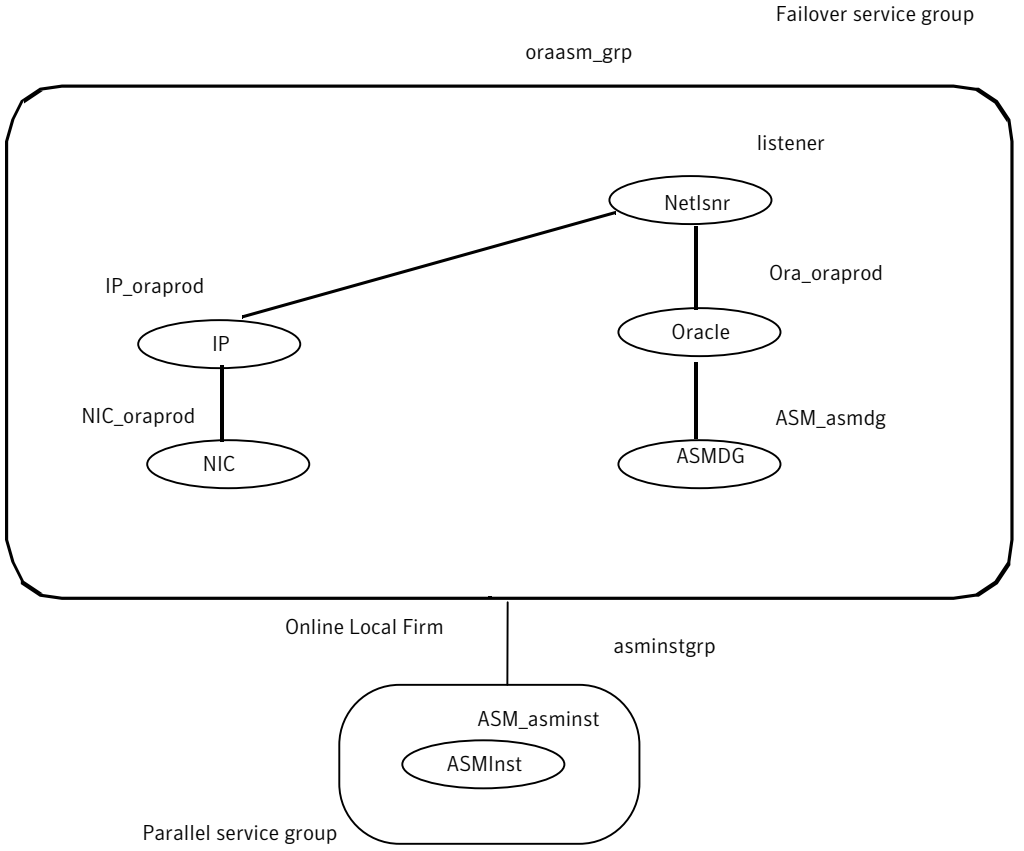
Sample configuration for ASM disks as raw disks

If you use raw devices as ASM disks, you can configure your service group in the following way:

- Oracle and ASMDG resources as parent failover service groups, and ASMInst resource as parallel service group
- The service groups are made dependent using an Online Local Firm dependency.

Figure B-6 describes a typical service group with ASMInst resource as a parallel service group.

Figure B-6 Dependency graph with ASMInst resource as a parallel service group



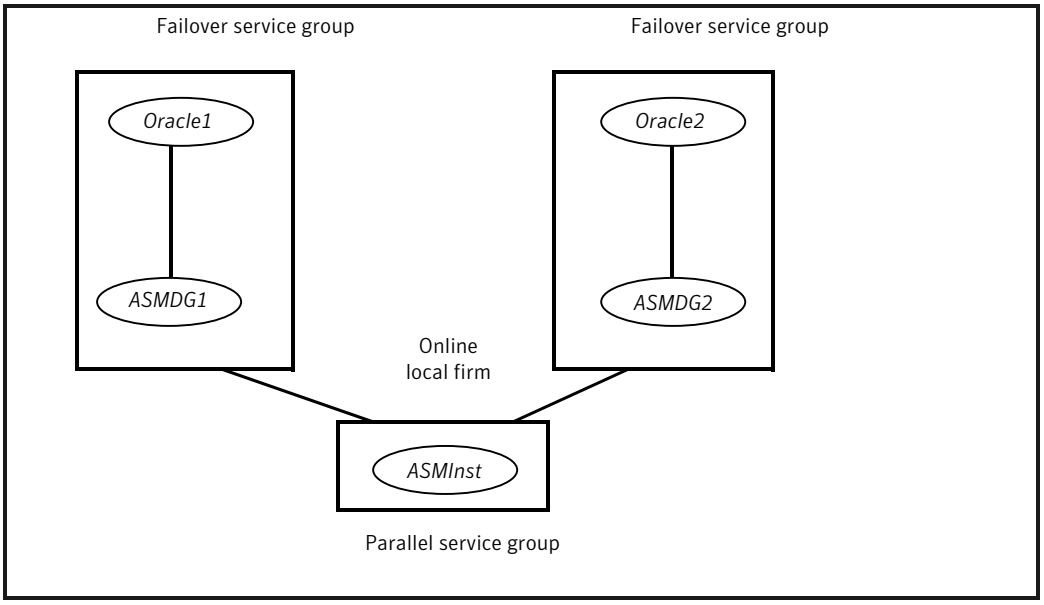
The Oracle ASM instance and ASM disk groups in the cluster are configured as resources of type ASMInst and ASMDG respectively. The ASMInst agent is configured as parallel service group, asminstgrp.

The virtual IP address for the service group is configured using the IP and NIC resource types. The Oracle and ASMDG resources are configured as failover service group, oraasm_grp. The Oracle server can be started after each of these resources is brought online.

The oraasm_grp is made dependent on the asminstgrp using an Online Local Firm dependency.

Figure B-7 describes a typical service group with multiple Oracle instances sharing an ASMInst resource that is configured as a parallel service group.

Figure B-7 Dependency graph for Oracle ASM with multiple Oracle instances on a node



If you have multiple Oracle instances, a failover service group is configured for each Oracle instance. The Oracle service groups share a single ASM instance that is configured as a parallel service group. The Oracle service groups are made dependent on the ASMInst service group using an Online Local Firm dependency. However, each database must use exclusive ASM disk groups, so that the Veritas Cluster Server agent for Oracle can fail over the disk group.

Sample configuration file for ASM-managed Oracle instance

Review the sample configuration for an Oracle instance that is ASM-managed. The sample file has the ASMInst resource as part of a parallel service group.

```
include "types.cf"
include "OracleTypes.cf"
include "OracleASMTypes.cf"

cluster vcs (
)

system symnode01 (
)
```

```
system symnode02 (
)

group asminstgrp (
    SystemList = { symnode01 = 0, symnode02 = 1 }
    Parallel = 1
    )

    ASMInst ASM_asminst (
        Sid = "+ASM"
        Owner = "oraprod"
        Home = "/orahome/Oracle"
        )
group oraasm_grp (
    SystemList = { symnode01 = 0, symnode02 = 1 }
    AutoStartList = { symnode01 }
    )

    ASMDG ASM-asmdg (
        Sid = "+ASM"
        Owner = "oracle"
        Home = "/orahome/Oracle"
        DiskGroups = { asmhighdg }
        )

    IP IP_oraprod (

        Address = "10.212.102.13"
        NetMask = "255.255.240.0"
    )

    NIC NIC_oraprod (

    )

    Netlsnr LSNR_oraprod_lsnr (
        Owner = "oraprod"
        Home = "/orahome/Oracle"
        TnsAdmin = "/orahome/Oracle/network/admin"
        Listener = LISTENER_PROD
        MonScript = "./bin/Netlsnr/LsnrTest.pl"
    )

    Oracle ORA_oraprod (
```

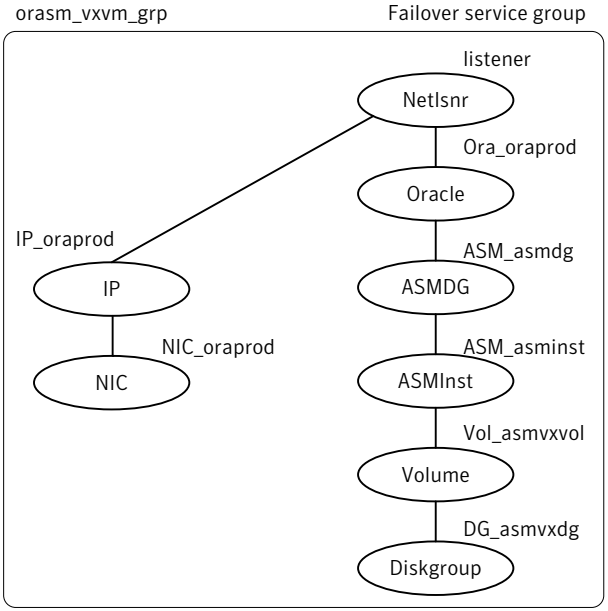
```
    Sid = PROD
    Owner = "oraprod"
    Home = "/orahome/Oracle"
    EnvFile = "/tmp/env.sh"
    DetailMonitor = 1
    MonScript = "./bin/Oracle/SqlTest.pl"
    User = thor
    Pword = hvlTptWvj
    Table = thor
    MonitorOption = 0
)

requires group asminstgrp online local firm
IP_oraprod requires NIC_oraprod
LSNR_oraprod_lsnr requires IP_oraprod
LSNR_oraprod_lsnr requires ORA_oraprod
ORA_oraprod requires ASM_asmdg
```

Sample configuration for ASM disks as VxVM volumes

Figure B-8 describes a typical service group with VxVM disks chosen for Oracle ASM.

Figure B-8 Dependency graph for ASM on VxVM disks

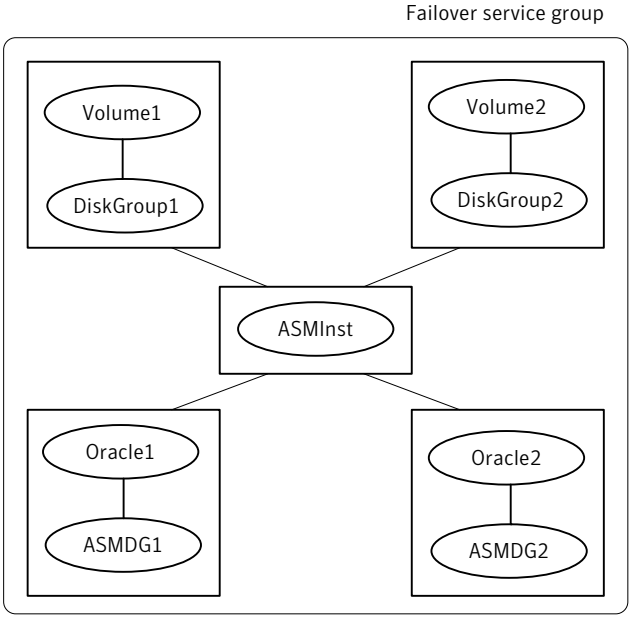


This configuration has a single failover service group. The Oracle ASM instance and ASM disk groups in the cluster are configured as resources of type ASMInst and ASMDG respectively.

The VxVM disk groups and volumes in the cluster are configured as resources of type DiskGroup and Volume respectively. The virtual IP address for the service group is configured using the IP and NIC resource types. The Oracle server can be started after each of these resources is brought online.

Figure B-9 describes a typical service group with multiple Oracle instances sharing the ASMInst resource that is part of a single failover service group.

Figure B-9 Dependency graph for Oracle ASM with multiple Oracle instances on a node



Sample configuration file for ASM disks as VxVM disks

Review the sample configuration for an Oracle instance that is ASM-managed.

```
include "types.cf"
include "OracleTypes.cf"
include "OracleASMTypes.cf"

cluster vcs (
)

system symnode01 (
)

system symnode02 (
)

group orasm_vxvm_grp (
    SystemList = { symnode01 = 0, symnode02 = 1 }
    AutoStartList = { symnode01 }
)
```

```
    ASMDG ASM-asmdg (
        Sid = "+ASM"
        Owner = oracle
        Home = "/orahome/Oracle"
        DiskGroups = { asmhighdg }
        )

    ASMInst ASM_asminst (
        Sid = "+ASM"
        Owner = oraprod
        Home = "/orahome/Oracle"
        )

    DiskGroup DG_asmvxdg (
        DiskGroup = asmvxdg

)

    IP IP_oraprod (

        Address = "10.212.102.13"
        NetMask = "255.255.240.0"
    )

    NIC NIC_oraprod (

)

    Netlsnr LSNR_oraprod_lsnr (
        Owner = oraprod
        Home = "/orahome/Oracle"
        TnsAdmin = "/orahome/Oracle/network/admin"
        Listener = LISTENER_PROD
        MonScript = "./bin/Netlsnr/LsnrTest.pl"
        LsnrPwd = cqfOdoOolOo
        AgentDebug = 1
    )

    Oracle ORA_oraprod (
        Sid = PROD
        Owner = oraprod
        Home = "/orahome/Oracle"
        EnvFile = "/tmp/env.sh"
```

```
        DetailMonitor = 1
        MonScript = "./bin/Oracle/SqlTest.pl"
        User = thor
        Pword = hvlTptWvj
        Table = thor
        MonitorOption = 0
        AgentDebug = 1
    )

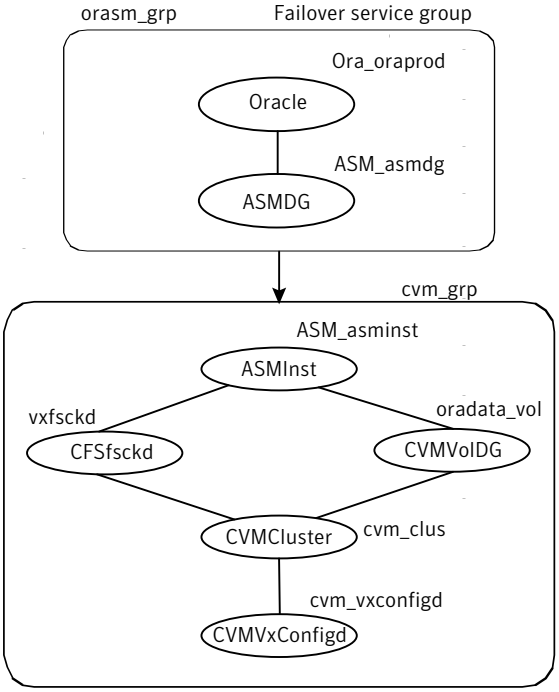
    Volume Vol_asmvxvol (
        Volume = asmvxvol
        DiskGroup = asmvxdg
    )

    ASM_asminst requires VOL_asmvxvol
    ASM_asmdg requires ASM_asminst
    IP_oraprod requires NIC_oraprod
    LSNR_oraprod_lsnr requires IP_oraprod
    LSNR_oraprod_lsnr requires ORA_oraprod
    ORA_oraprod requires ASM_asmdg
    VOL_asmvxvol requires DG_asmvxdg
```

Sample configuration for ASM disks as CVM volumes

Figure B-10 describes a typical service group with CVM volumes chosen for Oracle ASM.

Figure B-10 Dependency graph for ASM on CVM volumes

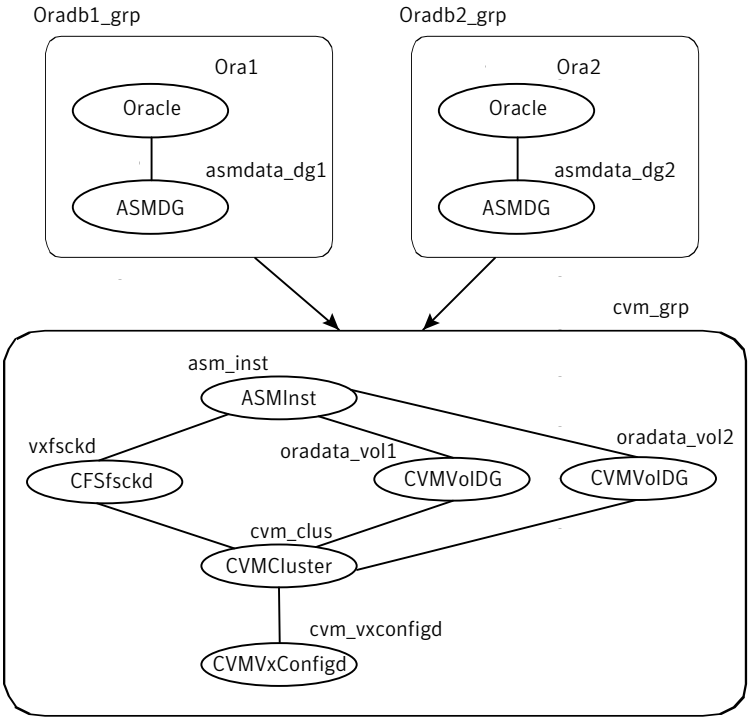


This configuration has two service groups. The Oracle and ASMDG resources are part of the parent failover service group oraasm_grp. The ASMInst resource belongs to the CVM service group cvm_grp, which is a parallel service group. The service groups are linked with online local firm dependency.

After the CVM volume where the database resides comes online, the ASMDG agent mounts the ASM disk group that the database requires. The virtual IP address for the service group is configured using the IP and NIC resource types. The Oracle server can be started after each of these resources come online.

Figure B-11 describes a typical service group with multiple Oracle instances which share the ASMInst resource that is part of a CVM parallel service group.

Figure B-11 Dependency graph for Oracle ASM with multiple Oracle instances on a node



If you have multiple Oracle instances, a failover service group is configured for each Oracle instance. The Oracle service groups share a single ASM instance that is configured as part of the CVM parallel service group. The Oracle service groups are made dependent on the CVM service group using an Online Local Firm dependency. However, each database must use exclusive ASM disk groups, so that the Veritas Cluster Server agent for Oracle can fail over the disk group.

Sample configuration file for ASM that uses CVM volumes

Review the sample configuration for an Oracle instance that uses CVM volumes for ASM.

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

```
cluster vcsclus_asm (
 UserNames = { admin = abcdef }
 Administrator = { admin }
 HacliUserLevel = COMMANDROOT
 )

system symnode01 (
 )

system symnode02 (
 )


group cvm (
 SystemList = { symnode01 = 0, symnode02 = 1 }
 AutoFailOver = 0
 Parallel = 1
 AutoStartList = { symnode01, symnode02 }
 )

 CFSfsckd vxfsckd (
  )

 CVMCluster cvm_clus (
  CVMClustName = vcsclus_asm
  CVMNodeId = { symnode01 = 0, symnode02 = 1 }
  CVMTransport = gab
  CVMTimeout = 200
  )

 CVMVolDg oradata_vol (
  CVMDiskGroup = ora_dg
  CVMVolume = { oradatavol }
  CVMActivation = sw
  )

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

 ASMInst ASM_asminst (
  Sid = "+ASM"
```

```
 Owner = oracle
 Home = "/orahome/Oracle"
 )

ASM_asminst requires vxfsckd
ASM_asminst requires oradata_vol
oradata_vol requires cvm_clus
vxfsckd requires cvm_clus
cvm_clus requires cvm_vxconfigd


group oraasm_grp (
 SystemList = { symnode01 = 0, symnode02 = 1 }
 AutoFailOver = 1
 AutoStartList = { symnode01, symnode02 }
 )

 ASMDG ASM_asmdg (
  Sid = "+ASM"
  Owner = oracle
  Home = "/orahome/Oracle"
  DiskGroups = { ASM_DG }
  )

 Oracle Ora_oraprod (
  Owner = oracle
  Sid = vrts
  Home = "/orahome/Oracle"
  )

 requires group cvm_grp online local firm
 Ora_oraprod requires ASM_asmdg
```

Appendix C

Best practices

This appendix includes the following topics:

- Best practices for multiple Oracle instance configurations

Best practices for multiple Oracle instance configurations

Review some of the best practices for using multiple Oracle instances in a VCS environment:

- For each SID to be configured, create UNIX accounts with DBA privileges.
- Make sure that each Oracle instance has a separate disk group and is configured as a separate service group.
- Define the system parameters such that the allocation of semaphore and shared memory is appropriate on all systems.
- Use a dedicated set of binaries for each Oracle instance, even if each instance uses the same Oracle version.
- If your configuration uses the same Oracle version for all instances, install a version on the root disk or preferably on a secondary disk. Locate the pfiles in the default location and define several listener processes to ensure clean failover.
- If your configuration has different versions of Oracle, create a separate $ORACLE_HOME for each Oracle version.
- Follow the Optimal Flexible Architecture (OFA) standard (/uxx/<SID>). In cluster configurations, you could adapt the standard to make it more application-specific. For example, /app/uxx/<SID>.
- Listeners accompanying different versions of Oracle may not be backward-compatible. So, if you want to create a single listener.ora file, you

must verify that the listener supports the other versions of Oracle in the cluster. You must also create a separate Envfile for each version of Oracle.

- Make sure that each listener listens to a different virtual address. Also, assign different names to listeners and make sure that they do not listen to the same port.
- The pfiles must be coordinated between systems. For the same instance of a database, ensure that the pfiles referenced are identical across the nodes.

Appendix D

Using the SPFILE in a VCS cluster for Oracle

This appendix includes the following topics:

- About the Oracle initialization parameter files
- Starting an Oracle instance
- Using the SPFILE in a VCS cluster

About the Oracle initialization parameter files

Oracle versions earlier to Oracle9i used an initialization file init*SID*.ora, a text file, to start database instances. Changes that were applied to instance parameters during a database session were not saved to the file. You had to manually apply them to the initialization file.

Oracle9i introduced the SPFILE, which is a binary file stored on the database server. With this feature, changes to the instance parameters can be set to be persistent across all startup and shutdown procedures.

Starting an Oracle instance

For versions above Oracle9i, you can start an Oracle instance in the following ways:

- Using the default SPFILE spfile*SID*.ora
- Using the default init.ora file init*SID*.ora
- By specifying an initialization file init.ora
- By specifying an SPFILE in the initialization file init.ora

When you run the `startup` command without a PFILE clause, Oracle reads the initialization parameters from the SPFILE. On AIX platforms, the default location for the SPFILE or PFILE is $ORACLE_HOME/dbs.

Oracle locates the initialization parameter file by examining file names in the following order:

- SPFILE*SID*.ora
- SPFILE.ora
- init*SID*.ora

Using the SPFILE in a VCS cluster

When using the Veritas Cluster Server agent for Oracle, you can start a database instance by specifying a PFILE. If you do not specify the PFILE, the database instance starts up using the default SPFILE.

The agent attribute Pfile must specify the location of the PFILE. If your configuration uses the SPFILE, the contents of the PFILE must specify the location of the SPFILE, which must be created from the PFILE.

Note: If you want the SPFILE's session parameter changes be persistent across an instance failover, then Symantec recommends you to save the SPFILE on shared storage.

Specifying the SPFILE location in the PFILE

To specify the location of the SPFILE in a PFILE, create a PFILE and specify the following entry in the PFILE:

```
SPFILE = spfile_location
```

The variable *spfile_location* represents the complete path of the SPFILE. For example:

```
SPFILE = /database/startup/spfileora1.ora
```

In this case, to start the database use the following command:

```
startup pfile=location_of_pfile
```

Creating the SPFILE from a PFILE

The SPFILE must be created from the PFILE. You must have the sysdba or the sysoper system privileges to create an SPFILE.

You can run the following command to create the SPFILE:

```
CREATE SPFILE [= spfile_name] FROM PFILE [= pfile_name ];
```

If you do not specify the complete path for the SPFILE, this command creates an SPFILE at the default location ($ORACLE_HOME/dbs on AIX).

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