Oracle9*i* Real Application Clusters

Real Application Clusters Guard I - Concepts and Administration

Release 2 (9.2)

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Oracle9*i* Real Application Clusters Real Application Clusters Guard I - Concepts and Administration, Release 2 (9.2)

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Preface

This guide describes the administration of Oracle Real Application Clusters Guard. It describes the configuration parameters, how to set up customized features, how to use the command-line interface, how to set up the network configuration, and how to troubleshoot Oracle Real Application Clusters Guard.

This preface contains these topics:

Audience

Oracle9*i* Real Application Clusters *Real Application Clusters Guard I - Concepts and Administration* is intended for database administrators and systems administrators who administer an Oracle Real Application Clusters Guard environment.

To use this document, you need to have a thorough understanding of the concepts of Oracle Real Application Clusters Guard, the administration of the Oracle server and Oracle9*i* Real Application Clusters, and your platform-specific cluster technology.

Organization

This document contains the following chapters and appendices:

Chapter 1, "Oracle Real Application Clusters Guard Architecture"

This chapter describes the architecture of Oracle Real Application Clusters Guard.

Chapter 2, "Oracle Real Application Clusters Guard Operation"

This chapter describes the operation of Oracle Real Application Clusters Guard.

Chapter 3, "Oracle Real Application Clusters Guard Configuration Parameters"

This chapter describes the configuration parameters for Oracle Real Application Clusters Guard and discusses their values. It also explains how to change their values.

Chapter 4, "Using Oracle Real Application Cluster Guard Commands"

This chapter explains how to use the command-line interface of Oracle Real Application Clusters Guard.

Chapter 5, "Customizing Oracle Real Application Clusters Guard"

This chapter describes how to customize the call-home feature, the custom query, role change notification, and Oracle Enterprise Manager for Oracle Real Application Clusters Guard. It also explains how to use the `DBMS_LIBCACHE` package to warm the cache on the secondary instance.

Chapter 6, "Administering Oracle Real Application Clusters Guard"

This chapter describes how to administer planned outages, recover from unplanned outages, and administer application failover, backups, and configuration changes.

Chapter 7, "Configuring the Network for Oracle Real Application Clusters Guard"

This chapter explains how to set up the network configuration.

Chapter 8, "Troubleshooting Oracle Real Application Clusters Guard"

This chapter describes message output and explains how to interpret the log files. It contains troubleshooting strategies for startup problems, command-line problems, monitor problems, and problems that originate outside of Oracle Real Application Clusters Guard.

Appendix A, "Oracle Real Application Clusters Guard Error Messages"

This appendix contains the Oracle Real Application Clusters Guard error messages.

Glossary

The glossary defines Oracle Real Application Clusters Guard terms.

Related Documentation

For more information, see these Oracle resources:

- *Oracle9i Real Application Clusters Concepts*
- *Oracle9i Real Application Clusters Installation and Configuration*
- *Oracle9i Database Administrator's Guide*
- *Oracle9i Backup and Recovery Concepts*
- *Oracle Net Services Administrator's Guide*
- Your platform-specific Oracle Real Application Clusters Guard configuration guide

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Conventions

This section describes the conventions used in the text and code examples of this documentation set. It describes:

- Conventions in Text
- Conventions in Code Examples

Conventions in Text

We use various conventions in text to help you more quickly identify special terms. The following table describes those conventions and provides examples of their use.

Convention	Meaning	Example
Bold	Bold typeface indicates terms that are defined in the text or terms that appear in a glossary, or both.	When you specify this clause, you create an **index-organized table**.
Italics	Italic typeface indicates book titles or emphasis.	*Oracle9i Database Concepts* Ensure that the recovery catalog and target database do *not* reside on the same disk.

Convention	Meaning	Example
UPPERCASE monospace (fixed-width) font	Uppercase monospace typeface indicates elements supplied by the system. Such elements include parameters, privileges, datatypes, RMAN keywords, SQL keywords, SQL*Plus or utility commands, packages and methods, as well as system-supplied column names, database objects and structures, usernames, and roles.	You can specify this clause only for a NUMBER column. You can back up the database by using the BACKUP command. Query the TABLE_NAME column in the USER_TABLES data dictionary view. Use the DBMS_STATS.GENERATE_STATS procedure.
lowercase monospace (fixed-width) font	Lowercase monospace typeface indicates executables, filenames, directory names, and sample user-supplied elements. Such elements include computer and database names, net service names, and connect identifiers, as well as user-supplied database objects and structures, column names, packages and classes, usernames and roles, program units, and parameter values. **Note:** Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.	Enter sqlplus to open SQL*Plus. The password is specified in the orapwd file. Back up the datafiles and control files in the /disk1/oracle/dbs directory. The department_id, department_name, and location_id columns are in the hr.departments table. Set the QUERY_REWRITE_ENABLED initialization parameter to true. Connect as oe user. The JRepUtil class implements these methods.
lowercase italic monospace (fixed-width) font	Lowercase italic monospace font represents placeholders or variables.	You can specify the *parallel_clause*. Run U*old_release*.SQL where *old_release* refers to the release you installed prior to upgrading.

Conventions in Code Examples

Code examples illustrate SQL, PL/SQL, SQL*Plus, or other command-line statements. They are displayed in a monospace (fixed-width) font and separated from normal text as shown in this example:

```
SELECT username FROM dba_users WHERE username = 'MIGRATE';
```

The following table describes typographic conventions used in code examples and provides examples of their use.

Convention	Meaning	Example
[ ]	Brackets enclose one or more optional items. Do not enter the brackets.	`DECIMAL (digits [ , precision ])`
{ }	Braces enclose two or more items, one of which is required. Do not enter the braces.	`{ENABLE | DISABLE}`
|	A vertical bar represents a choice of two or more options within brackets or braces. Enter one of the options. Do not enter the vertical bar.	`{ENABLE | DISABLE}` `[COMPRESS | NOCOMPRESS]`
...	Horizontal ellipsis points indicate either:	
	■ That we have omitted parts of the code that are not directly related to the example	`CREATE TABLE ... AS subquery;`
	■ That you can repeat a portion of the code	`SELECT col1, col2, ... , coln FROM employees;`

.
.
.
	Vertical ellipsis points indicate that we have omitted several lines of code not directly related to the example.	`SQL> SELECT NAME FROM V$DATAFILE;`
		`NAME`
		`----------`
		`/fsl/dbs/tbs_01.dbf`
		`/fs1/dbs/tbs_02.dbf`
		`.`
		`.`
		`.`
		`/fsl/dbs/tbs_09.dbf`
		`9 rows selected.`

Other notation	You must enter symbols other than brackets, braces, vertical bars, and ellipsis points as shown.	`acctbal NUMBER(11,2);` `acct CONSTANT NUMBER(4) := 3;`
Italics	Italicized text indicates placeholders or variables for which you must supply particular values.	`CONNECT SYSTEM/system_password` `DB_NAME = database_name`

UPPERCASE	Uppercase typeface indicates elements supplied by the system. We show these terms in uppercase in order to distinguish them from terms you define. Unless terms appear in brackets, enter them in the order and with the spelling shown. However, because these terms are not case sensitive, you can enter them in lowercase.	`SELECT last_name, employee_id FROM employees;`
		`SELECT * FROM USER_TABLES;`
		`DROP TABLE hr.employees;`

Convention	Meaning	Example

lowercase	Lowercase typeface indicates programmatic elements that you supply. For example, lowercase indicates names of tables, columns, or files.
	
	Note: Some programmatic elements use a mixture of UPPERCASE and lowercase. Enter these elements as shown.
		`SELECT last_name, employee_id FROM employees;`
		
		`sqlplus hr/hr`
		
		`CREATE USER mjones IDENTIFIED BY ty3MU9;`

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1

Oracle Real Application Clusters Guard Architecture

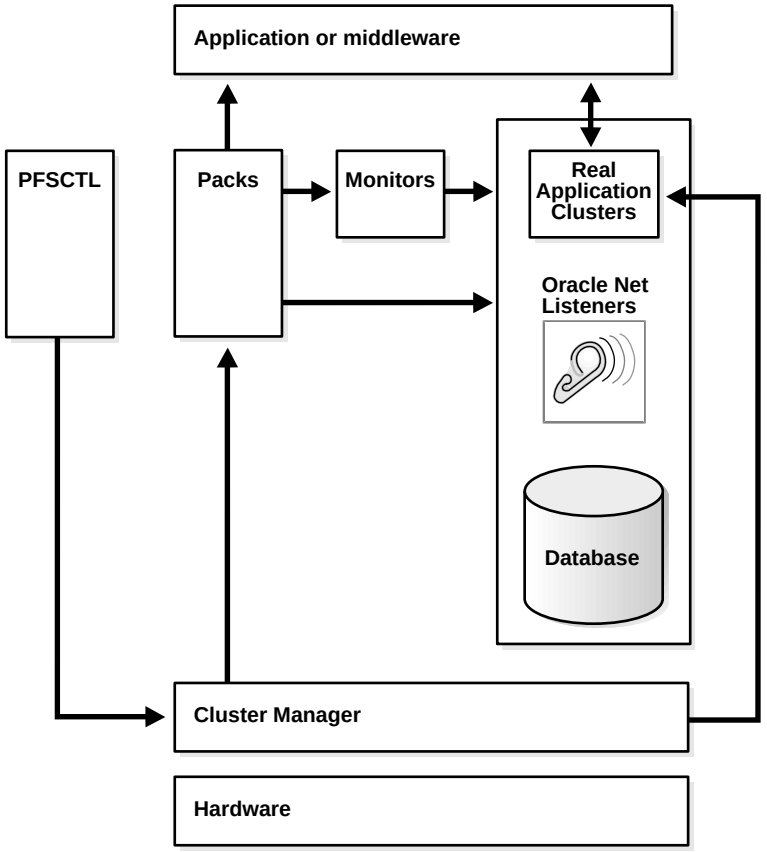
This chapter describes the architecture of Oracle Real Application Clusters Guard. It includes the following topics:

- Overview of Oracle Real Application Clusters Guard Components
- Concepts of Oracle Real Application Clusters Guard
- Architecture of Oracle Real Application Clusters Guard
- Additional Configurations of Oracle Real Application Clusters Guard

Overview of Oracle Real Application Clusters Guard Components

Oracle Real Application Clusters Guard works with Real Application Clusters and the port-specific cluster manager to monitor and maintain availability. Figure 1–1 shows the relationship between these components of Oracle Real Application Clusters Guard to the cluster manager.

Figure 1–1 How Oracle Real Application Clusters Guard is Related to Real Application Clusters and the Cluster Manager



A database server that runs Real Application Clusters consists of the Oracle database, Real Application Clusters software, and the Oracle Net listeners that accept client requests. These software components run on each node of a cluster.

They use the services provided by the hardware, the operating system, and the port-specific cluster manager. The cluster manager monitors and reports the health of the nodes in the cluster and controls pack behavior.

A **pack** is software that ensures the availability of the set of resources required to run an Oracle **instance**. The pack controls the startup, shutdown, and restarting of Oracle processes. There is one pack for each instance. The application software or middleware receives direction from the packs and from Real Application Clusters.

Oracle Real Application Clusters Guard consists of the components described in the following sections:

- Oracle Real Application Clusters Guard Packs
- PFSCTL Control Utility
- Oracle Real Application Clusters Guard Monitors
- Oracle Real Application Clusters Guard Configuration Templates
- PFSSETUP Utility

Oracle Real Application Clusters Guard Packs

The pack controls the startup, shutdown, and restarting of Oracle processes. There is one pack for each instance. Each pack controls the following resources on its node:

- Oracle instance
- Monitors
- Listeners
- IP addresses

PFSCTL Control Utility

The PFSCTL control utility is responsible for starting, stopping, and operating Oracle Real Application Clusters Guard through its interaction with the cluster manager. It provides a command-line interface to the user.

> **See Also:** Chapter 2, "Oracle Real Application Clusters Guard Operation"

Oracle Real Application Clusters Guard Monitors

Oracle Real Application Clusters Guard has three monitors. They are described in the following table.

Monitor	Purpose
Instance monitor	Detects termination of the local Oracle instance (such as a `SHUTDOWN ABORT`) and initiates a failover
Heartbeat monitor	Detects unavailable service (such as an instance hang) for the primary and secondary instance roles and initiates a failover
Listener monitor	Monitors and restarts the listeners

See Also: "Oracle Real Application Clusters Guard Monitors" on page 1-9

Oracle Real Application Clusters Guard Configuration Templates

Oracle Real Application Clusters Guard provides configuration templates that allow it to be easily configured. The templates contain configurations for such settings as Oracle Net Services and initialization parameters that have already been tested. The PFSSETUP Utility assists with the generation of the files that are required by Oracle Real Application Clusters Guard. The files are automatically generated with the correct values, derived from the customized templates.

See Also:

- Chapter 3, "Oracle Real Application Clusters Guard Configuration Parameters"
- Your platform-specific Oracle Real Application Clusters Guard installation guide

PFSSETUP Utility

The PFSSETUP utility assists with the generation of appropriate Oracle Real Application Clusters Guard files for the specified environment, as well as simplified configuration and set up of Oracle Real Application Clusters Guard software. It also makes it easier to deploy changes in the Oracle Real Application Clusters Guard environment.

See Also:

- Chapter 3, "Oracle Real Application Clusters Guard Configuration Parameters"
- Your platform-specific Oracle Real Application Clusters Guard installation guide

Concepts of Oracle Real Application Clusters Guard

The concepts described in the following sections are important for understanding Oracle Real Application Clusters Guard architecture:

- Instance Roles
- Preferred Primary and Secondary Nodes
- Home and Foreign Nodes

Instance Roles

In a Real Application Clusters environment where the `ACTIVE_INSTANCE_COUNT` parameter in the initialization parameter file (`init.ora`) is set to `1`, an instance has either a **primary instance role** or a **secondary instance role**. The instance that mounts the database first assumes the role of primary instance. The second instance to mount the database assumes the role of secondary instance. If the primary instance fails or is shut down, then the secondary instance automatically assumes the primary instance role. When the failed instance returns to active status, it assumes the role of secondary instance. The `V$INSTANCE` dynamic performance view displays the instance roles of the instances.

Preferred Primary and Secondary Nodes

The **preferred primary node** is the node where the pack with the primary instance role resides by default at startup. It is designated by the user in the Oracle Real Application Clusters Guard configuration file. Oracle Real Application Clusters Guard ensures that the first instance to be started starts on the preferred primary node.

The **preferred secondary node** is the node where the pack with the secondary instance role resides by default at startup. It is designated by the user in the Oracle Real Application Clusters Guard configuration file. Oracle Real Application Clusters Guard starts the secondary instance on the preferred secondary node.

Real Application Clusters enforces a **primary/secondary configuration** when the ACTIVE_INSTANCE_COUNT parameter in the initialization parameter file (init.ora) is set to 1. The user must set ACTIVE_INSTANCE_COUNT to 1 as shown in the sample configuration files provided with Oracle Real Application Clusters Guard.

The Oracle Net listener then enforces the routing of work requests to the primary and secondary instances by using the INSTANCE_ROLE parameter that tnsnames.ora found in the CONNECT_DATA portion of the tnsnames.ora file.

All locks are mastered by the primary instance only. This minimizes communication between nodes and improves performance.

> **See Also:** Chapter 7, "Configuring the Network for Oracle Real Application Clusters Guard"

Home and Foreign Nodes

The **home node** (primary) is the default node for a specific pack. When the pack is not running on its home node, it is running on its **foreign node** (secondary). At initial startup, each pack runs on its home node.

When a pack runs on its foreign node, the only pack function that occurs is configuring the relocatable IP address to be up. New connections that request this IP address are routed to the primary instance by the Oracle Net listener.

Architecture of Oracle Real Application Clusters Guard

Figure 1–2 shows Oracle Real Application Clusters Guard architecture for a two-node cluster. Node A is the primary node, and Node B is the secondary node. Each node contains:

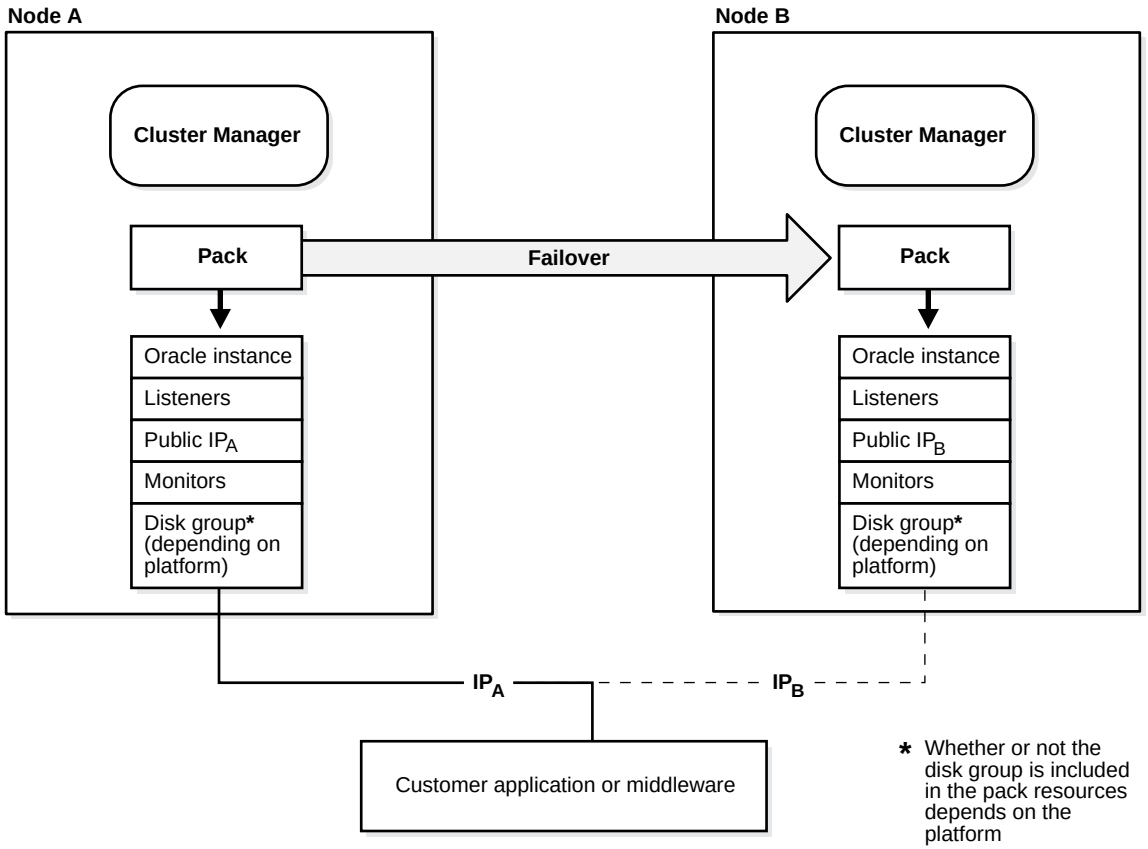
- A cluster manager, that executes the run and halt scripts automatically upon failover or as a consequence of a user command
- A pack, that controls the resources available on its node

The resources on each node include:

- Oracle instance
- Listeners (both public and private)
- IP address
- Monitors

During failover, the primary instance role moves from Node A to Node B, making Node B the new primary node.

Figure 1–2 Oracle Real Application Clusters Guard Architecture for a Two-Node Cluster



This rest of this section contains the following topics:

- Oracle Real Application Clusters Guard Packs
- Oracle Real Application Clusters Guard Monitors

Oracle Real Application Clusters Guard Packs

A pack is software that ensures the availability of the resources required to run an Oracle instance. It supports and maintains access to the instance through the listeners. A pack controls the startup, shutdown, and restarting of Oracle processes. There is one pack for each instance.

Resources

Each pack controls the following resources on its node:

- Listeners
- IP Addresses
- Pack Functions, depending on the platform
- Monitors

See Also: "Oracle Real Application Clusters Guard Monitors" on page 1-9

Listeners The public listener connects a client to an instance. Private listeners are used by tools such as Oracle Enterprise Manager and Recovery Manager (RMAN) to connect to an instance. Private listeners can also be used by the database administrator for administration tasks.

IP Addresses Clients can use the pack's **relocatable IP address** to access the resources managed by the pack. A relocatable IP address is not associated with a specific physical server; it can float between physical servers. The relocatable IP address is initially associated with only the primary node. If the primary node fails, then the relocatable IP address fails over to a different cluster node (a secondary node). The relocatable IP address is configured to be up as the first step when the pack is running and is configured to be down as the last step when the pack is halted.

A stationary, private IP address is configured for private tasks such as IPC, heartbeat, system management and RMAN operations. A private listener supports access to the instance through the private IP address.

Pack Functions Packs do the following:

- Start and stop the relocatable IP address and public listener
- Start and stop the private listener

- Start and stop the Oracle instance
- Start and stop the monitors

A pack starts up the Oracle instance and monitors the instance. If it determines that the instance has expired, then it ensures that the resources associated with that instance are moved to the secondary node and reenables service at the secondary node.

A pack can run on either its home node or its foreign node. When it is on its home node, it starts up and shuts down everything. When the pack is on its foreign node, it only configures the relocatable IP address to be up or down.

Oracle Real Application Clusters Guard Monitors

Oracle Real Application Clusters Guard has three monitors. They are discussed in the following sections:

- Instance Monitor
- Listener Monitor
- Heartbeat Monitor

Instance Monitor

The instance monitor detects termination of the local instance and initiates failover or restarts the instance.

Note: Because the instance monitor connects as a user session, its actions are reflected in database statistics such as enqueue waits.

Listener Monitor

The listener monitor checks and restarts the public and private listeners on its own node. When the public listener fails to restart a configurable number of times within a configurable interval, the listener monitor exits, initiating a halt script. Oracle Real Application Clusters Guard either begins failover or restarts the primary instance, depending on the state of the secondary node.

Heartbeat Monitor

The heartbeat monitor checks the availability of the Oracle instance. The local Oracle instance is considered unavailable if the heartbeat monitor fails to complete

its tasks after three consecutive attempts. During normal operation, the heartbeat monitor on each instance:

- Updates its own local heartbeat
- Checks the heartbeat of the other instance

The heartbeat monitor on the primary instance also executes a **customer query** specified by the user. Executing the customer query tests whether the primary instance is capable of work.

The heartbeat monitor allows for special circumstances such as instance recovery and unusually large numbers of sessions logging on.

The heartbeat monitor also initiates one kind of failover action: If the primary instance is unavailable and the primary instance role has not resumed normal function on its new node, then the heartbeat monitor initiates takeover. A **takeover** occurs when the secondary node executes failover of the primary instance role to itself.

> **See Also:** Chapter 2, "Oracle Real Application Clusters Guard Operation"

Additional Configurations of Oracle Real Application Clusters Guard

The two-node cluster configuration with one database, with one node serving as the primary node and the other node serving as the secondary node is an ideal configuration. Because it is ideal, users may need to use their resources more efficiently. Multiple installations of Oracle Real Application Clusters Guard can exist on a multinode cluster, so that nodes are shared by several database services. Two multinode configurations have been tested for Oracle Real Application Clusters Guard:

- The **hub configuration**, in which a single node serves as the secondary node to several primary nodes
- The **ring configuration**, in which the nodes serve as primary nodes and also as secondary nodes for other nodes

Although these configurations use resources more efficiently than a configuration with a single dedicated secondary node for each primary node, there are disadvantages to these configurations:

- The ability to isolate failures is reduced.

- Performance may be degraded.

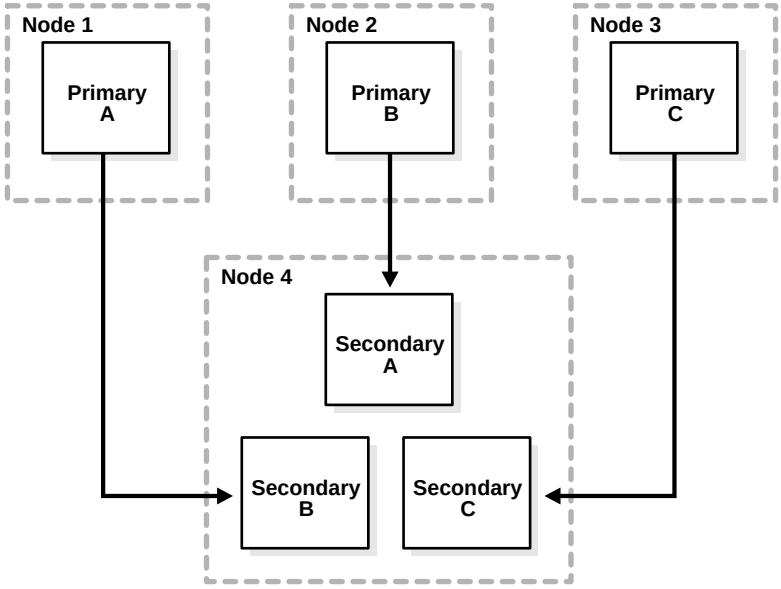
The following sections describe two tested configurations:

- Hub Configuration
- Ring Configuration

Hub Configuration

A hub configuration consists of one node that serves as the secondary node for other nodes that serve as primary nodes for separate installations of Oracle Real Application Clusters Guard databases. The simplest possible hub configuration consists of three nodes. Oracle Real Application Clusters Guard has been tested in a four-node hub configuration. Figure 1–3 shows that the primary instance for database A resides on Node 1, the primary instance for database B resides on Node 2, and the primary instance for database C resides on Node 3. The secondary instances for all three databases reside on Node 4.

Figure 1–3 Four-Node Hub Configuration for Oracle Real Application Clusters Guard Databases



In a stable or **resilient** state, all primary instances run on their preferred primary nodes. When a failure on a primary node occurs, the primary instance fails over to its secondary instance on Node 4. A single failover has minimal impact on the other Oracle Real Application Clusters Guard installations, but if several failures occur, then performance may suffer. In addition, if Node 4 itself fails, then all of the Oracle Real Application Clusters Guard installations lose **resilience**.

Table 1–1 summarizes the advantages and disadvantages of a hub configuration.

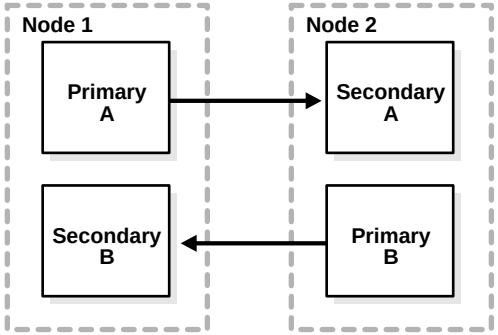
Table 1–1 Hub Configuration Advantages and Disadvantages.

Advantages	Disadvantages
Reduces use of resources: *n*+1 nodes for *n* databases	The secondary node may have to accommodate multiple services if there is more than one failure. The impact of multiple failures may need to be assessed.
-	If the secondary node fails, then all of the Oracle Real Application Clusters Guard installations lose their resilience.
-	It is more difficult to isolate failures.

Ring Configuration

Another multinode configuration is the ring configuration. Each node contains a primary instance and serves as the secondary node for another node. The simplest possible ring configuration is the two-node ring configuration shown in Figure 1–4.

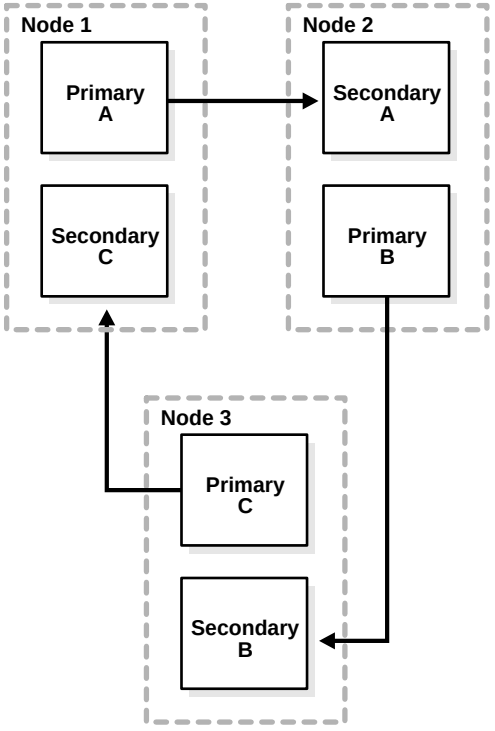
Figure 1–4 Two-Node Ring Configuration for Oracle Real Application Clusters Guard Databases



The primary instance for database A resides on Node 1, while the secondary instance for database A resides on Node 2. The primary instance for database B resides on Node 2, while the secondary instance for database B resides on Node 1.

Oracle Real Application Clusters Guard has been tested for a three-node ring configuration. This is shown in Figure 1–5.

Figure 1–5 Three-Node Ring Configuration for Oracle Real Application Clusters Guard



The primary instance for database A resides on Node 1, while the secondary instance for database A resides on Node 2. The primary instance for database B resides on Node 2, while the secondary instance for database B resides on Node 3. The primary instance for database C resides on Node 3, while the secondary instance for database C resides on Node 1.

Table 1–2 summarizes the advantages and disadvantages of a three-node ring configuration.

Table 1–2 Ring Configuration Advantages and Disadvantages

Advantages	Disadvantages
All nodes hold equal roles.	Failover results in two primary instances sharing a single node. Performance may suffer compared to a dedicated secondary configuration.
More efficient use of resources than hub configuration because there are *n* nodes for *n* databases	It is more difficult to isolate failures compared to a dedicated secondary configuration.
Reduced resource requirement for a single node because only two primary instances must run on a single node.	-

2

Oracle Real Application Clusters Guard Operation

This chapter describes the operation of Oracle Real Application Clusters Guard. It contains the following sections:

Overview of Oracle Real Application Clusters Guard Operation

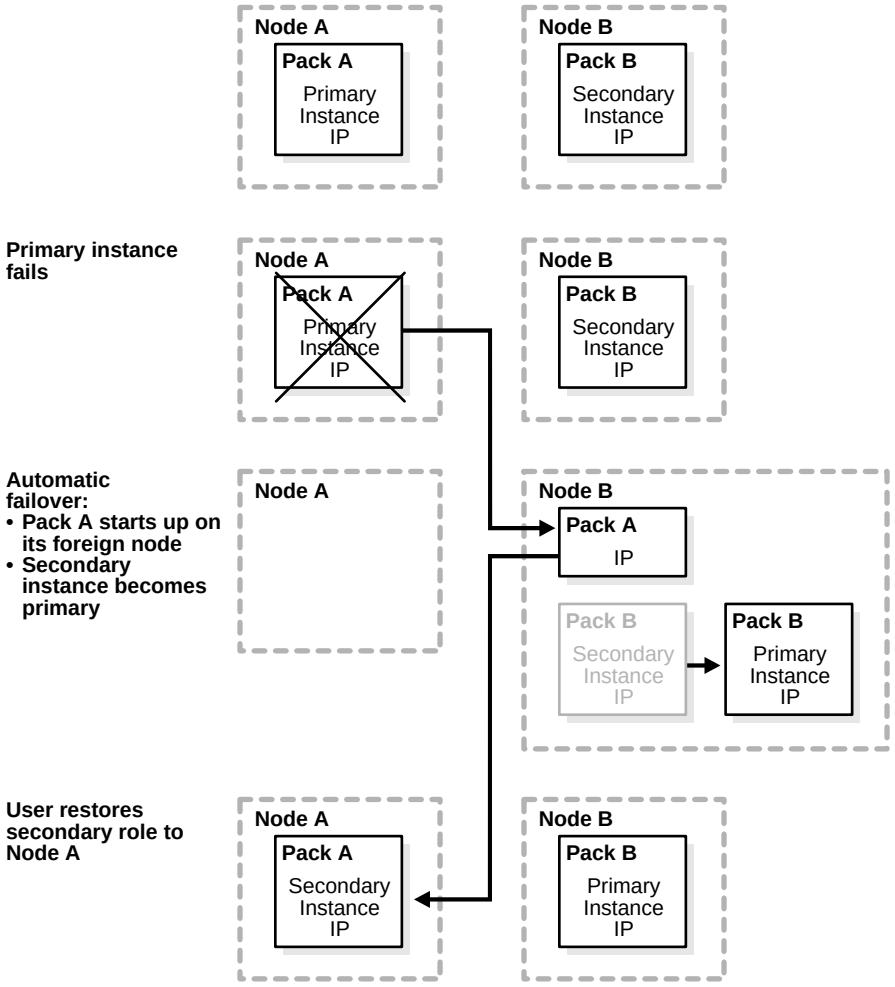
This chapter describes the operation of **Oracle Real Application Clusters Guard**. It is important to distinguish between the automatic actions of Oracle Real Application Clusters Guard and the actions that the user can take when Oracle Real Application Clusters Guard prompts the user. The most typical case is what happens when the **primary instance** fails, and it illustrates the automatic actions of Oracle Real Application Clusters Guard as well as the control that the user has over the final outcome.

> **See Also:** Chapter 4, "Using Oracle Real Application Cluster Guard Commands"

Failure of the Primary Instance

Figure 2–1 shows what happens when the primary instance fails. During normal operation, both Node A and Node B are operational. Pack A is running on its home node, Node A, and has the **primary instance role**. It contains the primary instance and an IP address. Pack B is running on its home node, Node B, and has the **secondary instance role**. It contains the **secondary instance** and an IP address.

Figure 2–1 Failure of the Primary Instance



If the primary instance fails, then Oracle Real Application Clusters Guard automatically does the following:

- The secondary instance becomes the primary instance.
- Pack A starts on Node B in foreign mode. This means that only its relocatable IP address is configured to be up on Node B.

Now both Pack A and Pack B are running on Node B. Pack B contains the primary instance and its IP address. Pack A has only the relocatable IP address configured to be up. Nothing is running on Node A.

A notification about the failure is sent to the PFS log. If the user has customized the Oracle Real Application Clusters Guard call-home script to notify an administrator of the failure, then the administrator can use the `restore` command to restore the secondary instance role. Oracle Real Application Clusters Guard starts Pack A on Node A. Because the instance on Node B now has the primary instance role, the instance associated with Pack A assumes the secondary instance role when it restarts. When both instances are up and operating, the system has **resilience**.

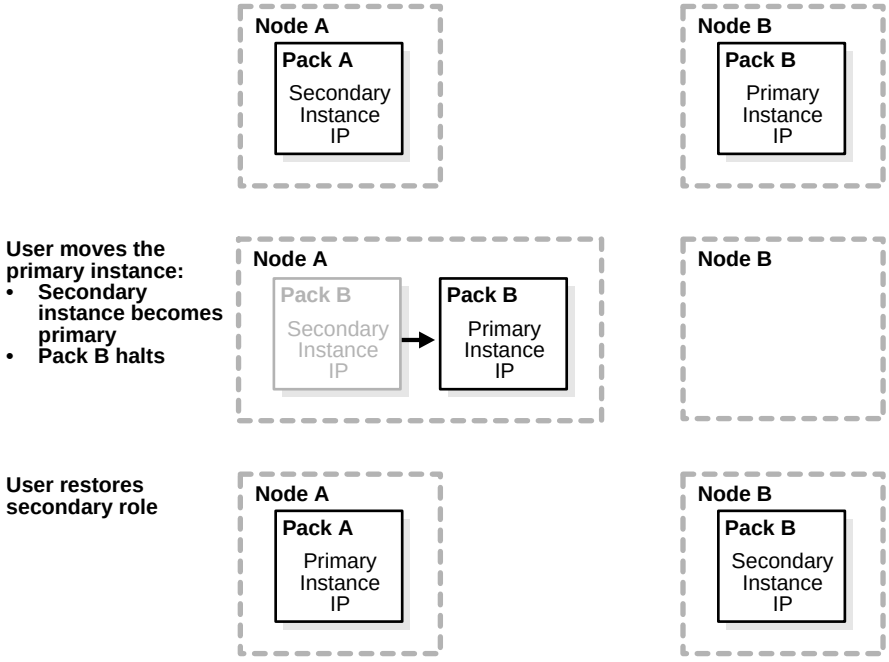
See Also:

- Chapter 4, "Using Oracle Real Application Cluster Guard Commands"
- "Setting Up the Call-Home Feature" on page 5-2

Restoring the Nodes to Their Original Roles

After Oracle Real Application Clusters Guard fails over the primary instance role, the packs are on their home nodes, but the instance roles are reversed. If you want the primary instance to run on the preferred primary node, then use the `move_primary` and `restore` commands. Figure 2–2 shows what happens when you return the roles to their preferred nodes.

Figure 2–2 Returning the Packs to Their Home Nodes



Pack A is on Node A and has the secondary instance role. Pack B is on Node B and has the primary instance role. When the user enters the `move_primary` command, Oracle Real Application Clusters Guard halts Pack B. The secondary instance, which is running on Node A, becomes the primary instance.

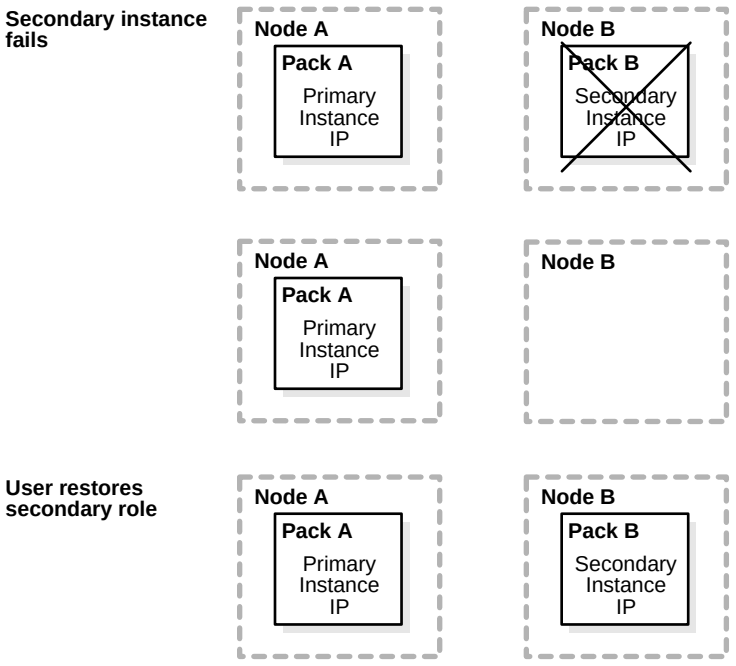
When the user enters the `restore` command, Oracle Real Application Clusters Guard starts Pack B on Node B. Pack B assumes the secondary instance role.

The packs are now running on their home nodes with their original roles.

Failure of the Secondary Instance

Figure 2–3 shows what happens when the secondary instance fails.

Figure 2–3 Failure of the Secondary Instance



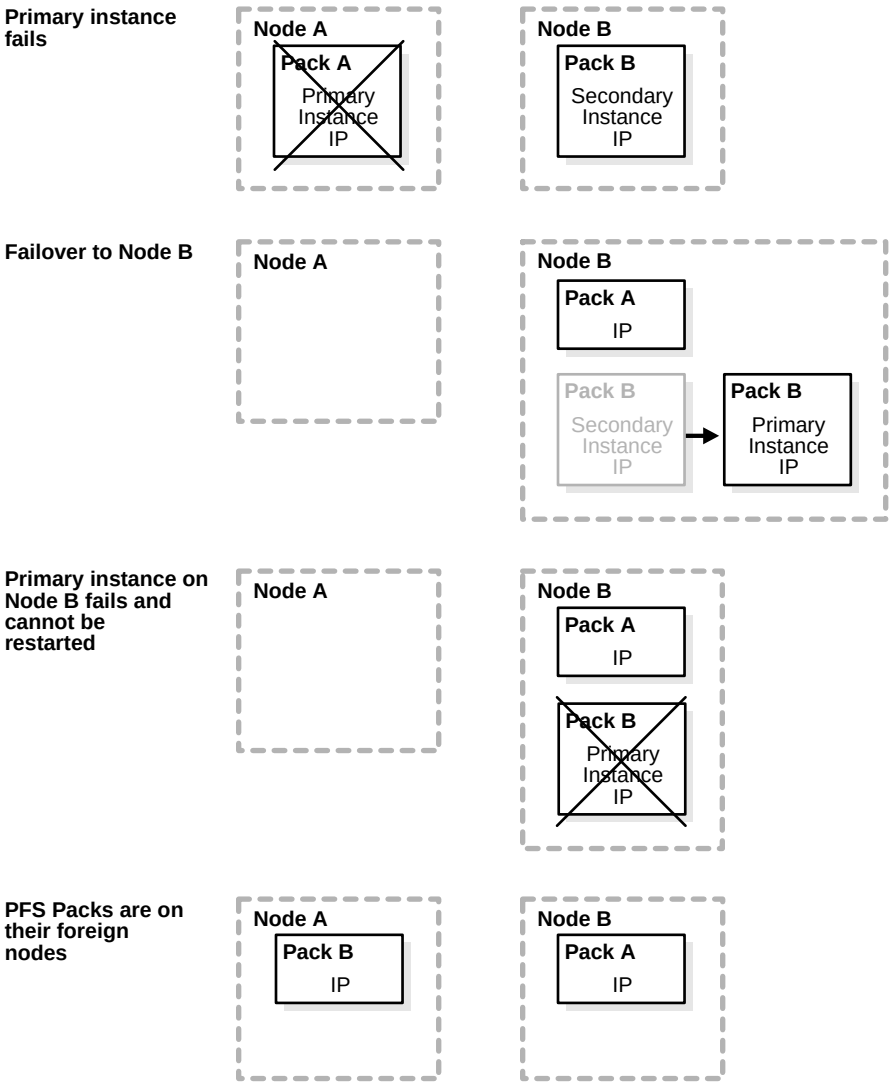
When the secondary instance fails, Oracle Real Application Clusters Guard sends a notification of the failure to the PFS log. The user must enter the `restore` command to restore the secondary instance role to Node B. Both packs retain their original roles on their home nodes.

Note: When there is any failure in the system, it is important to analyze the cause and repair the problem, as well as to restore resilience. For information about troubleshooting, see Chapter 8, "Troubleshooting Oracle Real Application Clusters Guard".

Failure of Both Instances

Figure 2–4 shows what happens when both instances fail.

Figure 2–4 Failure of Both Instances



Initially, Pack A is on Node A and has the primary instance role. Pack B is on Node B and has the secondary instance role. If the primary instance fails, then the secondary instance assumes the primary instance role and Pack A starts on Node B with only its relocatable IP address configured to be up.

If the other instance fails and cannot be restarted, then Pack A remains on Node B and Pack B is started on Node A. Because both packs are on their foreign nodes, only the relocatable IP addresses are configured to be up. No instances are running.

Because the packs are still running, the user must halt them with the `pfshalt` command. If the user tries to start the instances with the `pfsboot` command before halting the packs, then the `pfsboot` command fails.

> **See Also:** Chapter 4, "Using Oracle Real Application Cluster Guard Commands"

3

Oracle Real Application Clusters Guard Configuration Parameters

This chapter describes the Oracle Real Application Clusters Guard configuration parameters. It contains the following sections:

Overview of the Oracle Real Application Clusters Guard Configuration File

Oracle Real Application Clusters Guard provides a set of templates that allow Oracle Real Application Clusters Guard to be easily configured. The templates contain tested configurations for such settings as Oracle Net Service parameters and initialization parameters. The Oracle Real Application Clusters Guard setup utility (PFSSETUP) generates and deploys the files that are required by Oracle Real Application Clusters Guard. The files are automatically generated with the correct values, derived from the customized configuration file (`$ORACLE_SERVICE.conf`).

The Oracle Real Application Clusters Guard configuration file template is located in `$ORACLE_HOME/pfs/setup/conf/savsetup.dat`.

The information in this file corresponds to a single Oracle9*i* Real Application Clusters database. If multiple databases are part of your Oracle Real Application Clusters Guard configuration, then a separate configuration file must be created for each database.

Copy the configuration file template:

```
$ cd $ORACLE_HOME/pfs/setup/conf
$ cp savsetup.dat $ORACLE_SERVICE.conf
```

Use a text editor to modify the new configuration file.

The configuration parameters are grouped by the method that must be employed to modify the parameters. You may want to change the relocatable IP address, for example, if it conflicts with another IP address in the network, or you may want to turn on debugging to do some troubleshooting. Depending on the parameter that needs to be changed, there are different methods that you must employ to make the changes.

The methods of changing Oracle Real Application Clusters Guard parameters are summarized in Table 3–1.

Table 3–1 How to Modify the Oracle Real Application Clusters Guard Configuration Parameter File

Type of Configuration Parameter	Tasks to Complete Using the PFSSETUP Utility	Tasks to Complete as the Root Operating System User	Tasks to Complete as the Oracle User
Permanent cluster database parameters	Generate and deploy all the files.	Re-create the existing packs by using the `deletepacks` and `createpacks` scripts.	Shut down the database.

Table 3–1 How to Modify the Oracle Real Application Clusters Guard Configuration Parameter File

Type of Configuration Parameter	Tasks to Complete Using the PFSSETUP Utility	Tasks to Complete as the Root Operating System User	Tasks to Complete as the Oracle User
Platform-specific configuration parameters	Generate and deploy the user definitions file.	Re-create the existing packs by using the `deletepacks` and `createpacks` scripts.	Shut down the database.
Database and Oracle Real Application Clusters Guard configuration parameters	Generate and deploy all the files.	Halt the packs.	Run the `catpfs.sql` script.
Oracle Real Application Clusters Guard configuration parameters	Generate and deploy the user definitions file.	Halt the packs.	Shut down the database.
Network configuration parameters	Generate and deploy the user definitions file and the Oracle network files.	Halt the packs.	Shut down the database and the listeners.
Database configuration parameters	Generate and deploy the Oracle instance files.	Halt the packs.	Shut down the database and the listeners.

See Also:

- Your platform-specific Oracle Real Application Clusters Guard configuration guide
- "Changing Oracle Real Application Clusters Guard Configuration Parameters" on page 3-13 for detailed steps

Oracle Real Application Clusters Guard Configuration Parameters

The Oracle Real Application Clusters Guard configuration parameters are described in the following sections:

- Permanent Cluster and Database Parameters
- Platform-Specific Configuration Parameters
- Database and Oracle Real Application Clusters Guard Configuration Parameters
- Oracle Real Application Clusters Guard Configuration Parameters

- Network Configuration Parameters
- Database Configuration Parameters

Permanent Cluster and Database Parameters

Table 3–2 contains the permanent cluster and database parameters.

Table 3–2 Permanent Cluster and Database Configuration Parameters

Parameter Name	Valid Values	Description
PLATFORM	Examples: HP, SUN, DEC, IBM Default: None	Specifies the hardware cluster platform
PFS_CLUSTER_NAME	Range of values: A valid cluster name that does not include any of the following characters: ? | :*<>"%#+@~&^-_‘’[]{};=., Default: None	Specifies the cluster name. It should be unique among the clusters that run on the same network.
PFS_HOSTA	Range of values: A valid host name that does not include any of the following characters: ? | :*<>"%#+@~&^-_‘’[]{};=., Default: None	Specifies the host name of the systems where the Real Application Clusters database exists. The value must be the same as that returned by the hostname system command. The hostname command cannot return the domain name in addition to the host name.
PFS_HOSTB	Range of values: A valid host name that does not include any of the following characters: ? | :*<>"%#+@~&^-_‘’[]{};=., Default: None	Specifies the host name of the systems where the Real Application Clusters database exists. The value must be the same as that returned by the hostname system command. The hostname command cannot return the domain name in addition to the host name.
ORACLE_BASE	Range of values: Any valid directory Default: None Recommended OFA value: *software_mount_point*/app/oracle Example: /u01/app/oracle	Specifies the directory at the top of the Oracle software and administrative file structure. It must be identical for all nodes of a cluster that access the database. Note: Comment out the ORACLE_BASE parameter if you are not using an OFA-compliant configuration. For example: #ORACLE_BASE=

Table 3–2 Permanent Cluster and Database Configuration Parameters (Cont.)

Parameter Name	Valid Values	Description
ORACLE_HOME	Range of values: Any valid directory Default: None Recommended OFA value: $ORACLE_BASE/product/release Example: /u01/app/oracle/product/9.2.0.0	Specifies the directory containing the Oracle software for a specific Oracle database server release. It must be identical for all nodes of a cluster that access the database.
DB_NAME	Range of values: Valid database name Default: None Example: PRO	Specifies the value of the DB_NAME initialization parameter entered during installation or database creation. Multiple instances must have the same value for DB_NAME.
PFS_IP_PACK_HOSTA	-	Specifies the relocatable IP address that the clients use to access the Real Application Clusters database. The entry for the relocatable IP address and its logical host name must exist in the /etc/hosts file.
PFS_IP_PACK_HOSTB	-	Specifies the relocatable IP address that the clients use to access the Real Application Clusters database. The entry for the relocatable IP address and its logical host name must exist in the /etc/hosts file.
PFS_IP_SUBNET_HOSTA	-	Specifies the subnet for the IP address that is added to the public network adapter. The IP address moves with the pack if the pack is moved to another node.
PFS_IP_SUBNET_HOSTB	-	Specifies the subnet for the IP address that is added to the public network adapter. The IP address moves with the pack if the pack is moved to another node.

Platform-Specific Configuration Parameters

This section contains parameters that are specific to the Sun platform. Table 3–3 contains parameters that are specific to the Sun platform.

Table 3–3 Sun-Specific Configuration Parameters

Parameter Name	Valid Values	Description
PFS_NET_IF_A	-	Specifies the public network adapter. The public network adapter must already be part of a Network Adapter Failover (NAFO) group. Before installing Oracle Real Application Clusters Guard, create a NAFO group to host the relocatable IP address for a Real Application Clusters Guard pack.
PFS_NET_IF_B	-	Specifies the public network adapter. The public network adapter must already be part of a Network Adapter Failover (NAFO) group. Before installing Oracle Real Application Clusters Guard, create a NAFO group to host the relocatable IP address for a Real Application Clusters Guard pack.
START_NET_TIMEOUT	Default: 180	Specifies the maximum time in seconds for Sun Cluster to start the pack
STOP_NET_TIMEOUT	Default: 180	Specifies the maximum time in seconds for Sun Cluster to stop the pack

Database and Oracle Real Application Clusters Guard Configuration Parameters

Table 3–4 contains database and Oracle Real Application Clusters Guard parameters.

Table 3–4 Database and Oracle Real Application Clusters Guard Configuration Parameters

Parameter Name	Valid Values	Description
ORACLE_SERVICE	-	Specifies the name of the service. Must be unique in the cluster. Oracle Corporation recommends restricting the name to four characters to avoid filename problems on heterogeneous systems.
ORACLE_USER	Range of values: Any valid operating system user that is part of the operating system DBA group	Specifies the name of the operating system `oracle` user. This is the user that owns the Oracle Real Application Clusters Guard software.

Table 3–4 Database and Oracle Real Application Clusters Guard Configuration Parameters (Cont.)

Parameter Name	Valid Values	Description
ORACLE_SID_HOSTA	Range of values: Any valid ORACLE_SID string Default: None Example: PRO1	Specifies the Oracle System Identifier (SID), which is the same as the Oracle server instance. Because the SID is incorporated into many filenames, Oracle Corporation recommends restricting it to no more than four characters to avoid filename problems on heterogeneous systems. The SID for each instance in an Oracle9*i* Real Application Clusters cluster must be unique and should incorporate the name of the database it manipulates.
ORACLE_SID_HOSTB	Range of values: Any valid ORACLE_SID string Default: None Example: PRO2	Specifies the Oracle System Identifier (SID), which is the same as the Oracle server instance. Because the SID is incorporated into many filenames, Oracle Corporation recommends restricting it to no more than four characters to avoid filename problems on heterogeneous systems. The SID for each instance in an Oracle9*i* Real Application Clusters cluster must be unique and should incorporate the name of the database it manipulates.
INSTANCE_NAME_HOSTA	Default: None Example: PRO1	Specifies the name of the instance and is used to uniquely identify a specific instance when multiple instances share common service names. The instance name can be the same as the SID. It is indicated by the INSTANCE_NAME parameter in the initialization parameter file. The INSTANCE_NAME for each instance in an Oracle9*i* Real Application Clusters cluster must be unique.
INSTANCE_NAME_HOSTB	Default: None Example: PRO2	Specifies the name of the instance and is used to uniquely identify a specific instance when multiple instances share common service names. The instance name can be the same as the SID. It is indicated by the INSTANCE_NAME parameter in the initialization parameter file. The INSTANCE_NAME for each instance in an Oracle9*i* Real Application Clusters cluster must be unique.

Table 3–4 Database and Oracle Real Application Clusters Guard Configuration Parameters (Cont.)

Parameter Name	Valid Values	Description
SERVICE_NAMES	Range of values: Any ASCII string Example: PRO.oracle.com, where PRO is the database name and oracle.com is the database domain	Specifies the name of the database service on the network. By default, Oracle Universal Installer and Database Configuration Assistant create a service name that includes the entire global database name, a name comprised of the database name (DB_NAME) and the domain name (DB_DOMAIN), entered during installation or database creation. It is possible to provide multiple service names (by individual SERVICE_NAMES entries) so that different uses of an instance can be identified separately.
IS_MTS	Range of values: $PFS_TRUE, $PFS_FALSE Default: $PFS_FALSE	Specify $PFS_TRUE if you are running a shared server process
TNS_ADMIN	Range of values: Any valid directory Default: $ORACLE_HOME/network/admin	Specifies the directory containing the Oracle Net configuration files. It must be identical for all nodes of a cluster that access the database.

Oracle Real Application Clusters Guard Configuration Parameters

Table 3–5 contains Oracle Real Application Clusters Guard configuration parameters.

Table 3–5 Oracle Real Application Clusters Guard Configuration Parameters

Parameter Name	Valid Values	Description
PFILE_HOSTA	Range of values: Any valid initialization parameter file that references control files Default setting for OFA configuration: $ORACLE_BASE /admin/$DB_NAME /pfile /init$ORACLE_SID_ HOSTA.ora Default setting for non-OFA configuration: $ORACLE_HOME /dbs/init$ORACLE_ SID_HOSTA.ora	Specifies the initialization parameter file that is used when Oracle Real Application Clusters Guard starts the instance
PFILE_HOSTB	Range of values: Any valid initialization parameter file that references control files Default setting for OFA configuration: $ORACLE_BASE /admin/$DB_NAME /pfile /init$ORACLE_SID_ HOSTB.ora Default setting for non-OFA configuration: $ORACLE_HOME /dbs/init$ORACLE_ SID_HOSTB.ora	Specifies the initialization parameter file that is used when Oracle Real Application Clusters Guard starts the instance
PFS_PREFERRED_PRIMARY	Range of values: $PFS_ HOSTA, $PFS_HOSTB Default: $PFS_HOSTA	Specifies the preferred primary node of the cluster
PFS_PREFERRED_SECONDARY	Range of values: $PFS_ HOSTA, $PFS_HOSTB Default: $PFS_HOSTB	Specifies the preferred secondary node of the cluster

Table 3–5 Oracle Real Application Clusters Guard Configuration Parameters (Cont.)

Parameter Name	Valid Values	Description
PFS_LANGUAGE	Range of values: Any valid language name Default: AMERICAN	Specifies language conventions for Oracle messages, day names, and month names. Each supported language has a unique name such as AMERICAN or JAPANESE. **See Also:** *Oracle9i Globalization Support Guide*
PFS_TERRITORY	Range of values: Any valid territory name Default: AMERICA	Specifies conventions such as calendar, date, monetary, and numeric formats. Each supported territory has a unique name such as AMERICA or JAPAN. **See Also:** *Oracle9i Globalization Support Guide*
CHARSET	Range of values: Any valid character set Default: US7ASCII	Specifies the character set used by the client application. Each supported character set has a unique acronym such as US7ASCII or UTF8. **See Also:** *Oracle9i Globalization Support Guide*
PFS_KEEP_PRIMARY	Range of values: $PFS_TRUE, $PFS_FALSE Default: $PFS_TRUE	Specifies whether to leave the primary pack up when the secondary pack does not come up during PFSBOOT. **See Also:** "Changing the PFS_KEEP_PRIMARY Parameter" on page 6-12
PFS_DEBUGGING	Range of values: $PFS_TRUE, $PFS_FALSE Default: $PFS_FALSE	Specifies whether to enable or disable Oracle Real Application Clusters Guard debugging
LISTENER_CHECK_INTERVAL	Range of values: At least 0 Default: 5	Specifies, in seconds, the frequency with which the listener monitor checks the public listener
PRIV_LSNR_CHECK_INTERVAL	Range of values: At least 0 Default: 60	Specifies, in seconds, the frequency with which the listener monitor checks the private listener
MAX_LSNR_RESTART	Range of values: At least 0 Default: 3	Specifies the maximum number of times the listener can be restarted

Table 3–5 Oracle Real Application Clusters Guard Configuration Parameters (Cont.)

Parameter Name	Valid Values	Description
MIN_LSNR_RESTART_INTERVAL	Range of values: At least 0 Default: 300	Specifies, in seconds, the time period in which Oracle Real Application Clusters Guard can try to restart the listener. If Oracle Real Application Clusters Guard tries to restart the listener more than MAX_LSNR_RESTART times within MIN_LSNR_RESTART_INTERVAL, then Oracle Real Application Clusters Guard exits the listener monitor.
DUMPLSNR_TIMEOUT	Range of values: At least 0 Default: 60	Specifies, in seconds, how long to wait for the NETSTAT -rn command to complete
ORACLE_ARCH_TIMEOUT	Range of values: At least 0 Default: 60	Specifies, in seconds, how long to wait for the ALTER DATABASE ARCHIVE LOG ALL statement to complete
ORACLE_CKPT_TIMEOUT	Range of values: At least 0 Default: 60	Specifies in seconds how long to wait for the ALTER SYSTEM CHECKPOINT GLOBAL statement to complete
PFS_DUMP_LEVEL	Range of values: 0 to 10 Default: 10	Specifies the dump level associated with Oracle system state dumps
ORACLE_DUMP_TIMEOUT	Range of values: At least 0 Default: 60	Specifies in seconds how long to wait for Oracle SYSTEMSTATE and Oracle9*i* Real Application Clusters lock tree dump to complete

Network Configuration Parameters

Table 3–6 contains network configuration parameters.

Table 3–6 Network Configuration Parameters

Parameter Names	Valid Values	Description
PFS_IP_HOSTA	-	Specifies the static host IP address on PFS_HOSTA
PFS_IP_HOSTB	-	Specifies the static host IP address on PFS_HOSTB

Table 3–6 Network Configuration Parameters

Parameter Names	Valid Values	Description
PFS_PORT_DED_HOSTA	Range of values: 1025 to 65535	Specifies the port setting for a dedicated configuration on PFS_HOSTA. Many operating systems reserve port numbers below 1024 for use by privileged processes.
PFS_PORT_DED_HOSTB	Range of values: 1025 to 65535	Specifies the port setting for a dedicated configuration on PFS_HOSTB. Many operating systems reserve port numbers below 1024 for use by privileged processes.
PFS_PORT_MTS_HOSTA	Range of values: 1025 to 65535	Specifies the port setting for a shared server configuration on PFS_HOSTA. Many operating systems reserve port numbers below 1024 for use by privileged processes.
PFS_PORT_MTS_HOSTB	Range of values: 1025 to 65535	Specifies the port setting for a shared server configuration on PFS_HOSTB. Many operating systems reserve port numbers below 1024 for use by privileged processes.

Database Configuration Parameters

Table 3–7 contains database configuration parameters.

Table 3–7 Database Configuration Parameters

Parameter Name	Value	Description
DB_DOMAIN	Range of values: Any legal string of name components, separated by periods, and up to 128 characters long. This value cannot be null. Default: WORLD Example: oracle.com	Specifies the database domain in which the database is located, entered during installation or database creation. When possible, Oracle Corporation recommends that the database domain mirror the network domain.
INSTANCE_NUMBER_HOSTA	Example: 1	Specifies a unique number that maps the instance to one free list group for each database object created with the FREELIST_GROUPS storage parameter. Oracle Corporation recommends setting INSTANCE_NUMBER_HOST*n* to the same value as the THREAD_HOST*n* parameter.

Table 3–7 Database Configuration Parameters (Cont.)

Parameter Name	Value	Description
INSTANCE_NUMBER HOSTB	Example: 2	Specifies a unique number that maps the instance to one free list group for each database object created with the FREELIST_GROUPS storage parameter. Oracle Corporation recommends setting INSTANCE_NUMBER_HOST*n* to the same value as the THREAD_HOST*n* parameter.
THREAD_HOSTA	Range of values: 0 to maximum number of enabled threads Example: 1	Specifies the number of the redo thread to be used by the instance. Any available redo thread number can be used, but an instance cannot use the same thread number as another instance. Also, an instance cannot start when its redo thread is disabled. A value of 0 causes an available, enabled public thread to be chosen. An instance cannot mount a database if the thread is used by another instance or if the thread is disabled. Multiple instance must have different values for THREAD_HOSTA and THREAD_HOSTB.
THREAD_HOSTB	Range of values: 0 to maximum number of enabled threads Example: 2	Specifies the number of the redo thread to be used by the instance. Any available redo thread number can be used, but an instance cannot use the same thread number as another instance. Also, an instance cannot start when its redo thread is disabled. A value of 0 causes an available, enabled public thread to be chosen. An instance cannot mount a database if the thread is used by another instance or if the thread is disabled. Multiple instance must have different values for THREAD_HOSTA and THREAD_HOSTB.

Changing Oracle Real Application Clusters Guard Configuration Parameters

Use different methods to change Oracle Real Application Clusters Guard configuration parameters. This section contains the following topics:

- Changing Permanent Cluster and Database Parameters
- Changing Platform-Specific Configuration Parameters

- Changing Database and Oracle Real Application Clusters Guard Configuration Parameters
- Changing Oracle Real Application Clusters Guard Configuration Parameters
- Changing Network Configuration Parameters
- Changing Database Configuration Parameters

The procedures that are described in these sections use the PFSCTL command line.

> **See Also:** Chapter 4, "Using Oracle Real Application Cluster Guard Commands"

Changing Permanent Cluster and Database Parameters

To modify the parameters in Table 3–2 on page 3-4, you must:

1. Generate and deploy all the files.
2. Re-create the packs.

You may want to change these parameters in the following situations:

- You want to change one of the permanent cluster settings that was originally specified when the packs were created.
- You want to change one of the permanent database settings that was originally specified during Oracle installation or with a CREATE DATABASE statement.

For example, you might need to change the relocatable IP address if it conflicts with another IP address in the network. Another example is changing $ORACLE_HOME if the original file system where $ORACLE_HOME resided becomes unavailable.

The following steps and examples show how to reinstall Oracle Real Application Clusters Guard after modifying the parameters in Table 3–2:

1. Modify the parameters from Table 3–2 in the $ORACLE_SERVICE.conf file.
2. Invoke the PFSCTL command line as root:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
```

```
DB_NAME is set to sales
```

3. Shut down the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new set of Oracle Real Application Clusters Guard files. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFSSETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter y to continue. You should see output similar to the following:

```
PFSSETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 200
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit
```

6. Choose Option 6:

```
PFS_SETUP> 6
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ALL_FILES

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 PFS_SALES.RUN
 PFS_SALES.HALT
 PFS_SALES.MONSTART
 PFS_SALES.MONSTOP
 PFS_SALES_User.def
 PFS_SALES_System.def
 listener.ora.ded.pfs
 tnsnames.ora.ded.pfs
 tnsnames.ora.ded.clnt.pfs
 SALES_config1.ded.pfs
 SALES_config2.ded.pfs
 SALES_config.pfs
 init_SALES1_HOSTA.ora
 init_SALES2_HOSTB.ora

Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should see output similar to the following:

```
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/packs
HOSTA
Backing up directory on
/home_oracle/92_sales/pfs/setup/output/SALES/include HOSTA
Generating ORACLE Real Application Clusters Guard files
Generating Packs
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/network
HOSTA
Generating ORACLE network files
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/pfile
HOSTA
Generating ORACLE instance files
```

9. Deploy the new set of Oracle Real Application Clusters Guard files. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

10. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit
```

```
PFS_SETUP>
```

11. Choose Option 6:

```
PFS_SETUP> 6
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ALL_FILES

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu
```

12. Choose Option 2:

```
PFS_SETUP> 2
```

13. Delete the existing packs as `root`:

```
# deletepacks
```

14. Create the new packs as `root`:

```
# createpacks
```

15. Start the packs by using PFSCTL as `root`.

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.
```

```
ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

16. Enter the PFSBOOT command:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Changing Platform-Specific Configuration Parameters

To modify the parameters in Table 3–3 on page 3-6 and Table 3–4 on page 3-6, you must:

1. Generate and deploy the user definitions file.
2. Re-create the packs.

This is necessary in the following situations:

- You want to change one of the cluster settings that was specified during Oracle Real Application Clusters Guard installation.
- You want to change one of the permanent database settings that was specified during Oracle installation or with a CREATE DATABASE statement.

For example, you might need to change the maximum time in seconds to wait when Oracle Real Application Clusters Guard starts a relocatable IP address.

The following steps and examples show how to create a new user definitions file:

1. Modify the parameters from Table 3–3 and Table 3–4 in the $ORACLE_SERVICE.conf file.
2. Invoke PFSCTL as root.

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.
```

```
ORACLE_SERVICE is set to SALES
DB_NAME is set to sales
```

3. Shut down the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new user definitions file. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit
```

6. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 PFS_SALES_User.def

Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should see output similar to the following:

```
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/include
HOSTA
```

9. Deploy a new user definitions file. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
```

```
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu
```

10. Choose Option 2:

```
PFS_SETUP> 2
```

You should see output similar to the following:

```
The list of affected files is
PFS_SALES_User.def

Do you wish to continue? [Y/N]
```

11. Enter y to continue. You should see output similar to the following:

```
Deploying user file
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTA
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTB
```

12. Delete the existing packs as root:

```
# deletepacks
```

13. Create the new packs as root:

```
# createpacks
```

14. Invoke PFSCTL as root.

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.
```

```
ORACLE_SERVICE is set to SALES
DB_NAME is set to sales
```

15. Start the packs:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Changing Database and Oracle Real Application Clusters Guard Configuration Parameters

To modify the parameters in Table 3–4 on page 3-6, you must:

1. Generate and deploy all the files.
2. Run `catpfs.sql` to re-create the Oracle Real Application Clusters Guard schema.

This is necessary in the following situations:

- You want to change one of the database settings that was originally specified during Oracle Real Application Clusters Guard installation.
- You want to change one of the Oracle Real Application Clusters Guard settings that was originally specified during Oracle Real Application Clusters Guard installation.

For example, you may need to change the `$ORACLE_SID` parameter, or you may want to configure Oracle Real Application Clusters Guard to support a shared server.

The following steps and examples show how to create new Oracle Real Application Clusters Guard files and Oracle Real Application Clusters Guard schema.

1. Modify the parameters from Table 3–4 in the `$ORACLE_SERVICE.conf` file.
2. Invoke `PFSCTL` as `root`:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
```

```
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

3. Shut down the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new set of Oracle Real Application Clusters Guard files. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
```

```
6] All the files
7] Quit

PFS_SETUP>
```

6. Choose Option 6:

```
PFS_SETUP> 6
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ALL_FILES

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 PFS_SALES.RUN
 PFS_SALES.HALT
 PFS_SALES.MONSTART
 PFS_SALES.MONSTOP
 PFS_SALES_User.def
 PFS_SALES_System.def
 listener.ora.ded.pfs
 tnsnames.ora.ded.pfs
```

```
 tnsnames.ora.ded.clnt.pfs
 SALES_config1.ded.pfs
 SALES_config2.ded.pfs
 SALES_config.pfs
 init_SALES1_HOSTA.ora
 init_SALES2_HOSTB.ora

Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should see output similar to the following:

```
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/packs
HOSTA
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/include
HOSTA
Generating ORACLE Real Application Clusters Guard files
Generating Packs
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/network
HOSTA
Generating ORACLE network files
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/pfile
HOSTA
Generating ORACLE instance files
```

9. Deploy the new set of Oracle Real Application Clusters Guard files. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

10. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
```

```
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

11. Choose Option 6:

```
PFS_SETUP> 6
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ALL_FILES

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

12. Choose Option 2:

```
PFS_SETUP> 2
```

13. Open the database outside of the packs.

14. Run `catpfs.sql` to re-create the Oracle Real Application Clusters Guard schema. Enter the following commands:

```
$ sqlplus "system/manager as sysdba"
SQL> @?/pfs/admin/catpfs.sql
```

15. Shut down the database.

16. Invoke `PFSCTL` as `root`:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

17. Start the packs:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Changing Oracle Real Application Clusters Guard Configuration Parameters

To modify the parameters in Table 3–5 on page 3-9, you must generate and deploy the user definitions file.

This is necessary if you want to change one of the Oracle Real Application Clusters Guard settings that was originally specified during Oracle Real Application Clusters Guard installation.

For example, you may need to change the location of the initialization parameter file that Oracle Real Application Clusters Guard uses to start up the instance, or you may need to turn on debugging to troubleshoot Oracle Real Application Clusters Guard.

The following steps and examples show how to create a new user definitions file.

1. Modify the parameters from Table 3–5 in the `$ORACLE_SERVICE.conf` file.

2. Invoke PFSCTL as root:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

3. Shut down the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new user definitions file. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin
```

```
Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

6. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 PFS_SALES_User.def
```

```
Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should see output similar to the following:

```
Backing up directory on /home_oracle
/92_sales/pfs/setup/output/SALES/include HOSTA
```

9. Deploy a new user definitions file. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

10. Choose Option 2:

```
PFS_SETUP> 2
```

You should see output similar to the following:

```
The list of affected files is
PFS_SALES_User.def

Do you wish to continue? [Y/N]
```

11. Enter y to continue. You should see output similar to the following:

```
Deploying user file
```

```
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTA
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTB
```

12. Invoke PFSCTL as root.

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

13. Start the packs:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Changing Network Configuration Parameters

To modify the parameters in Table 3–6 on page 3-11, you must:

1. Generate and deploy the user definitions files.
2. Generate and deploy the Oracle network files.

This is necessary when you want to change one of the network settings that was specified during Oracle Real Application Clusters Guard installation.

For example, you may need to change the port number for the Oracle Real Application Clusters Guard listener.

The following steps and examples show how to create a new user definitions file and new Oracle network files.

1. Modify the parameters from table Table 3–6 in the $ORACLE_SERVICE.conf file.
2. Invoke PFSCTL as root:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

3. Shut down the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new user definitions file and new Oracle Network files. Invoke PFSSETUP as $ORACLE_USER:

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
```

```
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

6. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 PFS_SALES_User.def

Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should output similar to the following:

```
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/include
HOSTA

Press Enter to continue
```

9. Press the Enter key. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

10. Choose Option 6:

```
PFS_SETUP> 6
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

11. Enter y to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
```

```
ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

12. Choose Option 3:

```
PFS_SETUP> 3
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_NETWORK_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

13. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 listener.ora.ded.pfs
 tnsnames.ora.ded.pfs
 tnsnames.ora.ded.clnt.pfs

Do you wish to continue? [Y/N]
```

14. Enter y to continue.

15. Deploy a new user definitions file. Invoke PFSSETUP as $ORACLE_USER.

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_USER_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

16. Choose Option 2:

```
PFS_SETUP> 2
```

You should see output similar to the following:

```
The list of affected files is
PFS_SALES_User.def
```

```
Do you wish to continue? [Y/N]
```

17. Enter y to continue. You should see output similar to the following:

```
Deploying user file
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTA
Backing up directory on /mnt1/oracle/admin/sales/pfs/include HOSTB

Press Enter to continue
```

18. Press the Enter key. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

19. Choose Option 3:

```
PFS_SETUP> 3
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_NETWORK_FILE
```

```
Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

20. Choose Option 2:

```
PFS_SETUP> 2
```

You should see output similar to the following:

```
The list of affected files is
 listener.ora.ded.pfs
 tnsnames.ora.ded.pfs
 tnsnames.ora.ded.clnt.pfs

Do you wish to continue? [Y/N]
```

21. Enter `y` to continue.

22. On both nodes, change the network file suffixes as follows:

- From `listener.ora.ded.pfs` to `listener.ora`
- From `tnsnames.ora.ded.pfs` to `tnsnames.ora`

23. Distribute the `tnsnames.ora.ded.clnt.pfs` file to the client nodes.

24. Invoke `PFSCTL` as `root`:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

25. Start the packs:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Changing Database Configuration Parameters

To modify the parameters in Table 3–7 on page 3-12, you must generate and deploy the Oracle instance files.

This is necessary if you want to change one of the database settings that was specified during Oracle Real Application Clusters Guard installation.

For example, you may need to change the database domain to mirror the network domain.

The following steps and examples show how to create new Oracle instance files.

1. Modify the parameters from Table 3–7 in the `$ORACLE_SERVICE.conf` file.
2. Invoke `PFSCTL` as `root`:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

3. Stop the packs:

```
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

4. Generate a new Oracle instance file. Invoke `PFSSETUP` as `$ORACLE_USER`.

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:06 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

Do you wish to continue? [Y/N]
```

5. Enter `y` to continue. You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:32:54 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Choose the set of files from the following:
1] User definitions file
2] ORACLE Real Application Clusters Guard files
3] ORACLE network files
4] ORACLE instance files
5] ORACLE network and instance files
6] All the files
7] Quit

PFS_SETUP>
```

6. Choose Option 4:

```
PFS_SETUP> 4
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin
```

```
Selected option ORACLE_INSTANCE_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

7. Choose Option 1:

```
PFS_SETUP> 1
```

You should see output similar to the following:

```
The list of affected files is
 SALES_config1.ded.pfs
 SALES_config2.ded.pfs
 SALES_config.pfs
 init_SALES1_HOSTA.ora
 init_SALES2_HOSTB.ora

Do you wish to continue? [Y/N]
```

8. Enter y to continue. You should see output similar to the following:

```
Backing up directory on /home_oracle/92_sales/pfs/setup/output/SALES/pfile
HOSTA
Generating ORACLE instance files.
```

9. Deploy a new Oracle instance file. Invoke PFSSETUP as $ORACLE_USER.

```
$ pfssetup
```

You should see output similar to the following:

```
PFS_SETUP for Solaris: Version 9.2.0.1.0 on Wed Feb  1 15:33:16 PST 2001
(c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.

ORACLE_BASE is set to /mnt1/oracle
ORACLE_HOME is set to /home_oracle/92_sales
PFS_HOME is set to /mnt1/oracle/admin/sales/pfs
```

```
TNS_ADMIN is set to /mnt1/oracle/admin/sales/network/admin

Selected option ORACLE_INSTANCE_FILE

Choose an operation on the selected files:
1] Generate only
2] Deploy only
3] Generate and deploy
4] Deinstall
5] List the affected files
6] Return to Main Menu

PFS_SETUP>
```

10. Choose Option 2:

```
PFS_SETUP> 2
```

You should see output similar to the following:

```
The list of affected files is
 SALES_config1.ded.pfs
 SALES_config2.ded.pfs
 SALES_config.pfs
 init_SALES1_HOSTA.ora
 init_SALES2_HOSTB.ora

Do you wish to continue? [Y/N]
```

11. Enter `y` to continue. You should see output similar to the following:

```
Deploying user file
Backing up directory on /mnt1/oracle/admin/sales/pfs/pfile HOSTA
Backing up directory on /mnt1/oracle/admin/sales/pfs/pfile HOSTB
```

12. Incorporate the Oracle Real Application Cluster Guard initialization parameter files into the existing initialization parameter files by using the `IFILE` initialization parameter.

> **See Also:** *Oracle9i Database Reference* for information about the `IFILE` initialization parameter

13. Invoke `PFSCTL` as `root`:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for HOSTA: Version 9.2.0.1.0 - Production on  Feb 01 2001 14:38:00
 (c) Copyright 2001, 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

14. Start the packs:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded
```

4

Using Oracle Real Application Cluster Guard Commands

This chapter describes the Oracle Real Application Clusters Guard user commands. It contains the following sections:

Overview of the Oracle Real Application Clusters Guard Command-Line Utility

The PFSCTL control utility is responsible for starting, stopping, and operating Oracle Real Application Clusters Guard through its interaction with the cluster manager. It provides a command-line interface to the user. Many of the commands influence the behavior of the packs. A pack is software that ensures the availability of the set of resources required to run an Oracle instance. The pack controls the startup, shutdown, and restarting of Oracle Real Application Clusters Guard. There is one pack for each Oracle instance. Each pack controls the following resources on its node:

- Oracle instance
- Monitors
- Listeners
- IP addresses

See Also: Chapter 1, "Oracle Real Application Clusters Guard Architecture"

Oracle Real Application Clusters Guard User Commands

Table 4–1 shows the PFSCTL user commands that are available in Oracle Real Application Clusters Guard.

Table 4–1 Oracle Real Application Clusters Guard User Commands

Command	Description
`pfsboot`	Start all packs
`pfshalt`	Stop all packs
`move_primary [seconds]`	Move the primary role to the secondary instance in the specified number of seconds (optional). The default number of seconds is `30`.
`restore`	Restore the pack to the secondary role
`status`	Display the state of the packs
`stop_secondary [seconds]`	Stop the secondary pack in the specified number of seconds (optional). The default number is seconds is `30`.

Table 4–1 Oracle Real Application Clusters Guard User Commands (Cont.)

Command	Description
`bootone` *`pack_name`* `[-f]`	Start the specified pack, with the option `[-f]` to start it on the foreign node. **Note:** Pack name is case-sensitive.
`haltone` *`pack_name`*	Stop the specified pack. **Note:** Pack name is case-sensitive.
`switchover [`*`seconds`*`]`	Move the primary role to the secondary instance, then restore the secondary role to the former primary instance. The default number of seconds is 30, which applies to moving the primary role.
`call_home`	Test user-defined call-home script
`report [-f` *`filename`*`]` `[-d` *`yyyy/mo/dd-hh:mi:ss`*`][-s]`	Generates an uptime report. `-f` *`filename`*: Specifies the filename for the report. Example: `report.rpt` Default: Standard output `-d` *`yyyy/mo/dd-hh:mi:ss`*: Specifies the date and time from which to start the report (where *`yyyy`* is the year, *`mo`* is the month, *`dd`* is the date, *`hh`* is the hour based on 24 hours, *`mi`* is minutes, and *`ss`* is seconds Example: `2001/08/10-12:10:10` Default: Generate the report from the beginning of the logs `-s`: Generate only the uptime summary Default: Generates the full report
`help`	List `PFSCTL` commands
`quit/exit`	Exit `PFSCTL`

To use `PFSCTL` commands, the `ORACLE_SERVICE` and `DB_NAME` environment variables must be defined.

Run `PFSCTL` commands as `root` because they invoke cluster-specific commands. `PFSCTL` commands are case-insensitive except for the pack name that is specified in the `bootone` and `haltone` commands. They may be run from any node.

Enter the commands by entering the name of the script and then the name of the command.

For example, to start all packs, enter the following command:

```
# pfsctl
```

You should see output similar to the following:

```
PFSCTL for hostA: Version 9.2.0.1.0 - Production on  Feb 25 2001 16:37:01
(c) Copyright 2001, 2002 Oracle Corporation. All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales
```

When the PFSCTL prompt appears, enter the following command:

```
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

If there are multiple databases and you want to change to another Oracle Real Application Clusters Guard environment, then perform the following steps:

1. Exit the current Oracle Real Application Clusters Guard environment:

   ```
   PFSCTL> exit
   ```

2. Set the ORACLE_SERVICE and DB_NAME environment variables to a new value. For example:

   ```
   # export ORACLE_SERVICE=FIN
   # export DB_NAME=fin
   ```

3. Invoke PFSCTL:

   ```
   # pfsctl
   ```

Starting Oracle Real Application Clusters Guard

Starting Oracle Real Application Clusters Guard means starting all the packs. Do this by entering the following commands:

```
# pfsctl
PFSCTL> pfsboot
```

You should see output similar to the following:

```
pfsboot command succeeded.
```

Displaying the Current Status of Oracle Real Application Clusters Guard

You can see the current status of the packs by entering the following commands:

```
# pfsctl
PFSCTL> status
```

If both packs are up, then you should see output similar to the following:

```
hostA
Info: Pack PFS_SALES_hostA started.
hostB
Info: Pack PFS_SALES_hostB started.
Info: Local database instance is up.
Info: Remote database instance is up.
Info: Running primary role locally.
Info: Running secondary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

If Oracle Real Application Clusters Guard is running in nonresilient mode, then you should see output similar to the following:

```
hostB
Info: Pack PFS_SALES_hostA started.
hostB
Info: Pack PFS_SALES_hostB started.
Info: Local database instance is down.
Info: Remote database instance is up.
Info: No role running locally.
Info: Running primary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

If both packs are down, then you should see output similar to the following:

```
Info: Pack PFS_SALES_hostA stopped.
Info: Pack PFS_SALES_hostB stopped.
Info: Local database instance is down.
Info: Remote database instance is down.
Info: No role running locally.
Info: No role running on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

Restoring Oracle Real Application Clusters Guard After a Failure

When there is a failure on the primary node, Oracle Real Application Clusters Guard automatically fails over the pack that was operating on the failed node. To restore resilience, you must restore operation of the pack to the failed node, where it then has the secondary role.

To restore the pack to the secondary role, enter the following commands:

```
# pfsctl
PFSCTL> restore
```

You should see output similar to the following:

```
restore command succeeded.
```

You can also use this command to restore resilience when the secondary pack fails.

Moving the Primary Role

Use the `move_primary` command if you want to do maintenance on the primary node. The `move_primary` command shuts down the instance on the primary node, using the `SHUTDOWN TRANSACTIONAL` statement. It triggers a failover after the instance is down, and the secondary node becomes the primary node. The optional seconds parameter specifies the time interval for the `SHUTDOWN TRANSACTIONAL` statement to complete. By default, the value is 30 seconds. If the `SHUTDOWN TRANSACTIONAL` statement times out, then `PFSCTL` issues a `SHUTDOWN ABORT` statement.

To do a clean shutdown, make sure that all active sessions are closed before you issue the `move_primary` command.

To move the primary role, enter commands similar to the following:

```
# pfsctl
PFSCTL> move_primary 40
```

You should see output similar to the following:

```
move_primary_40 command succeeded.
```

Switching Roles in Oracle Real Application Clusters Guard

After a failover, when you have restored resilience with the `restore` command, the primary role and the secondary role are not on their original nodes. If you want the roles to reside on their original nodes, then use the `switchover` command. The `switchover` command is equivalent to entering the `move_primary` command and then the `restore` command.

If you specify a number of seconds in the `switchover` command, then the number of seconds is applied to the `SHUTDOWN TRANSACTIONAL` statement that is part of moving the primary role. For example:

```
PFSCTL> switchover 40
```

If you do not specify a number of seconds, then the default value of 30 seconds is used.

The following example shows what happens when you use the `switchover` command. Invoke `PFSCTL`:

```
# pfsctl
```

The output shows that `ORACLE_SERVICE` is set to `SALES`:

```
PFSCTL for hostA: Version 9.2.0.1.0 - Production on  Feb 07 200118:15:10
(c) Copyright 2001 , 2002 Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

ORACLE_SERVICE is set to sales
DB_NAME is set to sales
```

Enter the `status` command to see where the primary and secondary roles are:

```
PFSCTL> status
```

You should see output similar to the following:

```
hostA
```

```
Info: Pack PFS_sales_hostA started.
hostB
Info: Pack PFS_sales_hostB started.
Info: Local database instance is up.
Info: Remote database instance is up.
Info: Running primary role locally.
Info: Running secondary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

It shows that the local host, `hostA`, has the primary role and `hostB` has the secondary role.

Enter the `switchover` command:

```
PFSCTL> switchover
```

You should see output similar to the following:

```
switchover command succeeded.
```

Enter the `status` command:

```
PFSCTL> status
```

You should see output similar to the following:

```
hostA
Info: Pack PFS_sales_hostA started.
hostB
Info: Pack PFS_sales_hostB started.
Info: Local database instance is up.
Info: Remote database instance is up.
Info: Running secondary role locally.
Info: Running primary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

It shows that hostA has the secondary role and hostB has the primary role. The switchover was successful.

See Also: "Moving the Primary Role" on page 4-6

Halting Oracle Real Application Clusters Guard

When you need to perform a task which requires stopping Oracle Real Application Clusters Guard, use the pfshalt command. Such tasks include upgrading Oracle Real Application Clusters Guard and other Oracle software.

Stopping Oracle Real Application Clusters Guard means stopping all the packs. Do this by entering the following commands:

```
# pfsctl
PFSCTL> pfshalt
```

You should see output similar to the following:

```
pfshalt command succeeded.
```

Halting a Single Pack

Use the haltone command when you want to stop a specific pack no matter whether it is primary or secondary or on which node it is running. You may want to stop a specific pack when you want to do maintenance work. The consequences of halting a pack are different depending on what state the system is in and which pack you want to stop. Table 4–2 shows different conditions and the consequences of using the haltone command.

Table 4–2 Consequences of Using the haltone Command

Initial Condition	Consequence
The system is resilient. The pack you want to stop has the primary role.	The secondary pack becomes primary.
The system is resilient. The pack you want to stop has the secondary role.	The primary pack remains primary.
The system is not resilient.	No pack is running.

Stop a single pack by entering commands similar to the following:

```
# pfsctl
PFSCTL> haltone PFS_SALES_hostA
```

PFS_SALES_hostA is the name of the pack that you want to stop.

You should see output similar to the following:

```
haltone_PFS_SALES_hostA command succeeded.
```

Starting a Single Pack

Use the bootone command to start a specific pack on either its home node or on its foreign node (using the -f option).

Start a pack on its foreign node if you want to bring up the relocatable IP address on that node. Enter a command similar to the following:

```
PFSCTL> bootone PFS_SALES_hostA -f
```

You should see output similar to the following:

```
bootone_PFS_SALES_hostA_-f command succeeded.
```

Now the PFS_SALES_hostA pack is running on its foreign node and its IP address is available on that node.

The bootone command is especially useful when you want to start the primary pack on the node that is not specified as the preferred primary node. The pfsboot command always starts the packs so that the primary instance runs on the preferred primary node. However, in some cases, you may want to start Oracle Real Application Clusters Guard with the primary role on the node that is not specified as the preferred primary node. There are several ways to do this, but using the bootone command is more efficient.

If the preferred primary node is Node A and you want to start the primary role on Node B, then perform the following steps:

1. Stop the packs on both nodes:

   ```
   PFSCTL> pfshalt
   ```

   You should see output similar to the following:

   ```
   pfshalt command succeeded.
   ```

2. Start the pack whose home node you want to be the primary node. If the pack name is PFS_SALES_hostB, then enter the following command:

```
PFSCTL> bootone PFS_SALES_hostB
```

You should see output similar to the following:

```
bootone_PFS_SALES_hostB command succeeded.
```

3. Start the other pack. If the pack name is PFS_SALES_hostA, then enter the following command:

```
PFSCTL> bootone PFS_SALES_hostA
```

You should see output similar to the following:

```
bootone_PFS_SALES_hostA command succeeded.
```

Both packs are now running their home nodes. The instance on Node B has the primary role because it was started first.

See Also: "Home and Foreign Nodes" on page 1-6

Stopping the Secondary Role

Use the stop_secondary command if you want to do maintenance on the secondary node. It shuts down the secondary instance. The optional seconds parameter specifies the time for the SHUTDOWN TRANSACTIONAL statement to complete. By default, the value is 30 seconds. Enter commands similar to the following:

```
# pfsctl
PFSCTL> stop_secondary 40
```

You should see output similar to the following:

```
stop_secondary_40 command succeeded.
```

Using Oracle Real Application Clusters Guard Commands for Planned Outages

You can use PFSCTL commands to shut down the instance on the node that you need to perform maintenance on. This section contains general instructions for planned outages on the node with primary role and the node with secondary role.

Note: Recall that when one node is unavailable, Oracle Real Application Clusters Guard cannot perform failover. Plan accordingly.

Planned Outage on the Secondary Node

To use PFSCTL commands for a planned outage on the secondary node, perform the following steps on the primary node:

1. Stop the secondary instance. Use commands similar to the following:

   ```
   # pfsctl
   PFSCTL> stop_secondary
   ```

   You should see output similar to the following:

   ```
   stop_secondary command succeeded.
   ```

2. Complete the desired maintenance on the secondary node.
3. Restore the secondary instance to the secondary node. Use the following command:

   ```
   PFSCTL> restore
   ```

   You should see output similar to the following:

   ```
   restore command succeeded.
   ```

Planned Outage on the Primary Node

To use PFSCTL commands for a planned outage on the primary node, perform the following steps on the secondary node:

1. Move the primary role to the secondary instance. Use commands similar to the following:

   ```
   # pfsctl
   PFSCTL> move_primary
   ```

   You should see output similar to the following:

   ```
   move_primary command succeeded.
   ```

2. Complete the desired maintenance on the former primary node.

3. Restore the secondary role to the former primary node. Use the following command:

   ```
   PFSCTL> restore
   ```

   You should see output similar to the following:

   ```
   restore command succeeded.
   ```

4. (Optional) Move the primary role back to the original primary node and restore the secondary role to the original secondary node. Use the following command:

   ```
   PFSCTL> switchover
   ```

   You should see output similar to the following:

   ```
   switchover command succeeded.
   ```

Testing the Call-Home Script

When Oracle Real Application Clusters Guard detects a failure, the call-home feature executes a callout to a call-home script that has been customized by the user. The call-home script can be used to page or send e-mail, for example. The call-home script is located in:

```
$PFS_HOME/user/pfs_$ORACLE_SERVICE_callhome.sh
```

The `call_home` command provides a way to test the script.

To test your call-home script, enter the following commands:

```
# pfsctl
PFSCTL> call_home
```

Successful completion of the command results in the customized outcome, such as a page.

See Also: "Setting Up the Call-Home Feature" on page 5-2

Listing the Oracle Real Application Clusters Guard Commands

To list the PFSCTL commands and their formats, enter the following commands:

```
# pfsctl
PFSCTL> help
```

You should see output similar to the following:

```
The following commands are available:
    PFSBOOT
    PFSHALT
    MOVE_PRIMARY [seconds]
    STOP_SECONDARY [seconds]
    RESTORE
    STATUS
    SWITCHOVER [seconds]
    REPORT [-f filename][-d yyyy/mm/dd-hh:mm:ss][-s]
    QUIT
    EXIT
    BOOTONE [pack name] [-f]
    HALTONE [pack name]
    CALL_HOME
    HELP
help command succeeded.
```

Generating the Uptime Report

Use the `report` command to generate an uptime report. For example, enter the following command:

```
PFSCTL> report -f report.txt -d 2001/11/09-16:42:00
```

You should see output similar to the following:

```
=================================================================
| Oracle Real Application Clusters Guard for Solaris: Version 9.2.0.1.0
|
| (c) Copyright 2001, 2002 Oracle Corporation.  All right reserved.
|
| Up Time Report generated by PFSCTL report on 11/09/01
=================================================================
Oracle service: SALES
Report time interval: 2001/11/09-16:42:00 -- 2001/11/09-17:00:31

Itemized downtime information:

Downtime Start          Node    Downtime End
Node    Interval (secs)
=================================================================================
Planned downtime
2001/11/09-16:55:42     hostA  2001/11/09-17:00:31     hostA  289
```

```
Unplanned downtime
 ----/--/-----:--:--              n/a     2001/11/09-16:42:00     hostA  0
2001/11/09-16:44:35     hostA  2001/11/09-16:44:45     hostB  10
2001/11/09-16:54:17     hostB  2001/11/09-16:54:32     hostA  15

Downtime summary:
Total planned downtime: 289 seconds
Total unplanned downtime: 25 seconds
Total downtime: 314 seconds
Availability for this interval: 97.7497%
```

Exiting PFSCTL

Use the `exit` or `quit` command to exit PFSCTL.

```
PFSCTL> exit
```

5

Customizing Oracle Real Application Clusters Guard

This chapter describes the scripts that should be customized for each Oracle Real Application Clusters Guard environment. It includes the following sections:

Overview of Customizing Oracle Real Application Clusters Guard

You can customize your Oracle Real Application Clusters Guard installation. Table 5–1 shows the features that can be customized and the important files, scripts, or packages associated with each feature.

Table 5–1 Oracle Real Application Clusters Guard Features That Can Be Customized

Feature	File, Scripts, or Packages
Call-home	`$PFS_HOME/user/pfs_$ORACLE_SERVICE_callhome.sh` script
Customer query	`$ORACLE_HOME/pfs/admin/catpfs.sql` script
Role change notification	`$PFS_HOME/user/pfs_$ORACLE_SERVICE_notifyrole.sh` script
Oracle Enterprise Manager	`ORATAB` file
Warming the library cache on the secondary instance	`DBMS_LIBCACHE` package and `pfs_$ORACLE_SERVICE_warmcache.sh` script

Setting Up the Call-Home Feature

For failures in Oracle Real Application Clusters Guard that result in the primary instance or primary role becoming unavailable, Oracle Real Application Clusters Guard automatically executes specific failover or recovery actions. Although Oracle Real Application Clusters Guard can take certain automated actions, it requires manual intervention to repair some types of failures. It is important for those failures to be examined and quickly repaired so that a secondary outage does not occur. For example, a secondary instance may shut down due to a failure of the secondary node. Oracle Real Application Clusters Guard cannot restart the failed node because it requires manual examination of why the node failed, some repair action, and then restarting the failed node. The failure of the secondary node does not cause any downtime because the primary instance and service are still available, but Oracle Real Application Clusters Guard sends a call-home message to the Oracle Real Application Clusters Guard log immediately so that normal operation can be restored quickly.

Oracle Real Application Clusters Guard sends a call-home message to the Oracle Real Application Clusters Guard log for every failure that occurs in Oracle Real Application Clusters Guard, regardless of the type of the failure. Oracle Real Application Clusters Guard also executes a callout to the call-home script. The Oracle Real Application Clusters Guard Setup Utility (PFSSETUP) generates the

script, which is located in `$PFS_HOME/user/pfs_$ORACLE_SERVICE_callhome.sh`.

This script is not executable until you customize it to suit the your environment. For example, you can customize the script so that an e-mail notification results in sending a page to the appropriate administrator.

The following call-home template is part of the call-home script:

```
# Call_Home Template
#
CALLHOME_MESSAGE=$1
#
# Example:
#
# mail <userid> << EOF
# !!! Alert: $CALLHOME_MESSAGE at ‘date‘ !!!
# EOF
```

When there is a failure, this part of the call-home script logs a message in `pfs_$ORACLE_SERVICE_`*`host`*`.log` similar to the following:

```
Fri Jul 27 12:48:08 2001 PFS-2019: Info: Real Application Clusters Guard
callhome with OracleUp_for_SALES_error_Will_failover now
Fri Jul 27 12:48:09 2001 PFS-2019: Info: Real Application Clusters Guard
callhome with Failing_over_service_SALES now
```

It also e-mails the messages to the user ID that you specify when you customize the template.

Note: Oracle Real Application Clusters Guard does not provide an external call-home mechanism. It relies on the operating system or third-party tools installed on your site for sending notification to an administrator.

Setting Up the Customer Query

The heartbeat monitor checks not only whether the primary instance has a heartbeat but also whether it is capable of work. It monitors the work capability by repeatedly running a customized PL/SQL procedure containing a query that should represent the actual work that needs to be done in the instance. The default `catpfs.sql` script, which you run when you create the Oracle Real Application Clusters Guard database, prompts the user for a table owner and a table name upon which to run a

basic SELECT statement. Modify the customer_query package in the catpfs.sql script to reflect your business needs before running the script.

The customer query, customer_query.test, is contained in catpfs.sql and is located in the $ORACLE_HOME/pfs/admin directory. The contents of the customer_query.test template are as follows:

```
REM customer_query package executed by ORACLE_PING
create or replace package customer_query as
 procedure test (total_rows out number);
 end customer_query;
/

create or replace package body customer_query as
  procedure test (total_rows out number) is
  begin
          -- Example customer queries:
          -- select count(*) into total_rows from &&syn_name;
          -- select max(emp_id) into total_rows from &&syn_name;
          -- select sum(salary) into total_rows from &&syn_name;
  end;
end customer_query;
/

/*  from ORACLE_PING */
EXEC SQL EXECUTE
      BEGIN
         customer_query.test(:number_of_rows);
      END ;
END-EXEC ;
```

The customer query can be modified to select any single specific value such as a specific row, a row count, or a maximum value. When you write the customer query, consider the following recommendations:

- Access a table that is representative of the application.
- Exercise as much of the database as possible. Do not reissue the same query each time the heartbeat monitor runs. Consider selecting a random row each time.
- Choose queries that can be completed within the desired timeout interval. For example, do not use queries that require the entire table to be scanned. Although the parameter values can be increased, increases contribute to the length of time it takes to detect a failure due to a database hang.

Test the customer query when the system is under heavy load to ensure that it can be completed within the interval defined by the USER_TIMEOUT value in the ORAPING_CONFIG table.

> **See Also:** "Making Online Changes to the ORAPING_CONFIG Table" on page 6-14 to find out how to check the value of USER_TIMEOUT

Setting Up Role Change Notification

When an instance or pack starts up, shuts down or changes its role from secondary to primary, Oracle Real Application Clusters Guard sends a message to the Oracle Real Application Clusters Guard log. Automatic role change notification occurs when Oracle Real Application Clusters Guard takes automatic actions. Manual role change notification occurs only when PFSCTL commands are executed.

Table 5–2 shows notifications of role changes.

Table 5–2 Role Change Notifications

Notification	Type	Description
UP	Automatic	Called after the instance is started or after its role changes from secondary to primary
DOWN	Automatic	Called before the instance is shut down
CLEANUP	Manual	Called after the instance is shut down
PLANNED_UP	Manual	Called from PFSCTL before the instance is started
PLANNED_DOWN	Manual	Called from PFSCTL before the instance is shut down

The notification is implemented by a script called pfs_$ORACLE_SERVICE_notifyrole.sh. The PFSSETUP utility generates the script, which resides under the $PFS_HOME/user directory. The script is not executable until you modify it. You can modify it to perform certain actions before an instance shuts down, for example. The following is the role notification script template:

```
# Role Notification Template
#
NOTIFY_ORACLE_SERVICE=$1
NOTIFY_NODE=$2
NOTIFY_ROLE=$3
NOTIFY_STATUS=$4
```

```
NOTIFY_LOGGING_DATE=$5
#
# --- DO NOT MODIFY ABOVE THIS LINE ---
#
# Example
#
case $NOTIFY_STATUS in
  "planned_up")
#  Run scripts that you want executed before the instance starts.
  ;;

  "up")
#  Run scripts that you want executed after the instance starts.
  ;;

  "planned_down" | "down")
#  Run scripts that you want executed before the instance is shut down.
#  WARNING: Scripts executed at this step will affect failover time.
  ;;

  "cleanup")
#  Run scripts that you want executed after the instance is shut down.
  ;;

esac
```

> **See Also:** Your platform-specific Oracle Real Application Clusters Guard installation guide for more information about the PFS Installer

Examples of Role Change Notification Messages

The following examples show the messages that occur on each host:

- Role Change Notification: pfsboot Command
- Role Change Notification: pfshalt Command
- Role Change Notification: move_primary Command
- Role Change Notification: restore Command
- Role Change Notification: Automatic Failover

Role Change Notification: pfsboot Command

When the `pfsboot` command is entered on HOSTA, the following messages appear in the Oracle Real Application Clusters Guard log on HOSTA:

```
Fri Dec 22 16:31:27 2000 PFS-5555: sales hostA unknown planned_up 2000/12/22-16:31:26
Fri Dec 22 16:32:13 2000 PFS-5555: sales hostA primary up 2000/12/22-16:32:12
```

The following messages appear in the Oracle Real Application Clusters Guard log on HOSTB:

```
Fri Dec 22 16:32:25 2000 PFS-5555: sales hostB unknown planned_up 2000/12/22-16:32:23
Fri Dec 22 16:33:18 2000 PFS-5555: sales hostB secondary up 2000/12/22-16:33:17
```

Role Change Notification: pfshalt Command

When the `pfshalt` command is entered on HOSTA, the following messages appear in the Oracle Real Application Clusters Guard log on HOSTA:

```
Fri Dec 22 16:38:41 2000 PFS-5555: sales hostA primary planned_down 2000/12/22-16:38:40
Fri Dec 22 16:38:50 2000 PFS-5555: sales hostA primary down 2000/12/22-16:38:49
Fri Dec 22 16:40:09 2000 PFS-5555: sales hostA primary cleanup 2000/12/22-16:40:08
```

The following messages appear in the Oracle Real Application Clusters Guard log on HOSTB:

```
Fri Dec 22 16:37:56 2000 PFS-5555: sales hostB secondary planned_down 2000/12/22-16:37:54
Fri Dec 22 16:38:04 2000 PFS-5555: sales hostB secondary down 2000/12/22-16:38:04
Fri Dec 22 16:38:27 2000 PFS-5555: sales hostB secondary cleanup 2000/12/22-16:38:26
```

Role Change Notification: move_primary Command

When the `move_primary` command is entered on HOSTA, the following messages appear in the Oracle Real Application Clusters Guard log on HOSTA:

```
Fri Dec 22 11:21:35 2000 PFS-5555: sales hostA primary planned_down 2000/12/22-11:21:35
Fri Dec 22 11:22:15 2000 PFS-5555: sales hostA primary down 2000/12/22-11:22:15
Fri Dec 22 11:22:25 2000 PFS-5555: sales hostA primary cleanup 2000/12/22-11:22:24
```

The following message appears in the Oracle Real Application Clusters Guard log on HOSTB:

```
Fri Dec 22 11:22:10 2000 PFS-5555: sales hostB primary up 2000/12/22-11:22:09
```

Role Change Notification: restore Command

When the `restore` command is entered on HOSTA, the following messages appear on the Oracle Real Application Clusters Guard log on HOSTA:

```
Fri Dec 22 12:20:24 2000 PFS-5555: sales hostA unknown planned_up 2000/12/22-12:20:23
```

```
Fri Dec 22 12:21:24 2000 PFS-5555: sales hostA secondary up 2000/12/22-12:21:23
```

No messages appear in the Oracle Real Application Clusters Guard log on HOSTB.

Role Change Notification: Automatic Failover

When automatic failover occurs, the following messages appear in the Oracle Real Application Clusters Guard log on HOSTA:

```
Fri Dec 22 15:03:42 2000 PFS-5555: sales hostA primary down 2000/12/22-15:03:41
Fri Dec 22 15:04:51 2000 PFS-5555: sales hostA primary cleanup 2000/12/22-15:04:50
```

The following message appears in the Oracle Real Application Clusters Guard log on HOSTB:

```
Fri Dec 22 15:03:38 2000 PFS-5555: sales hostB primary up 2000/12/22-15:03:37
```

Setting Up Oracle Enterprise Manager for Oracle Real Application Clusters Guard

You can use Oracle Enterprise Manager to administer the Oracle Real Application Clusters Guard database. The following requirements must be met in order to use Oracle Enterprise Manager:

- The Oracle System Identifier (SID) for each instance in the Oracle9*i* Real Application Clusters must be unique.
- The ORATAB file must be configured for SRVCTL.

> **Note:** Follow these guidelines rather than the Oracle Enterprise Manager instructions other Oracle9*i* Real Application Clusters documentation.

Modifying the ORATAB File for Oracle Real Application Clusters Guard

Create an entry for the Oracle9*i* Real Application Clusters database in the ORATAB file. Oracle Enterprise Manager uses the ORATAB file during service discovery to determine:

- Whether the database is an Oracle9*i* Real Application Clusters database
- The database name

Use the following syntax for the Oracle9*i* Real Application Clusters entry:

```
db_name:$ORACLE_HOME:N
```

DB_NAME is the database name given to the Oracle9*i* Real Application Clusters database. $ORACLE_HOME is the directory path to the database. N indicates that the database should not be started at reboot time.

The following example is for a database named SALES:

```
SALES:/u01/oracle/901:N
```

Warming the Library Cache on the Secondary Instance

This section contains the following topics:

Overview of Warming the Library Cache

The library cache includes the shared SQL areas, private SQL areas, PL/SQL procedures and packages, and control structures such as locks and library cache handles. A shared SQL area contains the parse tree and execution plan for a single SQL statement or for similar SQL statements. Oracle saves memory by using one shared SQL area for multiple similar DML statements, particularly when many users execute the same application. A private SQL area contains data such as bind information and runtime buffers. Oracle processes PL/SQL program units (procedures, functions, packages, anonymous blocks, and database triggers) much the same way it processes individual SQL statements. Oracle allocates a shared area to hold the parsed, compiled form of a program unit. Oracle allocates a private area to hold values specific to the session that executes the program unit, including local, global, and package variables and buffers for executing SQL.

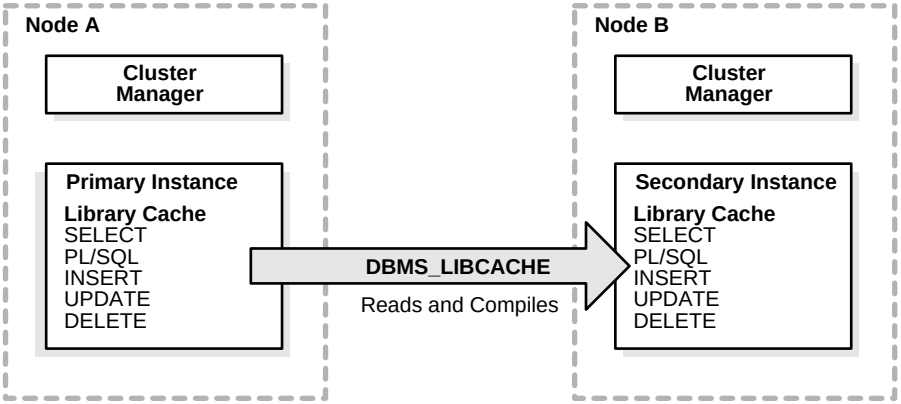
Maintaining information about frequently executed SQL and PL/SQL statements in the library cache improves the performance of the Oracle database server. In an Oracle9*i* Real Application Clusters primary/secondary configuration, the library cache associated with the primary instance contains up-to-date information. If failover occurs, then the benefit of that information is lost unless the library cache on the secondary instance is populated before failover.

You can use the DBMS_LIBCACHE package to transfer the information in the library cache of the primary instance to the library cache of the secondary instance. This

process is called **warming the library cache**. It improves performance immediately after failover because the new primary library cache does not need to be populated with parsed SQL statements and compiled PL/SQL units.

Figure 5–1 shows the library cache being compiled at the secondary instance, by using SQL statements and PL/SQL units extracted from the primary instance.

Figure 5–1 Warming the Library Cache of the Secondary Instance



DBMS_LIBCACHE captures and compiles the part of selected cursors that can be shared. It selects cursors based on the amount of shared memory that is used and the frequency with which the associated SQL statements are used. It then populates the library cache on the secondary instance with the compiled cursors.

Execute the DBMS_LIBCACHE package on the secondary instance:

- As a regularly scheduled job
- Before executing a manual failover or switchover

See Also:

- *Oracle9i Database Concepts*
- "Using DBMS_LIBCACHE" on page 5-14

Setting Up DBMS_LIBCACHE

Installing the DBMS_LIBCACHE procedure causes the following actions to occur:

1. Creates a user named PARSER.

2. Asks for a password for PARSER.
3. Asks for default and temporary tablespace for PARSER.
4. Creates a database link named LIBC_LINK that is owned by PARSER.
5. Asks for an appropriate connect string to use when the database link connects to other instances of the Oracle9*i* Real Application Clusters configuration. This connect string collects the library cache information.

> **Note:** Oracle Net configuration of the `listener.ora` and `tnsnames.ora` files for this connect string must already be completed on all the nodes of the Oracle9*i* Real Application Clusters configuration.

The DBMS_LIBCACHE package can be installed at any time, either during installation of Oracle9*i* Real Application Clusters or later, during normal operation.

Perform the following steps to set up DBMS_LIBCACHE:

1. Connect as the user SYS. Enter the following commands:

```
$ cd $ORACLE_HOME/pfs/admin
$ sqlplus "/ as sysdba"
```

You should see output similar to the following:

```
SQL*Plus: Release 9.0.1.0_0 - Production on Fri Feb 9 15:45:54 2001

(c) Copyright 2001 Oracle Corporation.  All rights reserved.

Connected to:
Oracle9i Enterprise Edition Release 9.0.1.0_0 - Production
With the Partitioning and Real Application Clusters options
JServer Release 9.0.1.0_0 - Production

SQL>
```

2. Create the header definition package for DBMS_LIBCACHE by running `catlibc.sql`. The `catlibc.sql` procedure is found in the `$ORACLE_HOME/pfs/admin` directory, which you entered in Step 1. Enter the following command:

```
SQL> @catlibc.sql
```

You should see output similar to the following, including the errors:

```
Package created.

drop public synonym dbms_libcache$def
                    *
ERROR at line 1:
ORA-01432: public synonym to be dropped does not exist

Synonym created.

Grant succeeded.

View created.

Grant succeeded.

drop public synonym v$sql2
                    *
ERROR at line 1:
ORA-01432: public synonym to be dropped does not exist

Synonym created.

... Creating the parsing user and database link.

Below are the list of online tablespaces in this database.
Decide which tablespace you wish to use for the PARSER user.

TABLESPACE_NAME
------------------------------
RBS
TEMP
USERS
Please enter the parsing users password and tablespaces.

Enter value for parser_password:
```

3. The package has created a user called PARSER. Enter the password for PARSER. For example, the password may be `parser`:

```
parser
```

You should see output similar to the following:

```
Enter value for default_tablespace:
```

4. Enter the default tablespace for PARSER. For example:

```
USERS
```

You should see output similar to the following:

```
Enter value for temporary_tablespace:
```

5. Enter the temporary tablespace for PARSER. For example:

```
TEMP
```

You should see output similar to the following:

```
User created.

Grant succeeded.

Enter value for parser_password:
```

6. Enter the password that you specified in step 3. For example:

```
parser
```

You should see output similar to the following, including the error:

```
Connected.
drop public database link libc_link
                          *
ERROR at line 1:
ORA-02024: database link not found

Please enter the parsing users TNS connect string.

Enter value for connect_string:
```

7. Enter the TNS connect string that is used to connect to the other instance of the Oracle9*i* Real Application Clusters configuration. PARSER uses this database link to connect to the library cache on the other instance. For example:

```
parser_service
```

You should see output similar to the following:

```
Database link created.
```

8. Create the DBMS_LIBCACHE package. Connect as user SYS and run dbmslibc.sql, which is found in the $ORACLE_HOME/pfs/admin directory. Enter the following commands:

```
$ cd $ORACLE_HOME/pfs/admin
$ sqlplus "/ as sysdba"

SQL> @dbmslibc
```

You should see output similar to the following, including the error:

```
Package created.

drop public synonym dbms_libcache
                    *
ERROR at line 1:
ORA-01432: public synonym to be dropped does not exist

Synonym created.

Grant succeeded.

Grant succeeded.

Package body created.
```

Using DBMS_LIBCACHE

The main public interface of the DBMS_LIBCACHE package is the COMPILE_FROM_REMOTE procedure. Invoke it from the instance on which the library cache needs to be populated, the secondary instance in the context of Oracle Real Application Clusters Guard. While the DBMS_LIBCACHE package has been designed for an Oracle9*i* Real Application Clusters configuration, you can use it in other Oracle environments that would benefit from warming the library cache.

Oracle Corporation recommends that you invoke the procedure after the contents of the library cache on the primary instance have stabilized. You can use the COMPILE_FROM_REMOTE procedure in the following ways:

- As a regularly scheduled job
- Before executing a manual failover or switchover

On the secondary instance, perform the following steps:

1. Connect as the user PARSER, by using SQL*Plus:

```
$ sqlplus parser/parser
```

2. Turn on server output:

```
SQL> set serveroutput on;
```

3. Execute the COMPILE_FROM_REMOTE procedure. The SQL statement should have the following format:

```
EXECUTE sys.dbms_libcache.compile_from_remote(db_link,username,threshold_
executions,threshold_sharable_mem);
```

Table 5–3 describes the arguments for executing the COMPILE_FROM_REMOTE procedure.

Table 5–3 Arguments for the COMPILE_FROM_REMOTE Procedure

Name	Description	Mandatory	Default Value
DB_LINK	The database link that points to the primary instance	Yes	LIBC_LINK, which is the database link that is created during installation. Can be changed by the user.
USERNAME	The user whose information is extracted from the primary instance to be parsed on the secondary instance	No	All users

Table 5–3 Arguments for the COMPILE_FROM_REMOTE Procedure (Cont.)

Name	Description	Mandatory	Default Value
THRESHOLD_EXECUTIONS	Minimum number of executions of a SQL statement that must have occurred before the SQL statement is considered for extraction	No	3 Check the EXECUTIONS column in the V$SQL view for the SQL statements that are considered. Increasing the value causes the secondary instance to extract only the most frequently executed SQL statements. Decreasing the value causes the secondary instance to extract more SQL statements, which then populates the cache with more information. If some SQL statements are not used often, then the additional information has limited usefulness.
THRESHOLD_SHARABLE_MEM	Minimum size of cursors that is considered for extraction	No	1000 Check the SHARABLE_MEM column of the V$SQL view for the statements that are considered. Increasing the value causes the secondary instance to extract and create only the largest cursors. Generally, the largest cursors take most of the time needed for warming the library cache. Decreasing the value causes the secondary instance to extract smaller cursors that may not be as useful.

Only DB_LINK is mandatory. The EXECUTE statement must contain a value for DB_LINK. Specify values for the other arguments only if their values are different from

the default values.For example, suppose you want to specify the parameter values shown in the following table.

Parameter	Value
DB_LINK	LIBC_LINK
USERNAME	APPS
THRESHOLD_EXECUTION	5
THRESHOLD_SHARABLE_MEM	800

Then execute the COMPILE_FROM_REMOTE procedure with the following SQL statement:

```
SQL> EXECUTE sys.dbms_libcache.compile_from_remote('LIBC_LINK','APPS',5,800);
```

Example: Compiling All Cursors for All Users with Default Threshold Values

Enter the following SQL statement:

```
SQL> EXECUTE sys.dbms_libcache.compile_from_remote('LIBC_LINK');
```

You should see output similar to the following:

```
Total SQL statements to compile=14
Total SQL statements compiled=14
```

Example: Compiling All Cursors for the Oracle GL Application with Default Threshold Values

The COMPILE_FROM_REMOTE procedure is invoked twice because the cursors may be owned by the APPS user or the GL user:

```
SQL> EXECUTE sys.dbms_libcache.compile_from_remote('LIBC_LINK', 'APPS');
SQL> EXECUTE sys.dbms_libcache.compile_from_remote('LIBC_LINK', 'GL');
```

6

Administering Oracle Real Application Clusters Guard

This chapter describes how to administer an Oracle Real Application Clusters Guard environment. It includes the following sections:

Administering Planned Outages

This section contains the following topics:

Maintenance on the Primary Node

Maintenance, such as hardware repair or an operating system upgrade, requires a planned outage so that the primary role can be moved to the secondary node. Plan it for a part of the business cycle that is less busy and give advance notification to users. To administer a planned outage on the primary node, perform the following steps:

1. From the `PFSCTL` command line, enter the `move_primary` command to move the primary role to the secondary instance:

   ```
   PFSCTL> move_primary
   ```

2. Complete maintenance.

3. Restore the pack to the secondary role on the idle node.

   ```
   PFSCTL> restore
   ```

   Note: The system is now resilient, but the primary and secondary roles are reversed from the initial states. If you want to restore the nodes to their initial states, then continue with the following step.

4. Move the primary role to the original primary node and the secondary role to the original secondary node (optional):

   ```
   PFSCTL> switchover
   ```

Maintenance on the Secondary Node

Maintenance on the secondary node does not interrupt operation, but the system is not resilient while the secondary node is down. To administer a planned outage on the secondary node, perform the following steps:

1. Stop the secondary instance:

   ```
   PFSCTL> stop_secondary
   ```

2. Complete maintenance.
3. Restore the pack on the secondary node.

```
PFSCTL> restore
```

Recovering from an Unplanned Outage on One Node

When an unplanned outage occurs on the primary node, Oracle Real Application Clusters Guard automatically fails over to the secondary node and notifies the user that a role change has occurred. At this point, Oracle Real Application Clusters Guard is operating in a nonresilient state with the primary role on the former secondary node.

After you have performed root cause analysis and repaired the source of the fault, restore the secondary role on the former primary node by using the `restore` command:

```
PFSCTL> restore
```

The primary and secondary roles have now been reversed. Choose one of the following actions:

- Operate with Reversed Primary and Secondary Roles
- Return to the Original Primary / Secondary Configuration
- Choose a Less Critical Application to Restore

Operate with Reversed Primary and Secondary Roles

After restoring both packs, you can continue to operate with primary and secondary roles that are reversed from the initial state. For sites with symmetric configurations, there is no need to return to the original state. Returning to the original roles requires a planned outage and can be avoided. In fact, some users intentionally operate with role reversal on a fixed schedule (such as every three months) in order to test the capabilities of the system.

Return to the Original Primary/Secondary Configuration

Returning to the original primary / secondary configuration requires a planned outage while the primary role is moved. Plan it for a less busy part of your business cycle and give advance notice to users. Execute it as follows:

```
# pfsctl
PFSCTL> switchover
```

Choose a Less Critical Application to Restore

If your system includes more than one uniquely identified database on each node, then performance may be degraded after a failover. For example, if you have a two-node cluster in a primary / secondary configuration and you are also running an unrelated database on the secondary node, then the secondary node runs the primary services as well as the unrelated database after failover and may be overloaded. In this situation, you should move the less critical service to the other node when it is restored.

Perform the following steps for each of the services that are moved to the restored node:

1. Set the `ORACLE_SERVICE` and `DB_NAME` environment variables. For example:

   ```
   $ export ORACLE_SERVICE=SALES
   $ export DB_NAME=sales
   ```

2. Restore the instance with secondary role:

   ```
   # pfsctl
   PFSCTL> restore
   ```

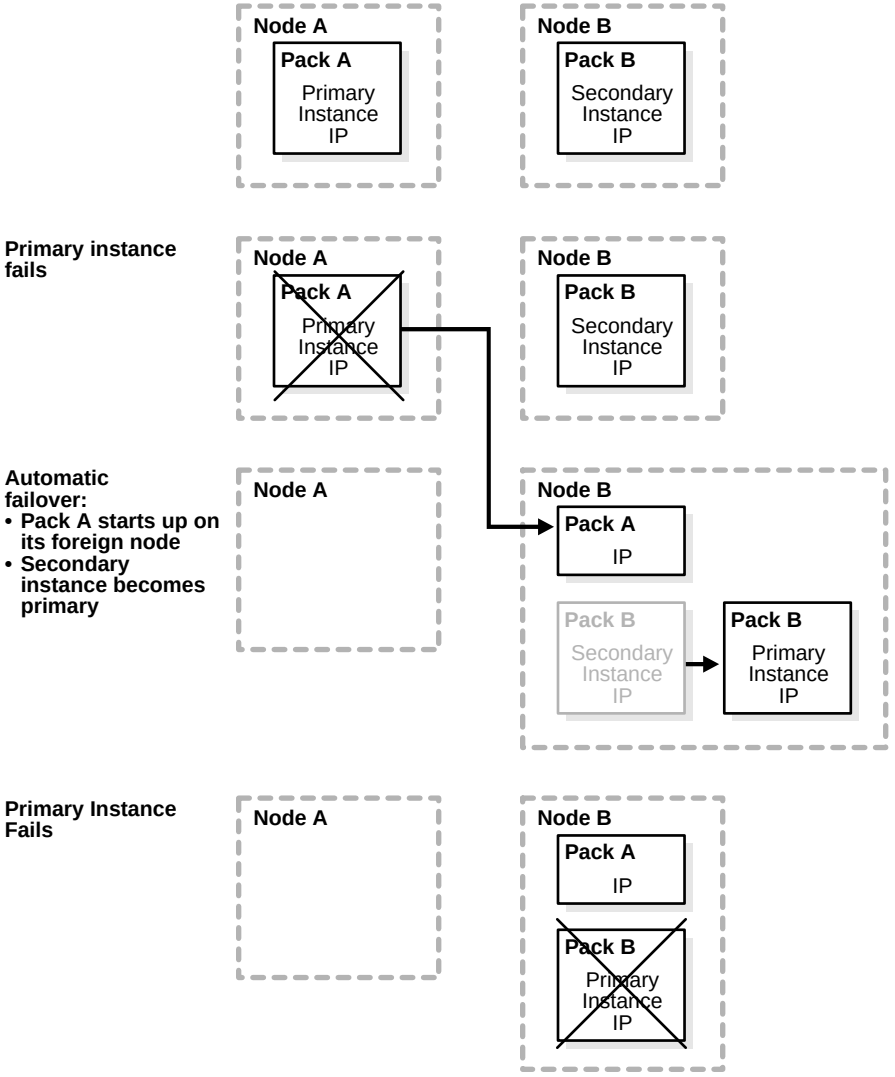
3. Move the primary role to the original primary node:

   ```
   PFSCTL> switchover
   ```

Recovering from Unplanned Outages on Both Nodes

Figure 6–1 and Figure 6–2 show what happens when both instances of a two-node cluster fail.

Figure 6–1 Failure of Both Instances, Part 1



During normal operation, both Node A and Node B are up and operational. Pack A is running on its home node, Node A, and has the primary role. It contains the primary instance and an IP address. Pack B is running on its home node, Node B, and has the secondary role. It contains the secondary instance and an IP address.

If the primary instance fails, then Oracle Real Application Clusters Guard automatically takes the following failover actions:

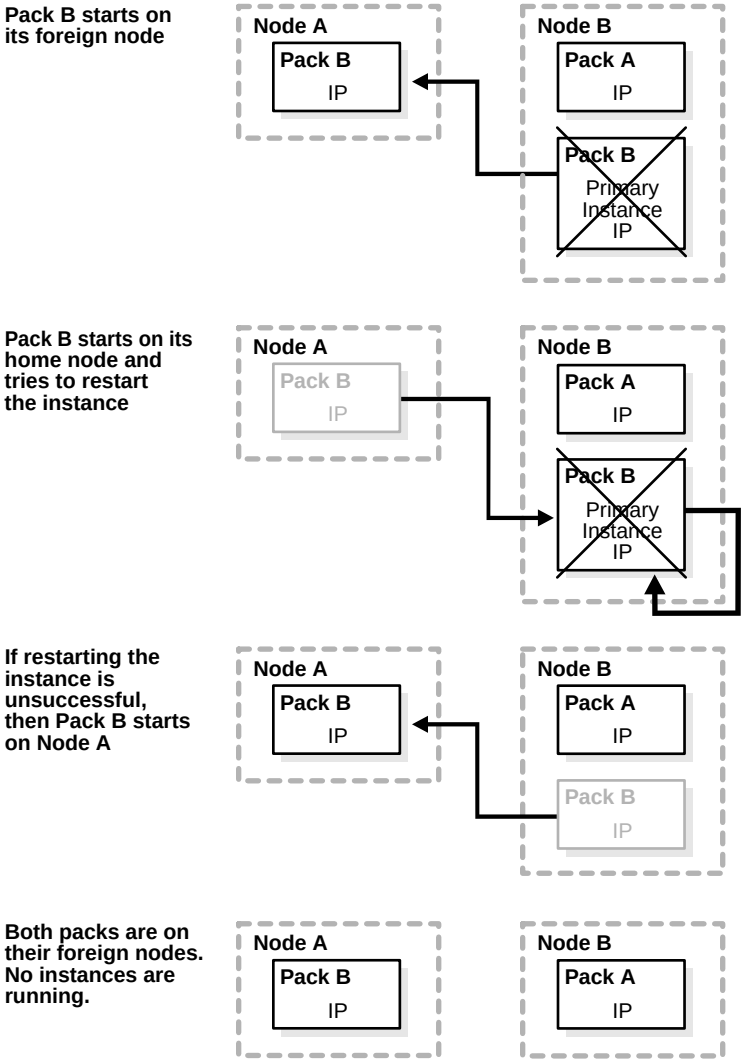
- The secondary instance becomes the primary instance.
- Pack A starts on Node B in foreign mode. This means that only its IP address is activated on Node B.

Now both Pack A and Pack B are running on Node B. Pack B contains the primary instance and its IP address. Pack A contains only an IP address. Nothing is running on Node A. The system is not resilient.

If the primary instance fails, then Pack A and Pack B contain only IP addresses.

Figure 6–2 shows what happens after the primary instance fails.

Figure 6–2 Failure of Both Instances, Part 2



Pack B starts on its foreign node (Node A). Pack A is still running on Node B. Only the IP addresses are up on the nodes. Because there is no instance running, Pack B restarts on its home node and tries to restart the primary instance. If restarting the instance is unsuccessful, Pack B again starts on its foreign node. The outcome of double instance failure is:

- Both packs are running on their foreign nodes.
- Only the IP addresses are up.
- No instances are running.

Diagnose and repair the cause of the failures. To restart the instances, you must perform the following steps:

1. Halt both of the packs. Enter the following command:

   ```
   PFSCTL> pfshalt
   ```

   You should see output similar to the following:

   ```
   pfshalt command succeeded.
   ```

2. Start both of the packs. Enter the following command:

   ```
   PFSCTL> pfsboot
   ```

   You should see output similar to the following:

   ```
   pfsboot command succeeded.
   ```

Administering Failover of the Applications

Oracle Real Application Clusters Guard restores service quickly. The application must restart transactions when it receives an Oracle message that indicates that failure has occurred.

Failing over the application when the primary instance fails is straightforward. The application sessions receive the `ORA-1089` and `ORA-1034` Oracle errors for new requests and the `ORA-1041`, `ORA-3113`, and `ORA-3114` Oracle errors for active requests. These errors must be trapped by the application. At reconnection, the application connects transparently to the new primary instance. For example, in the case of a Web server, the server threads are restarted for each connection pool against the new primary instance. The current transactions are then resubmitted by the clients.

Failing over the application when the primary node fails is not straightforward because of TCP/IP time-out. TCP/IP time-out is a significant problem for high availability. It occurs when a node fails without closing the sockets, because new requests can be made to an IP address that is unavailable. For active requests, the delays to the client are the values for `TCP_IP_ABORT_CINTERVAL` and `TCP_IP_ABORT_INTERVAL`. For sessions that are waiting for read/write completion, the

delay is the value for TCP_KEEPALIVE_INTERVAL. The values for these TCP/IP parameter should be tuned at each site.

Note: These parameters are specific to your operating system. See your operating system-specific documentation for more information.

TCP/IP time-outs are addressed in Oracle Real Application Clusters Guard by using relocatable IP addresses and the call-home feature. Because Oracle Real Application Clusters Guard moves the IP addresses, active requests for an address do not wait to time out. Requests for connection are refused immediately and are routed transparently to the new primary instance. Requests that issue SQL statements receive a broken pipe error (ORA-3113), allowing the application to restart. The application should detect this error and take appropriate action.

See Also: "Setting Up the Call-Home Feature" on page 5-2

Enhancing Application Failover with Role Change Notification

The role change notification in Oracle Real Application Clusters Guard can enhance application failover. The feature allows you to implement actions such as running or halting applications when the notification of a role change (UP, PLANNED_UP, PLANNED_DOWN, DOWN, CLEANUP) is received. For example, when the instance starts, the notification can be used to start the applications. When the instance terminates, the notification can be used to halt the applications. It is also possible to halt the application when a role starts. This allows secondary applications to halt when the primary role fails over, for example.

Automatic role change notification behaves as follows:

- An UP notification occurs
  - After the instance (primary or secondary) starts
  - After an instance role changes from secondary to primary
- A DOWN notification occurs before the instance (primary or secondary) is shut down
- A CLEANUP notification occurs after the instance (primary or secondary) is shut down

Manual role notification occurs only when PFSCTL commands are executed, for example, during planned outages. Manual role notification behaves as follows:

- A PLANNED_UP notification occurs before the instance (primary or secondary) starts
- A PLANNED_DOWN notification occurs before the instance (primary or secondary) is shut down

See Also: "Setting Up Role Change Notification" on page 5-5

Changing the Configuration

Most configuration changes can be made to an Oracle Real Application Clusters Guard environment by switching over to the secondary instance, applying the change, and switching back (optional). The following types of configuration changes are described in this section:

- Changing the Oracle Real Application Clusters Guard Configuration Parameters
- Changing the Configuration of Both Instances of Oracle9i Real Application Clusters
- Making Online Changes to the Configuration
- Changing the PFS_KEEP_PRIMARY Parameter
- Making Online Changes to the ORAPING_CONFIG Table

Changing the Oracle Real Application Clusters Guard Configuration Parameters

There are several ways to change Oracle Real Application Clusters Guard configuration parameters, depending on what kind of parameter needs to be changed. For example, changing $ORACLE_HOME requires the packs to be re-created, while changing the port numbers requires that the packs, the database, and the listener be halted.

See Also: Chapter 3, "Oracle Real Application Clusters Guard Configuration Parameters" for information about changing configuration parameters

Changing the Configuration of Both Instances of Oracle9*i* Real Application Clusters

To change initialization parameters for both instances, perform the following steps:

Note: This applies only to initialization parameters that are not included in the mandatory parameters listed in the `$ORACLE_SERVICE_config.pfs`, `$ORACLE_SERVICE_config.`*`Host`*`.ded.pfs`, and `init_$ORACLE_SID_`*`Host`*`.ora` files. Changing the `INSTANCE_NAMES` parameter, for example, requires the `catpfs.sql` script to be rerun.

1. Modify the desired parameters for both instances.
2. Stop the secondary instance.

   ```
   PFSCTL> stop_secondary
   ```

3. Restart the secondary instance.

   ```
   PFSCTL> restore
   ```

4. Move the primary role to the secondary instance.

   ```
   PFSCTL> move_primary
   ```

5. Restore the secondary instance on the former primary node.

   ```
   PFSCTL> restore
   ```

6. Reverse the roles to their original locations, if desired. (Use the `switchover` command.)

See Also: Chapter 3, "Oracle Real Application Clusters Guard Configuration Parameters" for information about changing configuration parameters

Making Online Changes to the Configuration

Oracle supports many online configuration changes.

1. Make the online configuration change at the primary instance. For example, enter the following SQL statement:

   ```
   SQL> ALTER SYSTEM SET fast_start_mttr_target = 120;
   ```

2. Make the same configuration change to the Oracle configuration files to ensure that the change is preserved at the next failover or restart.

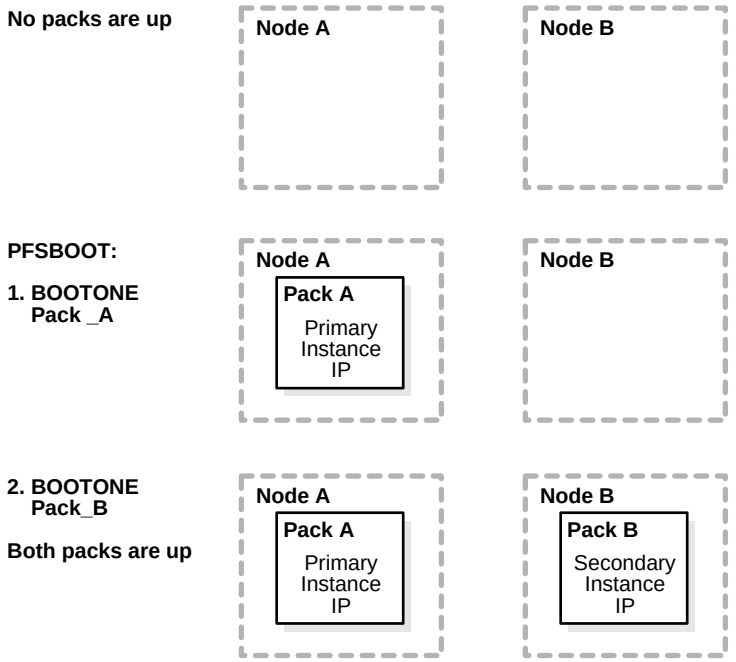
See Also: *Oracle9i Database Reference* to find out which initialization parameters can be changed online

Changing the PFS_KEEP_PRIMARY Parameter

The PFS_KEEP_PRIMARY parameter specifies whether to leave the primary pack up and running when the secondary pack does not come up when the `pfsboot` command is entered.

Figure 6–3 shows the effect of entering the `pfsboot` command during normal operation.

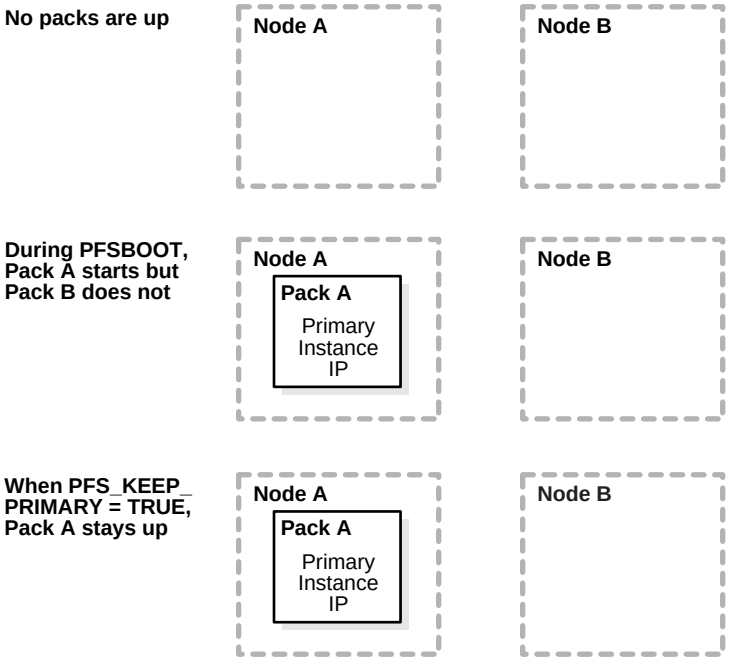
Figure 6–3 Using the pfsboot Command During Normal Operation



Before the command is entered, no packs are running. When the `pfsboot` command is entered, Oracle Real Application Clusters Guard first starts Pack A on Node A, which becomes the primary node. Then Oracle Real Application Clusters Guard starts Pack B on Node B, which becomes the secondary node.

Figure 6–4 shows what happens when PFS_KEEP_PRIMARY is set to $PFS_TRUE and the second pack does not start.

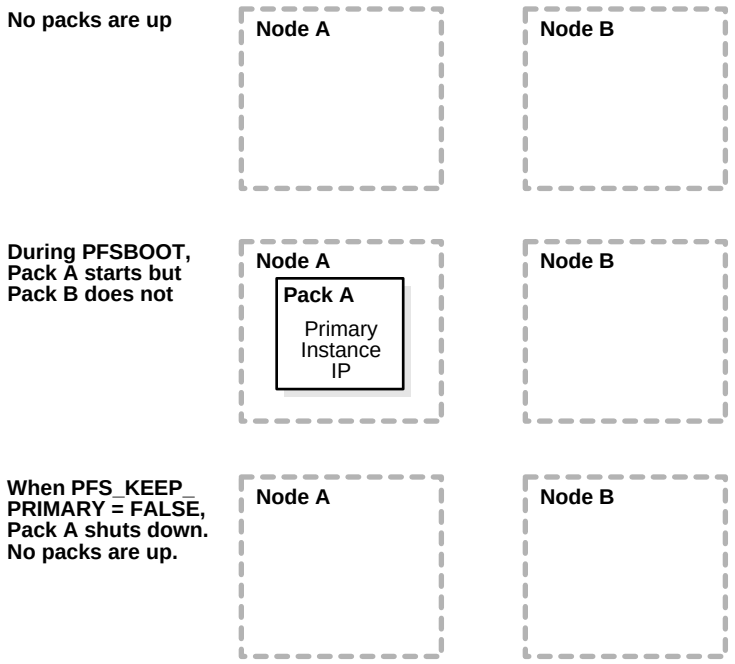
Figure 6–4 Using the pfsboot Command When PFS_KEEP_PRIMARY=$PFS_TRUE and the Secondary Pack Does Not Start



When the pfsboot command is entered, Oracle Real Application Clusters Guard starts Pack A on Node A, which becomes the primary node. However, when Oracle Real Application Clusters Guard tries to start Pack B on Node B, it fails for some reason. If PFS_KEEP_PRIMARY is set to $PFS_TRUE, then Pack A remains up. The system runs without resilience while you diagnose the cause of the failure on Node B.

Figure 6–5 shows what happens when PFS_KEEP_PRIMARY is set to $PFS_FALSE and the second pack does not start.

Figure 6–5 Using the pfsboot Command When PFS_KEEP_PRIMARY=$PFS_FALSE and the Secondary Pack Does Not Start



When the `pfsboot` command is entered, Oracle Real Application Clusters Guard starts Pack A on Node A, which becomes the primary node. If Oracle Real Application Clusters Guard fails to start Pack B on Node B and `PFS_KEEP_PRIMARY` is set to `$PFS_FALSE`, then Oracle Real Application Clusters Guard shuts down Pack A on Node A. No packs are running.

> **See Also:** "Changing Oracle Real Application Clusters Guard Configuration Parameters" on page 3-28 for more information about changing the value of the `PFS_KEEP_PRIMARY` parameter

Making Online Changes to the ORAPING_CONFIG Table

The heartbeat monitor uses a database table, `ORAPING_CONFIG`, to record the configuration information. The use of a table ensures that both instances of the cluster always use the same value. This table is refreshed on an interval defined by the `CONFIG_INTERVAL` parameter.

Table 6–1 shows the parameters in the `ORAPING_CONFIG` table.

Table 6–1 Parameters in the ORAPING_CONFIG Table

Parameter Name	Default Value	Description
INTERNAL_TIMEOUT	30	Time in seconds to execute internal ORACLE_PING statements
USER_TIMEOUT	60	Time in seconds to execute customer query
MAX_TRIES	3	Number of times to try to execute the heartbeat monitor cycle before declaring failure
SPECIAL_WAIT	300	Time in seconds to wait for special events to complete
RECOVERY_RAMPUP_TIME	300	Time in seconds to wait for ramp-up after failover
CYCLE_TIME	120	Time in seconds to execute heartbeat monitor and sleep cycle
CONNECT_TIMEOUT	30	Time in seconds to establish heartbeat monitor connection
CONFIG_INTERVAL	600	Time in seconds to wait before reading the ORAPING_CONFIG table
TRACE_FLAG	0	Flag to enable (1) or disable (0) SQL trace
TRACE_ITERATIONS	1	Number of heartbeat monitor cycles to trace if trace is enabled
LOGON_STORM_THRESHOLD	50	If the number of sessions logging on to the database exceeds the value of LOGON_STORM_THRESHOLD during the heartbeat monitor cycle, then Oracle Real Application Clusters Guard ignores the CONNECT_TIMEOUT parameter.

Suppose performance issues arise during initial testing of the system. Then you can run Oracle Real Application Clusters Guard with the values in the ORAPING_CONFIG table raised to a level that allows problems to persist long enough for detailed analysis. You can lower the configuration values when the system is stable.

Another reason to change the values in the ORAPING_CONFIG table is to customize them for different workloads. False failovers can occur when workloads are so large that timeouts occur simply because the system is busy.

To change the values in the ORAPING_CONFIG table, perform steps similar to the following:

1. Connect as the $ORACLE_USER and view the default values in the ORAPING_CONFIG table. Enter the following commands:

```
$ sqlplus /
SQL> SELECT * FROM oraping_config;
```

You should see the following output:

```
INTERNAL_TIMEOUT USER_TIMEOUT MAX_RETRIES SPECIAL_WAIT
RECOVERY_RAMPUP_TIME
---------------- ------------ ----------- ------------
--------------------
CYCLE_TIME CONNECT_TIMEOUT CONFIG_INTERVAL TRACE_FLAG
TRACE_ITERATIONS
---------- --------------- --------------- ----------
---------------
LOGON_STORM_THRESHOLD
--------------------
              30           60           3          300
300
       120              30             600          0               1
                   50
```

2. Update the ORAPING_CONFIG table. Enter commands similar to the following:

```
SQL> UPDATE oraping_config SET
  2  cycle_time = 300,
  3  connect_timeout = 120,
  4  user_timeout = 120,
  5  special_wait = 600,
  6  logon_storm_threshold =100;
1 row updated.
SQL> COMMIT;
```

3. View the results of the update. Enter the following command:

```
SQL> SELECT * FROM oraping_config;
```

You should see output similar to the following:

```
INTERNAL_TIMEOUT USER_TIMEOUT MAX_RETRIES SPECIAL_WAIT
RECOVERY_RAMPUP_TIME
---------------- ------------ ----------- ------------
--------------------
CYCLE_TIME CONNECT_TIMEOUT CONFIG_INTERVAL TRACE_FLAG
TRACE_ITERATIONS
---------- --------------- --------------- ----------
```

```
---------------
LOGON_STORM_THRESHOLD
--------------------
              30          120           3          600
300
       300             120             600          0                1
                  100
```

Managing the Oracle Real Application Clusters Guard Log Files

> **Note:** Do not delete the Oracle Real Application Clusters Guard log files. They are essential for tracking faults.

Oracle Real Application Clusters Guard writes log files and debug files to the following locations:

- OFA configuration: `$ORACLE_BASE/admin/$DB_NAME/pfs/pfsdump`
- Non-OFA configuration: `$ORACLE_HOME/pfs/$DB_NAME/log`

To find the Oracle Real Application Clusters Guard logs, change to the `pfsdump` directory. Enter a command similar to the following:

```
$ cd /mnt1/oracle/admin/sales/pfs/pfsdump
```

List the contents of the directory. You should see output similar to the following:

```
pfs_sales_host1.debug      pfs_sales_host1_ping.log
pfs_sales_host1.log
```

Allow sufficient space for the log files. If the log files become too large, then copy them manually to a backup location. Oracle Real Application Clusters Guard automatically opens a new copy of the file that has been archived when it writes to the file again.

> **See Also:** "Interpreting Message Output in Oracle Real Application Clusters Guard" on page 8-2

Recovering from a Failover While Datafiles Are in Backup Mode

When datafiles are in backup mode, they appear to instance recovery as if they are past versions. Oracle issues a message at the next startup that says media recovery

is required. Media recovery is *not* required. Solve the problem by taking the following actions:

1. Stop the packs.
2. Mount the database.
3. Take each affected datafile out of backup mode.
4. Restart the packs.

> **Note:** RMAN does not encounter this problem. If you use RMAN, this procedure is not necessary.

The steps are shown in more detail as follows:

1. Halt the packs. Enter the following command:

```
PFSCTL>  pfshalt
```

2. Mount one of the instances. Enter commands similar to the following:

```
$ sqlplus "system/manager as sysdba"
SQL> startup mount;
```

3. Identify the datafiles that are in backup mode. Enter commands similar to the following:

```
SELECT file#, recover, fuzzy, tablespace_name, name
FROM v$datafile_header
WHERE fuzzy = 'YES' ;
```

   You should see output similar to the following:

```
FILE#      REC  FUZ  TABLESPACE  NAME
-----      ---  ---  ----------  --------------------------------
6          NO   YES  USERS       /dev/vx/rdsk/home-dg/oracle_usr01
7          NO   YES  USERS       /dev/vx/rdsk/home-dg/oracle_usr02
```

4. Take the datafiles out of backup mode. Enter SQL statements similar to the following:

```
SQL> ALTER DATABASE DATAFILE '/dev/vx/rdsk/home-dg/oracle_usr01' END BACKUP;
```

   You should see output similar to the following:

```
Database altered.
```

Continue taking affected datafiles out of backup mode.

```
SQL> ALTER DATABASE DATAFILE '/dev/vx/rdsk/home-dg/oracle_usr02' END BACKUP;

Database altered.
```

> **Note:** If you repeat the ALTER DATABASE...END BACKUP statement, then Oracle issues errors. They are not destructive, and you can ignore them.

```
SQL> ALTER DATABASE DATAFILE '/dev/vx/rdsk/home-dg/oracle_usr01' END BACKUP;
```

Output similar to the following may occur:

```
alter database datafile '/dev/vx/rdsk/home-dg/oracle_usr01' end backup
*
ERROR at line 1:
ORA-01235: END BACKUP failed for 1 file(s) and succeeded for 0
ORA-01199: file 6 is not in online backup mode
ORA-01110: data file 6: '/dev/vx/rdsk/home-dg/oracle_usr01'
```

5. Unmount the Oracle instance.

```
SQL> shutdown immediate
```

6. Start the packs.

```
PFSCTL> pfsboot
```

> **Note:** You should also take datafiles out of backup mode before a switchover. You can do it manually, or you can implement it as a call-out from the PLANNED_DOWN state in role change notification.

See Also:

- *Oracle9i User-Managed Backup and Recovery Guide*
- *Oracle9i SQL Reference*
- "Setting Up Role Change Notification" on page 5-5

7

Configuring the Network for Oracle Real Application Clusters Guard

This chapter describes how to configure the Oracle network for Oracle Real Application Clusters Guard. It contains the following sections:

Configuring the Oracle Network

The following network configurations can be used with Oracle Real Application Clusters Guard:

- Dedicated Server Connections
- Shared Server Connections
- Transparent Application Failover Dedicated Connections

These options are supported with Oracle Real Application Clusters Guard, but you must configure them according to the guidelines in this chapter. The decision about which type of connection to use depends on the resources available, as well as application and business needs.

See Also: *Oracle Net Services Administrator's Guide*

Dedicated Server Connections

Dedicated server environments do not have cross-instance listener registration. A connection request made to a specific instance's listener can be connected only to that instance's service. When the primary instance fails, the re-connection request from the client is rejected by the failed instance's listener. Oracle Real Application Clusters Guard stops the failed instance's listener and the IP address to which it was listening. Oracle Real Application Clusters Guard then restarts the IP address on the node where the secondary instance performs recovery and becomes the primary instance. When the client resubmits the request, the client re-establishes the connection by using the new primary instance's listener that then connects the client to the new primary instance.

Oracle Real Application Clusters Guard uses the `LOCAL_LISTENER` initialization parameter to specify the network name that resolves to an address of Oracle Net local listeners (listeners that are running on the same machine as the instance). The address is specified in the `tnsnames.ora` file.

For example, if the `LOCAL_LISTENER` initialization parameter is set to `listener_SALES_HOSTA`, and `listener_SALES_HOSTA` uses TPC/IP on port 1421, then the entry in the `tnsnames.ora.ded.pfs` file looks like this:

```
listener_SALES_HOSTA=
    (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1421))
```

Note: The `HOST` is defined to be the relocatable IP address.

Example of an Oracle Real Application Clusters Guard Dedicated Network Configuration

Suppose an Oracle Real Application Clusters Guard environment called SALES exists as described in the following table.

Environment Component	Node 1	Node 2
ORACLE_SERVICE (database)	SALES	SALES
ORACLE_SID (instance)	SALES1	SALES2
Listener	SALES_HOSTA_LSNR	SALES_HOSTB_LSNR
Relocatable IP address	144.25.28.74	144.25.28.75

Configure the LOCAL_LISTENER parameter to allow for service registration. Then the following parameters are defined as shown in the following table.

Parameter	Node 1	Node 2
SERVICE_NAME	SALES.ORACLE.COM	SALES.ORACLE.COM
INSTANCE_NAME	SALES1	SALES2
LOCAL_LISTENER	listener_SALES_HOSTA	listener_SALES_HOSTB

The values of the LOCAL_LISTENER parameter can be resolved through the local tnsnames.ora files on Nodes 1 and 2, respectively:

```
listener_SALES_HOSTA=
    (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1421))

listener_SALES_HOSTB=
    (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1421))
```

The following actions result from this configuration:

1. The PMON process for instance SALES1 registers with listener SALES_HOSTA_LSNR.

   The PMON process for instance SALES2 registers with listener SALES_HOSTB_LSNR.

You can confirm this by asking for a services summary on each node:

```
LSNRCTL> services SALES_HOSTA_LSNR
```

You should see output similar to the following:

```
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1421)
Services Summary...
Service "sales.oracle.com"              has 1 instances.
  Instance "SALES1"
   Status: READY  Total handlers: 1  Relevant handlers: 1
    DEDICATED established:6 refused:0 current:0 max:0 state:ready
     Session: NS
```

To get a services summary on HOSTB, enter the following command:

```
LSNRCTL> services SALES_HOSTB_LSNR
```

You should see output similar to the following:

```
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1421)
Services Summary...
Service "sales.oracle.com"              has 1 instances.
  Instance "SALES2"
   Status: READY/SECONDARY Total handlers: 1  Relevant handlers: 1
     DEDICATED established:11 refused:0 current:0 max:0 state:ready
      Session: NS
```

2. The client requests a connection.

The connect descriptor contains addresses of listeners located on 144.25.28.74 and 144.25.28.75 that listen for connection requests for a database service called SALES.ORACLE.COM with a primary instance role.

The connect descriptor address list features connect-time failover and no client load balancing. Connect-time failover is enabled by setting FAILOVER=ON. When set to ON, the FAILOVER parameter instructs Oracle Net at connect time to fail over to 144.25.28.75 if the first address, 144.215.28.74, fails. The FAILOVER parameter defaults to ON for description lists, descriptions, and address lists.

The SALES_DED net service name enables connections to the instance with the primary instance role. The SERVER=DEDICATED specification forces a dedicated server connection.

Specify the SALES_DED net service name as follows:

```
SALES_DED=
 (DESCRIPTION=
    (LOAD_BALANCE=OFF)
    (ADDRESS_LIST=
     (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1421))
     (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1421)))
   (CONNECT_DATA=
     (SERVICE_NAME=SALES.ORACLE.COM)
     (SERVER=DEDICATED)
     (INSTANCE_ROLE=PRIMARY)))
```

3. The listener receives the request and directs it to the appropriate server.
4. The connection is accepted by the server.

See Also: *Oracle Net Services Administrator's Guide*

Shared Server Connections

Dynamic service registration relies on the PMON process to register instance information with a listener, as well as the current state and load of the instance and shared server dispatchers. The registered information enables the listener to forward client connection requests to the appropriate service handler.

In Oracle Real Application Clusters Guard, the LISTENER attribute in the DISPATCHER initialization parameter has been configured to allow for dynamic service registration of information to both listeners, also referred to as cross-instance listener registration. The primary instance registers with the primary instance listener as well as the secondary instance listener. This enables the primary instance to accept connections from its local listener, as well as from the secondary instance listener. A secondary instance registers with its local listener as a secondary instance.

Example of an Oracle Real Application Clusters Guard Shared Server Connection

Suppose that an Oracle Real Application Clusters Guard environment called SALES exists as described in the following table.

Environment Component	Node 1	Node 2
ORACLE_SERVICE	SALES	SALES
ORACLE_SID (instance)	SALES1	SALES2
Listener	SALES_HOSTA_LSNR	SALES_HOSTB_LSNR
Relocatable IP address	144.25.28.74	144.25.28.75

Define the DISPATCHERS initialization parameter on each node:

- On Node 1:

```
DISPATCHERS=
"(ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(LISTENER=listener_SALES)"
```

- On Node 2:

```
DISPATCHERS=
"(ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(LISTENER=listener_SALES)"
```

Note:

- Each instance has one dispatcher.
- The configuration forces the relocatable IP address to be used for the dispatcher.
- Oracle Net dynamically selects the TCP/IP port for the dispatcher.

The listener value (listener_SALES) can then be resolved through a local tnsnames.ora file on both servers as follows, assuming that the listener alias name is listener_SALES and the two ports are 1526:

```
listener_SALES=
DESCRIPTION=
     (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1526))
      (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1526))
```

The following actions result from this configuration:

1. Each dispatcher listens on the address assigned to it.

2. The PMON processes for the SALES1 and SALES2 instances register with both listeners. The listeners are updated dynamically with information about the load of the instances and dispatchers. You can confirm this by asking for a services summary on each node. Enter the following command:

```
$ lsnrctl
```

You should see output similar to the following:

```
LSNRCTL for Solaris: Version 9.0.1.0.0 - Production on 03-JAN-2001 13:54:16
(c) Copyright 2001 Oracle Corporation.  All rights reserved.

Welcome to LSNRCTL, type "help" for information.
```

Enter the following command:

```
LSNRCTL> set display normal
```

You should see output similar to the following:

```
Service display mode is NORMAL
```

Enter the following command:

```
LSNRCTL> services SALES_HOSTA_LSNR
```

You should see output similar to the following:

```
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1526)(QUEUESIZE
=1024)))
Services Summary...
Service "sales.oracle.com"               has 2 instances.
    Instance "sales1"
      Status: READY  Total handlers: 1  Relevant handlers: 1
        D000 established:3 refused:0 current:0 max:1022 state:ready
        (ADDRESS=(PROTOCOL=tcp)(HOST=144.25.28.74)(PORT=60349))
            Session: NS
    Instance "sales2"
      Status: READY/SECONDARY  Total handlers: 1  Relevant handlers: 1
        D000 established:0 refused:0 current:0 max:1022 state:ready
        (ADDRESS=(PROTOCOL=tcp)(HOST=144.25.28.75)(PORT=60858))
            Session: NS
The command completed successfully
```

3. The client requests a connection.

The connect descriptors list specifies connect-time failover and no client load balancing. At connection time, Oracle Net fails over to `144.25.28.75` if the first address, `144.215.28.74`, fails.

The `SALES_MTS` net service name enables connections to the instance with the primary instance role.

If a shared server is specified and a client connection request arrives when no dispatchers are registered, then the request can be handled by a dedicated server process. Oracle Real Application Clusters Guard forces clients to always use a dispatcher because `SERVER=SHARED` is configured in the connect data portion of the connect descriptor. If a dispatcher is not available, then the client connection request is rejected.

The client connect descriptor uses an address list that contains the listener addresses for the primary instance and the secondary instance. The `LOAD_BALANCE` parameter is set to `OFF` because all client connections should go to the primary instance.

For example, define `SALES_MTS` as follows:

```
SALES_MTS=
  (DESCRIPTION=
        (LOAD_BALANCE=OFF)
        (ADDRESS_LIST=
          (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1526))
          (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1526)))
         (CONNECT_DATA=
          (SERVICE_NAME=SALES.ORACLE.COM)
           (SERVER=SHARED)
           (INSTANCE_ROLE=PRIMARY)))
```

4. The listener receives the connection request and determines whether the client's request can be serviced. If not, the listener refuses the network connection request.
5. If the client's request is valid, then the listener performs one of the following actions:
   - The listener hands the connection request directly to a dispatcher.
   - The listener issues a redirect message to the client. The message contains the network address of a dispatcher. The client then dissolves the network session to the listener and establishes a network session to the dispatcher by using the network address provided in the message. The listener then directs the client's request to the appropriate server.

Transparent Application Failover Dedicated Connections

Transparent application failover (TAF) instructs Oracle Net to fail over an established connection to a different listener. This enables the user to continue to work, by using the new connection as if the original connection had not failed. Using TAF requires manual configuration of a net service name that includes the FAILOVER_MODE parameter in the CONNECT_DATA portion of the connect descriptor.

This section includes the following topics:

- TAF Basic Dedicated Connections
- TAF Preestablished Dedicated Connections

> **See Also:** *Oracle Net Services Administrator's Guide* for more information about TAF

TAF Basic Dedicated Connections

In this example of a TAF basic dedicated connection, the TAF application first tries to connect to the 144.25.28.74 IP address. If it cannot connect, then it attempts to perform a connect-time failover to 144.25.27.75. If the instance fails after the connection, then the TAF application fails over to the other node's listener, reserving SELECT statements that are in progress. If the failover connection attempt fails, then Oracle Net waits 5 seconds before trying to connect again. Oracle Net attempts to connect up to 180 times.

Specify a TAF basic dedicated connection for the SALES database as follows:

```
SALES_DED_BASIC=
  (DESCRIPTION=
     (LOAD_BALANCE=OFF)
     (FAILOVER=ON)
     (ADDRESS_LIST=
        (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1524))
        (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1524)))
     (CONNECT_DATA=
        (SERVICE_NAME=SALES.ORACLE.COM)
        (SERVER=DEDICATED)
        (INSTANCE_ROLE=PRIMARY)
        (FAILOVER_MODE=
             (BACKUP=SALES_DED_BASIC_BACKUP)
             (TYPE=SELECT)
             (METHOD=BASIC)
             (RETRIES=180)
```

```
            (DELAY=5))))

SALES_DED_BASIC_BACKUP=
  (DESCRIPTION=
     (LOAD_BALANCE=OFF)
     (FAILOVER=ON)
     (ADDRESS_LIST=
        (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1524))
        (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1524)))
     (CONNECT_DATA=
        (SERVICE_NAME=SALES.ORACLE.COM)
        (SERVER=DEDICATED)
        (INSTANCE_ROLE=PRIMARY)
        (FAILOVER_MODE=
             (BACKUP=SALES_DED_BASIC)
             (TYPE=SELECT)
             (METHOD=BASIC)
             (RETRIES=180)
             (DELAY=5))))
```

TAF Preestablished Dedicated Connections

When TAF is configured, a backup connection can be preestablished to the secondary instance. The initial and backup connections are specified explicitly. In the following example, Oracle Net connects to the listener on HOSTA and establishes a preconnection to HOSTB, the secondary instance. If HOSTA fails after the connection, then the TAF application fails over to HOSTB. The RETRIES and DELAY parameters cause Oracle Net to automatically try to connect again if the first connection attempt fails.

In the following example of a TAF preestablished dedicated connection, the TAF application tries to connect to the 144.25.28.74 address first. If it cannot, then Oracle Net attempts connect-time failover to 144.25.27.75. A backup connection is preestablished. If the instance fails after the connection, then the TAF application fails over to the other node's listener, reserving any SELECT statements in progress. If the failover connection attempt fails, then Oracle Net waits 5 seconds before trying to connect again. Oracle Net attempts to connect up to 180 times.

Define a TAF preestablished dedicated connection for the SALES database as follows:

```
SALES_DED_PRE=
  (DESCRIPTION=
     (LOAD_BALANCE=OFF)
     (FAILOVER=ON)
```

```
      (ADDRESS_LIST=
         (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1524))
         (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1524)))
      (CONNECT_DATA=
         (SERVICE_NAME=SALES.ORACLE.COM)
         (SERVER=DEDICATED)
         (INSTANCE_ROLE=PRIMARY)
         (FAILOVER_MODE=
             (BACKUP=SALES_DED_PRE_SECONDARY)
             (TYPE=SELECT)
             (METHOD=PRECONNECT)
             (RETRIES=180)
             (DELAY=5))))

SALES_DED_PRE_SECONDARY=
  (DESCRIPTION=
      (LOAD_BALANCE=OFF)
      (FAILOVER=ON)
      (ADDRESS_LIST=
           (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.75)(PORT=1524))
           (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1524)))
      (CONNECT_DATA=
           (SERVICE_NAME=SALES.ORACLE.COM)
      (SERVER=DEDICATED)
      (INSTANCE_ROLE=SECONDARY)
      (FAILOVER_MODE=
          (BACKUP=SALES_DED_PRE)
          (TYPE=SELECT)
          (METHOD=PRECONNECT)
          (RETRIES=48)
          (DELAY=900))))
```

8

Troubleshooting Oracle Real Application Clusters Guard

This chapter describes how to troubleshoot an Oracle Real Application Clusters Guard system. It includes the following topics:

Interpreting Message Output in Oracle Real Application Clusters Guard

Oracle Real Application Clusters Guard provides detailed error messages that can help in troubleshooting. Error messages from the Oracle database server and from third-party media vendors also provide useful troubleshooting output. This section contains the following topics:

- Identifying Types of Message Output for Oracle Real Application Clusters Guard
- Identifying Error Codes in Oracle Real Application Clusters Guard Logs and Trace Files
- Interpreting Oracle Real Application Clusters Guard Error Messages
- Enabling the Debugging Option for Oracle Real Application Clusters Guard

Identifying Types of Message Output for Oracle Real Application Clusters Guard

Table 8–1 shows the types of message output that are useful for troubleshooting Oracle Real Application Clusters Guard.

Table 8–1 Message Output

Type of Output	Produced By	Location	Description
PFSCTL messages	`PFSCTL` command line	Terminal and `PFSCTL.log` OFA: `$ORACLE_BASE /admin/$DB_NAME/pfs /pfsdump/PFSCTL.log` Non-OFA: `$ORACLE_HOME /pfs/$DB_NAME/log /PFSCTL.log`	-
PFS messages	Packs and monitors	OFA: `$ORACLE_BASE /admin/$DB_NAME/pfs /pfsdump/pfs_$ORACLE_ SERVICE_`*`Host`*`.log` Non-OFA: `$ORACLE_HOME /pfs/$DB_NAME/log /pfs_$ORACLE_SERVICE_`*`Host`*`.log`	Contains a chronological log of actions that are relevant to Oracle Real Application Clusters Guard, error messages that are generated by Oracle Real Application Clusters Guard and the Oracle database server, and administrative operations

Table 8–1 Message Output (Cont.)

Type of Output	Produced By	Location	Description
PFS debug file	$PFS_DEBUGGING command	OFA: $ORACLE_BASE /admin/$DB_NAME/pfs /pfsdump/pfs_$ORACLE_ SERVICE_*Host*.debug Non-OFA: $ORACLE_HOME /pfs/$DB_NAME/log /pfs_$ORACLE_SERVICE_ *Host*.debug	Contains detailed output generated by Oracle Real Application Clusters Guard processes. This file is appended when $PFS_ DEBUGGING is set to $PFS_ TRUE.
Monitor log files	Heartbeat monitor	OFA: $ORACLE_BASE/admin /$DB_NAME/pfs/pfsdump /pfs_$ORACLE_SERVICE_ *Host*_oraping.log Non-OFA: $ORACLE_HOME/pfs /$DB_NAME/log/pfs_ $ORACLE_SERVICE_*Host*_ oraping.log	Contains information about the functioning of the heartbeat monitor
PFS trace file	Heartbeat monitor	The directory specified by the USER_DUMP_DEST initialization parameter Default: $ORACLE_HOME /rdbms/log	Contains SQL*Trace output, including wait and bind data. This file is created when TRACE_FLAG is set to $PFS_ TRUE in the ORAPING_ CONFIG table. **See Also:** "Making Online Changes to the ORAPING_ CONFIG Table" on page 6-14
Fault data capture	Listener monitor	$ORACLE_ HOME/network/trace/pfs_ lsnr_*ListenerPID*.trc or $ORACLE_ HOME/network/trace/pfs_ lsnr_*Time*.trc *ListenerPID* is the process ID for the listener. *Time* is the time in seconds when the listener terminated.	Contains output generated by the netstat UNIX command

Table 8–1 Message Output (Cont.)

Type of Output	Produced By	Location	Description
Fault data capture	Pack	The directory specified by the USER_DUMP_DEST initialization parameter Default: $ORACLE_HOME /rdbms/log	Contains output generated by Oracle system state dump and utlclust.sql script
Alert log	Oracle database server	The directory specified by the BACKGROUND_DUMP_DEST initialization parameter Default: $ORACLE_HOME /rdbms/log	Contains a chronological log of errors, initialization parameter file settings, and administrative operations
Oracle trace file	Oracle database server	The directory specified by the USER_DUMP_DEST initialization parameter Default: $ORACLE_HOME /rdbms/log	Contains detailed output generated by Oracle server processes
System logs	Operating system	Depends on operating system For Sun: /var/adm/messages	-

Identifying Error Codes in Oracle Real Application Clusters Guard Logs and Trace Files

The following types of error codes are found in the Oracle Real Application Clusters Guard logs and trace files:

- Errors with the PFS prefix
- Errors with the ORA prefix
- Errors preceded by ERROR

Table 8–2 shows the error ranges for Oracle Real Application Clusters Guard error messages. The prefix is PFS.

Table 8–2 Oracle Real Application Clusters Guard Error Ranges

Error Range	Cause
0000-0999	Generic
1000-2999	Main layer

Table 8–2 Oracle Real Application Clusters Guard Error Ranges (Cont.)

Error Range	Cause
3000-3999	Operating system-dependent layer
4000-4999	Pack layer
5000-5999	PFSCTL command line
6000-6999	Instance monitor
7000-7999	Listener monitor
8000-8999	Heartbeat monitor
9000-9999	Internal Oracle Real Application Clusters Guard process and role change notification
10000-19999	Oracle Real Application Clusters Guard Setup Utility (PFSSETUP)

See Also:

- Appendix A, "Oracle Real Application Clusters Guard Error Messages"
- *Oracle9i Database Error Messages*

Interpreting Oracle Real Application Clusters Guard Error Messages

Note the following suggestions for identifying useful messages in the Oracle Real Application Clusters Guard log files:

- Most of the messages in the log are information for capturing the root cause of a problem the first time it occurs. When a problem occurs, try to identify one or two errors that are most important.
- Check for errors that are preceded by `Warning`. This indicates that a pack or a monitor has incurred a problem but is continuing to operate. It is an indication that actions may need to be taken before an outage occurs. The problem is described in the text of the message.
- Check for errors that are preceded by `Alert`. This indicates the problem that the pack or monitor incurred.
- Read the messages in chronological order. The errors before and after the warning or alert are usually the most informative.

- Identify the type of error according to Table 8–2. Refer to Appendix A for information about the most important messages.

Example: Interpreting Oracle Real Application Clusters Guard Errors

The following is an example of messages from the Oracle Real Application Clusters Guard log file, `pfs_SALES_hostA.log`:

```
Wed Jan 10 11:57:14 2001 PFS-6014: Info: Routine connecting to instance.
Wed Jan 10 11:57:14 2001  ERROR: Encountered Oracle error while executing CONNECT --!
Wed Jan 10 11:57:14 2001  ORA-01034: ORACLE not available
ORA-27101: shared memory realm does not exist
SVR4 Error: 2: No such file or directory
Wed Jan 10 11:57:14 2001 PFS-6016: Alert: Routine failed to connect to instance.
Wed Jan 10 11:57:14 2001 PFS-6003: Warning: Routine 1 exits. Attempt to stop routine 0.
Wed Jan 10 11:57:14 2001 PFS-6006: Alert: ORACLE instance is not available. Instance
monitor exits.
```

Read the log in chronological order. The first alert message is:

```
PFS-6016: Alert: Routine failed to connect to instance.
```

The Oracle Real Application Clusters Guard error number is `PFS-6016`, which means that the problem concerns the instance monitor. The messages before the alert contain an `ORA-01034` error:

```
ORA-01034: ORACLE not available
```

You can conclude that the pack was halted because the Oracle instance or the database is down.

Enabling the Debugging Option for Oracle Real Application Clusters Guard

If the standard Oracle Real Application Clusters Guard logging is not generating enough information, then the Oracle Real Application Clusters Guard debugging option can be used to generate more extensive output. Enable the Oracle Real Application Clusters Guard debugging option by setting the `PFS_DEBUGGING` parameter to `$PFS_TRUE`.

Use debugging for the following purposes:

- To understand the cluster commands issued by Oracle Real Application Clusters Guard
- To determine where an Oracle Real Application Clusters Guard command is failing

The output is redirected to a separate trace file to prevent overloading the Oracle Real Application Clusters Guard log file. The debugging output contains the following information:

- Information generated by the cluster commands issued by Oracle Real Application Clusters Guard
- The results of Oracle Real Application Clusters Guard statement execution

> **See Also:** "Changing Oracle Real Application Clusters Guard Configuration Parameters" on page 3-28 for more information about change the value of `PFS_DEBUGGING`

Troubleshooting Startup Problems for Oracle Real Application Clusters Guard

Use the `pfsboot` command to start the packs. The steps of the `pfsboot` command are as follows:

1. Check the prerequisites for executing the `PFSBOOT` command. These conditions cannot exist:
   - Packs are already running.
   - The Oracle instance is running outside of the packs.
   - Failover or restart is occurring.
2. Start the packs.

If the `pfsboot` command fails, then check the following items:

- ❑ Are there errors in the Oracle Real Application Clusters Guard logs?
- ❑ Are there errors in the alert logs?
- ❑ Is the cluster up and running?
- ❑ Is the network operating properly?

Oracle Corporation recommends setting up the call-home function to alert the user when the `pfsboot` command fails during normal processing.

The Oracle Real Application Clusters Guard logs should clearly describe why the `pfsboot` command failed. You may need to stop the database manually before reissuing the `pfsboot` command. The `pfsboot` command may also fail if the packs are running in foreign mode or if the monitors do not start successfully.

This section contains the following examples:

- Example: pfsboot Command Fails Because Packs Are Already Running
- Example: pfsboot Command Fails Because of an Invalid Initialization Parameter Value
- Example: pfsboot Command Starts and Fails

See Also:

- "Setting Up the Call-Home Feature" on page 5-2
- "Recovering from Unplanned Outages on Both Nodes" on page 6-4 for an explanation of a situation in which the packs may be running in foreign mode
- "Troubleshooting Oracle Real Application Clusters Guard Monitors" on page 8-17

Example: pfsboot Command Fails Because Packs Are Already Running

When you enter the `pfsboot` command, the following message may appear at the command line:

```
Alert: pfsboot command failed.
```

Diagnosis

The following output appears in the Oracle Real Application Clusters Guard log on `hostA` (`pfs_SALES_hostA.log`):

```
Fri Jan 12 16:15:07 2001 PFS-5014: Processing command pfsboot.
Fri Jan 12 16:15:08 2001 PFS-5074: Alert: System is not clear. Pack PFS_SALES_hostA is
running. Use PFSCTL PFSHALT first.
Fri Jan 12 16:15:09 2001 PFS-5080: Alert: pfsboot command failed
```

The first alert message is:

```
PFS-5074: Alert: System is not clear. Pack PFS_SALES_hostA is running. Use
PFSCTL PFSHALT first.
```

The message number indicates that the problem is in the `PFSCTL` command line. The text of the message indicates that the `PFS_SALES_hostA` pack is already running. Enter the `STATUS` command to find out the exact state of the packs:

```
PFSCTL> status
```

The following output results:

```
Info: Pack PFS_SALES_hostA started.
hostB
Info: Pack PFS_SALES_hostB started.
Info: Local database instance is up.
Info: Remote database instance is up.
Info: Running primary role locally.
Info: Running secondary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

Solution

The `status` command shows that both packs are running. If you want to restart the packs, then:

1. Halt both packs. Enter the `pfshalt` command:

   ```
   PFSCTL> pfshalt
   ```

2. Start both packs. Enter the `pfsboot` command:

   ```
   PFSCTL> pfsboot
   ```

Example: pfsboot Command Fails Because of an Invalid Initialization Parameter Value

When you enter the `pfsboot` command, the following message may appear at the command line:

```
Alert: pfsboot command failed.
```

Diagnosis

The following output appears in the Oracle Real Application Clusters Guard log on hostA (`pfs_SALES_hostA.log`):

```
Mon Jan 15 10:02:57 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
Mon Jan 15 10:02:58 2001 PFS-5555: SALES hostA unknown planned_up 2001/01/15-10:02:57
Mon Jan 15 10:02:58 2001 PFS-2021: Info: Calling user provided role change notification
script: /mnt1/oracle/admin/sales/pfs/user/pfs_SALES_notifyrole.sh
Mon Jan 15 10:02:59 2001 PFS-2012: Info: User role notification script succeeded
Mon Jan 15 10:03:08 2001 PFS-4005: Info: Pack PFS_SALES_hostA starting on home node.
```

```
Mon Jan 15 10:03:09 2001 PFS-4010: Info: Attempt to initialize all variables.
Mon Jan 15 10:03:10 2001 PFS-4011: Info: Attempt to enable IP address.
Mon Jan 15 10:03:11 2001 PFS-4012: Info: Attempt to acquire disk storage.
Mon Jan 15 10:03:11 2001 PFS-4013: Info: Attempt to start public listener monitor and
public listener SALES_hostA_LSNR.
Mon Jan 15 10:03:12 2001 PFS-7001: Info: Attempt to start private listener monitor and
private listener SALES_hostA_PRIVLSNR.
Mon Jan 15 10:03:13 2001 PFS-2020: Info: Start monitor avmlprog SALES_hostA_LSNR 12432
Mon Jan 15 10:03:14 2001 PFS-4014: Info: Attempt to start database instance.
Mon Jan 15 10:03:14 2001 PFS-2020: Info: Start monitor avmlprog SALES_hostA_PRIVLSNR 12540
Mon Jan 15 10:03:16 2001 PFS-1000: Alert: Attempt to start Oracle instance failed.
Mon Jan 15 10:03:21 2001 PFS-5050: Alert: PFSCTL BOOTONE failed.
.
.
.
Mon Jan 15 10:03:50 2001 PFS-5064: Alert: Attempt to start primary failed.
Mon Jan 15 10:03:51 2001 PFS-5080: Alert: pfsboot command failed.
```

The first alert message is:

```
PFS-1000: Alert: Attempt to start Oracle instance failed.
```

The message number indicates that the problem was reported from the Oracle Real Application Clusters Guard main layer. The text of the message reports a problem with starting the Oracle instance.

The alert log (`alertSALES1.log`) does not show an entry for instance startup.

Try to start the database manually outside of the packs. Enter the following commands:

```
$ sqlplus /nolog
SQL*Plus: release 9.2.0.0 - Production on Mon Jan 15 10:26:11 2001
© Copyright 2001 Oracle Corporation. All rights reserved.

SQL> connect / as sysdba
Connected to an idle instnace.

SQL> startup pfile=init_SALES1_hostA.ora
LRM-00101: unknown parameter name 'service_name'
ORA-01078: failure in processing system parameters
```

The Oracle errors indicate that there is a problem with the `SERVICE_NAME` initialization parameter.

Solution

Correct the problem with the initialization parameter. Restart the packs:

```
PFSCTL> pfsboot
```

Example: pfsboot Command Starts and Fails

When you enter the `pfsboot` command, the resulting output shows that the command succeeded:

```
PFSCTL> pfsboot
pfsboot command succeeded.
```

When you enter the `status` command, the following output may result:

```
hostA
Info: Pack PFS_SALES_hostA started.
hostB
Info: Pack PFS_SALES_hostB started.
Info: Local database instance is up.
Info: Remote database instance is up.
Info: Running primary role locally.
Info: Running secondary role on remote node.
Info: Cluster is up.
Info: Local node part of the cluster.
Info: Remote node part of the cluster.
Info: No internal process is running locally.
Info: No internal process is running remotely.
status command succeeded.
```

The output shows that although the `pfsboot` command started the instances, it shut down before starting other processes.

Diagnosis

If the packs start successfully and then shut down, then the following scenarios are possible:

- The packs terminated abnormally.
- A server-side error occurred.
- The heartbeat monitor failed to stay up.

Examine the Oracle Real Application Clusters Guard log, the database log, and the trace files for errors. The following output is from the Oracle Real Application Clusters Guard log:

```
Mon Jan 15 14:37:15 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
```

```
Mon Jan 15 14:37:26 2001 PFS-4005: Info: Pack PFS_SALES_hostA starting on home node.
Mon Jan 15 14:37:27 2001 PFS-4010: Info: Attempt to initialize all variables.
Mon Jan 15 14:37:28 2001 PFS-4011: Info: Attempt to enable IP address.
Mon Jan 15 14:37:28 2001 PFS-4012: Info: Attempt to acquire disk storage.
Mon Jan 15 14:37:29 2001 PFS-4013: Info: Attempt to start public listener monitor and
public listener SALES_hostA_LSNR.
Mon Jan 15 14:37:30 2001 PFS-7001: Info: Attempt to start private listener monitor and
private listener SALES_hostA_PRIVLSNR.
Mon Jan 15 14:37:30 2001 PFS-2020: Info: Start monitor avmlprog SALES_hostA_LSNR 8964
Mon Jan 15 14:37:32 2001 PFS-4014: Info: Attempt to start database instance.
Mon Jan 15 14:37:32 2001 PFS-2020: Info: Start monitor avmlprog SALES_hostA_PRIVLSNR 9069
Mon Jan 15 14:37:57 2001 PFS-4032: Info: Check if ACTIVE_INSTANCE_COUNT is set to 1.
Mon Jan 15 14:37:58 2001 PFS-4015: Info: Attempt to start instance monitor.
Mon Jan 15 14:37:59 2001 PFS-4016: Info: Attempt to check INSTANCE_ROLE.
Mon Jan 15 14:38:00 2001 PFS-2020: Info: Start monitor avmuprog SALES 9557
Mon Jan 15 14:38:01 2001 PFS-1001: Info: INSTANCE_ROLE is primary_instance.
Mon Jan 15 14:38:02 2001 PFS-4017: Info: Attempt to start ORACLE_PING.
Mon Jan 15 14:38:03 2001 PFS-2020: Info: Start monitor avmpprog SALES 9745
Mon Jan 15 14:38:03 2001 PFS-4018: Info: Attempt to enable pack switching.
Mon Jan 15 14:38:04 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
Mon Jan 15 14:38:04 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:38:05 2001 PFS-5555: SALES hostA primary up 2001/01/15-14:38:04
Mon Jan 15 14:38:05 2001 PFS-2021: Info: Calling user provided role change notification
script: /mnt1/oracle/admin/sales/pfs/user/pfs_SALES_notifyrole.sh
Mon Jan 15 14:38:06 2001 PFS-2012: Info: User role notification script succeeded
Mon Jan 15 14:38:06 2001 PFS-9900: Info: Attempt to start role change notification.
Mon Jan 15 14:38:08 2001 PFS-4020: Info: Attempt to start DBMS_JOBS.
Mon Jan 15 14:38:08 2001 PFS-2020: Info: Start monitor avmrprog SALES 10010
Mon Jan 15 14:38:09 2001 PFS-4004: Info: Run method on home node completed.
Mon Jan 15 14:38:13 2001 PFS-5002: PFSCTL BOOTONE succeeded.
Mon Jan 15 14:38:15 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
Mon Jan 15 14:38:15 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:38:26 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:38:36 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:38:47 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:38:58 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:39:09 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:39:10 2001 PFS-5002: PFSCTL BOOTONE succeeded.
Mon Jan 15 14:39:11 2001 PFS-5007: PFSCTL PFSBOOT succeeded.

Mon Jan 15 14:39:12 2001 PFS-3000: Info: Pack PFS_SALES_hostA started.
```

```
Mon Jan 15 14:39:14 2001 PFS-3000: Info: Pack PFS_SALES_hostB started.
Mon Jan 15 14:39:15 2001 PFS-3002: Info: Local database instance is up.
Mon Jan 15 14:39:17 2001 PFS-3004: Info: Remote database instance is up.
Mon Jan 15 14:39:19 2001 PFS-3006: Info: Running primary role locally.
Mon Jan 15 14:39:19 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:39:22 2001 PFS-3010: Info: Running secondary role on remote node.
Mon Jan 15 14:39:26 2001 PFS-3012: Info: Cluster is up.
Mon Jan 15 14:39:29 2001 PFS-3013: Info: Local node part of the cluster.
Mon Jan 15 14:39:30 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:39:31 2001 PFS-3014: Info: Remote node part of the cluster.
Mon Jan 15 14:39:32 2001 PFS-3072: Info: No internal process is running locally.
Mon Jan 15 14:39:33 2001 PFS-3073: Info: No internal process is running remotely
Mon Jan 15 14:39:34 2001 PFS-5015: pfsboot command succeeded.
Mon Jan 15 14:39:41 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:39:51 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:40:02 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:40:13 2001 PFS-8002: Warning: Instance sales1 is not registered with SALES_
hostA_LSNR.
Mon Jan 15 14:40:23 2001 PFS-8001: Alert: Shared server service or instance sales not
registered with SALES_hostA_LSNR in 120 seconds. Exit.
Mon Jan 15 14:40:25 2001 PFS-2019: Info: Real Application Clusters Guard callhome with
Oraping_monitor_exits now.
Mon Jan 15 14:40:25 2001 PFS-2019: Info: Real Application Clusters Guard callhome with
Oraping_for_SALES_error_Will_failover now.
Mon Jan 15 14:40:26 2001 PFS-2019: Info: Real Application Clusters Guard callhome with
Failing_over_service_SALES now.
Mon Jan 15 14:40:30 2001 PFS-4007: Info: Pack PFS_SALES_hostA stopping on home node.
Mon Jan 15 14:40:31 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
Mon Jan 15 14:40:31 2001 PFS-5555: SALES hostA primary down 2001/01/15-14:40:31
Mon Jan 15 14:40:32 2001 PFS-2021: Info: Calling user provided role change notification
script: /mnt1/oracle/admin/sales/pfs/user/pfs_SALES_notifyrole.sh
Mon Jan 15 14:40:32 2001 PFS-2012: Info: User role notification script succeeded
Mon Jan 15 14:40:33 2001 PFS-4028: Info: Attempt to halt instance monitor.
Mon Jan 15 14:40:34 2001 PFS-4029: Info: Attempt to halt ORACLE_PING.
Mon Jan 15 14:40:35 2001 PFS-3064: Info: Service PFS_SALES_Ping_hostA has already been
stopped.
Mon Jan 15 14:40:35 2001 PFS-9902: Info: Attempt to stop role change notification Mon Jan
15 14:40:36 2001 PFS-4027: Info: Attempt to archive, checkpoint, and dump database.
Mon Jan 15 14:40:45 2001 PFS-1012: Info: Local and remote ORACLE systemstates dumped to
USER_DUMP_DEST.
Mon Jan 15 14:40:45 2001 PFS-4026: Info: Attempt to abort database.
Mon Jan 15 14:40:46 2001 PFS-4019: Info: Attempt to send notification that instance role
has changed.
```

```
Mon Jan 15 14:40:47 2001 PFS-5555: SALES hostA primary cleanup 2001/01/15-14:40:46
Mon Jan 15 14:40:47 2001 PFS-2021: Info: Calling user provided role change notification
script: /mnt1/oracle/admin/sales/pfs/user/pfs_SALES_notifyrole.sh
Mon Jan 15 14:40:48 2001 PFS-2012: Info: User role notification script succeeded
Mon Jan 15 14:40:49 2001 PFS-2003: Info: Attempt to start internal Real Application
Clusters Guard process on primary instance.
Mon Jan 15 14:40:49 2001 PFS-4025: Info: Attempt to halt public listener monitor
and public listener SALES_hostA_LSNR.
Mon Jan 15 14:40:50 2001 PFS-7003: Info: Attempt to halt private listener monitor and
private listener SALES_hostA_PRIVLSNR.
Mon Jan 15 14:40:51 2001 PFS-2017: Info: Start to clean up Real Application Clusters Guard
processes.
Mon Jan 15 14:40:52 2001 PFS-4024: Info: Attempt to release disk storage.
Mon Jan 15 14:40:52 2001 PFS-2015: Info: Stop process ./avmlmon.sh_SALES_hostA_LSNR
succeeded.
Mon Jan 15 14:40:52 2001 PFS-4022: Info: Attempt to disable IP address.
Mon Jan 15 14:40:53 2001 PFS-2015: Info: Stop process SALES_hostA_LSNR succeeded
Mon Jan 15 14:40:53 2001 PFS-4030: Info: Halt method on home node completed.
Mon Jan 15 14:40:54 2001 PFS-2015: Info: Stop process ./avmlmon.sh_SALES_hostA_PRIVLSNR
succeeded.
Mon Jan 15 14:40:54 2001 PFS-2015: Info: Stop process  SALES_hostA_PRIVLSNR succeeded.
```

The first warning is:

```
Mon Jan 15 14:38:15 2001 PFS-8002: Warning: Instance sales1 is not registered
with SALES_hostA_LSNR.
```

The first alert is:

```
Mon Jan 15 14:40:23 2001 PFS-8005: Alert: Shared server service or instance
sales not registered with SALES_hostA_LSNR in 120 seconds. Exit.
```

The message numbers are in the 8000 range, so the problem has been reported from the heartbeat monitor. The message text indicates that there is a problem with service registration. The instance failed to register with the listener within 120 seconds.

- Check the environment variable and the initialization parameters that affect service registration:
- Is the `TNS_ADMIN` environment variable set correctly in the `$PFS_HOME/include/$ORACLE_SERVICE.env` file?
- Are the following initialization parameters set correctly?

  ```
  SERVICE_NAMES
  ACTIVE_INSTANCE_COUNT
  INSTANCE_NAME
  ```

- ❏ Does the LOCAL_LISTENER parameter (for dedicated connections) specify a valid alias in the $TNS_ADMIN/tnsnames.ora file?
- ❏ Does the LISTENER attribute of the DISPATCHERS parameter (for shared server connections) specify a valid alias in the $TNS_ADMIN/tnsnames.ora file?

For example, suppose a dedicated configuration has the following characteristics:

- ORACLE_SERVICE=SALES
- The relocatable IP address is 144.28.74
- The port is 1524

Suppose that LOCAL_LISTENER is defined in the SALES_config.hostA.ded.pfs file as follows:

```
LOCAL_LISTENER=listener_SALES_hostA
```

Then listener_SALES_hostA must be resolved properly in the tnsnames.ora file:

```
listener_SALES_hostA=
     (ADDRESS=(PROTOCOL=TCP)(HOST=144.25.28.74)(PORT=1524))
```

Solution

There are several causes of failed service registration. The best practice is to look for the simplest solutions first. For example, it is common for service registration to fail because the LOCAL_LISTENER parameter is not set correctly. Ensure that the value of the LOCAL_LISTENER parameter in the initialization parameter file (init.ora) matches the entry in the tnsnames.ora file.

Troubleshooting Command-Line Problems in Oracle Real Application Clusters Guard

If you cannot invoke the PFSCTL command line, then check the following conditions:

- ❏ Was Oracle Real Application Clusters Guard installed and deployed correctly?

  The oracle user must install the Oracle Real Application Clusters Guard software. If another user installed the Oracle Real Application Clusters Guard software, then reinstall the Oracle Real Application Clusters Guard software as oracle.

- Are you logged on as the superuser (root)?

  If you are not logged on as root, then you see output similar to the following:

```
      PFSCTL for hostA: Version 9.2.0.0- Production on  Jan 15 2001 16:49:59
        (c) Copyright 2001 , Oracle Corporation.  All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.
pfsctl[38]: /home_oracle/901_sales/pfs/bin/PFSCTL.log: cannot create

ORACLE_SERVICE is set to SALES
DB_NAME is set to sales

PFSCTL>
```

  You must be logged on as root.

- Are the following environment variables set?

```
ORACLE_SERVICE
DB_NAME
```

  If ORACLE_SERVICE is not set, then you see output similar to the following:

```
       PFSCTL for hostA:Version 9.2.0.0- Production on  Jan 15 2001 16:47:30
       (c) Copyright 2001, Oracle Corporation. All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

Alert: ORACLE_SERVICE is not set. Set it and run PFSCTL again.

If DB_NAME is not set, then you see output similar to the following:
       PFSCTL for hostA:Version 9.2.0.0- Production on  Jan 15 2001 16:47:30
       (c) Copyright 2001, Oracle Corporation. All rights reserved.
Welcome to PFSCTL. Type HELP for additional information.

Alert: DB_NAME is not set. Set it and run PFSCTL again.
```

- Is $ORACLE_HOME/pfs/bin in the PATH variable?

  If $ORACLE_HOME/pfs/bin is not in the PATH variable, then you will see output similar to the following:

```
# pfsctl
pfsctl: command not found
```

  If $ORACLE_HOME/pfs/bin is not in the PATH variable, then either you can execute the PFSCTL command line utility from $ORACLE_HOME/pfs/bin or you can include $ORACLE_HOME/pfs/bin is in the PATH variable.

Troubleshooting Oracle Real Application Clusters Guard Monitors

This section contains the following topics:

Troubleshooting the Heartbeat Monitor

If the heartbeat monitor is not operating properly, then check the following items:

❏ Is the heartbeat monitor running?

The heartbeat monitor runs on the primary and secondary nodes. Check for its existence as follows:

```
$ ps -fu owner | grep avmpmon.sh
```

The heartbeat monitor should have a child process called `avmping`.

❏ Are there error messages or messages about restarting the heartbeat monitor in the Oracle Real Application Clusters Guard logs?

For example, these messages may appear in `pfs_SALES_hostA_ping.log`:

```
Tue Jan 16 09:11:57 2001 PFS-8500: Info: Oracle Real Application Clusters
Guard: oracle-ping v90100.
Tue Jan 16 09:11:57 2001 PFS-8501: Info: Rampup flag is set ON.
Tue Jan 16 09:11:57 2001 PFS-8503: Info: ORACLE_PING started.. Check
PFS$ORAPING_HEARTBEAT view.
Tue Jan 16 09:11:57 2001  ERROR : Encountered Oracle error while executing
SELECT--!
Tue Jan 16 09:11:57 2001  ORA-00942: table or view does not exist
```

❏ Are the heartbeat monitor tables in the database?

Look for the `oraping_heartbeat` and `oraping_config` tables, whose owner is `OPS$`*owner*. The tables are created by `$ORACLE_HOME/pfs/admin/catpfs.sql`.

Troubleshooting the Instance Monitor

If the instance monitor is not operating properly, then check the following items:

- Is the instance monitor running?

  The instance monitor runs on the primary and secondary nodes. Check for its existence by looking for the following message in the `pfs_$ORACLE_SERVICE_`*`host`*`.log`:

  ```
  Tue Jan 16 09:28:31 2001 PFS-2020: Info: Start monitor avmuprog SALES 5312
  ```

  There should be a child process for `avmuprog` called `avmumon`. Its process ID (PID) is `5312`. Check for its existence with the following command:

  ```
  $ ps -fu PFS_owner | grep avmumon
  ```

- Are the instance monitor tables in the database?

  Look for `pfs_up_$INSTANCE_NAME`, owned by *`owner`*. There should be 2 tables with 2 unique instance names. They are created by `$ORACLE_HOME/pfs/admin/catpfs.sql`.

- Are there error messages in the Oracle Real Application Clusters Guard log?

Troubleshooting the Listener Monitor

If the listener monitor is not operating properly, then check the following items:

- Is the `TNS_ADMIN` environment variable set correctly?

  Check the settings in the `$PFS_HOME/include/$ORACLE_SERVICE.env` and `$PFS_HOME/include/PFS_$ORACLE_SERVICE_`*`User`*`.def` files.

- Are the listener names correct?

  Check the `listener.ora` and `tnsnames.ora` files under the `$TNS_ADMIN` directory.

- Are the relocatable IP addresses enabled?

  Use the `netstat` UNIX command to check. For example, if your relocatable IP address is 139.185.141.55, make sure that you see an entry for it in the `netstat` output. Enter the following command:

  ```
  $ netstat -rn
  ```

  You should see output similar to the following:

```
Routing Table: IPv4
  Destination           Gateway           Flags  Ref   Use   Interface
-------------------- -------------------- ----- ----- ------ ---------
204.152.65.16        204.152.65.17         U         1    465  hme2
204.152.65.0         204.152.65.1          U         1    465  hme1
204.152.65.32        204.152.65.33         U         1    465  hme1:1
139.185.141.0        139.185.141.99        U         1   1200  hme0
139.185.141.0        139.185.141.106       U         1      0  hme0:6
139.185.141.0        139.185.141.105       U         1      0  hme0:5
139.185.141.0        139.185.141.55        U         1      0  hme0:7
224.0.0.0            139.185.141.99        U         1      0  hme0
default              139.185.141.1         UG        1   3117
127.0.0.1            127.0.0.1             UH        4 729224  lo0
```

See Also: Table 8–3 on page 8-21

- Does the listener monitor exist?

  For example, find the listener monitor PID in the `pfs_$ORACLE_SERVICE_host.log`:

  ```
  Mon Feb 12 16:02:42 2001 PFS-2020: Info: Start monitor avmlprog sales_hostA_LSNR 17878
  ```

  The listener monitor PID is `17878`.

  Enter the following command to find out whether the listener monitor exists:

  ```
  $ ps -ef | grep 17878
  ```

  You should see output similar to the following:

  ```
  root 17937 17878  0 16:02:42 ? 0:08 /bin/ksh ./avmlmon.sh sales_hostA_LSNR
  ```

- Are there error messages in the Oracle Real Application Clusters Guard log?

  For example, in the `pfs_SALES_hostA.log`:

  ```
  Mon Jan 15 13:29:00 2001 PFS-4037: Alert: Attempt to start listener monitor failed.
  ```

Troubleshooting the System Outside of the Packs

The packs cannot solve underlying performance or stability problems in the system. If such problems exist, then you must solve them outside of the packs. To troubleshoot outside of the packs, follow these steps:

1. Stop the packs. Enter the following command:

   ```
   PFSCTL> pfshalt
   ```

2. Enable the relocatable IP addresses and storage groups. See Table 8–3 on page 8-21.
3. Start the listeners that listen on the relocatable IP addresses.
4. Start the Oracle9*i* Real Application Clusters database.
5. Ensure that the instances are registered with the listeners.
6. Try to reproduce the problem to locate its source. Solve the problem.
7. Shut down the listeners.
8. Shut down the Oracle9*i* Real Application Clusters database.
9. Disable the relocatable IP addresses and storage groups. See Table 8–3 on page 8-21.
10. Start the packs. Enter the following command:

    ```
    PFSCTL> pfsboot
    ```

Table 8–3 shows how to enable and disable IP addresses and storage groups on the HP and Sun platforms.

Table 8–3 Enabling and Disabling IP Addresses and Storage Groups on HP and Sun Platforms

Action	HP Platform	Sun Platform

Enable IP address	`# cmmodnet -a -i IP_address IP_subnet`	**1.** List the available network interface:
		`# ifconfig IF:N IP_address up`
		IF is the interface (for example, `hme0`)
		N is an integer greater than 0
		2. Enable the IP address on the new interface:
		`# ifconfig IF addif IP_address netmask mask up`

Disable IP address	`# cmmodnet -r -i IP_address IP_subnet`	`# ifconfig IF removeif IP_address netmask mask down`
Enable storage group	`# vgchange -a s volume_group`	Done automatically by Sun Cluster Manager
Disable storage group	`# vgchange -s n volume_group`	Done automatically by Sun Cluster Manager

Example: Enabling an IP Address on the HP Platform

To enable 195.1.1.150 as a relocatable IP address, enter the following command:

```
# cmmodnet -a -i 195.1.1.150 195.1.1.0
```

Display the IP address by entering the following command:

```
$ netstat -in
```

You should see output similar to the following:

```
Name      Mtu     Network          Address          Ipkts    Opkts
lan2      1500    192.1.1.0        192.1.1.3        81859    40987
lan5:1    1500    195.1.1.0        195.1.1.150      0        0
lan0      1500    139.185.141.0    139.185.151.34   22782    23614
lo0       4136    127.0.0.0        127.0.0.1        30084    30084
lan5      1500    195.1.1.0        195.1.1.3        81855    40984
```

Example: Enabling an IP Address on the Sun Platform

To enable 144.25.27.74 as a relocatable IP address, enter the following command:

```
# ifconfig hme0:1 144.25.28.74 up
```

Display the IP addresses by entering the following command:

```
# ifconfig -a
```

You should see output similar to the following:

```
lo0: flags=1000849<UP,LOOPBACK,RUNNING,MULTICAST,IPv4> mtu 8232 index 1
        inet 127.0.0.1 netmask ff000000
hme0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 1500 index 2
        inet 144.25.28.70 netmask fffffc00 broadcast 144.25.31.255
hme0:1: flags=1000862<BROADCAST,NOTRAILERS,RUNNING,MULTICAST,IPv4> mtu 1500 ind2
        inet 144.25.28.74 netmask fffffc00 broadcast 144.25.31.255
hme1: flags=1008863<UP,BROADCAST,NOTRAILERS,RUNNING,MULTICAST,PRIVATE,IPv4> mtu3
        inet 204.152.65.1 netmask fffffff0 broadcast 204.152.65.15
hme1:1: flags=1008843<UP,BROADCAST,RUNNING,MULTICAST,PRIVATE,IPv4> mtu 1500 ind3
        inet 204.152.65.33 netmask fffffff0 broadcast 204.152.65.47
```

A

Oracle Real Application Clusters Guard Error Messages

Message Number Ranges

0xxx: Generic Messages
1xxx: Main Layer - Oracle Library Messages
2xxx: Main Layer - Internal Library Messages
3xxx: OSD Layer - Cluster Library Messages
4xxx: Pack Layer - Run and Halt Script Messages
5xxx: PFSCTL Command Line Messages
6xxx: Instance Monitor Messages
7xxx: Listener Monitor Messages
8xxx: Heartbeat Monitor Messages
9xxx: Internal Real Application Clusters Guard Process and Role Change Notification Messages
10xxx: PFSSETUP Messages

The message numbers have the PFS prefix.

Generic Messages: 0xxx

```
0001,  1,  "Alert: Incorrect number of arguments for %s."
 *Cause:  An incorrect number of parameters was passed to the function.
 *Action: Check the function interface and the parameters passed to it.
0002,  1,  "Alert: Invalid value specified for %s."
 *Cause:  An incorrect parameter value was passed to the function.
 *Action: Check the function interface and the parameters passed to it.
0003,  1,  "Alert: Specified log file does not exist or is not executable %s."
 *Cause:
 *Action: Check the existence of the file and its attributes.
0004,  1,  "Alert: System command %s failed."
 *Cause: Execution of the system command failed.
 *Action: Check the command format.
```

Main Layer - Oracle Library Messages: 1xxx

```
1000,  1,  "Alert: Failed to start ORACLE instance."
 *Cause:  Encountered errors when starting Oracle instance.
 *Action: Check INIT.ORA and database trace files.
1001,  1,  "Info: INSTANCE_ROLE is PRIMARY_INSTANCE."
1002,  1,  "Info: INSTANCE_ROLE is SECONDARY_INSTANCE."
1003,  1,  "Alert: Attempt to check INSTANCE_ROLE failed."
 *Cause:  Failed to obtain INSTANCE_ROLE from V$INSTANCE view.
 *Action: Check if ORACLE instance is up.
1004,  1,  "Alert: Attempt to abort instance failed."
 *Cause:  SHUTDOWN ABORT failed.
 *Action: Check if ORACLE instance is up. Check trace files.
1005,  1,  "Alert: Attempt to kill PMON using PID failed."
 *Cause:  Real Application Clusters Guard may have an incorrect PMON PID.
 *Action: Check if the process ID can be grepped using ps command.
1006,  1,  "Alert: INIT.ORA file %s does not exist."
 *Cause:  Specified INIT.ORA file does not exist.
 *Action: Check if the INIT.ORA file name is correct.
1007,  1,  "Warning: SHUTDOWN TRANSACTIONAL timed out."
 *Cause:  There might be some sessions still running.
 *Action: No action needed. Real Application Clusters Guard will issue
          SHUTDOWN ABORT.
1008,  1,  "Alert: Attempt to get PMON PID failed."
 *Cause: Using ps command to get PMON PID failed.
 *Action: Check if PMON exists and ORACLE_SID is correct.
1009,  1,  "Alert: Attempt to get background process %s PID failed."
 *Cause: Using ps command to get PID failed.
 *Action: Check if instance is up and ORACLE_SID is correct.
1010,  1,  "Alert: Attempt to kill background process %s failed."
 *Cause: Attempt to send signal 9 to background process failed.
 *Action: Check if instance is up. Check its trace files.
1011,  1,  "Info: Network status has been dumped to %s."
1012,  1,  "Info: Local and remote ORACLE systemstates dumped to USER_DUMP_DEST."
1013,  1,  "Info: Local ORACLE systemstate dumped to USER_DUMP_DEST."
1014,  1,  "Info: Remote ORACLE systemstate dumped to USER_DUMP_DEST."
1015,  1,  "Info: Local instance is down and no systemstate dump is performed on either
instance."
```

Main Layer - Internal Library Messages: 2xxx

```
2000,  1,  "Info: User-defined callhome script %s is not provided."
 *Cause:  The callhome script does not exist or it is not executable.
 *Action: Check with user.
2001,  1,  "Warning: The message number is incorrect."
 *Cause:  An incorrect message number was passed to the log function.
 *Action: Check the message number.
2002,  1,  "Info: User-defined role notification script is not provided: %s %s %s %s %s."
 *Cause:  Either it does not exist or it is not executable.
 *Action: Check with user.
```

```
2003,  1,  "Info: Attempt to start internal Real Application Clusters Guard process on
primary instance."
2004,  1,  "Info: Attempt to start internal Real Application Clusters Guard process on
secondary instance."
2005,  1,  "Info: Attempt to stop internal Real Application Clusters Guard process."
2006,  1,  "Info: Attempt to restart succeeded."
2007,  1,  "Info: Attempt to restart failed."
2008,  1,  "Alert: Attempt to kill internal Real Application Clusters Guard process %s
failed."
 *Cause: Attempt to send signal 9 to internal Real Application Clusters Guard process
         failed.
 *Action: Check the attributes of the corresponding script.
2009,  1,  "Info: Attempt to stop local internal Real Application Clusters Guard process."
2010,  1,  "Info: Attempt to stop remote internal Real Application Clusters Guard
process."
2011,  1,  "Info: Attempt to stop internal Real Application Clusters Guard process
succeeded."
2012,  1,  "Info: User-defined role notification script succeeded."
2013,  1,  "Warning: User-defined role notification script failed."
2014,  1,  "Warning: User-defined role notification script exists but is not executable."
2015,  1,  "Info: Attempt to stop process %s succeeded."
2016,  1,  "Warning: Attempt to stop process %s failed."
2017,  1,  "Info: Start cleanup of Real Application Clusters Guard processes."
2018,  1,  "Warning: Internal Real Application Clusters Guard process exists. Do PFSCTL
RESTORE after it finishes."
 *Cause: .
 *Action: Check status to make sure internal Real Application Clusters Guard process has
finished, and do RESTORE later.
2019,  1,  "Info: Real Application Clusters Guard callhome with %s now."
2020,  1,  "Info: Start monitor %s %s %s."
2021,  1,  "Info: Calling user-defined role change notification script: %s."
```

OSD Layer - Cluster Library Messages: 3xxx

```
3000,  1,  "Info: Pack %s started"
3001,  1,  "Info: Pack %s stopped"
3002,  1,  "Info: Local database instance is up"
3003,  1,  "Info: Local database instance is down"
3004,  1,  "Info: Remote database instance is up"
3005,  1,  "Info: Remote database instance is down"
3006,  1,  "Info: Running primary role locally"
3007,  1,  "Info: Running secondary role locally"
3008,  1,  "Info: No role running locally"
3009,  1,  "Info: Running primary role on remote node"
3010,  1,  "Info: Running secondary role on remote node"
3011,  1,  "Info: No role running on remote node"
3012,  1,  "Info: Cluster is up"
3013,  1,  "Info: Local node part of the cluster"
3014,  1,  "Info: Remote node part of the cluster"
```

```
3015,  1,  "Info: Pack %s is not running on either node"
3050,  1,  "Alert: Could not get information about pack %s."
 *Cause:
 *Action: Check pack and cluster status.
3051,  1,  "Alert: Could not get information about local database instance."
 *Cause:
 *Action: Check local instance status.
3052,  1,  "Alert: Could not get information about remote database instance."
 *Cause:
 *Action: Check remote instance status.
3053,  1,  "Alert: Could not get information about local database role."
 *Cause:
 *Action: Check local instance status.
3054,  1,  "Alert: Could not get information about remote database role."
 *Cause:
 *Action: Check remote instance status.
3055,  1,  "Alert: Neither node is running as part of the cluster."
 *Cause:
 *Action: Check cluster and node status.
3056,  1,  "Alert: Local node not part of the cluster."
 *Cause:
 *Action: Check cluster and node status.
3057,  1,  "Alert: Remote node not part of the cluster."
 *Cause:
 *Action: Check cluster and node status.
3058,  1,  "Alert: SUN data service not registered."
 *Cause:
 *Action: Check cluster status.
3059,  1,  "Alert: Node %s is either physically down or not part of the cluster."
 *Cause:
 *Action: Check node and/or cluster status.
3060,  1,  "Alert: Node %s is not configured to be part of the cluster."
 *Cause:
 *Action: Check cluster status.
3061,  1,  "Alert: Pack %s is not configured to run on the cluster."
 *Cause:
 *Action: Check cluster status.
3062,  1,  "Alert: Cluster is not running."
 *Cause: The cluster is not running.
 *Action: Check cluster status.
3063,  1,  "Alert: Cluster command failed: %s %s."
 *Cause: Cluster-related command returned an error.
 *Action: Check cluster log file.
3064,  1,  "Info: Service %s has already been stopped."
3065,  1,  "Alert: Failed to stop the service that restarts the service program."
 *Cause: Failed to stop service that restarts the service program.
 *Action: Check cluster log file.
3066,  1,  "Alert: Attempt to halt service %s failed."
 *Cause: Attempt to stop service returned an error.
 *Action: Check Real Application Clusters Guard log file and cluster log file.
```

```
3067,  1,  "Alert: Wrong pack name: %s. Pack is not registered or does not exist."
 *Cause: Pack name was incorrect or the pack has not been registered yet.
 *Action: Check cluster pack status.
3068,  1,  "Alert: Failed to give up pack: %s."
 *Cause: Failed to stop pack on this node.
 *Action: Check Real Application Clusters Guard log and cluster log files.
3069,  1,  "Info: Pack %s is not running on any node"
3070,  1,  "Info: Internal process is running locally"
3071,  1,  "Info: Internal process is running remotely"
3072,  1,  "Info: No internal process is running locally"
3073,  1,  "Info: No internal process is running remotely"
3074,  1,  "Alert: Give up pack cluster command timed out"
 *Cause:  Attempt to give up pack returned an error.
 *Action: Check cluster system log.
3075,  1,  "Alert: Cluster is running."
 *Cause:  The cluster is running.
 *Action: Check cluster status.
```

Pack Layer - Run and Halt Script Messages: 4xxx

```
4000,  1,  "Alert: Attempt to enable IP address failed."
 *Cause:  Attempt to enable IP address returned an error.
 *Action: Check if the IP address is correct or if that IP has been enabled.
4001,  1,  "Alert: Attempt to disable pack switch failed."
 *Cause:  Attempt to disable pack switch returned an error.
 *Action: Check if the pack name is correct and the status of pack.
4002,  1,  "Alert: Attempt to acquire disk storage failed."
 *Cause:  Attempt to acquire disk storage returned an error.
 *Action: Check disk storage names and status.
4003,  1,  "Alert: Attempt to enable pack switch failed."
 *Cause:  Attempt to enable pack switch returned an error.
 *Action: Check if the pack name is correct and the status of the pack.
4004,  1,  "Info: Run script on home node completed."
4005,  1,  "Info: Pack %s starting on home node."
4006,  1,  "Info: Pack %s starting on foreign node."
4007,  1,  "Info: Pack %s stopping on home node."
4008,  1,  "Info: Pack %s stopping on foreign node."
4009,  1,  "Alert: Attempt to release disk storage failed."
 *Cause:  Attempt to release storage returned an error.
 *Action: Check disk storage names and status.
4010,  1,  "Info: Attempt to initialize all variables."
4011,  1,  "Info: Attempt to enable IP address."
4012,  1,  "Info: Attempt to acquire disk storage."
4013,  1,  "Info: Attempt to start public listener monitor and public listener %s."
4014,  1,  "Info: Attempt to start database instance."
4015,  1,  "Info: Attempt to start instance monitor."
4016,  1,  "Info: Attempt to check INSTANCE_ROLE."
4017,  1,  "Info: Attempt to start heartbeat monitor."
4018,  1,  "Info: Attempt to enable pack switching."
```

```
4019,  1,  "Info: Attempt to send notification that instance role has changed."
4020,  1,  "Info: Attempt to start DBMS_JOBS."
4021,  1,  "Info: Run script on foreign node completed."
4022,  1,  "Info: Attempt to disable IP address."
4023,  1,  "Info: Halt script on foreign node completed."
4024,  1,  "Info: Attempt to release disk storage."
4025,  1,  "Info: Attempt to halt public listener monitor and public listener %s."
4026,  1,  "Info: Attempt to abort database."
4027,  1,  "Info: Attempt to archive, checkpoint, and dump database."
4028,  1,  "Info: Attempt to halt instance monitor."
4029,  1,  "Info: Attempt to halt heartbeat monitor."
4030,  1,  "Info: Halt script on home node completed."
4031,  1,  "Alert: Attempt to disable IP address failed."
 *Cause:  Attempt to disable IP address returned an error.
 *Action: Check if the IP address is correct or whether it has been disabled.
4032,  1,  "Info: Check if ACTIVE_INSTANCE_COUNT is set to 1."
4033,  1,  "Alert: ACTIVE_INSTANCE_COUNT is not set to 1."
 *Cause:
 *Action: Check INIT.ORA file to make sure ACTIVE_INSTANCE_COUNT=1.
4034,  1,  "Alert: Attempt to start instance monitor failed."
 *Cause:  Starting instance monitor returned an error.         .
 *Action: Check if Oracle instance is up. Check cluster log files.
4035,  1,  "Alert: Attempt to stop instance monitor failed."
 *Cause:  Attempt to stop instance monitor returned an error.
 *Action: Check if Oracle instance is up. Check cluster log files.
4036,  1,  "Alert: Instance monitor detected that the instance is down and initiated
failover."
 *Cause:  Instance monitor service exited.
 *Action: Check if Oracle instance is up.
4037,  1,  "Alert: Attempt to start listener monitor failed."
 *Cause:  Starting listener monitor returned an error. The listener may not be up.
 *Action: Check listener and LISTENER.ORA listener configuration file.
4038,  1,  "Alert: Attempt to stop listener monitor failed."
 *Cause:  Stopping listener monitor returned an error.
 *Action: Check listener and cluster log files.
4039,  1,  "Alert: Attempt to start heartbeat monitor failed."
 *Cause:  Starting the heartbeat monitor returned an error. The instance and listener may
          not be up.
 *Action: Check instance, listener, and cluster log files.
4040,  1,  "Alert: Attempt to stop heartbeat monitor failed."
 *Cause:  Stopping heartbeat monitor returned an error.
 *Action: Check cluster log files.
```

PFSCTL Command Line Messages: 5xxx

```
5002,  1,  "PFSCTL BOOTONE succeeded."
5003,  1,  "PFSCTL HALTONE succeeded."
5005,  1,  "Secondary role already up."
5006,  1,  "Update uptime log."
```

```
5007,  1,  "PFSCTL PFSBOOT succeeded."
5008,  1,  "PFSCTL PFSHALT succeeded."
5009,  1,  "Archiving the database now."
5010,  1,  "Checkpointing the database now."
5011,  1,  "The following commands are available:"
5012,  1,  "Welcome to PFSCTL. Type HELP for additional information."
5013,  1,  "ORACLE_SERVICE is set to %s"
5014,  1,  "Processing command %s."
5015,  1,  "%s command succeeded."
5016,  1,  "[seconds]"
5017,  1,  "[beginning date]"
5018,  1,  "[ending date]"
5019,  1,  "[pack name]"
5050,  1,  "Alert: PFSCTL BOOTONE failed."
   *Cause:  Attempt to start single pack failed.
   *Action: Check Real Application Clusters Guard log files.
5051,  1,  "Alert: PFSCTL HALTONE failed."
   *Cause:  Attempt to stop single pack failed.
   *Action: Check Real Application Clusters Guard log files.
5052,  1,  "Alert: Attempt to stop internal Real Application Clusters Guard process
failed."
   *Cause:  Attempt to send signal 9 to internal Real Application Clusters Guard process
            failed.
   *Action: Check the attribute of the corresponding script.
5053,  1,  "Warning: Secondary node not up."
   *Cause:  Could not find secondary node.
   *Action: Use cluster commands to check nodes in the cluster.
5054,  1,  "Info: Secondary running on foreign node."
5055,  1,  "Alert: PFSCTL MOVE_PRIMARY failed."
   *Cause:  SHUTDOWN TRANSACTIONAL on primary failed. Pack failover failed.
   *Action: Check database trace files and Real Application Clusters Guard log
            files.
5056,  1,  "Info: Primary pack moved. No longer resilient."
5057,  1,  "Warning: No primary pack."
   *Cause:  Cannot find a pack whose instance role is primary.
   *Action: Check pack status and roles of all instances.
5059,  1,  "Warning: Instance up without pack."
   *Cause:  Instance is running without pack.
   *Action: Check if DBA is running the instance for maintenance purposes.
5060,  1,  "Alert: Attempt to stop pack failed."
   *Cause:  Attempt to stop returned an error.
   *Action: Check Real Application Clusters Guard log files and cluster log files.
5061,  1,  "Alert: PFSCTL RESTORE failed."
   *Cause:  Attempt to start secondary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5062,  1,  "Warning: Secondary pack not up."
   *Cause:
   *Action:
5063,  1,  "Alert: Attempt to stop secondary failed."
```

```
   *Cause:  Attempt to stop secondary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5064,  1,  "Alert: Attempt to start primary failed."
   *Cause:  Attempt to start primary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5065,  1,  "Alert: Attempt to start secondary failed."
   *Cause:  Attempt to start secondary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5066,  1,  "Alert: Attempt to halt primary failed."
   *Cause:  Attempt to stop primary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5067,  1,  "Alert: Attempt to halt secondary failed."
   *Cause:  Attempt to stop secondary pack failed.
   *Action: Check Real Application Clusters Guard log files.
5068,  1,  "Warning: Secondary role is not up."
   *Cause: Cannot find SECONDARY_ROLE instance.
   *Action: Check both instances.
5071,  1,  "Info: System is clear."
5072,  1,  "Alert: Attempt to stop internal Real Application Clusters Guard process
failed."
   *Cause:  Attempt to send signal 9 to internal Real Application Clusters Guard process
            failed.
   *Action: Check the attribute of the corresponding script.
5073,  1,  "Alert: System is not clear. Instance %s is running. Use PFSCTL PFSHALT first."
   *Cause:  Instance is running.
   *Action: Stop instance before starting Real Application Clusters Guard.
5074,  1,  "Alert: System is not clear. Pack %s is running. Use PFSCTL PFSHALT first."
   *Cause:  Pack is running.
   *Action: Stop packs first before starting Real Application Clusters Guard.
5075,  1,  "Alert: System is not clear. Internal process is running. Use PFSCTL PFSHALT
first."
   *Cause:  Internal Real Application Clusters Guard process is running.
   *Action: Stop the internal process before starting Real Application Clusters Guard.
5076,  1,  "Alert: Failed to start pack %s on its foreign node."
   *Cause:  Start a pack on its foreign node failed.
   *Action: Check Real Application Clusters Guard log files.
5077,  1,  "Alert: Invalid command. Try again."
   *Cause:  This is not a valid PFSCTL command.
   *Action: Type HELP for correct commands.
5078,  1,  "Alert: ORACLE_SERVICE is not set. Set it and run PFSCTL again."
   *Cause:  The environment variable ORACLE_SERVICE is not set.
   *Action: Set it and run PFSCTL again.
5079,  1,  "Alert: DB_NAME is not set. Set it and run PFSCTL again."
   *Cause:  The environment variable DB_NAME is not set.
   *Action: Set it and run PFSCTL again.
5080,  1,  "Alert: %s command failed."
   *Cause:  PFSCTL command failed.
   *Action: Check Real Application Clusters Guard log files.
5081,  1,  "Alert: ORACLE_SERVICE is not set properly."
   *Cause:  The ORACLE_SERVICE environment variable is not set correctly.
```

```
   *Action: Check if its value is correct.
5555,  1,  "%s %s %s %s %s"
   *Cause: This is the Uptime Log Report message.
   *Action:
5556,  1,  "Oracle service: %s"
5557,  1,  "Report time interval: %s -- %s"
5558,  1,  "Itemized downtime information:"
5559,  1,  "Downtime Failed Downtime Recovered Interval"
5560,  1,  "Start Node End Node (hh:mm:ss)"
5561,  1,  "Planned downtime"
5562,  1,  "Unplanned downtime"
5563,  1,  "Downtime summary:"
5564,  1,  "Availability for this interval: %s%%"
5565,  1,  "Total planned downtime: %s (%s seconds)"
5566,  1,  "Total unplanned downtime: %s (%s seconds)"
5567,  1,  "Total downtime: %s (%s seconds)"
5568,  1,  "[-f filename] [-d yyyy/mm/dd-hh:mm:ss] [-s]"
5600,  1,  "Info: Checking if PFSCTL MOVE_PRIMARY finished."
5601,  1,  "Info: PFSCTL MOVE_PRIMARY completed successfully."
5602,  1,  "Alert: PFSCTL MOVE_PRIMARY failed to finish within timer."
5603,  1,  "Info: Wait for internal process to finish before issuing PFSCTL RESTORE."
```

Instance Monitor Messages: 6xxx

```
6000,  1, "Info: Instance monitor stopped monitoring."
6001,  1, "Alert: Instance monitor failed to start routine 0."
   *Cause:  Attempt to create a new process failed.
   *Action: Check system status.
6002,  1, "Info: Attempt to start routine 1."
6003,  1, "Warning: Routine 1 exits. Attempt to stop routine 0."
   *Cause:  Routine 0 died or instance was down.
   *Action: Real Application Clusters Guard will automatically restart
            both routines if instance is not down or start failover if instance is down.
6004,  1, "Info: Attempt to start routine 0."
6005,  1, "Alert: Instance monitor has tried restarting MAX_ORACLE_UP_RETRIES times."
   *Cause:  Instance monitor has restarted Routines 0 and 1 too many times.
   *Action: Check instances and Real Application Clusters Guard log files.
6006,  1, "Alert: ORACLE instance is not available. Instance monitor exits."
   *Cause:  Instance was down.
   *Action: Real Application Clusters Guard will initiate a failover.
6007,  1, "Info: Routine connected successfully."
6008,  1, "Info: Routine got INSTANCE_NAME successfully."
6009,  1, "Info: Routine checked lock table successfully."
6010,  1, "Alert: Routine found lock table missing."
   *Cause:  Missing critical Real Application Clusters Guard tables.
   *Action: Run catpfs.sql.
6011,  1, "Info: Routine 0 locked table. Routine now sleeping."
6012,  1, "Info: Stopped shadow process."
6013,  1, "Alert: Routine 0 failed to lock table. Routine exited."
```

```
   *Cause:  Routine 0 (update table) failed.
   *Action: Check instance status.
6014,  1, "Info: Routine connecting to instance."
6015,  1, "Info: Routine connected to instance successfully."
6016,  1, "Alert: Routine failed to connect to instance."
   *Cause:  Routine failed to connect to instance as normal user.
   *Action: Check instance status.
6017,  1, "Info: Routine disconnected successfully."
6018,  1, "Alert: Routine failed to disconnect."
   *Cause:  Routine failed to disconnect from an instance.
   *Action: Check instance status.
6019,  1, "Info: Routine does not need cleanup."
6020,  1, "Alert: Failed to stop routine 0."
   *Cause:  Attempt to send signal 9 to Routine 0 failed.
   *Action: Check Routine 0 status.
6021,  1, "Alert: Failed to set up signal handlers."
   *Cause:
   *Action: Check system status.
6022,  1, "Alert: Failed to stop shadow processes."
   *Cause:  Send signal 9 to shadow process failed.
   *Action: Check shadow process status.
6023,  1, "Alert: Attempt to CONNECT as normal user timed out."
   *Cause:
   *Action: Check instance status.
6024,  1, "Alert: Attempt to CONNECT as SYSDBA timed out."
   *Cause:
   *Action: Check instance status.
6025,  1, "Alert: Attempt to UPDATE timed out."
   *Cause:
   *Action: Check instance status.
6026,  1, "Alert: Attempt to SELECT timed out."
   *Cause:
   *Action: Check instance status.
6027,  1, "Alert: Attempted action timed out."
   *Cause:
   *Action: Check instance status.
```

Listener Monitor Messages: 7xxx

```
7000,  1,  "Warning: Listener %s has been restarted too many times. Listener will not be
restarted."
   *Cause:  The listener has been restarted multiple times, but it
            keeps failing. The monitor is not monitoring it now.
   *Action: Check the listener.
7001,  1,  "Info:  Attempt to start private listener monitor and private listener %s."
7002,  1,  "Alert: Attempt to start and monitor private listener %s failed."
   *Cause:  Starting private listener monitor returned an error.
   *Action: Check the listener and cluster log files.
7003,  1,  "Info: Attempt to halt private listener monitor and private listener %s."
```

```
7004,  1,  "Alert: Attempt to stop private listener %s failed."
   *Cause:  Stopping listener using LSNRCTL STOP failed.
   *Action: Check the listener.
7005,  1,  "Alert: Attempt to start listener %s failed."
   *Cause:  Starting listener using LSNRCTL START failed.
   *Action: Check the listener.
7006,  1,  "Info: Elapsed time exceeds MIN_LSNR_RESTART_INTERVAL; resetting listener
restart counter."
7007,  1,  "Warning: Incrementing listener restart counter to %s."
   *Cause:  Listener has been restarted recently.
   *Action: Check the listener.
7008,  1,  "Info: Attempt to start listener %s succeeded."
7009,  1,  "Info: Private listener %s restarted."
7010,  1,  "Info: Private listener %s failed again."
7011,  1,  "Alert: Listener monitor for %s terminated abnormally. No failover."
   *Cause:  Private listener monitor exits.
   *Action: Real Application Clusters Guard will keep monitor listener on but will not
            restart listener.
```

Heartbeat Monitor Messages: 8xxx

```
8000,  1,  "Warning: Defunct heartbeat monitor %s exists."
   *Cause:  A heartbeat monitor was found before starting heartbeat monitor.
            This may be a heartbeat monitor that was running before an
            abnormal exit or abort.
   *Action: Old heartbeat monitor will be stopped and a new one will be started.
8001,  1,  "Info: Instance %s is registered with %s."
8002,  1,  "Warning: Instance %s is not registered with %s."
   *Cause:  Checked listener status and found instance was not
            registered with listener.
   *Action: No action is needed. Real Application Clusters Guard will
            keep checking it for a specific time interval.
8003,  1,  "Info: Shared server service %s is registered with %s."
8004,  1,  "Warning: Shared server service %s is not registered with %s."
   *Cause:  Checked listener status and found instance was not
            registered with listener.
   *Action: No action is needed. Real Application Clusters Guard will
            keep checking it for a specific time interval.
8005,  1,  "Alert: Shared server service or instance %s not registered with %s in %s
seconds. Exit."
   *Cause:  Instance not registered with listener for too long time.
   *Action: Check INIT.ORA file and Oracle Net configuration file.
8006,  1,  "Info: Check if %s is registered with %s."
8007,  1,  "Info: Elapsed time exceeds heartbeat monitor time-out interval. Resetting
heartbeat monitor restart counter."
8008,  1,  "Warning: Heartbeat monitor timed out %s times. Restart heartbeat monitor."
   *Cause:  Heartbeat monitor recently timed out.
   *Action: Check Real Application Clusters Guard log files and instance status.
8009,  1,  "Alert: Heartbeat monitor timed out %s times. Exit."
```

```
   *Cause:  Heartbeat monitor recently timed out too many times.
   *Action: Real Application Clusters Guard initiates failover.
8010,  1,  "Info: Too many local fatal errors. Resetting heartbeat monitor local-fatal
counter."
8011,  1,  "Warning: Heartbeat monitor reports local fatal error %s times. Restarting
heartbeat monitor."
   *Cause:  Heartbeat monitor recently got local fatal error.
   *Action: Check local instance and Real Application Clusters Guard log file.
8012,  1,  "Alert: Heartbeat monitor reports local fatal error %s times. Exit."
   *Cause:  Heartbeat monitor recently got local fatal error too many times.
   *Action: Real Application Clusters Guard initiates failover.
8013,  1,  "Warning: Heartbeat monitor detects remote fatal error."
   *Cause:
   *Action:
8014,  1,  "Info: Too many remote fatal errors. Resetting heartbeat monitor remote-fatal
counter."
8015,  1,  "Warning: Heartbeat monitor reports remote fatal error %s times. Restarting
heartbeat monitor."
   *Cause:  Heartbeat monitor recently detected remote side fatal.
   *Action: Check remote instance and Real Application Clusters Guard log file
            on that node.
8016,  1,  "Alert: Heartbeat monitor reports remote fatal error %s times. Initiating
takeover."
   *Cause:  Heartbeat monitor recently detected remote fatal error too many
            times.
   *Action: Check secondary instance status.
8017,  1,  "Info: Attempt to initiate primary takeover from node %s to this node."
8018,  1,  "Info: Primary instance receives remote fatal error. No action taken."
8019,  1,  "Warning: Remote fatal error detected with role = UNKNOWN. No action taken."
   *Cause:  Current node detected remote fatal error but did not know its own role.
   *Action: Check local instance role.
8020,  1,  "Info: Too many tool errors. Resetting heartbeat monitor tool-error counter."
8021,  1,  "Warning: Heartbeat monitor reports tool error %s times. Restarting heartbeat
monitor."
   *Cause:  Heartbeat monitor recently detected tool errors.
   *Action: Check local system status.
8022,  1,  "Alert: Heartbeat monitor reports tool error %s times. Exit."
   *Cause:  Heartbeat monitor recently detected tool errors too many times.
   *Action: Check local system status.
8023,  1,  "Info: Too many heartbeat monitor errors during specified interval. Resetting
heartbeat monitor any-error counter."
8024,  1,  "Warning: Heartbeat monitor reports %s total errors of all kinds. Restarting
heartbeat monitor."
   *Cause:  Heartbeat monitor recently detected too many errors of all kinds.
   *Action: Check Real Application Clusters Guard log files.
8025,  1,  "Alert: Heartbeat monitor reports %s errors. Exit."
   *Cause:  Heartbeat monitor recently detected errors too many times.
   *Action: Check Real Application Clusters Guard log files.
8026,  1,  "Alert: Heartbeat monitor detects failure. Initiating failover."
   *Cause:  Heartbeat monitor detected failure.
```

```
   *Action: Check Real Application Clusters Guard log files.
8027,  1,  "Info: Defunct heartbeat monitor %s was stopped."
8028,  1,  "Alert: Attempt to stop defunct heartbeat monitor %s failed."
   *Cause:  Attempt to send signal 9 to it failed.
   *Action: Check heartbeat monitor status and system status.
8029,  1,  "Info: Attempt to start heartbeat monitor with parameters %s %s %s."
8030,  1,  "Warning: Heartbeat monitor exits with error code %s."
   *Cause:  Heartbeat monitor detected errors with instance.
   *Action: Check instance, heartbeat monitor, and system status.
8500,  1,  "Info: Oracle Real Application Clusters Guard: Heartbeat Monitor v90100."
8501,  1,  "Info: Ramp-up flag is set ON."
8502,  1,  "Info: Ramp-up flag is set OFF."
8503,  1,  "Info: Heartbeat monitor started. Check PFS$ORAPING_HEARTBEAT view."
8504,  1,  "Alert: Failed to CONNECT while getting initial heartbeat."
   *Cause:
   *Action: Check instance status.
8505,  1,  "Alert: Failed to SELECT while getting initial heartbeat."
   *Cause:
   *Action: Check instance status.
8506,  1,  "Alert: Failed to DISCONNECT while getting initial heartbeat."
   *Cause:
   *Action: Check instance status.
8507,  1,  "Alert: Cannot CONNECT to local instance as normal user."
   *Cause:
   *Action: Check instance status.
8508,  1,  "Alert: Cannot CONNECT to local instance as SYSDBA."
   *Cause:
   *Action: Check instance status.
8509,  1,  "Alert: Cannot SELECT from ORAPING_HEARTBEAT table."
   *Cause:
   *Action: Check instance status.
8510,  1,  "Alert: Cannot UPDATE ORAPING_HEARTBEAT table."
   *Cause:
   *Action: Check instance status.
8511,  1,  "Alert: Cannot SELECT from ORAPING_HEARTBEAT table."
   *Cause:
   *Action: Check instance status.
8512,  1,  "Alert: Cannot EXECUTE customer query."
   *Cause:  Executing PL/SQL package failed.
   *Action: Check instance status and PL/SQL package status.
8513,  1,  "Alert: Cannot check for instance recovery."
   *Cause:  SELECT from V$LOCK view failed.
   *Action: Check instance status.
8514,  1,  "Alert: Cannot check for logon storm."
   *Cause:  SELECT from V$SESSION view failed.
   *Action: Check instance status.
8515,  1,  "Alert: Cannot DISCONNECT from instance."
   *Cause:
   *Action: Check instance status.
```

```
8516,  1,  "Alert: Cannot enable SQL tracing."
   *Cause:  Attempt to set event failed.
   *Action: Check instance status.
8517,  1,  "Alert: Local fatal error."
   *Cause:
   *Action: Check local instance status.
8518,  1,  "Alert: Remote fatal error."
   *Cause:
   *Action: Check remote instance status.
8519,  1,  "Info: In ramp-up mode. Ignore all errors."
8520,  1,  "Alert: Neither primary nor secondary flag is set."
   *Cause:  Primary and secondary role flag files are missing.
   *Action: Check them in corresponding directory.
8521,  1,  "Alert: PFS_HOME and ORACLE_SERVICE are not set."
   *Cause:  Environment variables are not set.
   *Action: Set them.
8522,  1,  "Alert: CONNECT as normal user timed out."
   *Cause:
   *Action: Check instance status.
8523,  1,  "Alert: CONNECT as SYSDBA timed out."
   *Cause:
   *Action: Check instance status.
8524,  1,  "Alert: SELECT from ORAPING_CONFIG table timed out."
   *Cause:
   *Action: Check instance status.
8525,  1,  "Alert: UPDATE ORAPING_HEARTBEAT table timed out."
   *Cause:
   *Action: Check instance status.
8526,  1,  "Alert: SELECT from ORAPING_HEARTBEAT table timed out."
   *Cause:
   *Action: Check instance status.
8527,  1,  "Alert: SELECT from partner's ORAPING_HEARTBEAT table timed out."
   *Cause:
   *Action: Check instance status.
8528,  1,  "Alert: EXECUTE customer query timed out."
   *Cause:
   *Action: Check instance status.
8529,  1,  "Alert: Check for instance recovery timed out."
   *Cause:
   *Action: Check instance status.
8530,  1,  "Alert: Check for logon storm timed out."
   *Cause:
   *Action: Check instance status.
8531,  1,  "Alert: Enable SQL tracing timed out."
   *Cause:
   *Action: Check instance status.
8532,  1,  "Alert: Other time-out."
   *Cause:
   *Action: Check instance status.
8533,  1,  "Info: No cleanup is needed for shadow processes."
```

```
8534,  1,  "Alert: Check for logon storm failed."
   *Cause:
   *Action: Check instance status.
8535,  1,  "Alert: DECLARE cursor failed."
   *Cause:
   *Action: Check instance status.
8536,  1,  "Alert: OPEN cursor failed."
   *Cause:
   *Action: Check instance status.
8537,  1,  "Alert: FETCH cursor failed."
   *Cause:
   *Action: Check instance status.
8538,  1,  "Alert: CLOSE cursor failed."
   *Cause:
   *Action: Check instance status.
8539,  1,  "Alert: Partner failed to update its heartbeat."
   *Cause:
   *Action: Check instance status.
8540,  1,  "Alert: SELECT from partner's ORAPING_HEARTBEAT table failed."
   *Cause:
   *Action: Check instance status.
8541,  1,  "Alert: EXECUTE customer query failed."
   *Cause:
   *Action: Check instance status.
8542,  1,  "Alert: Cannot open heartbeat monitor's log file."
   *Cause:
   *Action: Check system and directory status.
8543,  1,  "Alert: ORACLE_HOME and/or ORACLE_SERVICE is not set."
   *Cause:  Environment variables are not set.
   *Action: Set them.
8544,  1,  "Warning: Failed to stop shadow processes."
   *Cause:  Attempt to send signal 9 to shadow process failed.
   *Action: Check shadow process and system status.
8545,  1,  "Warning: Instance recovery is in progress."
   *Cause:
   *Action:
8546,  1,  "Warning: System is in logon storm."
   *Cause:  Number of new sessions logged on in last heartbeat monitor cycle
            exceeds logon_storm_threshold.
   *Action: Check database instance status and PFS$ORAPING_CONFIG view.
8547,  1, "Warning: Failed to update ORAPING_CONFIG table to synchronize time out values."
   *Cause:  Updating the ORAPING_CONFIG table to synchronize time-out values failed"
   *Action: Check database error messages.
```

Internal Real Application Clusters Guard Process and Role Change Notification Messages: 9xxx

```
9000,  1,  "Info: Failover and role change succeeded."
9001,  1,  "Alert: Role change failed. Restarting instance."
```

```
   *Cause:  Primary role did not fail over correctly.
   *Action: Check remote instance and node.
9002,  1,  "Alert: Role change failed. Will not restart instance."
   *Cause:  Recently restarted. Will not restart again.
   *Action: Check instance and node status.
9003,  1,  "Alert: No resilience. Restarting instance."
   *Cause:  Secondary pack does not exist.
   *Action: No action is needed.
9004,  1,  "Alert: Instance running without pack. Do not restart instance."
   *Cause:  Instance was started without pack by DBA for maintenance purpose.
   *Action: Do nothing.
9005,  1,  "Alert: No resilience. Will not restart instance."
   *Cause:  Secondary pack does not exist and this node recently restarted
            instance.
   *Action: Check local instance.
9006,  1,  "Info: Pack failed over successfully to the other node."
9007,  1,  "Alert: Pack did not fail over to the other node. Will restart the pack."
   *Cause:  Pack did not failover.
   *Action: Pack will be restarted on its foreign node.
9008,  1,  "Info: Primary role failed over successfully."
9009,  1,  "Info: Restarting instance."
9010,  1,  "Alert: Primary role did not fail over. Will not restart instance."
   *Cause:  Instance role change failed.
   *Action: Check both instances.
/
9900,  1,  "Info: Attempt to start role change notification."
9901,  1,  "Alert: Attempt to start role change notification failed."
   *Cause:  Starting role change notification returned an error.
   *Action: Check instance and cluster status.
9902,  1,  "Info: Attempt to stop role change notification."
9903,  1,  "Alert: Attempt to stop role change notification failed."
   *Cause:  Stopping role change notification returned an error.
   *Action: Check instance and cluster status.
9904,  1,  "Info: Secondary instance had a reconfiguration event or timed out."
9905,  1,  "Info: Secondary instance waits for reconfiguration event again."
```

PFSSETUP Messages: 10xxx

```
10001,  1,  "Do you wish to continue? [Y/N] "
10002,  1,  "ORACLE_HOME is set to %s"
10003,  1,  "ORACLE_BASE is set to %s"
10004,  1,  "TNS_ADMIN is set to %s"
10005,  1,  "PFS_HOME is set to %s"
10006,  1,  "Choose the set of files from the following:"
10007,  1,  "2] ORACLE Real Application Clusters Guard files"
10008,  1,  "3] ORACLE network files"
10009,  1,  "4] ORACLE instance files"
10010,  1,  "5] ORACLE network and instance files"
10011,  1,  "6] All the files"
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10012,  1,  "7] Quit"
10013,  1,  "Choose an operation on the selected files:"
10014,  1,  "1] Generate only"
10015,  1,  "2] Deploy only"
10016,  1,  "3] Generate and deploy"
10017,  1,  "5] List the affected files"
10018,  1,  "6] Return to Main Menu"
10019,  1,  "Press Enter to continue."
10020,  1,  "Packs already configured. Run DELETEPACKS first."
10021,  1,  "Deploying user file."
10022,  1,  "Changing ownership and file permissions."
10023,  1,  "Generating Packs."
10024,  1,  "Generating ORACLE Real Application Clusters Guard files."
10025,  1,  "Generating ORACLE network files."
10026,  1,  "Generating ORACLE instance files."
10027,  1,  "Backing up %s directory on %s."
10028,  1,  "Deploying files."
10029,  1,  "Deploying ORACLE Real Application Clusters Guard files."
10030,  1,  "Deploying ORACLE network files."
10031,  1,  "Deploying ORACLE instance files."
10032,  1,  "DB_NAME is set to %s"
10033,  1,  "The list of affected files is \n "
10034,  1,  "1] User definitions file"
10035,  1,  "This utility should be run under root privileges."
10036,  1,  "4] Deinstall"
10037,1,  "Deinstalling USER file."
10038,1,  "Deinstalling ORACLE Real Application Clusters Guard files."
10039,1,  "Deinstalling ORACLE network files."
10040,1,  "Deinstalling ORACLE instance files."
10041,  1,  "pfsroot file %s has been created on %s. Please run it as root user."
10042,  1,  "Failed to create pfsroot file %s on %s."
10050,  1,  "Alert: ORACLE_SERVICE is not set. Set it and rerun this script"
   *Cause:  Environment variable is not set.
   *Action: Set it.
10051,  1,  "Alert: DB_NAME is not set. Set it and rerun this script."
   *Cause:  Environment variable is not set.
   *Action: Set it.
10052,  1,  "Alert: Could not find Real Application Clusters Guard configuration file %s."
   *Cause:
   *Action: Check if Real Application Clusters Guard configuration file
            exists.
10053,  1,  "Alert: Cannot start the cluster."
   *Cause:  Starting cluster failed.
   *Action: Check cluster status and cluster log files.
10054,  1,  "Alert: Cannot configure pack %s."
   *Cause:  Configuring pack failed.
   *Action: Check cluster status and cluster log files.
10055,  1,  "Alert: Cannot configure data service %s."
   *Cause:
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   *Action: Check cluster status and cluster log files.
10056,  1,  "Alert: Node %s is down."
   *Cause:
   *Action: Check node status and cluster status.
10057,  1,  "Alert: Errors in generating %s."
   *Cause:
   *Action: Check PFSSETUP log file.
10058,  1,  "Alert: Check file %s."
   *Cause:
   *Action: Check PFSSETUP log files.
10059,  1,  "Alert: Real Application Clusters Guard installation terminated
unsuccessfully."
   *Cause:
   *Action: Check PFSSETUP log files.
10060,  1,  "Alert: Could not generate file %s properly."
   *Cause:
   *Action: Check PFSSETUP log files.
10061,  1,  "Warning: Start the cluster on other node before starting packs."
   *Cause:  Node was not running in a cluster.
   *Action: Start the node as part of the cluster first.
10062,  1,  "Alert: ORACLE_HOME is not set. Set it and rerun this script."
   *Cause:  Environment variable is not set.
   *Action: Set it.
10063,  1,  "ORACLE_BASE is not set."
   *Cause:  Environment variable is not set.
   *Action: None.
10064,  1,  "Selected option  ."
   *Cause:  Part of option chosen message.
   *Action: None.
10065,  1,  "WARNING: DEINSTALL option selected. This will remove some installed files."
   *Cause:  Warn users of the option chosen.
   *Action: User will be prompted for a continue/not continue decision.
10066,  1,  "Enter a number between 1 and 7."
   *Cause:  Chosen an incorrect option during PFSSETUP.
   *Action: Enter a correct number for operation to perform.
10067,  1,  "Invalid message number."
   *Cause:  Message id does not exist in avemesg.sh
   *Action: Check message id being used. Verify it is in avemesg.sh
10068,  1,  "Exiting! This host is not a member of cluster."
   *Cause:  This host  is not listed as valid cluster member.
   *Action: Check for valid hosts in config file.
10069,  1,  "User is not a member of Oracle owner”s primary group. Exiting."
   *Cause:  User does not belong to oracle user’s primary group.
   *Action: User is not a member of the group that is the primary group of oracle user.
10070,  1,  "The following files have incorrect checksums on host: ."
   *Cause:  These files have not been deployed witch correct checksums.
   *Action: Deploy files again.
10071,  1,  "Verifying checksums of deployed files on host."
   *Cause:  Verifying checksums of deployed files on remote hosts.
   *Action: None.
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```
10072,  1,  "Files deployed successfully."
   *Cause:  Checksums correct on remote host.
   *Action: None.
10073,  1,  "Warning! Deploying files while one or more of the following packs are up: ."
   *Cause:  Not safe to deploy Real Application Clusters Guard files while packs
            are up.
   *Action: Bring down the packs before deploying files.
10074,  1,  "Directory %s does not exist."
   *Cause:  The directory required for OFS structure does not exist
   *Action: Make sure DB_NAME is set correctly and proper case
10075,  1,  "Deleting pack %s."
   *Cause:
   *Action:
10080,  1,  "READ permission does not exist for RTR File."
   *Cause:  The template RTR file ORCL.oraserver does not have
            READ access attribute.
   *Action: Change the permission mode of the file to allow it to be read.
10081,  1,  "Could not find RTR file."
   *Cause:  The specified RTR file does not exist.
   *Action: Check if the ORCL.oraserver file exists in
            $ORACLE_HOME/pfs/setup/template/include directory.
10082,  1,  "This node is not in cluster mode."
   *Cause:  The node on which this command is being executed is not
            booted in cluster mode.
   *Action: Reboot the node into cluster mode.
10083,  1,  "Failed to disable resource."
   *Cause:  Resource is not in the right states to be disabled.
            Possible causes are: resource group is being reconfigured
            or has failed, resource has failed, or resource dependencies
            exist in this resource group.
   *Action: Check the specific error message displayed and the setup
            log file for details. Also use "scstat" command to check
            the resource states and resource dependencies. Wait until
            the reconfiguration finishes, or clear the failure state,
            or disable the other resources on which this resource
            depend.
10085,  1,  "Failed to remove resource."
   *Cause:  Resource is not in an appropriate state to be removed.
            Possible causes are: resource group is being reconfigured or
            has failed, or resource has failed or is not disabled.
   *Action: Check the specific error message displayed and the setup
            log file for details. Also use "scstat" command to check
            the resource group state. Wait until the reconfiguration
            finishes, or clear the failure state, or disable the resource.
10086,  1,  "Failed to remove resource Group."
   *Cause:  The resource group is not in an appropriate state to be
            removed. Possible causes are: resource group is being
            reconfigured, resources still exist in this resource group.
   *Action: Check the detailed error message displayed or in the
```

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            setup log file. Also use "scstat" to check the resource
            group state. Wait until the reconfiguration finishes,
            or remove all the resources first.
10087,  1,  "Remove Resource Type failed."
   *Cause:  The resource type is not registered, or a resource of
            this resource type exists.
   *Action: Remove all the existing resources of this resource type.
10088,  1,  "Failed to register an resource type into Sun Cluster."
   *Cause:  The RTR file for this resource type does not exist or
            has some syntax errors, or the specified nodes are not
            configured into the cluster.
   *Action: Check the error message for the cause. Check if the
            RTR file for this resource type exists, and if the
            specified nodes are configured in the cluster.
10089,  1,  "Failed to register logical host."
   *Cause:  The resource group to which the logical host is added to
            does not exist, or the logical host name and the shared
            IP address entry in the /etc/inet/hosts has some errors,
            or the NAFO group for the specified adapter does not exist
            on this node.
   *Action: Check if the resource group to add the logical host is
            created in the cluster, or check if the logical host name
            and shared address entries are specified correctly in the
            /etc/inet/hosts file. If they are correct, verify the
            settings in the /etc/nsswitch.conf file include "files"
            for host lookup, or check the health of the name server.
            If the NAFO group does not exits, create appropriate NAFO
            group on this node or recreate the logical host with
            correct NAFO.
10090,  1,  "Could not find logical host name from /etc/hosts for IP address."
   *Cause:  Either the logical host name or the IP address or both
            are not specified in the /etc/hosts file.
   *Action: Check if the entries of logical host name and IP address
            are specified correctly in the /etc/hosts file.
10091,  1,  "Failed to enable the Oracle server resource."
   *Cause: The resource does not exist, or it depends on other
           resources which are disabled, or the resource is in
           failure state, or the resource group is undergoing a
           reconfiguration.
   *Action: Check if the resource exists and its dependencies and
            state, or check the state of the resource group that
            it belongs to.
10092,  1, "Failed to bring the resource group into MANAGED state for pack."
   *Cause: The resource group is invalid, or the resource group is
            being reconfigured or has failed.
   *Action: Check if the resource group exists, and if it has failed.
            If so, clear the failure flag.
10093,  1, "UDLM lock manager is not running. Please try again later."
   *Cause: Starting the pack before the lock manager has started.
   *Action: Since UDLM lock manager is not ready, wait and try to
```

```
            start the pack again later.
10094,  1, "DLM lock test failed."
   *Cause: Starting the pack before the lock manager has started.
   *Action: Since UDLM lock manager is not ready, wait and try to start the pack again
            later.
```

Glossary

cluster manager

An platform-specific component that discovers and tracks the membership state of each **node** by providing a common view of cluster membership across the cluster. The cluster manager also monitors process health, specifically the health of the database instance.

customer query

A PL/SQL procedure containing a query that should represent the actual work that must be done in the **instance**. The purpose of the customer query is to determine whether the primary instance is capable of work. The customer modifies the PL/SQL procedure that is provided in the **Oracle Real Application Clusters Guard** `catpfs.sql` script.

failover

The means of failure recognition and recovery used by Real Application Clusters.

fault tolerance

The ability of a system or component to continue normal operation despite the presence of hardware or software faults. This normally involves some degree of redundancy.

foreign node

The node where a pack runs when it is not running on its default (**home node**). When a pack is running on its foreign node, only the IP address is configured to be up.

HA

See **high availability**.

hardware failover

A type of **failover** performed by the platform-specific **cluster manager**. If a node or the **instance** running on it fails, then the cluster manager restarts the instance on another node in the cluster. Restarting the Oracle instance requires moving the IP addresses, volumes, and file systems containing the Oracle datafiles. It also requires starting the Oracle server and opening the datafiles on the new node.

heartbeat

A periodic message that shows that an **instance** is active.

high availability

A type of system with redundant components that provides consistent and uninterrupted service, even when hardware or software fails. Availability is often expressed as a percentage of time that the database is available over the period of a year, such as 99.95%. It can also be expressed as the number of hours times the number of days in the week that the system is expected to run, such as 24 hours a day and 7 days a week. High availability can be defined to exclude unplanned downtime only or both planned and unplanned downtime.

home node

The default node for a specific **pack**. At initial startup, each pack runs on its home node. See also **foreign node**.

hub configuration

A configuration in which a single node serves as the secondary node to several primary nodes.

instance

The combination of the **System Global Area (SGA)** and each process for the Oracle database. The memory and processes of an instance manage the associated database's data and serve the database users. Each instance has unique system identifier (SID), instance name, rollback segments, and thread ID.

interconnect

The communication link between the nodes.

interprocess communication (IPC)

A high-speed operating system-dependent transport component. The IPC transfers messages between instances on different nodes. Also referred to as the **interconnect**.

IPC

See **interprocess communication (IPC)**.

listener

A process that resides on the server to listen for incoming client connection requests and manage the traffic to the server. When a client requests a network session with a server, a listener receives the request. If the client information matches the listener information, then the listener grants a connection to the server.

listener.ora

A listener configuration file that identifies the following for a listener:

- Unique name
- Protocol addresses on which the listener is accepting connection requests
- Services that the listener listens for

The `listener.ora` file typically resides in `$ORACLE_HOME/network/admin` on UNIX platforms. Oracle9*i* does not require identification of the database service because of service registration. However, static service configuration is required for Oracle Enterprise Manager.

mean time between failures (MTBF)

The average time (usually expressed in hours) that a component works without failure. It is calculated by dividing the total number of failures into the total number of operating hours observed. The term can also mean the length of time a user can reasonably expect a device or system to work before an failure occurs.

mean time to failure (MTTF)

The average period of time that a component will work until failure.

mean time to recover (MTTR)

The average time that it takes to get a failed piece of hardware back online. Outside the context of Real Application Clusters, the acronym MTTR is also used for mean time to repair.

MTBF

See **mean time between failures (MTBF)**.

MTTF

See **mean time to failure (MTTF)**.

MTTR

See **mean time to recover (MTTR)**.

node

A node is a machine on which an **instance** resides.

Oracle Net

A software component that enables connectivity. It includes a core communication layer called the Oracle Net foundation layer and network protocol support. Oracle Net allows services and their applications to reside on different computers and communicate as peer applications. The main function of Oracle Net is to establish network sessions and transfer data between a client machine and a server or between two servers. After a network session has been established, Oracle Net acts as a data courier for the client and the server.

Oracle Real Application Clusters

A breakthrough architecture that allows clusters to access a shared database. Real Application Clusters includes the software component that provides the necessary Real Application Clusters scripts, initialization files, and datafiles to make the Oracle9*i* Enterprise Edition an Oracle9*i* Real Application Clusters database.

Oracle Real Application Clusters Guard

A **failover** protection feature. Oracle Real Application Clusters Guard is an integral component of Real Application Clusters. Oracle Real Application Clusters Guard provides the following functions:

- Automated, fast recovery and bounded recovery time from failures that stop the Oracle **instance**
- Automatic capture of diagnostic data when certain types of failures occur
- Enforced **primary/secondary configuration**. Clients connecting through Oracle Net Services are properly routed to the primary node even if connected to another node in the cluster

- Elimination of delays that clients experience when reestablishing connections after a failure

pack

Software that ensures the availability of the set of resources required to run an Oracle **instance**. The pack controls the startup, shutdown, and restarting of Oracle processes. There is one pack for each instance.

planned downtime

Includes routine operations, maintenance, and upgrades that cause the system to be unavailable to users. See also **unplanned downtime**.

preferred primary node

The node where the **pack** with the primary role resides by default at startup. See also **preferred secondary node**.

preferred secondary node

The node where the **pack** with the secondary role resides by default at startup. See also **preferred primary node**.

primary instance

In primary / secondary configurations, the **instance** through which all clients access the database. See also **secondary instance**.

primary instance role

In primary / secondary configurations, the **instance** that mounts the database first assumes the primary role. It performs the work requested by application sessions. If the primary instance fails or is shut down, then **failover** occurs, and another instance assumes the primary instance role. See also **primary/secondary configuration** and **secondary instance role**.

primary/secondary configuration

A configuration in which the primary **instance** is the instance where all clients access the database. The secondary instance provides backup services to the primary instance in case the primary instance fails. See also **primary instance**, **primary instance role**, **secondary instance**, and **secondary instance role**.

Real Application Clusters

See **Oracle Real Application Clusters**.

relocatable IP address

A public IP address that is configured to be up or down by the Oracle Real Application Clusters Guard **pack**.

resilience

A two-node cluster is resilient if both nodes have instances that are active. If the primary node has an **instance** that is active but the instance on the secondary node is down, the cluster is in a nonresilient state.

ring configuration

A configuration in which each node serves as a primary node and also as a secondary node for another node, forming a closed ring.

scalability

The ability to add additional nodes to **Real Application Clusters** environments and achieve markedly improved performance.

secondary instance

In a **primary/secondary configuration**, the **instance** that provides backup services to the primary instance in case the primary instance fails.

secondary instance role

In a **primary/secondary configuration**, the second **instance** to mount the database assumes the secondary role. The instance with the primary role performs the work that is requested by application sessions, but selected tasks such as reporting and planned operations can be performed by the instance with the secondary instance role. See also **primary instance**, **primary instance role**, and **secondary instance**.

service name

A logical representation of a database. This is the way a database is presented to clients. A database can be presented as multiple services and a service can be implemented as multiple database instances. The service name is a string that includes:

- The global database name
- A name comprised of the database name (`DB_NAME`)
- Domain name (`DB_DOMAIN`)

The service name is entered during installation or database creation.

If you are not sure what the global database name is, you can obtain it from the combined values of the SERVICE_NAMES parameter in the common database initialization file.

The service name is included in the CONNECT_DATA part of the connect descriptor.

service registration

A feature whereby PMON, the process monitor, automatically registers information with a **listener**. Because this information is registered with the listener, the listener.ora file does not need to be configured with this static information.

Service registration provides the listener with the following information:

- The service names for each running **instance** of the database
- Instance names of the database
- Service handlers (dispatchers and dedicated servers) available for each instance This allows the listener to direct a client's request appropriately.
- Dispatcher, instance, and node load information. This load information allows the listener to determine which dispatcher can best handle a client connection's request. If all dispatchers are blocked, then the listener can spawn a dedicated server for the connection.

System Global Area (SGA)

A group of shared memory structures that contain data and control information for one Oracle database **instance**. The SGA and Oracle processes constitute an Oracle instance. Oracle automatically allocates memory for an SGA whenever you start an instance and the operating system reclaims the memory when you shut down the instance. Each instance has only one SGA.

TAF

See **Transparent Application Failover (TAF)**.

takeover

Occurs when the secondary node executes **failover** of the **primary instance role** to itself. Occurs only when the primary **instance** is unavailable and the primary instance role has not resumed normal function on a new node. See also **primary instance**, **primary instance role**, **primary/secondary configuration**, **secondary instance**, and **secondary instance role**.

TNS

See **Transport Network Substrate (TNS)**.

tnsnames.ora

A file that contains net service names. This file is needed on clients, nodes, the console, and the Oracle Performance Manager machine.

transparency

An action is transparent if it takes place without any effect that is visible to users.

Transparent Application Failover (TAF)

A runtime **failover** for **high availability** environments, such as **Real Application Clusters** and **Oracle Real Application Clusters Guard**. TAF refers to the failover and reestablishment of application-to-service connections. It allows client applications to automatically reconnect to the database if the connection fails, and optionally resume a SELECT statement that was in progress. This reconnect happens automatically from within the Oracle Call Interface (OCI) library.

Transport Network Substrate (TNS)

A foundation technology, built into the Oracle Net foundation layer that works with any standard network transport protocol.

unplanned downtime

System downtime that includes system faults, data and media errors, and site outages that cause the system to be unavailable to users. See also **planned downtime**.

warming the library cache

The process of transferring information about parsed SQL statements and compiled PL/SQL units from the library cache on the primary **instance** to the library cache on the secondary instance. Warming the cache improves performance after **failover** because the library cache is already populated.

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