Sun Cluster Data Service for Oracle Parallel Server/Real Application Clusters Guide for Solaris OS

SPARC Platform Edition

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Preface

Sun Cluster Data Service for Oracle Parallel Server/Real Application Clusters Guide for Solaris OS explains how to install and configure Sun™ Cluster Support for Oracle Parallel Server/Real Application Clusters.

This document is intended for system administrators with extensive knowledge of Sun software and hardware. Do not use this document as a planning or presales guide. Before reading this document, you should have already determined your system requirements and purchased the appropriate equipment and software.

The instructions in this document assume knowledge of the Solaris™ Operating System and expertise with the volume manager software that is used with Sun Cluster.

UNIX Commands

This document contains information about commands that are specific to installing and configuring Sun Cluster data services. The document does *not* contain comprehensive information about basic UNIX® commands and procedures, such as shutting down the system, booting the system, and configuring devices. Information about basic UNIX commands and procedures is available from the following sources:

- Online documentation for the Solaris Operating System
- Solaris Operating System man pages
- Other software documentation that you received with your system

Typographic Conventions

The following table describes the typographic changes that are used in this book.

TABLE P–1 Typographic Conventions

Typeface or Symbol	Meaning	Example
`AaBbCc123`	The names of commands, files, and directories, and onscreen computer output	Edit your `.login` file. Use `ls -a` to list all files. `machine_name% you have mail.`
`AaBbCc123`	What you type, contrasted with onscreen computer output	`machine_name%` **`su`** `Password:`
AaBbCc123	Command-line placeholder: replace with a real name or value	To delete a file, type **`rm`** *filename*.
AaBbCc123	Book titles, new terms, or terms to be emphasized	Read Chapter 6 in *User's Guide*. These are called *class* options. You must be *root* to do this.

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P–2 Shell Prompts

Shell	Prompt
C shell prompt	`machine_name%`
C shell superuser prompt	`machine_name#`
Bourne shell and Korn shell prompt	`$`
Bourne shell and Korn shell superuser prompt	`#`

Related Documentation

Information about related Sun Cluster topics is available in the documentation that is listed in the following table. All Sun Cluster documentation is available at `http://docs.sun.com`.

Topic	Documentation
Data service administration	*Sun Cluster Data Services Planning and Administration Guide for Solaris OS*
	Individual data service guides
Concepts	*Sun Cluster Concepts Guide for Solaris OS*
Overview	*Sun Cluster Overview for Solaris OS*
Software installation	*Sun Cluster Software Installation Guide for Solaris OS*
System administration	*Sun Cluster System Administration Guide for Solaris OS*
Hardware administration	*Sun Cluster 3.x Hardware Administration Manual for Solaris OS*
	Individual hardware administration guides
Data service development	*Sun Cluster Data Services Developer's Guide for Solaris OS*
Error messages	*Sun Cluster Error Messages Guide for Solaris OS*
Command and function reference	*Sun Cluster Reference Manual for Solaris OS*

For a complete list of Sun Cluster documentation, see the release notes for your release of Sun Cluster at `http://docs.sun.com`.

Accessing Sun Documentation Online

The docs.sun.com^{SM} Web site enables you to access Sun technical documentation online. You can browse the docs.sun.com archive or search for a specific book title or subject. The URL is `http://docs.sun.com`.

Ordering Sun Documentation

Sun Microsystems offers select product documentation in print. For a list of documents and how to order them, see "Buy printed documentation" at http://docs.sun.com.

Help

If you have problems installing or using Sun Cluster, contact your service provider and provide the following information:

- Your name and email address (if available)
- Your company name, address, and phone number
- The model and serial numbers of your systems
- The release number of the Solaris Operating System (for example, Solaris 8)
- The release number of Sun Cluster (for example, Sun Cluster 3.0)

Use the following commands to gather information about each node on your system for your service provider.

Command	Function
`prtconf -v`	Displays the size of the system memory and reports information about peripheral devices
`psrinfo -v`	Displays information about processors
`showrev –p`	Reports which patches are installed
SPARC: `prtdiag -v`	Displays system diagnostic information
`scinstall -pv`	Displays Sun Cluster release and package version information

Also have available the contents of the `/var/adm/messages` file.

CHAPTER 1

Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

This chapter describes the steps to install Sun Cluster Support for Oracle Parallel Server/Real Application Clusters on your Sun Cluster nodes. This chapter contains the following procedures.

- "How to Use VxVM" on page 22
- "How to Use Hardware RAID Support" on page 23
- "How to Use the Cluster File System" on page 25
- "How to Create a Node-Specific Directory for the Cluster File System" on page 26
- "How to Create a Node-Specific File for the Cluster File System" on page 29
- "How to Install Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31
- "How to Prepare the Sun Cluster Nodes" on page 32
- "How to Install the Oracle UDLM Software" on page 33
- "How to Create a VxVM Shared-Disk Group for the Oracle Parallel Server/Real Application Clusters Database" on page 36

Overview of the Installation Process for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

The following table summarizes the installation tasks and provides cross-references to detailed instructions for performing the tasks.

TABLE 1–1 Task Map: Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

Task	Cross-Reference
Understand preinstallation considerations and special requirements	"Preinstallation Considerations" on page 16 "Special Requirements" on page 19
(Optional) Install volume management software	"Installing Storage Management Software With Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 22
(Optional) Create node-specific files and directories that the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software requires.	"Creating Node-Specific Files and Directories for the Cluster File System" on page 25
Install data service packages	"Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31
Install the UNIX Distributed Lock Manager	"Installing the Oracle UDLM" on page 32
(Optional) Create a shared-disk group for the Oracle Parallel Server/Real Application Clusters database	"Creating a VxVM Shared-Disk Group for the Oracle Parallel Server/Real Application Clusters Database" on page 35

Preinstallation Considerations

Oracle Parallel Server/Real Application Clusters is a scalable application that can run on more than one node concurrently. Before you install Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, consider the points that are listed in the subsections that follow.

Atypical Features of This Data Service

Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is an atypical Sun Cluster high-availability data service. This data service is a set of packages that, when installed, enables Oracle Parallel Server/Real Application Clusters to run on Sun Cluster nodes. This data service also enables Sun Cluster Support for Oracle Parallel Server/Real Application Clusters to be managed by using Sun Clustercommands.

This data service does not provide automatic failover or fault monitoring because the Oracle Parallel Server/Real Application Clusters software already provides this functionality. The Oracle Parallel Server/Real Application Clusters software is not registered with or managed by the Sun Cluster Resource Group Manager (RGM).

You can configure Oracle Parallel Server/Real Application Clusters to use the shared-disk architecture of the Sun Cluster software. In this configuration, a single database is shared among multiple instances of the Oracle Parallel Server/Real Application Clusters software that access the database concurrently. The UNIX Distributed Lock Manager (Oracle UDLM) controls access to shared resources between cluster nodes.

Hardware and Software Requirements

Before you begin the installation, note the hardware and software requirements in the subsections that follow.

Sun Cluster Framework Requirements

Sun Cluster Support for Oracle Parallel Server/Real Application Clusters requires a functioning cluster with the initial cluster framework already installed. See the *Sun Cluster Software Installation Guide for Solaris OS* for details about initial installation of cluster software.

Storage Management Requirements

Decide which storage management scheme to use:

- VERITAS Volume Manager (VxVM) with the cluster feature
- Hardware redundant array of independent disks (RAID) support
- The cluster file system

  If you use the cluster file system, decide which volume manager to use:

  - Solaris Volume Manager
  - VxVM *without* the cluster feature

Software License Requirements

Verify that you have obtained and installed the appropriate licenses for your software. If you install your licenses incorrectly or incompletely, the nodes might abort.

For example, if you use VxVM with the cluster feature, verify that you have installed a valid license for the Volume Manager cluster feature by running one of the following commands:

- For versions of VxVM earlier than 3.5, run the `vxlicense -p` command.
- For VxVM version 3.5, run the `vxlicrep` command.

Supported Topology Requirements

Check with a Sun Enterprise Services representative for the current supported topologies for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, cluster interconnect, storage management scheme, and hardware configurations.

Patch Installation Requirements

Ensure that you have installed all of the applicable software patches for the Solaris operating environment, Sun Cluster, Oracle, and your volume manager. If you need to install any Sun Cluster Support for Oracle Parallel Server/Real Application Clusters patches, you must apply these patches after you install the data service.

Location of Application Binary Files and Application Configuration Files

You can install the application binary files and application configuration files on one of the following locations.

- **The local disks of each cluster node.** Placing the application binary files and application configuration files on the individual cluster nodes enables you to upgrade the application later without shutting down the data service.

  The disadvantage is that you then have several copies of the application binary files and application configuration files to maintain and administer.
- **The cluster file system.** If you put the application binary files and application configuration files on the cluster file system, you have only one copy to maintain and manage. However, you must shut down the data service in the entire cluster to upgrade the application. If a small amount of downtime for upgrades is acceptable, place a single copy of the application binary files and application configuration files on the cluster file system.

Requirements for Using the Cluster File System

You can store only these files that are associated with Oracle Parallel Server/Real Application Clusters on the cluster file system:

- Application binary files

- Configuration files (for example `init.ora`, `tnsnames.ora`, `listener.ora`, and `sqlnet.ora`)
- Archived redo log files
- Alert files (for example `alert_`*sid*`.log`)
- Trace files (`*.trc`)

Note – You *must not* store data files, control files, nor online redo log files on the cluster file system.

The input/output (I/O) performance during the writing of archived redo log files is affected by the location of the device group for archived redo log files. For optimum performance, ensure that the primary of the device group for archived redo log files is located on the same node as the Oracle Parallel Server/Real Application Clusters database instance. This device group contains the cluster file system that holds archived redo log files of the database instance.

See the planning chapter of the *Sun Cluster Software Installation Guide for Solaris OS* for information about how to create cluster file systems.

Special Requirements

This section lists special requirements for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

32-Bit Mode or 64-Bit Mode

Before you decide which architecture to use for the Oracle UDLM and the Oracle relational database management system (RDBMS), note the following points.

- The architecture of both Oracle components must match. For example, if you have 64-bit architecture for your Oracle UDLM, you must have 64-bit architecture for your RDBMS.
- If you have 32-bit architecture for your Oracle components, you can boot the node on which the components reside in either 32-bit mode or 64-bit mode. However, if you have 64-bit architecture for your Oracle components, you must boot the node on which the components reside in 64-bit mode.
- You must use the same architecture when you boot all of the nodes. For example, if you boot one node to use 32-bit architecture, you must boot all of the nodes to use 32-bit architecture.

Log File Locations

The following list shows the locations of the data service log files.

- **Current log**: `/var/cluster/ucmm/ucmm_reconf.log`
- **Previous logs**: `/var/cluster/ucmm/ucmm_reconf.log.0` (`0`,`1`,...) – This location is dependent on the Oracle UDLM package.
- **Oracle UDLM logs**: `/var/cluster/ucmm/dlm_`*nodename*`/logs` – If you cannot find the Oracle log files at this location, contact Oracle support.
- **Oracle UDLM core files**: `/var/cluster/ucmm/dlm_`*nodename*`/cores` – If you cannot find the Oracle log files at this location, contact Oracle support.

Node Failures and Recovery Procedures

In an Oracle Parallel Server/Real Application Clusters environment, multiple Oracle instances cooperate to provide access to the same shared database. The Oracle clients can use any of the instances to access the database. Thus, if one or more instances have failed, clients can connect to a surviving instance and continue to access the database.

Note – If a node fails, boot the node into maintenance mode to correct the problem. After you have corrected the problem, reboot the node. See the *Sun Cluster System Administration Guide for Solaris OS* for more information.

Note – When you install this data service, ensure that you complete all steps of all procedures that precede installing the Oracle RDBMS software and creating your Oracle database *before you reboot the nodes*. Otherwise, the nodes will panic. If the nodes panic, you must boot into maintenance mode to correct the problem. After you have corrected the problem, you must reboot the nodes. The procedures that you must complete are listed in Table 2–1.

Using the Sun Cluster `LogicalHostname` Resource With Oracle Parallel Server/Real Application Clusters

If a cluster node that is running an instance of Oracle Parallel Server/Real Application Clusters fails, an operation that a client application attempted might be required to time out before the operation is attempted again on another instance. If the

Transmission Control Protocol/Internet Protocol (TCP/IP) network timeout is high, the client application might require a significant length of time to detect the failure. Typically, client applications require between three and nine minutes to detect such failures.

In such situations, client applications can use the Sun Cluster `LogicalHostname` resource for connecting to an Oracle Parallel Server/Real Application Clusters database that is running on Sun Cluster. You can configure the `LogicalHostname` resource in a separate resource group that is mastered on the nodes on which Oracle Parallel Server/Real Application Clusters is running. If a node fails, the `LogicalHostname` resource fails over to another surviving node on which Oracle Parallel Server/Real Application Clusters is running. The failover of the `LogicalHostname` resource enables new connections to be directed to the other instance of Oracle Parallel Server/Real Application Clusters.

Caution – Before using the `LogicalHostname` resource for this purpose, consider the effect on existing user connections of failover or failback of the `LogicalHostname` resource.

Using the Oracle Parallel Fail Safe/Real Application Clusters Guard Option With Sun Cluster 3.1

For information about the installation, administration, and operation of the Oracle Parallel Fail Safe/Real Application Clusters Guard option, see the Oracle documentation. If you plan to use this product option with Sun Cluster 3.1, note the points in the subsections that follow before you install Sun Cluster 3.1.

Hostname Restrictions

If you use the Oracle Parallel Fail Safe/Real Application Clusters Guard option with Sun Cluster 3.1, the following restrictions apply to hostnames that you use in your cluster:

- Hostnames cannot contain special characters.
- You cannot change the hostnames after you install Sun Cluster 3.1.

For more information about these restrictions and any other requirements, see the Oracle documentation.

Sun Cluster Command Usage Restrictions

If you use the Oracle Parallel Fail Safe/Real Application Clusters Guard option with Sun Cluster 3.1, do *not* use Sun Cluster commands to perform the following operations:

- Manipulating the state of resources that Oracle Parallel Fail Safe/Real Application Clusters Guard installs. Using Sun Cluster commands for this purpose might cause failures.
- Querying the state of the resources that Oracle Parallel Fail Safe/Real Application Clusters Guard installs. This state might not reflect the actual state. To check the state of the Oracle Parallel Fail Safe/Real Application Clusters Guard, use the commands that Oracle supplies.

Installing Storage Management Software With Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

For Sun Cluster Support for Oracle Parallel Server/Real Application Clusters disks, use the following configurations.

- VxVM with the cluster feature
- Hardware RAID support
- The cluster file system

▼ How to Use VxVM

To use the VxVM software with Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, perform the following tasks.

1. **(Optional) If you are using VxVM with the cluster feature, obtain a license for the Volume Manager cluster feature in addition to the basic VxVM license.**

   See your VxVM documentation for more information about VxVM licensing requirements.

Caution – Failure to correctly install the license for the Volume Manager cluster feature might cause a panic when you install Oracle Parallel Server/Real Application Clusters support. Before you install the Oracle Parallel Server/Real Application Clusters packages, run the `vxlicense -p` or `vxlicrep` command to ensure that you have installed a valid license for the Volume Manager cluster feature.

2. **Install and configure the VxVM software on the cluster nodes.**

   See "Installing and Configuring VERITAS Volume Manager" in *Sun Cluster Software Installation Guide for Solaris OS* and the VxVM documentation for more information.

Where to Go From Here

Go to "Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31 to install the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages.

▼ How to Use Hardware RAID Support

You can use Sun Cluster Support for Oracle Parallel Server/Real Application Clusters with hardware RAID support.

For example, you can use Sun StorEdge™ A3500/A3500FC disk arrays with hardware RAID support and without VxVM software. To use this combination, configure raw device identities (`/dev/did/rdsk*`) on top of the disk arrays' logical unit numbers (LUNs). To set up the raw devices for Oracle Parallel Server/Real Application Clusters on a cluster that uses StorEdge A3500/A3500FC disk arrays with hardware RAID, perform the following steps.

1. **Create LUNs on the disk arrays.**

   See the Sun Cluster hardware documentation for information about how to create LUNs.

2. **After you create the LUNs, run the `format`(1M) command to partition the disk arrays' LUNs into as many slices as you need.**

   The following example lists output from the `format` command.

```
# format

0. c0t2d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
   /sbus@3,0/SUNW,fas@3,8800000/sd@2,0
1. c0t3d0 <SUN18G cyl 7506 alt 2 hd 19 sec 248>
```

```
   /sbus@3,0/SUNW,fas@3,8800000/sd@3,0
2. c1t5d0 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
   /pseudo/rdnexus@1/rdriver@5,0
3. c1t5d1 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
   /pseudo/rdnexus@1/rdriver@5,1
4. c2t5d0 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
   /pseudo/rdnexus@2/rdriver@5,0
5. c2t5d1 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
   /pseudo/rdnexus@2/rdriver@5,1
6. c3t4d2 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
   /pseudo/rdnexus@3/rdriver@4,2
```

Note – To prevent a loss of disk partition information, do not start the partition at cylinder 0 for any disk slice that is used for raw data. The disk partition table is stored in cylinder 0 of the disk.

3. **Run the `scdidadm`(1M) command to find the raw device identity (DID) that corresponds to the LUNs that you created in Step 1.**

   The following example lists output from the `scdidadm -L` command.

```
# scdidadm -L

1        phys-schost-1:/dev/rdsk/c0t2d0   /dev/did/rdsk/d1
1        phys-schost-2:/dev/rdsk/c0t2d0   /dev/did/rdsk/d1
2        phys-schost-1:/dev/rdsk/c0t3d0   /dev/did/rdsk/d2
2        phys-schost-2:/dev/rdsk/c0t3d0   /dev/did/rdsk/d2
3        phys-schost-2:/dev/rdsk/c4t4d0   /dev/did/rdsk/d3
3        phys-schost-1:/dev/rdsk/c1t5d0   /dev/did/rdsk/d3
4        phys-schost-2:/dev/rdsk/c3t5d0   /dev/did/rdsk/d4
4        phys-schost-1:/dev/rdsk/c2t5d0   /dev/did/rdsk/d4
5        phys-schost-2:/dev/rdsk/c4t4d1   /dev/did/rdsk/d5
5        phys-schost-1:/dev/rdsk/c1t5d1   /dev/did/rdsk/d5
6        phys-schost-2:/dev/rdsk/c3t5d1   /dev/did/rdsk/d6
6        phys-schost-1:/dev/rdsk/c2t5d1   /dev/did/rdsk/d6
```

4. **Use the DID that the `scdidadm` output identifies to set up the raw devices.**

   For example, the `scdidadm` output might identify that the raw DID that corresponds to the disk arrays' LUNs is `d4`. In this instance, use the `/dev/did/rdsk/d4s`*N* raw device, where *N* is the slice number.

Where to Go From Here

Go to "Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31 to install the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages.

▼ How to Use the Cluster File System

1. **Create and mount the cluster file system.**
   See "Configuring the Cluster" in *Sun Cluster Software Installation Guide for Solaris OS* for information about how to create and mount the cluster file system.

2. **When you add an entry to the `/etc/vfstab` file for the mount point, set UNIX file system (UFS) file-system-specific options for various types of Oracle files.**
   See the following table.

File Type	Options
Archived redo log files	`global,logging,forcedirectio`
Oracle application binary files, configuration files, alert files, and trace files	`global,logging`

Where to Go From Here

Go to "Creating Node-Specific Files and Directories for the Cluster File System" on page 25 to create node-specific files and directories that the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software requires.

Creating Node-Specific Files and Directories for the Cluster File System

When Oracle software is installed on the cluster file system, all the files in the directory that the `ORACLE_HOME` environment variable specifies are accessible by all cluster nodes.

An installation might require that some Oracle files or directories maintain node-specific information. You can satisfy this requirement by using a symbolic link whose target is a file or a directory on a file system that is local to a node. Such a file system is not part of the cluster file system.

To use a symbolic link for this purpose, you must allocate an area on a local file system. To enable Oracle applications to create symbolic links to files in this area, the applications must be able to access files in this area. Because the symbolic links reside on the cluster file system, all references to the links from all nodes are the same. Therefore, all nodes must have the same namespace for the area on the local file system.

Creating a Node-Specific Directory for the Cluster File System

Perform this procedure for each directory that is to maintain node-specific information. The following directories are typically required to maintain node-specific information:

- `$ORACLE_HOME/network/agent`
- `$ORACLE_HOME/network/log`
- `$ORACLE_HOME/network/trace`
- `$ORACLE_HOME/srvm/log`
- `$ORACLE_HOME/apache`

For information about other directories that might be required to maintain node-specific information, see your Oracle documentation.

▼ How to Create a Node-Specific Directory for the Cluster File System

1. **On each cluster node, create the local directory that is to maintain node-specific information.**

   Ensure that the local directory structure that you create matches the global directory structure that contains the node-specific information. For example, the global directory `/global/oracle/network/agent` might contain node-specific information that you require to be stored locally under the `/local` directory. In this situation, you would create a directory that is named `/local/oracle/network/agent`.

   # **mkdir -p** *local-dir*

`-p`	Specifies that all nonexistent parent directories are created first
local-dir	Specifies the full path name of the directory that you are creating

2. **On each cluster node, make a local copy of the global directory that is to maintain node-specific information.**

   Ensure that the local copy of the node-specific information is contained in the local directory that you created in Step 1.

   # **cp -pr** *global-dir local-dir-parent*

`-p`	Specifies that the owner, group, permissions modes, modification time, access time, and access control lists are preserved.
`-r`	Specifies that the directory and all its files, including any subdirectories and their files, are copied.

global-dir Specifies the full path of the global directory that you are copying. This directory resides on the cluster file system under the directory that the ORACLE_HOME environment variable specifies.

local-dir-parent Specifies the directory on the local node that is to contain the local copy. This directory is the parent directory of the directory that you created in Step 1.

3. Replace the global directory that you copied in Step 2 with a symbolic link to the local copy of the global directory.

a. From any cluster node, remove the global directory that you copied in Step 2.

```
# rm -r global-dir
```

`-r` Specifies that the directory and all its files, including any subdirectories and their files, are removed.

global-dir Specifies the file name and full path of the global directory that you are removing. This directory is the global directory that you copied in Step 2.

b. From any cluster node, create a symbolic link from the local copy of the directory to the global directory that you removed in Step a.

```
# ln -s local-dir global-dir
```

`-s` Specifies that the link is a symbolic link

local-dir Specifies that the local directory that you created in Step 1 is the source of the link

global-dir Specifies that the global directory that you removed in Step a is the target of the link

EXAMPLE 1–1 Creating Node-Specific Directories

This example shows the sequence of operations that is required to create node-specific directories on a two-node cluster. This cluster is configured as follows:

- The ORACLE_HOME environment variable specifies the /global/oracle directory.
- The local file system on each node is located under the /local directory.

The following operations are performed on each node:

1. To create the required directories on the local file system, the following commands are run:

```
# mkdir -p /local/oracle/network/agent

# mkdir -p /local/oracle/network/log

# mkdir -p /local/oracle/network/trace
```

EXAMPLE 1–1 Creating Node-Specific Directories *(Continued)*

```
# mkdir -p /local/oracle/srvm/log

# mkdir -p /local/oracle/apache
```

2. To make local copies of the global directories that are to maintain node-specific information, the following commands are run:

```
# cp -pr $ORACLE_HOME/network/agent /local/oracle/network/.

# cp -pr $ORACLE_HOME/network/log /local/oracle/network/.

# cp -pr $ORACLE_HOME/network/trace /local/oracle/network/.

# cp -pr $ORACLE_HOME/srvm/log /local/oracle/srvm/.

# cp -pr $ORACLE_HOME/apache /local/oracle/.
```

The following operations are performed on only one node:

1. To remove the global directories, the following commands are run:

```
# rm -r $ORACLE_HOME/network/agent

# rm -r $ORACLE_HOME/network/log

# rm -r $ORACLE_HOME/network/trace

# rm -r $ORACLE_HOME/srvm/log

# rm -r $ORACLE_HOME/apache
```

2. To create symbolic links from the local directories to their corresponding global directories, the following commands are run:

```
# ln -s /local/oracle/network/agent $ORACLE_HOME/network/agent

# ln -s /local/oracle/network/log $ORACLE_HOME/network/log

# ln -s /local/oracle/network/trace $ORACLE_HOME/network/trace

# ln -s /local/oracle/srvm/log $ORACLE_HOME/srvm/log

# ln -s /local/oracle/apache $ORACLE_HOME/apache
```

Creating a Node-Specific File for the Cluster File System

Perform this procedure for each file that is to maintain node-specific information. The following files are typically required to maintain node-specific information:

- `$ORACLE_HOME/network/admin/snmp_ro.ora`
- `$ORACLE_HOME/network/admin/snmp_rw.ora`

For information about other files that might be required to maintain node-specific information, see your Oracle documentation.

▼ How to Create a Node-Specific File for the Cluster File System

1. **On each cluster node, create the local directory that will contain the file that is to maintain node-specific information.**

   # **mkdir -p** *local-dir*

`-p`	Specifies that all nonexistent parent directories are created first
local-dir	Specifies the full path name of the directory that you are creating

2. **On each cluster node, make a local copy of the global file that is to maintain node-specific information.**

   # **cp -p** *global-file local-dir*

`-p`	Specifies that the owner, group, permissions modes, modification time, access time, and access control lists are preserved.
global-file	Specifies the file name and full path of the global file that you are copying. This file was installed on the cluster file system under the directory that the `ORACLE_HOME` environment variable specifies.
local-dir	Specifies the directory that is to contain the local copy of the file. This directory is the directory that you created in Step 1.

3. **Replace the global file that you copied in Step 2 with a symbolic link to the local copy of the file.**

   a. **From any cluster node, remove the global file that you copied in Step 2.**

      # **rm** *global-file*

global-file	Specifies the file name and full path of the global file that you are removing. This file is the global file that you copied in Step 2.

   b. **From any cluster node, create a symbolic link from the local copy of the file to the global file that you removed in Step a.**

      # **ln -s** *local-file global-file*

`-s`	Specifies that the link is a symbolic link
local-file	Specifies that the file that you copied in Step 2 is the source of the link
global-file	Specifies that the global version of the file that you removed in Step a is the target of the link

EXAMPLE 1–2 Creating Node-Specific Files

This example shows the sequence of operations that is required to create node-specific files on a two-node cluster. This cluster is configured as follows:

- The `ORACLE_HOME` environment variable specifies the `/global/oracle` directory.
- The local file system on each node is located under the `/local` directory.

The following operations are performed on each node:

1. To create the local directory that will contain the files that are to maintain node-specific information, the following command is run:

```
# mkdir -p /local/oracle/network/admin
```

2. To make a local copy of the global files that are to maintain node-specific information, the following commands are run:

```
# cp -p $ORACLE_HOME/network/admin/snmp_ro.ora \
  /local/oracle/network/admin/.

# cp -p $ORACLE_HOME/network/admin/snmp_rw.ora \
  /local/oracle/network/admin/.
```

The following operations are performed on only one node:

1. To remove the global files, the following commands are run:

```
# rm $ORACLE_HOME/network/admin/snmp_ro.ora

# rm $ORACLE_HOME/network/admin/snmp_rw.ora
```

2. To create symbolic links from the local copies of the files to their corresponding global files, the following commands are run:

```
# ln -s /local/oracle/network/admin/snmp_ro.ora \
  $ORACLE_HOME/network/admin/snmp_rw.ora

# ln -s /local/oracle/network/admin/snmp_rw.ora \
  $ORACLE_HOME/network/admin/snmp_rw.ora
```

Where to Go From Here

Go to "Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31 to install the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages.

Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages

If you did not install the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters packages during your initial Sun Cluster installation, perform this procedure to install the packages. Perform this procedure on all of the cluster nodes that can run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters. To complete this procedure, you need the Sun Java Enterprise System Accessory CD Volume 3.

Install the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters packages by using the `pkgadd` utility.

Note – Because of the preparation that is required before installation, the `scinstall`(1M) utility does not support automatic installation of the data service packages.

▼ How to Install Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages

1. **Load the Sun Java Enterprise System Accessory CD Volume 3 into the CD-ROM drive.**
2. **Become superuser.**
3. **Change the current working directory to the directory that contains the packages for the version of the Solaris operating environment that you are using.**
   - If you are using Solaris 8, run the following command:

     ```
     # cd /cdrom/cdrom0/components/SunCluster_Oracle_RAC/Solaris_8/Packages
     ```
   - If you are using Solaris 9, run the following command:

     ```
     # cd /cdrom/cdrom0/components/SunCluster_Oracle_RAC/Solaris_9/Packages
     ```
4. **On each cluster node that can run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, transfer the contents of the required software packages from the CD-ROM to the node.**

The required software packages depend on the storage management scheme that you are using.

- If you are using VxVM with the cluster feature, run the following command:

```
# pkgadd -d . SUNWscucm SUNWudlm SUNWudlmr SUNWcvmr SUNWcvm
```

- If you are using hardware RAID support, run the following command:

```
# pkgadd -d . SUNWscucm SUNWudlm SUNWudlmr SUNWschwr
```

- If you are using the cluster file system, run the following command:

```
# pkgadd -d . SUNWscucm SUNWudlm SUNWudlmr
```

Caution – Before you reboot the nodes, you must ensure that you have correctly installed and configured the Oracle UDLM software. For more information, see "Installing the Oracle UDLM" on page 32. Also verify that you have correctly installed your volume manager packages. If you plan to use VxVM, check that you have installed the software and check that the license for the VxVM cluster feature is valid. Otherwise, a panic will occur.

Where to Go From Here

Go to "Installing the Oracle UDLM" on page 32 to install the Oracle UDLM.

Installing the Oracle UDLM

Installing the Oracle UDLM involves the following tasks:

- Preparing the nodes
- Installing the Oracle UDLM software

▼ How to Prepare the Sun Cluster Nodes

For the Oracle UDLM software to run correctly, sufficient shared memory must be available on all of the cluster nodes. See the Oracle Parallel Server/Real Application Clusters CD-ROM for all of the installation instructions. To prepare the Sun Cluster nodes, check that you have completed the following tasks.

- You have correctly set up the Oracle user account and database administration group.

- You have configured the system to support the shared memory requirements of the Oracle UDLM.

Note – Perform the following steps as superuser on each cluster node.

---

1. **On each node, create an entry for the database administrator group in the `/etc/group` file, and add potential users to the group.**

   This group normally is named `dba`. Verify that `root` and `oracle` are members of the `dba` group, and add entries as necessary for other database administrator (DBA) users. Verify that the group IDs are the same on all of the nodes that run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters. For example, add the following entry to the `/etc/group` file.

   ```
   dba:*:520:root,oracle
   ```

   You can make the name service entries in a network name service, such as the Network Information Service (NIS) or NIS+, so that the information is available to the data service clients. You can also make entries in the local `/etc` files to eliminate dependency on the network name service.

2. **On each node, create an entry for the Oracle user ID (the group and password) in the `/etc/passwd` file, and run the `pwconv`(1M) command to create an entry in the `/etc/shadow` file.**

   This Oracle user ID is normally `oracle`. For example, add the following entry to the `/etc/passwd` file.

   ```
   # useradd -u 120 -g dba -d /oracle-home oracle
   ```

   Ensure that the user IDs are the same on all of the nodes that run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

Where to Go From Here

After you set up the cluster environment for Oracle Parallel Server/Real Application Clusters, go to "How to Install the Oracle UDLM Software" on page 33 to install the Oracle UDLM software on each cluster node.

▼ How to Install the Oracle UDLM Software

Note – You must install the Oracle UDLM software on the local disk of each node.

Caution – Before you install the Oracle UDLM software, ensure that you have created entries for the database administrator group and the Oracle user ID. See "How to Prepare the Sun Cluster Nodes" on page 32 for details.

1. **Become superuser on a cluster node.**

2. **Install the Oracle UDLM software.**

   See the appropriate Oracle Parallel Server/Real Application Clusters installation documentation for instructions.

   Note – Ensure that you did not receive any error messages when you installed the Oracle UDLM packages. If an error occurred during package installation, correct the problem before you install the Oracle UDLM software.

3. **Update the `/etc/system` file with the shared memory configuration information.**

   You must configure these parameters on the basis of the resources that are available in the cluster. Decide the appropriate values, but ensure that the Oracle UDLM can create a shared memory segment that conforms to its configuration requirements.

   The following example shows entries to configure in the `/etc/system` file.

```
*SHARED MEMORY/ORACLE
set shmsys:shminfo_shmmax=268435456
set semsys:seminfo_semmap=1024
set semsys:seminfo_semmni=2048
set semsys:seminfo_semmns=2048
set semsys:seminfo_semmsl=2048
set semsys:seminfo_semmnu=2048
set semsys:seminfo_semume=200
set shmsys:shminfo_shmmin=200
set shmsys:shminfo_shmmni=200
set shmsys:shminfo_shmseg=200
```

4. **Shut down and reboot each node on which the Oracle UDLM software is installed.**

Caution – Before you reboot, you must ensure that you have correctly installed and configured the Oracle UDLM software. Also verify that you have correctly installed your volume manager packages. If you use VxVM, check that you have installed the software and that the license for the VxVM cluster feature is valid. Otherwise, a panic will occur.

For detailed instructions, see "Shutting Down and Booting a Single Cluster Node" in *Sun Cluster System Administration Guide for Solaris OS*.

Where to Go From Here

After you have installed the Oracle UDLM software on each cluster node, the next step depends on your storage management scheme.

- If you are using VxVM *without* the cluster file system, go to "Creating a VxVM Shared-Disk Group for the Oracle Parallel Server/Real Application Clusters Database" on page 35 to create a shared-disk group for the Oracle Parallel Server/Real Application Clusters database.
- Otherwise, go to "Registering and Configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 39 to register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

Creating a VxVM Shared-Disk Group for the Oracle Parallel Server/Real Application Clusters Database

Note – Perform this task only if you are using VxVM *without* the cluster file system.

If you are using VxVM without the cluster file system, VxVM requires a shared-disk group for the Oracle Parallel Server/Real Application Clusters database to use.

Before You Begin

Before you create a VxVM shared-disk group for the Oracle Parallel Server/Real Application Clusters database, note the following points.

- Do not register the shared-disk group as a cluster device group with the cluster.
- Do not create any file systems in the shared-disk group because only the raw data file uses this disk group.
- Create volumes as the `gen` use type.

- Disks that you add to the shared-disk group must be directly attached to all of the cluster nodes.
- Ensure that your VxVM license is current. If your license expires, the node panics.

▼ How to Create a VxVM Shared-Disk Group for the Oracle Parallel Server/Real Application Clusters Database

- **Use VERITAS commands that are provided for creating a VxVM shared-disk group.**

  For information about VxVM shared-disk groups, see your VxVM documentation.

Where to Go From Here

After you have created a shared-disk group for the Oracle Parallel Server/Real Application Clusters database, go to "Registering and Configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 39 to register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

CHAPTER 2

Administering Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

This chapter describes the steps to administer Sun Cluster Support for Oracle Parallel Server/Real Application Clusters on your Sun Cluster nodes. This chapter contains the following procedures.

- "How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for a Cluster" on page 40
- "How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for Selected Nodes" on page 42
- "How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From a Cluster" on page 44
- "How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From Selected Nodes" on page 45
- "How to Create the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 47
- "How to Add Nodes to the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 50
- "How to Remove the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 51
- "How to Remove Nodes From the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 53
- "How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled" on page 57

Overview of Administration Tasks for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

The following table summarizes the administration tasks and provides cross-references to detailed instructions for performing the tasks.

TABLE 2–1 Task Map: Administering Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

Task	Cross-Reference
Register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters	"Registering and Configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 39
Install the Oracle relational database management system (RDBMS) software and create your Oracle database	Oracle Parallel Server/Real Application Clusters installation documentation
Tune Sun Cluster Support for Oracle Parallel Server/Real Application Clusters extension properties	"Tuning Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 54
Upgrade Sun Cluster Support for Oracle Parallel Server/Real Application Clusters to upgrade your cluster to use a new version of Sun Cluster	"Upgrading Sun Cluster Software" in *Sun Cluster Software Installation Guide for Solaris OS* "How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for a Cluster" on page 40
Troubleshoot Sun Cluster Support for Oracle Parallel Server/Real Application Clusters	Chapter 3

Registering and Configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

Registering and configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters enables this support to be managed by using Sun Cluster commands.

You can register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for the following entities:

- **A cluster.** For more information, see "How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for a Cluster" on page 40.
- **Selected nodes in a cluster.** For more information, see "How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for Selected Nodes" on page 42.

Overview of the RAC Framework Resource Group

The Real Application Clusters (RAC) framework resource group enables Oracle Parallel Server/Real Application Clusters to be managed by using Sun Cluster commands. This resource group contains an instance of the following single-instance resource types:

- `SUNW.rac_framework`, which represents the framework that enables Oracle Parallel Server/Real Application Clusters to be managed by using Sun Cluster commands
- `SUNW.rac_udlm`, which represents the UNIX Distributed Lock Manager (Oracle UDLM) component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

In addition, the RAC framework resource group contains an instance of a single-instance resource type that represents the storage management scheme that you are using.

- VxVM with the cluster feature is represented by the `SUNW.rac_cvm` resource type.
- Hardware RAID support is represented by the `SUNW.rac_hwraid` resource type.
- The cluster file system is not represented by a resource type.

Note – The resource types that are defined for the RAC framework resource group do *not* enable the Resource Group Manager (RGM) to manage instances of Oracle Parallel Server/Real Application Clusters.

Determining Whether to Use `scsetup` or `scrgadm`

The procedures that follow explain how to configure resources for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters by using the `scsetup`(1M) utility. The `scsetup` utility enables you to configure resources for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters interactively, thereby reducing the possibility for configuration errors that might result from command syntax errors or omissions. The `scsetup` utility ensures that all required resources are created on the basis of the software that is installed on your cluster nodes.

Note – For instructions about how to configure resources for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters by using the `scrgadm`(1M) utility, see "Creating, Modifying, and Removing the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 47.

▼ How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for a Cluster

When you register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for a cluster, the RAC framework resource group is created.

Before you perform this procedure, ensure that the required Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages are installed on each node. The packages that are required depend on the storage management scheme that you are using. For more information, see "Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31.

1. **Become superuser.**

2. **From one node only, create the RAC framework resource group.**

Note – The following instructions explain how to perform this operation by using the `scsetup` utility. For information about how to perform this operation by using the `scrgadm` utility, see "How to Create the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 47.

a. Start the `scsetup` utility.

```
# scsetup
```

The `scsetup` main menu is displayed.

b. Type the number that corresponds to the option for data services.

The Data Services menu is displayed.

c. Type the number that corresponds to the option for configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

The Sun Cluster Support for Oracle RAC menu is displayed.

d. Type the number that corresponds to the option for creating the RAC framework resource group.

The `scsetup` utility displays a list of the cluster nodes on which the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters packages are installed. The `scsetup` utility also asks you to confirm that the RAC framework resource group should be created on these nodes.

e. To confirm that the `scsetup` utility should create the RAC framework resource group on the listed nodes, type `y`.

The `scsetup` utility creates the RAC framework resource group and the resources that this resource group contains on the listed nodes.

Note – If the value of a resource property is changed from its default value, the `scsetup` utility sets the property to the changed value for the resource that the `scsetup` utility creates.

3. Determine if the RAC framework resource group and its resources are online.

Use the `scstat`(1M) utility for this purpose. The resource group to verify is named `rac-framework-rg`. The `scsetup` utility automatically assigns this name when you create the resource group.

```
# scstat -g
```

- If the RAC framework resource group and its resources are online, no further action is required.

- If the RAC framework resource group and its resources are *not* online, bring them online.

  ```
  # scswitch -Z -g rac-framework-rg
  ```

`-Z`	Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online
`-g rac-framework-rg`	Specifies that the resource group to be moved to the `MANAGED` state and brought online is `rac-framework-rg`

Where to Go From Here

See your Oracle Parallel Server/Real Application Clusters installation documentation for information about how to install the Oracle RDBMS software and create your Oracle database.

▼ How to Register and Configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for Selected Nodes

When you register and configure Sun Cluster Support for Oracle Parallel Server/Real Application Clusters for selected nodes, the nodes are added to the RAC framework resource group.

Perform this procedure in the following situations:

- You are adding nodes to a cluster and you want to run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters on the nodes.
- You want to run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters on only a subset of nodes in a cluster.

Before you perform this procedure, ensure that the required Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages are installed on each node. The packages that are required depend on the storage management scheme that you are using. For more information, see "Installing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Packages" on page 31.

1. **Become superuser.**

2. **Add the nodes to the RAC framework resource group.**

Note – The following instructions explain how to perform this operation by using the `scsetup` utility. For information about how to perform this operation by using the `scrgadm` utility, see "How to Add Nodes to the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 50.

---

a. Start the `scsetup` utility.

```
# scsetup
```

b. Type the number that corresponds to the option for data services.

The Data Services menu is displayed.

c. Type the number that corresponds to the option for configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

The Sun Cluster Support for Oracle RAC menu is displayed.

d. Type the number that corresponds to the option for adding a node to the RAC framework resource group.

The `scsetup` utility responds as follows:

- The list of nodes that you can add to the RAC framework resource group is displayed. This list contains the cluster nodes on which the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters packages are installed, but on which the RAC framework resource group does not exist.
- The `scsetup` utility prompts you for the list of nodes that you are adding.

e. Type a comma-separated list of the nodes that you are adding to the RAC framework resource group.

3. Bring the RAC framework resource group and its resources online.

```
# scswitch -Z -g rac-framework-rg
```

`-Z`	Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online
`-g rac-framework-rg`	Specifies that the resource group to be moved to the `MANAGED` state and brought online is `rac-framework-rg`

Where to Go From Here

See your Oracle Parallel Server/Real Application Clusters installation documentation for information about how to install the Oracle RDBMS software and create your Oracle database.

Removing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

Removing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters removes the RAC framework resource group or removes nodes from this resource group.

▼ How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From a Cluster

The cluster node from which you run the `scsetup` utility or `scrgadm` utility to perform this task must be booted in cluster mode.

1. **On one node of the cluster, become superuser.**
2. **Remove the RAC framework resource group.**

Note – The following instructions explain how to perform this operation by using the `scsetup` utility. For information about how to perform this operation by using the `scrgadm` utility, see "How to Remove the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 51.

---

   a. **Start the `scsetup` utility.**

      ```
      # scsetup
      ```

      The `scsetup` main menu is displayed.

   b. **Type the number that corresponds to the option for data services.**

The Data Services menu is displayed.

c. **Type the number that corresponds to the option for configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.**

The Sun Cluster Support for Oracle RAC menu is displayed.

d. **Type the number that corresponds to the option for removing the RAC framework resource group.**

The `scsetup` utility displays a list of the cluster nodes on which the RAC framework resource group exists. The `scsetup` utility also asks you to confirm that the RAC framework resource group should be removed from these nodes.

e. **To confirm that the `scsetup` utility should remove the RAC framework resource group from the listed nodes, type `y`.**

The `scsetup` utility removes the RAC framework resource group and the resources that this resource group contains from the listed nodes.

3. **Boot each node in the cluster in noncluster mode.**

4. **From each node in the cluster, uninstall the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages for the storage management scheme that you are using.**

- If you are using VxVM with the cluster feature, type the following command:

```
# pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWcvmr SUNWcvm
```

- If you are using hardware RAID support, type the following command:

```
# pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWschwr
```

- If you are using the cluster file system, type the following command:

```
# pkgrm SUNWscucm SUNWudlm SUNWudlmr
```

Note – To prevent the userland cluster membership monitor (UCMM) daemon `ucmmd` from being started when the cluster is rebooted, you *must* uninstall the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages.

▼ How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From Selected Nodes

1. **Become superuser.**

2. **Boot in noncluster mode the nodes from which you are removing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.**

3. **Remove the nodes from the RAC framework resource group.**

Note – The following instructions explain how to perform this operation by using the `scsetup` utility. For information about how to perform this operation by using the `scrgadm` utility, see "How to Remove Nodes From the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 53.

---

   a. **Start the `scsetup` utility.**

      ```
      # scsetup
      ```

   b. **Type the number that corresponds to the option for data services.**

      The Data Services menu is displayed.

   c. **Type the number that corresponds to the option for configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.**

      The Sun Cluster Support for Oracle RAC menu is displayed.

   d. **Type the number that corresponds to the option for removing a node from the RAC framework resource group.**

      The `scsetup` utility responds as follows:

      - The list of nodes in the RAC framework resource group is displayed.
      - The `scsetup` utility prompts you for the list of nodes that you are removing.

   e. **Type a comma-separated list of the nodes that you removing from the RAC framework resource group.**

4. **(Optional) From each node that you removed, uninstall the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages for the storage management scheme that you are using.**

   - If you are using VxVM with the cluster feature, type the following command:

     ```
     # pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWcvmr SUNWcvm
     ```

   - If you are using hardware RAID support, type the following command:

     ```
     # pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWschwr
     ```

   - If you are using the cluster file system, type the following command:

     ```
     # pkgrm SUNWscucm SUNWudlm SUNWudlmr
     ```

Creating, Modifying, and Removing the RAC Framework Resource Group by Using the `scrgadm` Utility

The `scrgadm` utility enables you to automate the creation, modification, and removal of the RAC framework resource group by using scripts. Automating this process reduces the time for propagating the same configuration information to many nodes in a cluster.

Note – For procedures that explain how to create, modify, or remove the RAC framework resource by using the `scsetup` utility, see "Registering and Configuring Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 39 and "Removing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 44. Using the `scsetup` utility reduces the possibility for configuration errors that might result from command syntax errors or omissions.

▼ How to Create the RAC Framework Resource Group by Using the `scrgadm` Utility

1. **On one node of the cluster, become superuser.**

2. **Create a scalable resource group.**

```
# scrgadm -a -g resource-group \
  -y nodelist=nodelist \
  -y maximum_primaries=num-in-list \
  -y desired_primaries=num-in-list \
  -y RG_mode=Scalable
```

`-g` *resource-group*
Specifies the name that you are assigning to the resource group.

`-y nodelist=`*nodelist*
Specifies a comma-separated list of cluster nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. The Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages must be installed on each node in this list.

`-y maximum_primaries=`*num-in-list*
Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

`-y desired_primaries=`*num-in-list*
Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

`-y RG_mode=Scalable`
Specifies that the resource group is scalable.

3. **Register the `SUNW.rac_framework` resource type.**

```
# scrgadm -a -t SUNW.rac_framework
```

4. **Add an instance of the `SUNW.rac_framework` resource type to the resource group that you created in Step 2.**

```
# scrgadm -a -j fmwk-resource \
  -g resource-group \
  -t SUNW.rac_framework
```

`-j` *fmwk-resource* — Specifies the name that you are assigning to the `SUNW.rac_framework` resource.

`-g` *resource-group* — Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created in Step 2.

5. **Register the `SUNW.rac_udlm` resource type.**

```
# scrgadm -a -t SUNW.rac_udlm
```

6. **Add an instance of the `SUNW.rac_udlm` resource type to the resource group that you created in Step 2.**

Ensure that this instance depends on the `SUNW.rac_framework` resource that you created in Step 4.

```
# scrgadm -a -j udlm-resource \
  -g resource-group \
  -t SUNW.rac_udlm \
  -y resource_dependencies=fmwk-resource
```

`-j` *udlm-resource*
Specifies the name that you are assigning to the `SUNW.rac_udlm` resource.

`-g` *resource-group*
Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created in Step 2.

`-y resource_dependencies=`*fmwk-resource*
Specifies that this instance depends on the `SUNW.rac_framework` resource that you created in Step 4.

7. **Register and add instances of the resource types that are required for the storage management scheme that you are using.**

   - If you are using VxVM with the cluster feature, register and add an instance of the `SUNW.rac_cvm` resource type to the resource group that you created in Step 2.

     Ensure that this instance depends on the `rac_framework` resource that you created in Step 4.

     ```
     # scrgadm -a -t SUNW.rac_cvm

     # scrgadm -a -j cvm-resource \
       -g resource-group \
       -t SUNW.rac_cvm \
       -y resource_dependencies=fmwk-resource
     ```

     `-j` *cvm-resource*
     Specifies the name that you are assigning to the `SUNW.rac_cvm` resource.

     `-g` *resource-group*
     Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created in Step 2.

     `-y resource_dependencies=`*fmwk-resource*
     Specifies that this instance depends on the `SUNW.rac_framework` resource that you created in Step 4.

   - If you are using hardware RAID support, register and add an instance of the `SUNW.rac_hwraid` resource type to the resource group that you created in Step 2.

     Ensure that this instance depends on the `rac_framework` resource that you created in Step 4.

     ```
     # scrgadm -a -t SUNW.rac_hwraid

     # scrgadm -a -j raid-resource \
       -g resource-group \
       -t SUNW.rac_hwraid \
       -y resource_dependencies=fmwk-resource
     ```

     `-j` *raid-resource*
     Specifies the name that you are assigning to the `SUNW.rac_hwraid` resource.

     `-g` *resource-group*
     Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created in Step 2.

`-y resource_dependencies=`*fmwk-resource*
Specifies that this instance depends on the `SUNW.rac_framework` resource that you created in Step 4.

- If you are using the cluster file system, no resource instance that represents this storage management scheme is required.

8. **Bring the RAC framework resource group and its resources online.**

```
# scswitch -Z -g resource-group
```

`-Z`	Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online
`-g` *resource-group*	Specifies that the resource group that you created in Step 2 is to be moved to the `MANAGED` state and brought online

▼ How to Add Nodes to the RAC Framework Resource Group by Using the `scrgadm` Utility

This procedure assumes that a RAC framework resource group has already been created for the cluster.

1. **On one node of the cluster, become superuser.**

2. **For the RAC framework resource group, specify a node list that contains the following nodes:**

   - The nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is already enabled.
   - The nodes that you are adding to the RAC framework resource group.

```
# scrgadm -c -g resource-group \
  -y nodelist=nodelist \
  -y maximum_primaries=num-in-list \
  -y desired_primaries=num-in-list
```

`-g` *resource-group*
Specifies the name of the RAC framework resource group to which you are adding nodes. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.

`-y nodelist=`*nodelist*
Specifies a comma-separated list of cluster nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is already enabled and the nodes that you are adding to the RAC framework resource group. The Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages must be installed on each node in this list.

`-y maximum_primaries=`*num-in-list*
Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

`-y desired_primaries=`*num-in-list*
Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

3. **Bring the RAC framework resource group and its resources online.**

```
# scswitch -Z -g resource-group
```

`-Z` Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online.

`-g` *resource-group* Specifies the name of the RAC framework resource group that is to be moved to the `MANAGED` state and brought online. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.

▼ How to Remove the RAC Framework Resource Group by Using the `scrgadm` Utility

The resources that the RAC framework resource group contains are described in "Overview of the RAC Framework Resource Group" on page 39. If the RAC framework resource group is created by using the `scsetup` utility, `scsetup` assigns names to the resources as listed in the following table.

TABLE 2–2 Names Assigned to RAC Framework Resources by `scsetup`

Resource Type	Resource Name
`SUNW.rac_cvm`	`rac_cvm`
`SUNW.rac_hwraid`	`rac_hwraid`
`SUNW.rac_udlm`	`rac_udlm`
`SUNW.rac_framework`	`rac_framework`

1. **On one node of the cluster, become superuser.**

2. **Disable each resource that the RAC framework resource group contains.**
Disable the instance of the `SUNW.rac_framework` resource only after you have disabled all other resources that the RAC framework resource group contains. The

other resources in the RAC framework resource group depend on `SUNW.rac_framework`.

```
# scswitch -n -j resource
```

`-j` *resource* Specifies the name of the resource that you are disabling. If this resource was created by using the `scsetup` utility, the name depends on the resource type as shown in Table 2–2.

3. **Remove each resource that you disabled in Step 2.**

   Remove the instance of the `SUNW.rac_framework` resource only after you have removed all other resources that the RAC framework resource group contains. The other resources in the RAC framework resource group depend on `SUNW.rac_framework`.

   ```
   # scrgadm -r -j resource
   ```

   `-j` *resource* Specifies the name of the resource that you are removing. If this resource was created by using the `scsetup` utility, the name depends on the resource type as shown in Table 2–2.

4. **Unregister the resource type of each resource that you removed in Step 3.**

   ```
   # scrgadm -r -t resource-type
   ```

   `-t` *resource-type* Specifies the name of the resource type that you are unregistering. This resource type was registered for the RAC framework resource group when the resource group was created. The resources that the RAC framework resource group contains are described in "Overview of the RAC Framework Resource Group" on page 39.

5. **Remove the RAC framework resource group.**

   ```
   # scrgadm -r -g resource-group
   ```

   `-g` *resource-group* Specifies the name of the RAC framework resource group that you are removing. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.

EXAMPLE 2–1 Removing the RAC Framework Resource Group by Using the `scrgadm` Utility

```
# scswitch -n -j rac_cvm
# scswitch -n -j rac_udlm
# scswitch -n -j rac_framework
# scrgadm -r -j rac_cvm
# scrgadm -r -j rac_udlm
# scrgadm -r -j rac_framework
# scrgadm -r -t SUNW.rac_cvm
# scrgadm -r -t SUNW.rac_udlm
# scrgadm -r -t SUNW.rac_framework
# scrgadm -r -g rac-framework-rg
```

EXAMPLE 2–1 Removing the RAC Framework Resource Group by Using the `scrgadm` Utility *(Continued)*

This example shows the commands that are required to remove a RAC framework resource group that was created by using the `scsetup` utility. The cluster from which this resource group is removed uses the VxVM volume manager.

Note – After you have removed the RAC framework resource group, you must boot each cluster node in noncluster mode and uninstall the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages. For more information, see "How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From a Cluster" on page 44.

▼ How to Remove Nodes From the RAC Framework Resource Group by Using the `scrgadm` Utility

1. **On one node of the cluster, become superuser.**
2. **Boot in noncluster mode the nodes from which you are removing Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.**
3. **For the RAC framework resource group, specify a node list that contains *only* the nodes that are to remain in the RAC framework resource group.**

   This node list must not include the nodes that you are removing.

   ```
   # scrgadm -c -g resource-group \
     -y nodelist=nodelist \
     -y maximum_primaries=num-in-list \
     -y desired_primaries=num-in-list
   ```

   `-g` *resource-group*
   Specifies the name of the RAC framework resource group from which you are removing nodes. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.

   `-y nodelist=`*nodelist*
   Specifies a comma-separated list of cluster nodes that are to remain in the RAC framework resource group. This node list must not include the nodes that you are removing.

   `-y maximum_primaries=`*num-in-list*
   Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

`-y desired_primaries=`*num-in-list*
Specifies the number of nodes on which Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is to be enabled. This number must equal the number of nodes in *nodelist*.

Note – After you have removed nodes from the RAC framework resource group, you can optionally uninstall the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters software packages from the nodes that you removed. For more information, see "How to Remove Sun Cluster Support for Oracle Parallel Server/Real Application Clusters From Selected Nodes" on page 45.

Tuning Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

To tune Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, you modify the extension properties of the resources in the RAC framework resource group. For details about these extension properties, see Appendix A. Typically, you use the command line `scrgadm -x` *parameter=value* to set extension properties when you create the Sun Cluster Support for Oracle Parallel Server/Real Application Clusters resources. You can also use the procedures in "Administering Data Service Resources" in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS* to configure the resources later.

Guidelines for Setting Timeouts

Many of the extension properties for Sun Cluster Support for Oracle Parallel Server/Real Application Clusters specify timeouts for steps in reconfiguration processes. The optimum values for most of these timeouts are independent of your cluster configuration. Therefore, you should not need to change the timeouts from their default values.

Timeouts that depend on your cluster configuration are described in the subsections that follow. If timeouts occur during reconfiguration processes, increase the values of these time-out properties to accommodate your cluster configuration.

VxVM Component Reconfiguration Step 4 Timeout

The time that is required for step 4 of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters is affected by the size and complexity of your VERITAS shared-disk group configuration. If your VERITAS shared-disk group configuration is large or complex and the reconfiguration of the VxVM component times out, increase the timeout for step 4 of a reconfiguration of the VxVM component.

To increase the timeout for step 4 of a reconfiguration of the VxVM component, increase the value of the `Cvm_step4_timeout` extension property of the `SUNW.rac_cvm` resource.

For details of the extension properties of the `SUNW.rac_cvm` resource type, see Table A–2.

EXAMPLE 2–2 Setting the VxVM Component Reconfiguration Step 4 Timeout

```
# scrgadm -c -j rac_cvm -x cvm_step4_timeout=1200
```

This example sets the timeout for step 4 of a reconfiguration of the VxVM component to 1200 seconds. This example assumes that the VxVM component is represented by an instance of the `SUNW.rac_cvm` resource type that is named `rac_cvm`.

Reservation Step Timeout

The time that is required for reservation commands to run is affected by the following factors:

- The number of shared physical disks in the cluster
- The load on the cluster

If the number of shared physical disks in the cluster is large, or if your cluster is heavily loaded, the reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters might time out. If such a timeout occurs, increase the reservation step timeout.

To increase the reservation step timeout, increase the `Reservation_timeout` extension property of the appropriate resource for your storage management scheme.

Storage Management Scheme	Resource
VxVM with the cluster feature	`SUNW.rac_cvm`
Hardware RAID support	`SUNW.rac_hwraid`

Note – If you are using the cluster file system, the reservation step timeout is not applicable.

Details of the extension properties of these resource types are available as follows:

- For the `SUNW.rac_cvm` resource type, see Table A–2.
- For the `SUNW.rac_hwraid` resource type, see Table A–3.

EXAMPLE 2–3 Setting the Reservation Step Timeout

```
# scrgadm -c -j rac_hwraid -x reservation_timeout=350
```

This example sets the timeout for the reservation step of a reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters to 350 seconds. In this example, the cluster uses hardware RAID support. This example assumes that the hardware RAID component is represented by an instance of the `SUNW.rac_hwraid` resource type that is named `rac_hwraid`.

Guidelines for Setting the Communications Port Range for the Oracle UDLM

An application other than the Oracle UDLM on a cluster node might use a range of communications ports that conflicts with the range for the Oracle UDLM. If such a conflict occurs, modify the range of communications ports that the Oracle UDLM uses.

The range of communications ports that the Oracle UDLM uses is determined by the values of the following extension properties of the `SUNW.rac_udlm` resource type:

- `Port`. Specifies the communications port number that the Oracle UDLM uses. The first number in the range of communications port numbers that the Oracle UDLM uses is the value of `Port`.
- `Num_ports`. Specifies the number of communications ports that the Oracle UDLM uses. The last number in the range of communications port numbers that the Oracle UDLM uses is the sum of the values of `Port` and `Num_ports`.

For details of the extension properties of the `SUNW.rac_udlm` resource type, see Table A–1.

EXAMPLE 2–4 Setting the Communications Port Number for the Oracle UDLM

```
# scrgadm -c -j rac_udlm -x port=7000
```

This example sets the communications port number that the Oracle UDLM uses to 7000. The following assumptions apply to this example:

- The Oracle UDLM component is represented by an instance of the `SUNW.rac_udlm` resource type that is named `rac_udlm`.

EXAMPLE 2–4 Setting the Communications Port Number for the Oracle UDLM *(Continued)*

- The command in this example is run as part of the procedure for modifying an extension property that is tunable only when disabled. For more information, see"How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled" on page 57.

▼ How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled

Restrictions apply to the circumstances in which you can modify an extension property that is tunable only when a resource is disabled. Those circumstances depend on the resource type as follows:

- `SUNW.rac_udlm` – Only when the Oracle UDLM is *not* running on any cluster node
- `SUNW.rac_cvm` – Only when VxVM is *not* running in cluster mode on any cluster node

1. **Disable each resource that the RAC framework resource group contains and bring the RAC framework resource group into the `UNMANAGED` state.**

   Disable the instance of the `SUNW.rac_framework` resource only after you have disabled all other resources that the RAC framework resource group contains. The other resources in the RAC framework resource group depend on the `SUNW.rac_framework` resource.

   For detailed instructions, see "Disabling Resources and Moving Their Resource Group Into the `UNMANAGED` State" in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*.

2. **Reboot all the nodes that are in the node list of the RAC framework resource group.**

3. **Use the `scrgadm` utility to set the property to its new value.**

   `# scrgadm -c -j` *resource* `-x` *property*`=`*value*

`-j` *resource*	Specifies the name of the resource for which you are modifying an extension property. If this resource was created by using the `scsetup` utility, the name depends on the resource type as shown in Table 2–2.
property	Specifies the name of the extension property that you are changing.
value	The new value of the extension property.

4. **Bring the RAC framework resource group and its resources online.**

   `# scswitch -Z -g` *resource-group*

`-Z`	Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online.
`-g` *resource-group*	Specifies the name of the RAC framework resource group that is to be moved to the `MANAGED` state and brought online. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.

CHAPTER 3

Troubleshooting Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

If you encounter a problem with Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, troubleshoot the problem by using the techniques that are described in the following sections.

- "Verifying the Status of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 59
- "Sources of Diagnostic Information" on page 62
- "Common Problems and Their Solutions" on page 62

Verifying the Status of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

The status of the `SUNW.rac_framework` resource indicates the status of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters. The Sun Cluster system administration tool `scstat`(1M) enables you to obtain the status of this resource.

▼ How to Verify the Status of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

1. **Become superuser.**
2. **Type the following command:**

```
# scstat -g
```

The following example shows that status of a RAC framework resource group that is faulty.

EXAMPLE 3–1 Status of a Faulty RAC Framework Resource Group

```
-- Resource Groups and Resources --

            Group Name        Resources
            ----------        ---------
 Resources: rac-framework-rg  rac_framework rac_udlm rac_cvm


-- Resource Groups --

            Group Name        Node Name  State
            ----------        ---------  -----
     Group: rac-framework-rg  node1      Online faulted
     Group: rac-framework-rg  node2      Online


-- Resources --

            Resource Name     Node Name  State     Status Message
            -------------     ---------  -----     --------------
  Resource: rac_framework     node1      Start failed Degraded - reconfiguration in progress
  Resource: rac_framework     node2      Online    Online

  Resource: rac_udlm          node1      Offline   Unknown - RAC framework is running
  Resource: rac_udlm          node2      Online    Online

  Resource: rac_cvm           node1      Offline   Unknown - RAC framework is running
  Resource: rac_cvm           node2      Online    Online
```

This example shows the status of the resources in a RAC framework resource group for the following two-node configuration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters:

- The configuration contains a RAC framework resource group that is named `rac-framework-rg`.
- The `rac-framework-rg` resource group contains the following resources:
  - An instance of the `SUNW.rac_framework` resource type that is named `rac_framework`
  - An instance of the `SUNW.rac_udlm` resource type that is named `rac_udlm`
  - An instance of the `SUNW.rac_cvm` resource type that is named `rac_cvm`

This example provides the following status information:

- A configuration error has prevented the `rac_framework` resource on cluster node `node1` from starting.
- The effects of this configuration error on other entities on cluster node `node1` are as follows:
  - The `rac-framework-rg` resource group is online, but faulted.

EXAMPLE 3–1 Status of a Faulty RAC Framework Resource Group *(Continued)*

- The `rac_udlm` resource and the `rac_cvm` resource are offline.
- The `rac-framework-rg` resource group and all resources on cluster node `node2` are online.

The following example shows that status of a RAC framework resource group that is operating correctly.

EXAMPLE 3–2 Status of an Operational RAC Framework Resource Group

```
-- Resource Groups and Resources --

            Group Name        Resources
            ----------        ---------
 Resources: rac-framework-rg  rac_framework rac_udlm rac_cvm


-- Resource Groups --

            Group Name        Node Name  State
            ----------        ---------  -----
     Group: rac-framework-rg  node1      Online
     Group: rac-framework-rg  node2      Online


-- Resources --

            Resource Name     Node Name  State     Status Message
            -------------     ---------  -----     --------------
  Resource: rac_framework     node1      Online    Online
  Resource: rac_framework     node2      Online    Online

  Resource: rac_udlm          node1      Online    Online
  Resource: rac_udlm          node2      Online    Online

  Resource: rac_cvm           node1      Online    Online
  Resource: rac_cvm           node2      Online    Online
```

This example shows the status of the resources in a RAC framework resource group for the following two-node configuration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters:

- The configuration contains a RAC framework resource group that is named `rac-framework-rg`.
- The `rac-framework-rg` resource group contains the following resources:
  - An instance of the `SUNW.rac_framework` resource type that is named `rac_framework`
  - An instance of the `SUNW.rac_udlm` resource type that is named `rac_udlm`
  - An instance of the `SUNW.rac_cvm` resource type that is named `rac_cvm`

EXAMPLE 3–2 Status of an Operational RAC Framework Resource Group *(Continued)*

This example indicates that all resources and resource groups in this configuration are online.

Sources of Diagnostic Information

The directory `/var/cluster/ucmm` contains the following sources of diagnostic information:

- Core files
- Log files that provide the following information:
  - Details of userland cluster membership monitor (UCMM) reconfigurations
  - Time-out settings
  - Events that are logged by the UNIX Distributed Lock Manager (Oracle UDLM)

The system messages file also contains diagnostic information.

If a problem occurs with Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, consult these files to obtain information about the cause of the problem.

Common Problems and Their Solutions

The subsections that follow describe problems that can affect Sun Cluster Support for Oracle Parallel Server/Real Application Clusters. Each subsection provides information about the cause of the problem and a solution to the problem.

Node Panic During Initialization of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters

If a fatal problem occurs during the initialization of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, the node panics with an error message similar to the following error message:

```
panic[cpu0]/thread=40037e60: Failfast: Aborting because "ucmmd"
died 30 seconds ago
```

To determine the cause of the problem, examine the system messages file. The most common causes of this problem are as follows:

- The license for VERITAS Volume Manager (VxVM) is missing or has expired.
- The `ORCLudlm` package that contains the Oracle UDLM is not installed.
- The amount of shared memory is insufficient to enable the Oracle UDLM to start.
- The version of the Oracle UDLM is incompatible with the version of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.
- A reconfiguration step has timed out.

To correct the problem, perform the appropriate recovery action for the cause of the problem and reboot the node that panicked.

Node Panic Caused by a Timeout

The timing out of any step in the reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters causes the node on which the timeout occurred to panic.

To prevent reconfiguration steps from timing out, tune the timeouts that depend on your cluster configuration. For more information, see "Guidelines for Setting Timeouts" on page 54.

If a reconfiguration step times out, use the `scrgadm` utility to increase the value of the extension property that specifies the timeout for the step. For more information, see Appendix A.

After you have increased the value of the extension property, reboot the node that panicked.

Failure of the `ucmmd` Daemon to Start

The UCMM daemon, `ucmmd`, manages the reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters. When a cluster is booted or rebooted, this daemon is started only after all components of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters are validated. If the validation of a component on a node fails, the `ucmmd` fails to start on the node.

To determine the cause of the problem, examine the following files:

- The UCMM reconfiguration log file `/var/cluster/ucmm/ucmm_reconf.log`
- The system messages file

The most common causes of this problem are as follows:

- The `ORCLudlm` package that contains the Oracle UDLM is not installed.
- An error occurred during a previous reconfiguration of a component Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.
- A step in a previous reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters timed out, causing the node on which the timeout occurred to panic.

To correct the problem, perform the appropriate recovery action for the cause of the problem and reboot the node on which `ucmmd` failed to start.

Failure of a `SUNW.rac_framework` Resource to Start

If a `SUNW.rac_framework` resource fails to start, verify the status of the resource to determine the cause of the failure. For more information, see "How to Verify the Status of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters" on page 59.

The state of a resource that failed to start is shown as `Start failed`. The associated status message indicates the cause of the failure to start as follows:

`Faulted - ucmmd is not running`
: The `ucmmd` daemon is not running on the node where the resource resides. For information about how to correct this problem, see "Failure of the `ucmmd` Daemon to Start" on page 63.

`Degraded - reconfiguration in progress`
: A configuration error occurred in one or more components of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters.

  To determine the cause of the configuration error, examine the following files:

  - The UCMM reconfiguration log file `/var/cluster/ucmm/ucmm_reconf.log`
  - The system messages file

  For more information about error messages that might indicate the cause of the configuration error, see *Sun Cluster Error Messages Guide for Solaris OS*.

  To correct the problem, correct the configuration error that caused the problem. Then reboot the node on which the erroneous component resides.

`Online`
Reconfiguration of Oracle Parallel Server/Real Application Clusters was not completed until after the `START` method of the `SUNW.rac_framework` resource timed out.

For instructions to correct the problem, see "How Recover From the Timing Out of the `START` Method" on page 65.

▼ How Recover From the Timing Out of the `START` Method

1. **Become superuser.**
2. **On the node where the `START` method timed out, take the RAC framework resource group offline.**

   `# scswitch -z -g` *resource-group* `-h` *nodelist*

`-g` *resource-group*	Specifies the name of the RAC framework resource group. If this resource group was created by using the `scsetup` utility, the name of the resource group is `rac-framework-rg`.
`-h` *nodelist*	Specifies a comma-separated list of other cluster nodes on which *resource-group* is online.

3. **On all cluster nodes that can run Sun Cluster Support for Oracle Parallel Server/Real Application Clusters, bring the RAC framework resource group online.**

   `# scswitch -Z -g` *resource-group*

`-Z`	Enables the resource and monitor, moves the resource group to the `MANAGED` state, and brings the resource group online
`-g` *resource-group*	Specifies that the resource group that you brought offline in Step 2 is to be moved to the `MANAGED` state and brought online

Failure of a Resource to Stop

If a resource fails to stop, correct this problem as explained in "Clearing the `STOP_FAILED` Error Flag on Resources" in *Sun Cluster Data Services Planning and Administration Guide for Solaris OS*.

APPENDIX **A**

Sun Cluster Support for Oracle Parallel Server/Real Application Clusters Extension Properties

The extension properties that you can set for each Sun Cluster Support for Oracle Parallel Server/Real Application Clusters resource type are listed as follows:

- `SUNW.rac_udlm` extension properties are listed in Table A–1.
- `SUNW.rac_cvm` extension properties are listed in Table A–2.
- `SUNW.rac_hwraid` extension properties are listed in Table A–3.

Note – The `SUNW.rac_framework` resource type has no extension properties.

You can update some extension properties dynamically. You can update others, however, only when you create or disable a resource. For more information, see "How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled" on page 57. The Tunable entries indicate when you can update each property.

See the `r_properties`(5) and the `rg_properties`(5) man pages for details about all of the system-defined properties.

TABLE A–1 `SUNW.rac_udlm` Extension Properties

Name/Data Type	Description
`Failfastmode` (enum)	The failfast mode of the node on which the UNIX Distributed Lock Manager (Oracle UDLM) is running. The failfast mode determines the action that is performed in response to a critical problem with this node. The possible values of this property are as follows: ■ `off` – Failfast mode is disabled. ■ `panic` – The node is forced to panic. **Default:** `panic` **Tunable:** Any time
`Num_ports` (integer)	The number of communications ports that the Oracle UDLM uses. **Default:** 32 **Range:** 16 – 64 **Tunable:** When disabled
`Oracle_config_file` (string)	The configuration file that the Oracle distributed lock manager (DLM) uses. This file must already exist. The file is installed when the Oracle software is installed. For more information, see the documentation for the Oracle software. **Default:** `/etc/opt/SUNWcluster/conf/udlm.conf` **Tunable:** Any time
`Port` (integer)	The communications port number that the Oracle UDLM uses. **Default:** 6000 **Range:** 1024 – 65500 **Tunable:** When disabled

TABLE A–1 `SUNW.rac_udlm` Extension Properties *(Continued)*

Name/Data Type	Description
`SchedclassSchedclass` (enum)	The scheduling class of the Oracle UDLM that is passed to the `priocntl`(1) command. The possible values of this property are as follows: ■ `RT` – Real-time ■ `TS` – Time-sharing ■ `IA` – Interactive **Default:** `RT` **Tunable:** When disabled
`Schedpriority` (integer)	This property specifies the scheduling priority of the Oracle UDLM that is passed to the `priocntl` command. **Default:** 11 **Range:** 0 – 59 **Tunable:** When disabled
`Udlm_abort_step_timeout` (integer)	The timeout (in seconds) for the abort step of an Oracle UDLM reconfiguration. **Default:** 325 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Udlm_start_step_timeout` (integer)	The timeout (in seconds) for the start step of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Udlm_step1_timeout` (integer)	The timeout (in seconds) for step 1 of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Udlm_step2_timeout` (integer)	The timeout (in seconds) for step 2 of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time

TABLE A–1 `SUNW.rac_udlm` Extension Properties *(Continued)*

Name/Data Type	Description
`Udlm_step3_timeout` (integer)	The timeout (in seconds) for step 3 of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Udlm_step4_timeout` (integer)	The timeout (in seconds) for step 4 of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Udlm_step5_timeout` (integer)	The timeout (in seconds) for step 5 of an Oracle UDLM reconfiguration. **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time

TABLE A–2 `SUNW.rac_cvm` Extension Properties

Name/Data Type	Description
`Cvm_abort_step_timeout` (integer)	The timeout (in seconds) for the abort step of a reconfiguration of the VERITAS Volume Manager (VxVM) component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 40 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Cvm_return_step_timeout` (integer)	The timeout (in seconds) for the return step of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 40 **Range:** 30 – 99999 seconds **Tunable:** Any time

TABLE A–2 `SUNW.rac_cvm` Extension Properties *(Continued)*

Name/Data Type	Description
`Cvm_start_step_timeout` (integer)	The timeout (in seconds) for the start step of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 120 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Cvm_step1_timeout` (integer)	The timeout (in seconds) for step 1 of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Cvm_step2_timeout` (integer)	The timeout (in seconds) for step 2 of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 100 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Cvm_step3_timeout` (integer)	The timeout (in seconds) for step 3 of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 240 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Cvm_step4_timeout` (integer)	The timeout (in seconds) for step 4 of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 320 **Range:** 100 – 99999 seconds **Tunable:** Any time

TABLE A–2 `SUNW.rac_cvm` Extension Properties *(Continued)*

Name/Data Type	Description
`Cvm_stop_step_timeout` (integer)	The timeout (in seconds) for the stop step of a reconfiguration of the VxVM component of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 40 **Range:** 30 – 99999 seconds **Tunable:** Any time
`Reservation_timeout` (integer)	The timeout (in seconds) for the reservation step of a reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 325 **Range:** 100 – 99999 seconds **Tunable:** Any time
`Vxclust_num_ports` (integer)	The number of communications ports that the `vxclust` program uses **Default:** 32 **Range:** 16 – 64 **Tunable:** When disabled
`Vxclust_port` (integer)	The communications port number that the `vxclust` program uses **Default:** 5568 **Range:** 1024 – 65535 **Tunable:** When disabled
`Vxconfigd_port` (integer)	The communications port number that the VxVM component configuration daemon `vxconfigd` uses **Default:** 5560 **Range:** 1024 – 65535 **Tunable:** When disabled

TABLE A–2 SUNW.rac_cvm Extension Properties *(Continued)*

Name/Data Type	Description
Vxkmsgd_port (integer)	The communications port number that the VxVM component messaging daemon vxkmsgd uses **Default:** 5559 **Range:** 1024 – 65535 **Tunable:** When disabled

TABLE A–3 SUNW.rac_hwraid Extension Properties

Name/Data Type	Description
Reservation_timeout (integer)	The timeout (in seconds) for the reservation step of a reconfiguration of Sun Cluster Support for Oracle Parallel Server/Real Application Clusters **Default:** 325 **Range:** 100 – 99999 seconds **Tunable:** Any time

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