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

SPARC Platform Edition

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Preface

Sun Cluster Data Service for Oracle Real Application Clusters Guide for Solaris OS explains how to install and configure Sun™ Cluster Support for Oracle 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	The command to remove a file is `rm` *filename*.
AaBbCc123	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. Do *not* save the file. (Emphasis sometimes appears in bold online.)

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	`$`

TABLE P–2 Shell Prompts   *(Continued)*

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`.

Related Third-Party Web Site References

Third-party URLs that are referenced in this document provide additional related information.

Note – Sun is not responsible for the availability of third-party web sites mentioned in this document. Sun does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Sun will not be responsible or liable for any actual or alleged damage or loss caused or alleged to be caused by or in connection with use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

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.

Installing Sun Cluster Support for Oracle Real Application Clusters

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

- "How to Use Solaris Volume Manager for Sun Cluster" on page 28
- "How to Use VxVM" on page 28
- "How to Use Hardware RAID Support" on page 29
- "How to Use Sun StorEdge QFS Shared File System" on page 31
- "How to Use the Cluster File System" on page 32
- "How to Create a Node-Specific Directory for a Shared File System" on page 34
- "How to Create a Node-Specific File for a Shared File System" on page 36
- "How to Install Sun Cluster Support for Oracle Real Application Clusters Packages" on page 39
- "How to Bypass the NIS Name Service" on page 41
- "How to Create the Database Administrator Group and the Oracle User Account" on page 42
- "How to Install the Oracle UDLM" on page 43
- "How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters Database" on page 45
- "How to Create a VxVM Shared-Disk Group for the Oracle Real Application Clusters Database" on page 51

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

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

Perform these tasks in the order in which they are listed in the table.

TABLE 1–1 Tasks for Installing Sun Cluster Support for Oracle Real Application Clusters

Task	Instructions
Understand preinstallation considerations and special requirements	"Preinstallation Considerations" on page 18 "Special Requirements" on page 26
Install storage management software	"Installing Storage Management Software With Sun Cluster Support for Oracle Real Application Clusters" on page 28
Create node-specific files and directories that the Sun Cluster Support for Oracle Real Application Clusters software requires	"Creating Node-Specific Files and Directories for a Shared File System" on page 33
Install data service packages	"Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38
Prepare the Sun Cluster nodes	"Preparing the Sun Cluster Nodes" on page 40
Install the UNIX Distributed Lock Manager	"Installing the Oracle UDLM" on page 43
Create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters database	"Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters Database" on page 45
Create a VxVM shared-disk group for the Oracle Real Application Clusters database	"Creating a VxVM Shared-Disk Group for the Oracle Real Application Clusters Database" on page 50

Preinstallation Considerations

Oracle Real Application Clusters is a scalable application that can run on more than one node concurrently. Sun Cluster Support for Oracle Real Application Clusters is a set of packages that, when installed, enables Oracle Real Application Clusters to run on Sun Cluster nodes. This data service also enables Oracle Real Application Clusters to be managed by using Sun Cluster commands.

Note – In earlier versions of Oracle, this scalable application is referred to as "Oracle Parallel Server". In this book, references to "Oracle Real Application Clusters" also apply to Oracle Parallel Server unless this book explicitly states otherwise.

This data service provides fault monitoring *only* to enable the status of Oracle Real Application Clusters resources to be monitored by Sun Cluster utilities. This data service does not provide automatic fault recovery because the Oracle Real Application Clusters software provides similar functionality.

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

Storage Management Requirements for the Oracle Real Application Clusters Database

You must configure Oracle 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 Real Application Clusters software that access the database concurrently. The UNIX Distributed Lock Manager (Oracle UDLM) controls access to shared resources between cluster nodes.

To satisfy these requirements, use one storage management scheme from the following list:

- Solaris Volume Manager for Sun Cluster

  Note – Solaris Volume Manager for Sun Cluster is supported *only* with Oracle Real Application Clusters. Solaris Volume Manager for Sun Cluster with Oracle Parallel Server is *not* supported.

- VERITAS Volume Manager (VxVM) with the cluster feature
- Hardware redundant array of independent disks (RAID) support
- Sun StorEdge™ QFS shared file system with hardware RAID support

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 fail to boot correctly.

For example, if you are using 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 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 System, Sun Cluster, Oracle, and your volume manager. If you need to install any Sun Cluster Support for Oracle Real Application Clusters patches, you must apply these patches after you install the data service packages.

Location of Oracle Binary Files and Oracle Configuration Files

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

- The local disks of each cluster node

- A shared file system from the following list:

  - The Sun StorEdge QFS shared file system
  - The cluster file system

Using Local Disks for Oracle Binary Files and Oracle Configuration Files

Placing the Oracle binary files and Oracle configuration files on the individual cluster nodes enables you to upgrade the Oracle application later without shutting down the data service.

The disadvantage is that you then have several copies of the Oracle application binary files and Oracle configuration files to maintain and administer.

Using a Shared File System for Oracle Binary Files and Oracle Configuration Files

To simplify the maintenance of your Oracle installation, you can install the Oracle binary files and Oracle configuration files on a shared file system. The following shared file systems are supported:

- The Sun StorEdge QFS shared file system
- 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

If you put the Oracle binary files and Oracle configuration files on a shared 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 Oracle application. If a small amount of downtime for upgrades is acceptable, place a single copy of the Oracle binary files and Oracle configuration files on a shared file system.

Requirements for Using the Sun StorEdge QFS Shared File System

You can store all of the files that are associated with Oracle Real Application Clusters on the Sun StorEdge QFS shared file system.

Distribute these files among several file systems as follows:

- Create one file system in the cluster to store these files:

    - Oracle binary files
    - Oracle configuration files (for example, `init.ora`, `tnsnames.ora`, `listener.ora`, and `sqlnet.ora`)
    - Alert files (for example, `alert_`*sid*`.log`)
    - Trace files (`*.trc`)

- Create one file system for each database to store these files for all Oracle Real Application Clusters instances of the database:

    - Data files
    - Control files
    - Online redo log files
    - Archived redo log files

For information about how to create a Sun StorEdge QFS shared file system, see the following documentation for Sun StorEdge QFS:

- *Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide*

- *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*

Requirements for Using the Cluster File System

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

- Oracle binary files
- Oracle 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, or 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 Real Application Clusters database instance. This device group contains the file system that holds archived redo log files of the database instance.

For information about how to create cluster file systems, see:

- "Planning the Global Devices and Cluster File Systems" in *Sun Cluster Software Installation Guide for Solaris OS*
- "Configuring the Cluster" in *Sun Cluster Software Installation Guide for Solaris OS*

Configuration Planning Questions

Use the questions in the subsections that follow to plan the installation and configuration of Sun Cluster Support for Oracle Real Application Clusters. Write the answers to these questions in the space that is provided on the data service worksheets in "Configuration Worksheets" in *Sun Cluster 3.1 Data Service Planning and Administration Guide*.

Resource Groups for Oracle RAC Server Resources

Which resource groups will you use for the Oracle Real Application Clusters (RAC) server resources?

You require one resource group for each Oracle Real Application Clusters database instance. Each resource group contains the Oracle RAC server resource for the database instance.

Use the answer to this question when you perform the procedure in "Registering and Configuring Oracle RAC Server Resources" on page 63.

Resource Groups for Oracle Listener Resources

Which resource groups will you use for the Oracle listener resources?

Use the answer to this question when you perform the procedure in "Registering and Configuring Oracle Listener Resources" on page 66.

The resource groups depend on your configuration of Oracle listeners with Real Application Clusters database instances. For general information about possible configurations of listeners for Real Application Clusters instances, see your Oracle documentation. Example configurations are described in the subsections that follow.

One Listener For One Real Application Clusters Instance

One listener serves only one Real Application Clusters instance. The listener listens on the fixed Internet Protocol (IP) address of the node. The listener cannot fail over.

In this situation, configure the listener resource as follows:

- Configure the listener resource and the RAC server resource in the same resource group.
- Ensure that this resource group is mastered on only one node.

One Listener That Cannot Fail Over for Several Real Application Clusters Instances

One listener serves several Real Application Clusters instances on the same node. The listener uses Oracle's transparent application failover (TAF) and load balancing to distribute client connections across all Real Application Clusters instances. The listener cannot fail over.

In this situation, configure the listener resource as follows:

- Configure the listener resource in its own resource group.
- Ensure that the listener's resource group is mastered on only one node.
- Create a dependency between the listener's resource group and RAC servers' resource groups.

One Listener That Can Fail Over for Several Real Application Clusters Instances

One listener that can fail over serves several Real Application Clusters instances on the same node. When the listener fails over to another node, the listener serves several Real Application Clusters instances on the other node.

The listener uses Oracle's TAF and load balancing to distribute client connections across all Real Application Clusters instances. To ensure fast error detection and short failover times, the listener listens on an address that is represented by a `LogicalHostname` resource.

In this situation, configure the listener resource as follows:

- Configure the listener resource and the `LogicalHostname` resource in the same resource group.
- Ensure that this resource group is mastered on the nodes on which Oracle Real Application Clusters is running.

For more information, see "`LogicalHostname` Resources for Oracle Listener Resources" on page 25.

One Listener for the Entire Cluster

One listener serves all Real Application Clusters instances on all nodes. The listener listens on an address that is represented by a `LogicalHostname` resource. This configuration ensures that the address is plumbed very quickly on another node after a node fails.

You can use this configuration if you configure Real Application Clusters instances to use a multithreaded server (MTS). In such a configuration, the `REMOTE_LISTENERS` parameter in the `init.ora` file specifies that each dispatcher registers with the listener on a logical IP address.

All clients connect through the one listener. The listener redirects each client connection to the least busy dispatcher. The least busy dispatcher might be on a different node from the listener.

If the listener fails, the listener's fault monitor restarts the listener. If the node where the listener is running fails, the listener is restarted on a different node. In both situations the dispatchers reregister after the listener is restarted.

If you are using one listener for the entire cluster, configure the following resources in the same resource group:

- The listener resource
- The `LogicalHostname` resource

For more information, see "`LogicalHostname` Resources for Oracle Listener Resources" on page 25.

`LogicalHostname` Resources for Oracle Listener Resources

Which `LogicalHostname` resources will Oracle listener resources use?

Use the answer to this question when you perform the procedure in "Registering and Configuring Oracle Listener Resources" on page 66.

If a cluster node that is running an instance of Oracle 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 connect to listener resources that are listening on an address that is represented by the Sun Cluster `LogicalHostname` resource. Configure the `LogicalHostname` resource and the listener resource in a separate resource group. Ensure that this resource group is mastered on the nodes on which Oracle Real Application Clusters is running. If a node fails, the resource group that contains the `LogicalHostname` resource and the listener resource fails over to another surviving node on which Oracle Real Application Clusters is running. The failover of the `LogicalHostname` resource enables new connections to be directed to the other instance of Oracle Real Application Clusters.

Resources for the Sun StorEdge QFS Shared File System

If you are using the Sun StorEdge QFS shared file system, answer the following questions:

- Which resources will you create to represent the metadata server for the Sun StorEdge QFS shared file system?

  One resource is required for each Sun StorEdge QFS metadata server.
- Which resource groups will you use for these resources?

For more information, see the following documentation for Sun StorEdge QFS:

- *Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide*
- *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*

Use the answers to these questions when you perform the procedure in "Registering and Configuring Oracle RAC Server Resources" on page 63.

Location of System Configuration Files

Where will the system configuration files reside?

For the advantages and disadvantages of using the local file system instead of the cluster file system, see "Location of Oracle Binary Files and Oracle Configuration Files" on page 20.

Special Requirements

This section lists special requirements for Sun Cluster Support for Oracle 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.

■ **Logs for Oracle RAC server resource**: `/var/opt/SUNWscor/oracle_server`

Rebooting Nodes During the Installation of Sun Cluster Support for Oracle Real Application Clusters

During installation of this data service, reboot the nodes *only* after you have installed and configured the Oracle UDLM software, and satisfied the prerequisites for performing this task. Otherwise, the nodes panic.

For information about how to recover from a node panic during installation, see "Node Panic During Initialization of Sun Cluster Support for Oracle Real Application Clusters" on page 92.

Using the Oracle Real Application Clusters Guard Option With Sun Cluster 3.1

For information about the installation, administration, and operation of the Oracle 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 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 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 Real Application Clusters Guard installs. Using Sun Cluster commands for this purpose might cause failures.
- Querying the state of the resources that Oracle Real Application Clusters Guard installs. This state might not reflect the actual state. To check the state of the Oracle Real Application Clusters Guard, use the commands that Oracle supplies.

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

Install the software for the storage management schemes that you are using for the Oracle Real Application Clusters database and the Oracle software.

- For information about storage management schemes for the database, see "Storage Management Requirements for the Oracle Real Application Clusters Database" on page 19.
- For information about storage management schemes for the Oracle software, see "Location of Oracle Binary Files and Oracle Configuration Files" on page 20.

▼ How to Use Solaris Volume Manager for Sun Cluster

To use the Solaris Volume Manager for Sun Cluster software with Sun Cluster Support for Oracle Real Application Clusters, perform the following tasks.

1. **Ensure that you are using Solaris 9 9/04 or compatible versions.**

   Solaris Volume Manager for Sun Cluster is installed during the installation of the Solaris Operating System.

2. **Configure the Solaris Volume Manager for Sun Cluster software on the cluster nodes.**

   For more information, see "Installing and Configuring Solstice DiskSuite/Solaris Volume Manager Software" in *Sun Cluster Software Installation Guide for Solaris OS*.

Where to Go From Here

Go to "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38 to install the Sun Cluster Support for Oracle Real Application Clusters software packages.

▼ How to Use VxVM

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

1. **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 Real Application Clusters support. Before you install the Oracle 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 to install the Sun Cluster Support for Oracle Real Application Clusters software packages.

▼ How to Use Hardware RAID Support

You can use Sun Cluster Support for Oracle 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 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 Real Application Clusters Packages" on page 38 to install the Sun Cluster Support for Oracle Real Application Clusters software packages.

▼ How to Use Sun StorEdge QFS Shared File System

You must use Sun StorEdge QFS shared file system with hardware RAID support.

Note – For detailed instructions for installing, configuring, and using Sun StorEdge QFS shared file system, see *Sun StorEdge QFS and Sun StorEdge SAM-FS Software Installation and Configuration Guide* and *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*.

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1. **Ensure that the Sun StorEdge QFS software is installed.**

2. **Ensure that each Sun StorEdge QFS shared file system is correctly configured for use with Sun Cluster Support for Oracle Real Application Clusters.**

3. **Ensure that each Sun StorEdge QFS shared file system is mounted with the correct options for use with Sun Cluster Support for Oracle Real Application Clusters.**

   - For the file system that contains binary files, configuration files, alert files, and trace files, use the default mount options.

   - For the file systems that contain data files, control files, online redo log files, and archived redo log files, set the mount options as follows:

     - In the `/etc/vfstab` file set the `shared` option.

     - In the `/etc/opt/SUNWsamfs/samfs.cmd` file or the `/etc/vfstab` file, set the following options:

       ```
       stripe=width
       sync_meta=1
       mh_write
       qwrite
       forcedirectio
       nstreams=1024
       rdlease=300     Set this value for optimum performance.
       wrlease=300     Set this value for optimum performance.
       aplease=300     Set this value for optimum performance.
       ```

       width   Specifies the required stripe width for devices in the file system. The required stripe width is a multiple of the file system's disk allocation unit (DAU). *width* must be an integer that is greater than or equal to 1.

Note – Ensure that settings in the `/etc/vfstab` file do not conflict with settings in the `/etc/opt/SUNWsamfs/samfs.cmd` file. Settings in the `/etc/vfstab` file override settings in the `/etc/opt/SUNWsamfs/samfs.cmd` file.

---

4. **Register and configure the data service for the Sun StorEdge QFS metadata server.**

Where to Go From Here

The next step depends on whether you are using the Sun StorEdge QFS file system for Oracle binary files and Oracle configuration files.

- If you are using the Sun StorEdge QFS file system for Oracle binary files and Oracle configuration files, go to "Creating Node-Specific Files and Directories for a Shared File System" on page 33.
- Otherwise, go to "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38.

▼ 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. **If you are using the UNIX file system (UFS), ensure that you specify the correct mount options for various types of Oracle files.**

   For the correct options, see the table that follows. You set these options when you add an entry to the `/etc/vfstab` file for the mount point.

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 a Shared File System" on page 33 to create node-specific files and directories that the Sun Cluster Support for Oracle Real Application Clusters software requires.

Creating Node-Specific Files and Directories for a Shared File System

To simplify the maintenance of your Oracle installation, you can install the Oracle binary files and Oracle configuration files on a shared file system. The following shared file systems are supported:

- The Sun StorEdge QFS shared file system
- The cluster file system

When Oracle software is installed on a shared file system, all the files in the directory that the `ORACLE_HOME` environment variable specifies are accessible by all cluster nodes. However, some Oracle files and directories must maintain node-specific information.

If you install Oracle software on a shared file system, you must create local copies of files and directories that must maintain node-specific information. To ensure that these files and directories are accessible by all cluster nodes, use 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 shared 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 shared 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 a Shared 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 a Shared 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 shared 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**

   # **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:

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

```
# 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 a Shared 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 a Shared 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 shared 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:

EXAMPLE 1–2 Creating Node-Specific Files   *(Continued)*

```
# 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 Real Application Clusters Packages" on page 38 to install the Sun Cluster Support for Oracle Real Application Clusters software packages.

Installing Sun Cluster Support for Oracle Real Application Clusters Packages

If you did not install the Sun Cluster Support for Oracle 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 Real Application Clusters. To complete this procedure, you need the Sun Java Enterprise System Accessory CD Volume 3.

The Sun Cluster Support for Oracle Real Application Clusters packages are as follows:

■ Packages for the RAC framework resource group
■ Packages for the Oracle RAC server resource and Oracle RAC listener resource

Install the Sun Cluster Support for Oracle 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 packages for the RAC framework resource group.

▼ How to Install Sun Cluster Support for Oracle 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 RAC framework resource group.**

   This directory depends on the version of the Solaris Operating System 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 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 for the Oracle Real Application Clusters database.

   - If you are using Solaris Volume Manager for Sun Cluster, run the following command:

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

   - 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 Sun StorEdge QFS shared file system with hardware RAID support, run the following command:

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

5. **Change the current working directory to the directory that contains the packages for the Oracle RAC server resource and Oracle RAC listener resource.**

   This directory depends on the version of the Solaris Operating System that you are using.

   - If you are using Solaris 8, run the following command:

     ```
     # cd /cdrom/cdrom0/components/SunCluster_HA_Oracle_3.1/Solaris_8/Packages
     ```

   - If you are using Solaris 9, run the following command:

     ```
     # cd /cdrom/cdrom0/components/SunCluster_HA_Oracle_3.1/Solaris_9/Packages
     ```

6. **On each cluster node that can run Sun Cluster Support for Oracle 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 locale that you require.

   - To install the C locale, run the following command:

     ```
     # pkgadd -d . SUNWscor
     ```

   - To install the Simplified Chinese locale, run the following command:

     ```
     # pkgadd -d . SUNWcscor
     ```

   - To install the Japanese locale, run the following command:

     ```
     # pkgadd -d . SUNWjscor
     ```

Where to Go From Here

Go to to prepare the Sun Cluster nodes.

Preparing the Sun Cluster Nodes

Preparing the Sun Cluster nodes modifies the configuration of the operating system to enable Oracle Real Application Clusters to run on Sun Cluster nodes. Preparing the Sun Cluster nodes and disks involves the following tasks:

- Bypassing the NIS name service
- Creating the database administrator group and the Oracle user account

Caution – Perform these tasks on all nodes where Sun Cluster Support for Oracle Real Application Clusters can run. If you do not perform these tasks on all nodes, the Oracle installation is incomplete. An incomplete Oracle installation causes Sun Cluster Support for Oracle Real Application Clusters to fail during startup.

▼ How to Bypass the NIS Name Service

Bypassing the NIS name service protects the Sun Cluster Support for Oracle Real Application Clusters data service against a failure of a cluster node's public network. A failure of a cluster node's public network might cause the NIS name service to become unavailable. If Sun Cluster Support for Oracle Real Application Clusters refers to the NIS name service, unavailability of the name service might cause the Sun Cluster Support for Oracle Real Application Clusters data service to fail.

Bypassing the NIS name service ensures that the Sun Cluster Support for Oracle Real Application Clusters data service does not refer to the NIS name service when the data service sets the user identifier (ID). The Sun Cluster Support for Oracle Real Application Clusters data service sets the user ID when the data service starts or stops the database.

1. **Become superuser on all nodes where Sun Cluster Support for Oracle Real Application Clusters can run.**

2. **On each node, include the following entries in the `/etc/nsswitch.conf` file.**

   ```
   passwd:    files nis [TRYAGAIN=0]
   publickey: files nis [TRYAGAIN=0]
   project:   files nis [TRYAGAIN=0]
   group:     files
   ```

   For more information about the /etc/nsswitch.conf file, see the nsswitch.conf(4) man page.

Where to Go From Here

Go to "How to Create the Database Administrator Group and the Oracle User Account" on page 42.

▼ How to Create the Database Administrator Group and the Oracle User Account

---

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 Real Application Clusters. For example, add the following entry to the /etc/group file.

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

   You can create 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 create 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 Real Application Clusters.

Where to Go From Here

After you set up the cluster environment for Oracle Real Application Clusters, go to "How to Install the Oracle UDLM" on page 43 to install the Oracle UDLM software on each cluster node.

Installing the Oracle UDLM

To enable the Oracle UDLM software to run correctly, you must ensure that sufficient shared memory is available on all of the cluster nodes. For detailed instructions for installing the Oracle UDLM, see the Oracle Real Application Clusters CD-ROM.

Caution – Before you install the Oracle UDLM, ensure that you have created entries for the database administrator group and the Oracle user ID. See "How to Create the Database Administrator Group and the Oracle User Account" on page 42 for details.

▼ How to Install the Oracle UDLM

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

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

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

   See the appropriate Oracle 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 as shown in the following table.

Storage Management Scheme	Next Step
Solaris Volume Manager for Sun Cluster	"Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters Database" on page 45
VxVM with the cluster feature	"Creating a VxVM Shared-Disk Group for the Oracle Real Application Clusters Database" on page 50
Other	"Registering and Configuring the RAC Framework Resource Group" on page 55

Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters Database

Note – Perform this task only if you are using Solaris Volume Manager for Sun Cluster.

If you are using Solaris Volume Manager for Sun Cluster, Solaris Volume Manager requires a multi-owner disk set for the Oracle Real Application Clusters database to use. For information about Solaris Volume Manager for Sun Cluster multi–owner disk sets, see "Disk Set Concepts for Solaris Volume Manager for Sun Cluster" in *Solaris Volume Manager Administration Guide*.

Before You Begin

Before you create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters database, note the following points.

- Ensure that the required Sun Cluster Support for Oracle Real Application Clusters software packages are installed on each node. For more information, see "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38.

- Do not create any file systems in the multi-owner disk set because only the raw data file uses this disk set.

- Disk devices that you add to the multi-owner disk set must be directly attached to all of the cluster nodes.

▼ How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle Real Application Clusters Database

1. **Create a multi-owner disk set.**

   Use the metaset(1M) command for this purpose.

   # **metaset -s** *setname* **-M -a -h** *nodelist*

   -s *setname*   Specifies the name of the disk set that you are creating.

-M	Specifies that the disk set that you are creating is a multi-owner disk set.
-a	Specifies that the nodes that the -h option specifies are to be added to the disk set.
-h *nodelist*	Specifies a space-separated list of nodes that are to be added to the disk set. The Sun Cluster Support for Oracle Real Application Clusters software packages *must* be installed on each node in the list.

2. **Add global devices to the disk set that you created in Step 1.**

   # **metaset -s** *setname* **-a** *devicelist*

-s *setname*	Specifies that you are modifying the disk set that you created in Step 1.
-a	Specifies that the devices that *devicelist* specifies are to be added to the disk set.
devicelist	Specifies a space-separated list of full device ID path names for the global devices that are to be added to the disk set. To enable consistent access to each device from any node in the cluster, ensure that each device ID path name is of the form /dev/did/dsk/d*N*, where *N* is the device number.

3. **For the disk set that you created in Step 1, create the volumes that the Oracle Real Application Clusters database will use.**

   Note – If you are creating many volumes for Oracle data files, you can simplify this step by using soft partitions. For more information, see "Soft Partitions (Overview)" in *Solaris Volume Manager Administration Guide* and "Soft Partitions (Tasks)" in *Solaris Volume Manager Administration Guide*.

   Create each volume by concatenating slices on global devices that you added in Step 2. Use the metainit(1M) command for this purpose.

   # **metainit -s** *setname* *volume-abbrev* *numstripes* *width* *slicelist*

-s *setname*	Specifies that you are creating a volume for the disk set that you created in Step 1.
volume-abbrev	Specifies the abbreviated name of the volume that you are creating. An abbreviated volume name has the format d*V*, where *V* is the volume number.
numstripes	Specifies the number of stripes in the volume.

width	Specifies the number of slices in each stripe. If you set *width* to greater than 1, the slices are striped.
slicelist	Specifies a space-separated list of slices that the volume contains. Each slice must reside on a global device that you added in Step 2.

4. **Verify that each node is correctly added to the multi-owner disk set.**

   Use the metastat(1M) command for this purpose.

   ```
   # metastat -s setname
   ```

-s *setname*	Specifies that you are verifying the disk set that you created in Step 1

   This command displays a table that contains the following information for each node that is correctly added to the disk set:

   - The Host column contains the node name.
   - The Owner column contains the text multi-owner.
   - The Member column contains the text Yes.

5. **Verify that the multi-owner disk set is correctly configured.**

   ```
   # scconf -pvv | grep setname
   ```

setname	Specifies that configuration information only for the disk set that you created in Step 1 is displayed

   This command displays the device group information for the disk set. For a multi-owner disk set, the device group type is Multi-owner_SVM.

6. **Verify the online status of the multi-owner disk set.**

   ```
   # scstat -D
   ```

   This command displays the node names of nodes in the multi-owner disk set that are online.

7. **On each node that can own the disk set, change the ownership of each volume that you created in Step 3 as follows:**

   - Owner: oracle
   - Group: dba

   Ensure that you change ownership only of volumes that the Oracle Real Application Clusters database will use.

   ```
   # chown oracle:dba volume-list
   ```

volume-list	Specifies a space-separated list of the logical names of the volumes that you created for the disk set. The format of these names depends on the type of device where the volume resides, as follows: ■ For block devices: /dev/md/*setname*/dsk/d*V* ■ For raw devices: /dev/md/*setname*/rdsk/d*V*

The replaceable items in these names are as follows:

setname   Specifies the name of the multi-owner disk set that you created in Step 1

V   Specifies the volume number of a volume that you created in Step 3

Ensure that this list specifies each volume that you created in Step 3.

8. **On each node that can own the disk set, grant the `oracle` user read access and write access to each volume for which you changed the ownership in Step 7.**

   Ensure that you change access permissions only of volumes that the Oracle Real Application Clusters database will use.

   ```
   # chmod u+rw volume-list
   ```

   volume-list   Specifies a space-separated list of the logical names of the volumes to which you are granting the `oracle` user read access and write access. Ensure that this list contains the volumes that you specified in Step 7.

EXAMPLE 1–3 Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster

This example shows the sequence of operations that is required to create a multi-owner disk set in Solaris Volume Manager for Sun Cluster. This example assumes that the volumes reside on raw devices.

1. To create the multi-owner disk set, the following command is run:

   ```
   # metaset -s racdbset -M -a -h rachost1 rachost2 rachost3 rachost4
   ```

   The multi-owner disk set is named `racdbset`. The nodes `rachost1`, `rachost2`, `rachost3`, and `rachost4` are added to this disk set.

2. To add the global device `/dev/did/dsk/d0` to the disk set, the following command is run:

   ```
   # metaset -s racdbset -a /dev/did/dsk/d0
   ```

3. To create a volume for the disk set, the following command is run:

   ```
   # metainit -s racdbset d0 1 1 /dev/did/dsk/d0s0
   ```

   The volume is named `d0`. This volume is created by a one-on-one concatenation of the slice `/dev/did/dsk/d0s0`. The slice is *not* striped.

4. To verify that each node is correctly added to the multi-owner disk set, the following command is run:

   ```
   # metastat -s racdbset
   Multi-owner Set name = racdbset, Set number = 1, Master = rachost2

   Host               Owner          Member
       rachost1           multi-owner    Yes
   ```

```
                   rachost2          multi-owner   Yes
                   rachost3          multi-owner   Yes
                   rachost4          multi-owner   Yes

          Drive Dbase

          d6     Yes

          d10    Yes
```

5. To verify that the multi-owner disk set is correctly configured, the following command is run:

```
# scconf -pvv | grep racdbset
Device group name:                                racdbset
   (racdbset) Device group type:                  Multi-owner_SVM
   (racdbset) Device group failback enabled:      no
   (racdbset) Device group node list:       rachost1, rachost2, rachost3, rachost4
   (racdbset) Device group ordered node list:     no
   (racdbset) Device group desired number of secondaries: 0
   (racdbset) Device group diskset name:          racdbset
```

6. To verify the online status of the multi-owner disk set, the following command is run:

```
# scstat -D

-- Device Group Servers --

                        Device Group        Primary             Secondary
                        ------------        -------             ---------


-- Device Group Status --

                        Device Group        Status
                        ------------        ------


-- Multi-owner Device Groups --

                        Device Group        Online Status
                        ------------        -------------
   Multi-owner device group:   racdbset    rachost1,rachost2,rachost3,rachost4
```

7. To change the ownership of the volume in the disk set to owner `oracle` in group `dba`, the following command is run:

   ```
   # chown oracle:dba /dev/md/racdbset/rdsk/d0
   ```

   This command is run on each node that can own the disk set.

EXAMPLE 1–3 Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster   *(Continued)*

8. To grant the `oracle` user read access to the volume in the disk set, the following command is run:

   `# chmod u+rw /dev/md/racdbset/rdsk/d0`

   This command is run on each node that can own the disk set.

Where to Go From Here

After you have created a multi-owner disk set for the Oracle Real Application Clusters database, go to "Registering and Configuring the RAC Framework Resource Group" on page 55 to register and configure Sun Cluster Support for Oracle Real Application Clusters.

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

---

Note – Perform this task only if you are using VxVM with the cluster feature.

If you are using VxVM with the cluster feature, VxVM requires a shared-disk group for the Oracle Real Application Clusters database to use.

Before You Begin

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

- Ensure that the required Sun Cluster Support for Oracle Real Application Clusters software packages are installed on each node. For more information, see "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38.

- 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 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 Real Application Clusters database, go to "Registering and Configuring the RAC Framework Resource Group" on page 55 to register and configure Sun Cluster Support for Oracle Real Application Clusters.

CHAPTER **2**

Administering Sun Cluster Support for Oracle Real Application Clusters

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

- "How to Register and Configure the RAC Framework Resource Group for a Cluster" on page 57
- "How to Register and Configure the RAC Framework Resource Group for Selected Nodes" on page 59
- "How to Verify the Installation of Oracle Real Application Clusters" on page 61
- "How to Create an Oracle Database" on page 61
- "How to Register and Configure Oracle RAC Server Resources" on page 63
- "How to Register and Configure Oracle Listener Resources" on page 66
- "How to Verify the Sun Cluster Support for Oracle Real Application Clusters Installation and Configuration" on page 69
- "How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled" on page 73
- "How to Remove Sun Cluster Support for Oracle Real Application Clusters From a Cluster" on page 74
- "How to Remove Sun Cluster Support for Oracle Real Application Clusters From Selected Nodes" on page 76
- "How to Create the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 78
- "How to Add Nodes to the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 81
- "How to Remove the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 82
- "How to Remove Nodes From the RAC Framework Resource Group by Using the `scrgadm` Utility" on page 84

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

Table 2–1 summarizes the tasks for setting up Sun Cluster Support for Oracle Real Application Clusters.

Perform these tasks in the order in which they are listed in the table.

TABLE 2–1 Tasks for Setting Up Sun Cluster Support for Oracle Real Application Clusters

Task	Instructions
Register and configure the Real Application Clusters (RAC) framework resource group	If you are using the scsetup utility for this task, see"Registering and Configuring the RAC Framework Resource Group" on page 55. If you are using the scrgadm utility for this task, see: ■ "How to Create the RAC Framework Resource Group by Using the scrgadm Utility" on page 78 ■ "How to Add Nodes to the RAC Framework Resource Group by Using the scrgadm Utility" on page 81
Install the Oracle Real Application Clusters software	Oracle Real Application Clusters installation documentation.
Verify the installation of the Oracle Real Application Clusters software	"Verifying the Installation of Oracle Real Application Clusters" on page 60.
Create your Oracle database	"Creating an Oracle Database" on page 61.
Automate the startup and shutdown of Oracle Real Application Clusters database instances	"Automating the Startup and Shutdown of Oracle Real Application Clusters Database Instances" on page 62.
Verify the Sun Cluster Support for Oracle Real Application Clusters installation and configuration	"Verifying the Sun Cluster Support for Oracle Real Application Clusters Installation and Configuration" on page 69.
(Optional) Tune Sun Cluster Support for Oracle Real Application Clusters extension properties	"Tuning Sun Cluster Support for Oracle Real Application Clusters" on page 70.

Table 2–2 summarizes other administration tasks for Sun Cluster Support for Oracle Real Application Clusters.

Perform these tasks whenever they are required.

TABLE 2–2 Other Administration Tasks for Sun Cluster Support for Oracle Real Application Clusters

Task	Instructions
Upgrade Sun Cluster Support for Oracle 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*. If you are using the scsetup utility, see also"How to Register and Configure the RAC Framework Resource Group for a Cluster" on page 57. If you are using the scrgadm utility, see also "How to Create the RAC Framework Resource Group by Using the scrgadm Utility" on page 78.
Remove Sun Cluster Support for Oracle Real Application Clusters	If you are using the scsetup utility for this task, see "Removing Sun Cluster Support for Oracle Real Application Clusters" on page 74. If you are using the scrgadm utility for this task, see: ■ "How to Remove the RAC Framework Resource Group by Using the scrgadm Utility" on page 82 ■ "How to Remove Nodes From the RAC Framework Resource Group by Using the scrgadm Utility" on page 84
Troubleshoot Sun Cluster Support for Oracle Real Application Clusters	Chapter 3

Registering and Configuring the RAC Framework Resource Group

Registering and configuring the RAC framework resource group enables Sun Cluster Support for Oracle Real Application Clusters to be managed by using Sun Cluster commands.

You can register and configure the RAC framework resource group for the following entities:

■ **A cluster.** For more information, see "How to Register and Configure the RAC Framework Resource Group for a Cluster" on page 57.
■ **Selected nodes in a cluster.** For more information, see "How to Register and Configure the RAC Framework Resource Group for Selected Nodes" on page 59.

Overview of the RAC Framework Resource Group

The RAC framework resource group enables Oracle 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 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 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 for the Oracle Real Application Clusters database.

- Solaris Volume Manager for Sun Cluster is represented by the `SUNW.rac_svm` resource type.
- 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 resource that represents Sun StorEdge QFS shared file system is *not* contained in the RAC framework resource group. For information about this resource, see:

- "Configuration Planning Questions" on page 22
- *Sun StorEdge QFS and Sun StorEdge SAM-FS File System Administration Guide*

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 Real Application Clusters.

Determining Whether to Use `scsetup` or `scrgadm`

The procedures that follow explain how to configure resources for the RAC framework resource group by using the `scsetup`(1M) utility. The `scsetup` utility enables you to configure resources for the RAC framework resource group interactively. Configuring these resources interactively reduces 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 the RAC framework resource group by using the scrgadm(1M) utility, see "Creating, Modifying, and Removing the RAC Framework Resource Group by Using the scrgadm Utility" on page 77.

▼ How to Register and Configure the RAC Framework Resource Group for a Cluster

When you register and configure the RAC framework resource group for a cluster, the RAC framework resource group is created.

Perform this procedure if you require Sun Cluster Support for Oracle Real Application Clusters to run on all nodes in a cluster.

Before you perform this procedure, ensure that the required Sun Cluster Support for Oracle 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 the Oracle Real Application Clusters database. For more information, see "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38.

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 78.

   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 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 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

The next steps are as follows:

1. Installing the Oracle Real Application Clusters software. For more information, see your Oracle Real Application Clusters installation documentation.
2. Verifying the installation of Oracle Real Application Clusters. For more information, see "Verifying the Installation of Oracle Real Application Clusters" on page 60.

▼ How to Register and Configure the RAC Framework Resource Group for Selected Nodes

When you register and configure the RAC framework resource group 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 require Sun Cluster Support for Oracle Real Application Clusters to run on the nodes.
- You require Sun Cluster Support for Oracle Real Application Clusters to run on only a subset of nodes in a cluster.

Before you perform this procedure, ensure that the required Sun Cluster Support for Oracle 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 the Oracle Real Application Clusters database. For more information, see "Installing Sun Cluster Support for Oracle Real Application Clusters Packages" on page 38.

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 81.

---

   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 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 Real Application Clusters packages are installed, but on which the RAC framework resource group does not yet 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 resources, 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

The next steps are as follows:

1. Installing the Oracle Real Application Clusters software. For more information, see your Oracle Real Application Clusters installation documentation.
2. Verifying the installation of Oracle Real Application Clusters. For more information, see "Verifying the Installation of Oracle Real Application Clusters" on page 60.

Verifying the Installation of Oracle Real Application Clusters

After you have installed Oracle Real Application Clusters, verify that the installation is correct. Perform this verification before you attempt to create your Oracle database. This verification does *not* verify that Real Application Clusters database instances can be started and stopped automatically.

▼ How to Verify the Installation of Oracle Real Application Clusters

1. **Confirm that the owner, group, and mode of the `$ORACLE_HOME/bin/oracle` file are as follows:**

   - Owner: `oracle`
   - Group: `dba`
   - Mode: `-rwsr-s--x`

   `# ls -l $ORACLE_HOME/bin/oracle`

2. **Confirm that the binary files for the Oracle listener exist in the `$ORACLE_HOME/bin` directory.**

Where to Go From Here

Go to

Creating an Oracle Database

Perform this task to configure and create the initial Oracle database in a Sun Cluster environment. If you create and configure additional databases, you do not need to repeat this task.

▼ How to Create an Oracle Database

1. **Ensure that the `init$ORACLE_SID.ora` file or the `config$ORACLE_SID.ora` file specifies the correct locations of the control files and alert files.**

   The locations of these files are specified as follows:

   - The location of control files is specified by the `control_files` keyword.
   - The location of alert files is specified by the `background_dump_dest` keyword.

2. **If you use Solaris authentication for database logins, set the `remote_os_authent` variable in the `init$ORACLE_SID.ora` file to `True`.**

3. **Ensure that all files that are related to the database are in the correct location.**

4. **Start the creation of the database by using one command from the following list:**

- The Oracle `dbca` command
- The Oracle `sqlplus` command

5. **Ensure that the file names of your control files match the file names in your configuration files.**

Where to Go From Here

Go to

Automating the Startup and Shutdown of Oracle Real Application Clusters Database Instances

Automating the startup and shutdown of Oracle Real Application Clusters database instances involves registering and configuring the following resources:

- Oracle RAC server resources
- Oracle listener resources

The Oracle RAC server resources provide fault monitoring only to enable the status of Oracle Real Application Clusters resources to be monitored by Sun Cluster utilities. These resources do not provide automatic fault recovery.

The procedures that follow contain instructions for registering and configuring resources. These instructions explain how to set *only* extension properties that Sun Cluster Support for Oracle Real Application Clusters requires you to set. Optionally, you can set additional extension properties to override their default values. For more information, see the following sections:

- "Tuning Sun Cluster Support for Oracle Real Application Clusters" on page 70
- Appendix A

Registering and Configuring Oracle RAC Server Resources

The `SUNW.oracle_rac_server` resource type represents the Oracle RAC server in a Sun Cluster configuration. Each instance of the Oracle RAC server is represented by a single `SUNW.oracle_rac_server` resource.

Configure each `SUNW.oracle_rac_server` resource as a single-instance resource that is restricted to run on only one node. You enforce this restriction as follows:

- Creating one failover resource group for each `SUNW.oracle_rac_server` resource
- Specifying a single node in the node list when you create each resource group
- Adding only one `SUNW.oracle_rac_server` resource to each resource group

Oracle RAC server instances should be started only after the RAC framework is enabled on a cluster node. You ensure that this requirement is met by creating the following affinities and dependencies:

- A strong positive affinity between the Oracle RAC server resource groups and the RAC framework resource group
- A dependency between the Oracle RAC server resource and the RAC framework resource

If you are using Sun StorEdge QFS shared file system, ensure that each Oracle RAC server instance is started only after Sun StorEdge QFS resources for this instance are started on a cluster node. You meet this requirement by creating a dependency between the Oracle RAC server resource and its related Sun StorEdge QFS resources.

▼ How to Register and Configure Oracle RAC Server Resources

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

2. **Register the `SUNW.oracle_rac_server` resource type.**

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

3. **For each node where Sun Cluster Support for Oracle Real Application Clusters can run, create a resource group and a resource for the Oracle RAC server.**

   a. **Create a failover resource group to contain the Oracle RAC server resource.**

   ```
   # scrgadm -a -g rac-server-rg -h node \
   -y RG_AFFINITIES=++rac-fmwk-rg \
   [-y RG_DEPENDENCIES=sqfs-rg-list]
   ```

-g *rac-server-rg*
   Specifies the name that you are assigning to the resource group.

-h *node*
   Specifies the node for which you are creating the resource group. You must specify only one node.

-y RG_AFFINITIES=++*rac-fmwk-rg*
   Creates a strong positive affinity to the RAC framework resource group. If the RAC framework resource group was created by using the scsetup utility, the RAC framework resource group is named rac-framework-rg.

-y RG_DEPENDENCIES=*sqfs-rg-list*
   Specifies a comma-separated list of Sun StorEdge QFS resource groups on which this Oracle RAC server instance depends. These resource groups are created when you register and configure the data service for the Sun StorEdge QFS metadata server. For more information about these resources, see "Configuration Planning Questions" on page 22. Create this dependency *only* if you are using Sun StorEdge QFS shared file system.

b. **Add an instance of the SUNW.oracle_rac_server resource type to the resource group that you created in Step a.**

   When you create this resource, specify the following information about the resource:

   - The Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

   - The Oracle system identifier. This identifier is the name of the Oracle database instance.

   ```
   # scrgadm -a -j rac-server-resource -g rac-server-rg \
   -t SUNW.oracle_rac_server \
   -y RESOURCE_DEPENDENCIES=rac-fmwk-rs[, sqfs-rs-list] \
   -x ORACLE_SID=ora-sid \
   -x ORACLE_HOME=ora-home
   ```

   -j *rac-server-resource*
      Specifies the name that you are assigning to the SUNW.oracle_rac_server resource.

   -g *rac-server-rg*
      Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created in Step a.

   -y RESOURCE_DEPENDENCIES=*rac-fmwk-rs*[, *sqfs-rs-list*]
      Specifies the resources on which this Oracle RAC server instance depends.

      You must specify the RAC framework resource. If the RAC framework resource group is created by using the scsetup utility, this resource is named rac_framework.

If you are using Sun StorEdge QFS shared file system, you must also specify a comma-separated list of Sun StorEdge QFS resources. These resources are created when you register and configure the data service for the Sun StorEdge QFS metadata server. For more information about these resources, see "Configuration Planning Questions" on page 22.

-x ORACLE_SID=*ora-sid*
Specifies the Oracle system identifier. This identifier is the name of the Oracle database instance.

-x ORACLE_HOME=*ora-home*
Specifies the path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

EXAMPLE 2–1 Registering and Configuring Oracle RAC Server Resources

This example shows the sequence of operations that is required to register and configure Oracle RAC server resources for a two-node cluster.

The example assumes that a RAC framework resource group named rac-framework-rg has been created. The example also assumes that this resource group contains a SUNW.rac_framework resource named rac_framework.

1. To register the SUNW.oracle_rac_server resource type, the following command is run:

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

2. To create the RAC1-rg resource group for node node1, the following command is run:

   ```
   # scrgadm -a -g RAC1-rg -h node1 \
   -y RG_AFFINITIES=++rac-framework-rg
   ```

3. To create the RAC2-rg resource group for node node2, the following command is run:

   ```
   # scrgadm -a -g RAC2-rg -h node2 \
   -y RG_AFFINITIES=++rac-framework-rg
   ```

4. To create the RAC1-rs resource in the RAC1-rg resource group for node node1, the following command is run:

   ```
   # scrgadm -a -j RAC1-rs -g RAC1-rg \
   -t SUNW.oracle_rac_server \
   -y RESOURCE_DEPENDENCIES=rac_framework \
   -x ORACLE_SID=RAC1 \
   -x ORACLE_HOME=/oracle
   ```

5. To create the RAC2-rs resource in the RAC2-rg resource group for node node2, the following command is run:

   ```
   # scrgadm -a -j RAC2-rs -g  RAC2-rg \
   -t SUNW.oracle_rac_server \
   -y RESOURCE_DEPENDENCIES=rac_framework \
   -x ORACLE_SID=RAC2 \
   ```

```
-x ORACLE_HOME=/oracle
```

Where to Go From Here

Go to "Registering and Configuring Oracle Listener Resources" on page 66.

Registering and Configuring Oracle Listener Resources

How you configure Oracle listener resources depends on how you require Oracle listeners to serve Oracle Real Application Clusters database instances. For more information, see "Resource Groups for Oracle Listener Resources" on page 23.

▼ How to Register and Configure Oracle Listener Resources

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

2. **Register the `SUNW.oracle_listener` resource type.**

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

3. **If your configuration of Oracle listeners requires a separate resource group, create a failover resource group for the listener resource.**

   Create this resource group only if your configuration of Oracle listeners requires a separate resource group. When you create this resource group, create any dependencies on other resource groups that your configuration requires. For more information see "Resource Groups for Oracle Listener Resources" on page 23.

   ```
   # scrgadm -a -g rac-listener-rg \
   [-y RG_DEPENDENCIES=rg-list]\
   -h nodelist
   ```

   -g *rac-listener-rg*
     Specifies the name that you are assigning to the resource group.

   -y RG_DEPENDENCIES=*rg-list*
     Specifies a comma-separated list of resource groups that this resource group depends on. If the Oracle home directory resides on a Sun StorEdge QFS shared file system, *rg-list* must specify the resource group for the Sun StorEdge QFS metadata server for the file system.

     If the resource group for the listener resource depends on no other resource groups, omit this option.

   -h *nodelist*
     Specifies a comma-separated list of nodes where the resource group can be brought online. The list may contain more than one node *only* if you are

configuring the listener to use a `LogicalHostname` resource. Otherwise, you must specify only one node.

4. **Add an instance of the `SUNW.oracle_listener` resource to each resource group that is to contain a `SUNW.oracle_listener` resource.**

When you create this resource, specify the following information about the resource:

- The name of the Oracle listener. This name must match the corresponding entry in the `listener.ora` file.
- The Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

```
# scrgadm -a -j listener-resource -g listener-rg \
-t SUNW.oracle_listener \
[-y RESOURCE_DEPENDENCIES=sqfs-rs-list] \
-x LISTENER_NAME=listener \
-x ORACLE_HOME=oracle-home
```

-j *listener-resource*
  Specifies the name that you are assigning to the `SUNW.oracle_listener` resource.

-g *listener-rg*
  Specifies the resource group to which you are adding the resource.

-y `RESOURCE_DEPENDENCIES`=*sqfs-rs-list*
  Specifies a comma-separated list of Sun StorEdge QFS resources on which this Oracle listener instance depends. These resources are created when you register and configure the data service for the Sun StorEdge QFS metadata server. For more information about these resources, see "Configuration Planning Questions" on page 22. Create this dependency *only* if the Oracle home directory resides on a Sun StorEdge QFS shared file system.

-x `LISTENER_NAME`=*listener*
  Specifies the name of the Oracle listener instance. This name must match the corresponding entry in the `listener.ora` file.

-x `ORACLE_HOME`=*ora-home*
  Specifies the path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

5. **Bring online each RAC server resource group that you created in "How to Register and Configure Oracle RAC Server Resources" on page 63.**

For each resource group, type the following command:

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

-Z   Moves the resource group to the `MANAGED` state, and brings
                      online the resource group

-g *rac-server-rg*   Specifies that a resource group that you created in "How to
                      Register and Configure Oracle RAC Server Resources" on page

63 is to be moved to the MANAGED state and brought online

6. **If you created Oracle listener resource groups in Step 3, bring online these resource groups.**

   For each resource group that you created, type the following command:

   # **scswitch -Z -g** *rac-listener-rg*

-Z	Moves the resource group to the MANAGED state, and brings online the resource group
-g *rac-listener-rg*	Specifies that a resource group that you created in Step 3 is to be moved to the MANAGED state and brought online

   EXAMPLE 2–2 Registering and Configuring Oracle Listener Resources

   This example shows the sequence of operations that is required to register and configure Oracle RAC listener resources for a two-node cluster.

   In this example, each listener serves only one Real Application Clusters instance. The listeners cannot fail over.

   The example assumes that RAC server resource groups named RAC1-rg and RAC2-rg have been created as shown in Example 2–1.

   1. To register the SUNW.oracle_listener resource type, the following command is run:

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

   2. To create the LRAC1-rs resource in the RAC1-rg resource group for node node1, the following command is run:

      ```
      # scrgadm -a -j LRAC1-rs -g RAC1-rg \
      -t SUNW.oracle_listener \
      -x LISTENER_NAME=LRAC1 \
      -x ORACLE_HOME=/oracle
      ```

   3. To create the LRAC2-rs resource in the RAC2-rg resource group for node node2, the following command is run:

      ```
      # scrgadm -a -j LRAC2-rs -g RAC2-rg \
      -t SUNW.oracle_listener \
      -x LISTENER_NAME=LRAC2 \
      -x ORACLE_HOME=/oracle
      ```

Where to Go From Here

Go to "Verifying the Sun Cluster Support for Oracle Real Application Clusters Installation and Configuration" on page 69.

Verifying the Sun Cluster Support for Oracle Real Application Clusters Installation and Configuration

After you install, register, and configure Sun Cluster Support for Oracle Real Application Clusters, verify the installation and configuration. Verifying the Sun Cluster Support for Oracle Real Application Clusters installation and configuration determines if Real Application Clusters database instances can be started and stopped automatically.

▼ How to Verify the Sun Cluster Support for Oracle Real Application Clusters Installation and Configuration

Perform this task as superuser for each Oracle RAC server resource group that you created when you performed the procedure in"Registering and Configuring Oracle RAC Server Resources" on page 63.

1. **Verify that the Oracle RAC server resource group is correctly configured.**

   # **scrgadm -pv -g** *rac-server-rg*

   -g *rac-server-rg*   Specifies the name of the Oracle RAC server resource group for the node

2. **Bring online the Oracle RAC server resource group.**

   # **scswitch -Z -g** *rac-server-rg*

   -g *rac-server-rg*   Specifies the name of the Oracle RAC server resource group for the node

3. **Verify that the Oracle RAC server resource group and its resources are online.**

   # **scstat -g**

4. **Take offline the Oracle RAC server resource group.**

   # **scswitch -F -g** *rac-server-rg*

   -g *rac-server-rg*   Specifies the name of the Oracle RAC server resource group for the node

5. **Verify that the Oracle RAC server resource group and its resources are offline.**

```
# scstat -g
```

6. **Bring online again the Oracle RAC server resource group.**

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

-g *rac-server-rg*   Specifies the name of the Oracle RAC server resource group for
the node

7. **Verify that the Oracle RAC server resource group and its resources are online.**

```
# scstat -g
```

Tuning Sun Cluster Support for Oracle Real Application Clusters

To tune the Sun Cluster Support for Oracle Real Application Clusters data service, you modify the extension properties of the resources for this data service. 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 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 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 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 more information, see "SUNW.rac_cvm Extension Properties" on page 102.

EXAMPLE 2–3 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 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
Solaris Volume Manager for Sun Cluster	`SUNW.rac_svm`
VxVM with the cluster feature	`SUNW.rac_cvm`
Hardware RAID support or Sun StorEdge QFS shared file system with hardware RAID support	`SUNW.rac_hwraid`

Details of the extension properties of these resource types are available in the following sections:

- "SUNW.rac_svm Extension Properties" on page 100
- "SUNW.rac_cvm Extension Properties" on page 102
- "SUNW.rac_hwraid Extension Properties" on page 105

EXAMPLE 2–4 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 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 more information, see "SUNW.rac_udlm Extension Properties" on page 97.

EXAMPLE 2–5 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.

- 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 73.

▼ 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 2–3.

   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`.

Removing Sun Cluster Support for Oracle Real Application Clusters

You can remove Sun Cluster Support for Oracle Real Application Clusters from the following entities:

- **A cluster.** For more information, see "How to Remove Sun Cluster Support for Oracle Real Application Clusters From a Cluster" on page 74.
- **Selected nodes in a cluster.** For more information, see "How to Remove Sun Cluster Support for Oracle Real Application Clusters From Selected Nodes" on page 76.

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

The cluster node from which you perform this task must be booted in cluster mode.

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

2. **Remove all RAC server resource groups in the cluster.**

   These resource groups were created as explained in "How to Register and Configure Oracle RAC Server Resources" on page 63.

   Remove each RAC server resource group as follows:

   a. **Disable each RAC server resource in the resource group.**

      For each resource, type the following command:

      # **scswitch -n -j** *resource*

      -j *resource*   Specifies the resource that you are disabling

   b. **Remove each RAC server resource in the resource group.**

      For each resource, type the following command:

      # **scrgadm -r -j** *resource*

      -j *resource*   Specifies the resource that you are removing

   c. **Remove the RAC server resource group.**

      # **scrgadm -r -g** *rac-server-rg*

-g *rac-server-rg*   Specifies the resource group that you are removing

3. **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 82.

---

   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 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.

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

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

  ■ If you are using Solaris Volume Manager for Sun Cluster, type the following command:

    `# pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWscmd`

  ■ 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 Sun StorEdge QFS shared file system with hardware RAID support, type the following command:

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

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 Real Application Clusters software packages.

▼ How to Remove Sun Cluster Support for Oracle 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 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 84.

---

   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 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 Real Application Clusters software packages for the storage management scheme that you are using for the Oracle Real Application Clusters database.**

    - If you are using Solaris Volume Manager for Sun Cluster, type the following command:

        # **`pkgrm SUNWscucm SUNWudlm SUNWudlmr SUNWscmd`**

    - 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 Sun StorEdge QFS shared file system with hardware RAID support, type the following command:

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

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 the RAC Framework Resource Group" on page 55 and "Removing Sun Cluster Support for Oracle Real Application Clusters" on page 74. 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 Real Application Clusters is to be enabled. The Sun Cluster Support for Oracle 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 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 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 for the Oracle Real Application Clusters database.**

   - If you are using Solaris Volume Manager for Sun Cluster, register and add an instance of the SUNW.rac_svm 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_svm
     ```

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

     -j *svm-resource*
         Specifies the name that you are assigning to the SUNW.rac_svm 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 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 Sun StorEdge QFS shared file system with hardware RAID support, you must register and add an instance of the resource type for hardware RAID support.

  No resource instance that represents Sun StorEdge QFS shared file system is required in the RAC framework resource group. Although a resource that represents each Sun StorEdge QFS shared file system is required, these resources are *not* contained in the RAC framework resource group. For information about these resources, see "Configuration Planning Questions" on page 22.

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 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 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 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 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 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 56. If the RAC
framework resource group is created by using the scsetup utility, scsetup assigns
names to the resources as listed in Table 2–3.

TABLE 2–3 Names Assigned to RAC Framework Resources by scsetup

Resource Type	Resource Name
SUNW.rac_svm	rac_svm
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. **Remove all RAC server resource groups in the cluster.**

   These resource groups were created as explained in "How to Register and
   Configure Oracle RAC Server Resources" on page 63.

   Remove each RAC server resource group as follows:

   a. **Disable each RAC server resource in the resource group.**

      For each resource, type the following command:

      # **scswitch -n -j** *resource*

      -j *resource*   Specifies the resource that you are disabling

   b. **Remove each RAC server resource in the resource group.**

For each resource, type the following command:

scrgadm -r -j *resource*

-j *resource*   Specifies the resource that you are removing

c. **Remove the RAC server resource group.**

scrgadm -r -g *rac-server-rg*

-g *rac-server-rg*   Specifies the resource group that you are removing

3. **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 2–3.

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

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 2–3.

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

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 56.

6. **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`.

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 Real Application Clusters software packages. For more information, see "How to Remove Sun Cluster Support for Oracle Real Application Clusters From a Cluster" on page 74.

EXAMPLE 2–6 Removing the RAC Framework Resource Group by Using the `scrgadm` Utility

```
# scswitch -n -j RAC1-rs
# scrgadm -r -j RAC1-rs
# scrgadm -r -g RAC1-rg
# scswitch -n -j RAC2-rs
# scrgadm -r -j RAC2-rs
# scrgadm -r -g RAC2-rg
# scswitch -n -j rac_svm
# scswitch -n -j rac_udlm
# scswitch -n -j rac_framework
# scrgadm -r -j rac_svm
# scrgadm -r -j rac_udlm
# scrgadm -r -j rac_framework
# scrgadm -r -t SUNW.rac_svm
# scrgadm -r -t SUNW.rac_udlm
# scrgadm -r -t SUNW.rac_framework
# scrgadm -r -g rac-framework-rg
```

This example shows the commands that are required to remove a RAC framework resource group that was created by using the `scsetup` utility. The resource groups `RAC1-rg` and `RAC2-rg` are RAC server resource groups that were created as shown in Example 2–1. The cluster from which this resource group is removed uses the Solaris Volume Manager for Sun Cluster.

▼ 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 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 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 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 Real Application Clusters
software packages from the nodes that you removed. For more information, see "How
to Remove Sun Cluster Support for Oracle Real Application Clusters From Selected
Nodes" on page 76.

Troubleshooting Sun Cluster Support for Oracle Real Application Clusters

If you encounter a problem with Sun Cluster Support for Oracle 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 Real Application Clusters" on page 87
- "Sources of Diagnostic Information" on page 91
- "Common Problems and Their Solutions" on page 92

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

The status of the `SUNW.rac_framework` resource indicates the status of Sun Cluster Support for Oracle 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 Real Application Clusters

1. **Become superuser.**

2. **Type the following command:**

   `# scstat -g`

The following examples show the status of the resources for a two-node configuration of Sun Cluster Support for Oracle Real Application Clusters. This configuration uses Solaris Volume Manager for Sun Cluster to store the Oracle Real Application Clusters database.

Each node contains a RAC framework resource group that is named `rac-framework-rg`. The resource type and resource name of each resource in these resource groups is shown in the following table.

Resource Type	Resource Instance Name
SUNW.rac_framework	rac_framework
SUNW.rac_udlm	rac_udlm
SUNW.rac_svm	rac_svm

Each node contains a resource group for an Oracle RAC server resource on as shown in the following table. The table also shows the resource type and the name of the resource in each resource group.

Node	Resource Group	Resource Type	Resource Name
node1	RAC1-rg	SUNW.oracle_rac_server	RAC1
node1	RAC2-rg	SUNW.oracle_rac_server	RAC2

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_svm
Resources: RAC1-rg           RAC1
Resources: RAC2-rg           RAC2


-- Resource Groups --

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

    Group: RAC1-rg           node1        Online

    Group: RAC2-rg           node2       Online


-- Resources --
```

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

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

Resource: RAC1               node1       Online     Online

Resource: RAC2               node2       Online     Faulted
```

This example provides the following status information for a RAC framework resource group that is faulty.

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

EXAMPLE 3–2 Status of a Faulty RAC Server Resource Group

```
-- Resource Groups and Resources --

            Group Name            Resources
            ----------            ---------
 Resources: rac-framework-rg      rac_framework rac_udlm rac_svm
 Resources: RAC1-rg               RAC1
 Resources: RAC2-rg               RAC2


-- Resource Groups --

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

    Group: RAC1-rg               node1           Online

    Group: RAC2-rg               node2           Online faulted
```

EXAMPLE 3–2 Status of a Faulty RAC Server Resource Group   *(Continued)*

```
-- 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_svm           node1         Online     Online
  Resource: rac_svm           node2         Online     Online

  Resource: RAC1              node1         Online     Online

  Resource: RAC2              node2         Online     Faulted - RAC instance not running
```

This example provides the following status information for a RAC server resource
group that is faulty:

- The Real Application Clusters database on node2 has failed to start. As a result of
  this failure, the RAC2-rg resource group and the RAC2 resource are online, but
  faulted

- All other resource groups and resources are online.

EXAMPLE 3–3 Status of an Operational Oracle Real Application Clusters Configuration

```
-- Resource Groups and Resources --

          Group Name            Resources
          ----------            ---------
  Resources: rac-framework-rg   rac_framework rac_udlm rac_svm
  Resources: RAC1-rg            RAC1
  Resources: RAC2-rg            RAC2


-- Resource Groups --

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

    Group: RAC1-rg             node1              Online

    Group: RAC2-rg             node2              Online


-- Resources --
```

EXAMPLE 3–3 Status of an Operational Oracle Real Application Clusters Configuration *(Continued)*

```
            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_svm               node1            Online     Online
Resource: rac_svm               node2            Online     Online

Resource: RAC1                  node1            Online     Online

Resource: RAC2                  node2            Online     Online
```

This example shows the status of an Oracle Real Application Clusters configuration that is operating correctly. The 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 directory `/var/opt/SUNWscor/oracle_server` contains log files for the Oracle RAC server resource.

The system messages file also contains diagnostic information.

If a problem occurs with Sun Cluster Support for Oracle 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 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 Real Application Clusters

If a fatal problem occurs during the initialization of Sun Cluster Support for Oracle 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 Real Application Clusters.

For instructions to correct the problem, see "How to Recover From a Node Panic During Initialization" on page 92.

A node might also panic during the initialization of Sun Cluster Support for Oracle Real Application Clusters because a reconfiguration step has timed out. For more information, see "Node Panic Caused by a Timeout" on page 93.

▼ How to Recover From a Node Panic During Initialization

1. **Boot into maintenance mode the node that panicked.**

    For more information, see *Sun Cluster System Administration Guide for Solaris OS*.

2. **Verify that you have correctly installed your volume manager packages.**

    If you are using VxVM, check that you have installed the software and check that the license for the VxVM cluster feature is valid.

3. **Ensure that you have completed all the procedures that precede installing and configuring the Oracle UDLM software.**

The procedures that you must complete are listed in Table 1–1.

4. **Ensure that the Oracle UDLM software is correctly installed and configured.**
   For more information, see "Installing the Oracle UDLM" on page 43.

5. **Reboot the node that panicked.**
   For more information, see *Sun Cluster System Administration Guide for Solaris OS*.

Node Panic Caused by a Timeout

The timing out of any step in the reconfiguration of Sun Cluster Support for Oracle 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 70.

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 a Node

Recovering from the failure of a node involves the following tasks:

1. Booting into maintenance mode the node that panicked
2. Performing the appropriate recovery action for the cause of the problem
3. Rebooting the node that panicked

For more information, see *Sun Cluster System Administration Guide for Solaris OS*

Note – In an Oracle 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.

Failure of the `ucmmd` Daemon to Start

The UCMM daemon, `ucmmd`, manages the reconfiguration of Sun Cluster Support for Oracle Real Application Clusters. When a cluster is booted or rebooted, this daemon is started only after all components of Sun Cluster Support for Oracle 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 Real Application Clusters.
- A step in a previous reconfiguration of Sun Cluster Support for Oracle 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 Real Application Clusters" on page 87.

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 94.

`Degraded - reconfiguration in progress`
A configuration error occurred in one or more components of Sun Cluster Support for Oracle 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 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 to Recover From the Timing Out of the START Method" on page 95.

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

1. **Become superuser.**

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

   To perform this operation, switch the primary nodes of the resource group to the other nodes where this group is online.

   # **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. Omit from this list the node where the START method timed out.

3. **On all cluster nodes that can run Sun Cluster Support for Oracle 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*.

Sun Cluster Support for Oracle Real Application Clusters Extension Properties

The extension properties that you can set for each Sun Cluster Support for Oracle Real Application Clusters resource type are listed in the following sections:

- "SUNW.rac_udlm Extension Properties" on page 97
- "SUNW.rac_svm Extension Properties" on page 100
- "SUNW.rac_cvm Extension Properties" on page 102
- "SUNW.rac_hwraid Extension Properties" on page 105
- "SUNW.oracle_rac_server Extension Properties" on page 105
- "SUNW.oracle_listener Extension Properties" on page 107

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 73. 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.

SUNW.rac_udlm Extension Properties

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

`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

`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

`SUNW.rac_svm` Extension Properties

`Debug_level` (integer)
   The level to which debug messages from the Solaris Volume Manager for Sun
   Cluster component are logged. When the debug level is increased, more messages
   are written to the log files during reconfiguration.

   Default: 1

   Range: 0 - 10

   Tunable: Any time

`Reservation_timeout` (integer)
   The timeout (in seconds) for the reservation step of a reconfiguration of the Solaris
   Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real
   Application Clusters.

   Default: 325

   Range: 100 – 99999 seconds

   Tunable: Any time

`Svm_abort_step_timeout` (integer)
   The timeout (in seconds) for the abort step of a reconfiguration of the Solaris
   Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real
   Application Clusters.

   Default: 120

   Range: 30 – 99999 seconds

   Tunable: Any time

`Svm_return_step_timeout` (integer)
   The timeout (in seconds) for the return step of a reconfiguration of the Solaris
   Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real
   Application Clusters.

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`Svm_start_step_timeout` (integer)
The timeout (in seconds) for the start step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`Svm_step1_timeout` (integer)
The timeout (in seconds) for step 1 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`Svm_step2_timeout` (integer)
The timeout (in seconds) for step 2 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`Svm_step3_timeout` (integer)
The timeout (in seconds) for step 3 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`Svm_step4_timeout` (integer)
The timeout (in seconds) for step 4 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 120

Range: 100 – 99999 seconds

Tunable: Any time

`Svm_stop_step_timeout` (integer)
The timeout (in seconds) for the stop step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Sun Cluster Support for Oracle Real Application Clusters.

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`SUNW.rac_cvm` Extension Properties

`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 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 Real Application Clusters

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`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 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 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 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 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 Real Application Clusters

   Default: 320

   Range: 100 – 99999 seconds

   Tunable: Any time

`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 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 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

`Vxkmsgd_port` (integer)
The communications port number that the VxVM component messaging daemon
`vxkmsgd` uses

Default: 5559

Range: 1024 – 65535

Tunable: When disabled

SUNW.rac_hwraid Extension Properties

`Reservation_timeout` (integer)
The timeout (in seconds) for the reservation step of a reconfiguration of Sun Cluster Support for Oracle Real Application Clusters

Default: 325

Range: 100 – 99999 seconds

Tunable: Any time

SUNW.oracle_rac_server Extension Properties

`Auto_End_Bkp` (Boolean)
Specifies whether the Oracle RAC server resource automatically recovers the database if an Oracle relational database management system (RDBMS) hot backup is interrupted. When a hot backup is interrupted, the database fails to open because of files that remain in hot backup mode. During the startup of the Oracle RAC server resource, the resource tests for the interruption of a hot backup by testing for an occurrence of the following RDBMS error:

`ORA-01113 file` *file* `needs media recovery`

To recover the database automatically, the Oracle RAC server resource performs the following actions:

- Releasing all files that remain in hot backup mode. The `sys.v$backup` view indicates which files remain in hot backup mode.
- Opening the database for use.

The permitted values for this property are as follows:

- `False` – Specifies that the Oracle RAC server resource does *not* automatically recover the database. If a hot backup is interrupted, you must recover the database manually. In this situation, the status of the Oracle RAC server resource is set to `FAULTED`. The default value of this property is `False`.
- `True` – Specifies that the Oracle RAC server resource automatically recovers the database.

Default: `False`

Range: Not applicable

Tunable: Any time

`Debug_level` (integer)
The level to which debug messages from the Oracle RAC server component are logged. When the debug level is increased, more debug messages are written to the log files.

Default: 1, which logs `syslog` messages

Range: 0 - 100

Tunable: Any time

`Oracle_Home` (string)
The path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Default: No default defined

Range: Not applicable

Tunable: When disabled

`Oracle_Sid` (string)
The Oracle system identifier. This identifier is the name of the Oracle database instance.

Default: No default defined

Range: Not applicable

Tunable: When disabled

`Parameter_file` (string)
The Oracle parameter file, which starts the database. If this property is not set, it defaults to `NULL`. When this property is `NULL`, the default Oracle mechanism is used to locate the parameter file.

Default: `NULL`

Range: Not applicable

Tunable: Any time

`User_env` (string)
The name of the file that contains the environment variables to be set before database startup or shutdown. All environment variables that have values that differ from Oracle defaults must be defined in this file.

For example, a user's `listener.ora` file might not reside under the `/var/opt/oracle` directory or the `$ORACLE_HOME/network/admin` directory. In this situation, the `TNS_ADMIN` environment variable should be defined.

The definition of each environment variable that is defined must follow the format *variable-name=value*. Each definition must start on a new line in the environment file.

Default: `NULL`

Range: Not applicable

Tunable: Any time

`Wait_for_online` (Boolean)
Specifies whether the `START` method of the Oracle RAC server resource waits for the database to be online before the `START` method exits. The permitted values for this property are as follows:

- `True` – Specifies that the `START` method of the Oracle RAC server resource waits for the database to be online before the `START` method exits. The default value of this property is `True`.
- `False` – Specifies that the `START` method runs the commands to start the database but does not wait for the database to come online before the `START` method exits.

Default: `True`

Range: Not applicable

Tunable: Any time

SUNW.oracle_listener Extension Properties

`LISTENER_NAME` (string)
The name of the Oracle listener. This name must match the corresponding entry in the `listener.ora` file.

Default: `LISTENER`

Range: Not applicable

Tunable: When disabled

`ORACLE_HOME` (string)
The path to the Oracle home directory.

Default: No default defined

Range: Not applicable

Tunable: When disabled

`Probe_timeout` (integer)
The time-out value in seconds that the fault monitor uses to probe an Oracle listener.

Default: 30

Range: 1– 99,999

Tunable: Any time

Introduced in release: 3.1 4/04

`User_env` (string)
A file that contains environment variables to be set before listener startup and shutdown. Those environment variables that have values that differ from Oracle defaults must be defined in this file.

For example, a user's `listener.ora` file might not reside under the `/var/opt/oracle` directory or the `$ORACLE_HOME/network/admin`. directory. In this situation, the `TNS_ADMIN` environment variable should be defined.

The definition of each environment variable that is defined must follow the format `VARIABLE_NAME=VARIABLE_VALUE`. Each of these environment variables must be specified, one per line in the environment file.

Default: ""

Range: Not applicable

Tunable: Any time

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