

Oracle® Solaris Cluster Data Service for Oracle Real Application Clusters Guide

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Contents

Preface	17
1 Installing Support for Oracle RAC	21
Overview of the Installation Process for Support for Oracle RAC	21
Preinstallation Considerations	22
Hardware and Software Requirements	23
Storage Management Requirements for Oracle Files	24
SPARC: Processor Architecture Requirements for Oracle Components	29
Using Oracle Data Guard With Support for Oracle RAC	29
Preparing the Oracle Solaris Cluster Nodes	29
Before You Begin	30
▼ How to Bypass the NIS Name Service	30
▼ How to Create the DBA Group and the DBA User Accounts	31
▼ How to Configure Shared Memory for Oracle RAC Software in the Global Cluster	34
▼ How to Configure Shared Memory for Oracle RAC Software in a Zone Cluster	35
▼ How to Set the Necessary Privileges for Oracle RAC Software in a Zone Cluster	37
▼ How to Configure the Logical Hostname Resources or Virtual IP Addresses for Oracle RAC Software in a Zone Cluster	37
Installing the Support for Oracle RAC Packages	38
▼ How to Install the Support for Oracle RAC Packages	38
SPARC: Installing the UDLM	40
▼ SPARC: How to Install the UDLM	40
2 Configuring Storage for Oracle Files	41
Summary of Configuration Tasks for Storage for Oracle Files	41
Tasks for Configuring the Sun QFS Shared File System for Oracle Files	41
Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files	43
Tasks for Configuring VxVM for Oracle Files	45

Tasks for Configuring Hardware RAID Support for Oracle Files	46
Tasks for Configuring ASM for Oracle Files	47
Tasks for Configuring Qualified NAS Devices for Oracle Files	47
Tasks for Configuring a Cluster File System for Oracle Files	48
Installing Storage Management Software With Support for Oracle RAC	49
Using Solaris Volume Manager for Sun Cluster	50
Using VxVM	51
Using Hardware RAID Support	51
Using the Sun QFS Shared File System	53
Using Oracle ASM	58
Using a Cluster File System	61
3 Registering and Configuring the Resource Groups	65
Registering and Configuring the Oracle RAC Framework Resource Group	65
Tools for Registering and Configuring the Oracle RAC Framework Resource Group	66
▼ How to Register and Configure the Oracle RAC Framework Resource Group by Using clsetup	66
Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group	70
Tools for Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group	71
▼ How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using clsetup	71
Creating a Global Device Group for the Oracle RAC Database	75
▼ How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database	75
▼ How to Create a VxVM Shared-Disk Group for the Oracle RAC Database	81
Registering and Configuring Storage Resources for Oracle Files	83
Tools for Registering and Configuring Storage Resources for Oracle Files	84
▼ How to Register and Configure Storage Resources for Oracle Files by Using clsetup	84
Registering and Configuring the Oracle ASM Resource Group	90
Tools for Registering and Configuring the Oracle ASM Resource Group	90
▼ How to Register and Configure the Oracle ASM Resource Group by Using clsetup	90
4 Enabling Oracle RAC to Run in a Cluster	99
Overview of Tasks for Enabling Oracle RAC to Run in a Cluster	99

Installing Oracle RAC Software	100
Installing Binary Files and Configuration Files on a Shared File System	100
Overriding Networking Defaults for Oracle 10g, 11g, or 12c Oracle Clusterware	101
Installing Oracle Clusterware on a Subset of Oracle Solaris Cluster Nodes	101
Next Steps	101
Creating Node-Specific Files and Directories for a Shared File System	101
▼ How to Create a Node-Specific Directory for a Shared File System	102
▼ How to Create a Node-Specific File for a Shared File System	105
Verifying the Installation of Oracle RAC	107
▼ How to Verify the Installation of Oracle 10g, 11g, or 12c RAC	107
▼ How to Verify the Installation of Oracle 9i RAC	107
Creating an Oracle ASM Instance and Disk Groups	108
▼ How to Create an Oracle ASM Instance and Disk Groups	108
Creating an Oracle Clusterware Framework Resource	108
▼ How to Create an Oracle Clusterware Framework Resource	109
Creating an Oracle Database	111
▼ How to Specify the Location of Data Files on a Shared File System for Oracle 10g, 11g, or 12c	112
▼ How to Specify the Location of Data Files on a Shared File System for Oracle 9i	112
Configuring Resources for Oracle RAC Database Instances	113
Tools for Registering and Configuring Resources for Oracle RAC Database Instances ...	113
▼ How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate	114
▼ How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances	120
Verifying the Installation and Configuration of Support for Oracle RAC	126
▼ How to Verify the Configuration of the Oracle RAC Framework Resource Group	127
▼ How to Verify the Configuration of the Multiple-Owner Volume-Manager Framework Resource Group	128
▼ How to Verify the Configuration of Storage Resources for Oracle Files	128
▼ How to Verify the Configuration of Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances	130
▼ How to Verify the Configuration of Resources for Oracle 9i RAC Database Instances	133
▼ How to Verify the Correct Behavior for Shutdown and Booting of the Cluster	134
5 Administering Support for Oracle RAC	137
Overview of Administration Tasks for Support for Oracle RAC	137

Automatically Generated Names for Oracle Solaris Cluster Objects	138
Administering Oracle RAC Databases From Oracle Solaris Cluster Software	139
Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances	140
Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 9i RAC Database Instances	142
Tuning Support for Oracle RAC	142
Guidelines for Setting Timeouts	143
SPARC: Guidelines for Setting the Communications Port Range for the UDLM	144
▼ How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled	145
Tuning the Support for Oracle RAC Fault Monitors	146
Operation of the Fault Monitor for a Scalable Device Group	147
Operation of the Fault Monitor for Scalable File-System Mount Points	147
Operation of the Oracle 9i RAC Server Fault Monitor	148
Operation of the Oracle 9i RAC Listener Fault Monitor	150
Obtaining Core Files for Troubleshooting DBMS Timeouts	150
Customizing the Oracle 9i RAC Server Fault Monitor	151
Defining Custom Behavior for Errors	151
Propagating a Custom Action File to All Nodes in a Cluster	159
Specifying the Custom Action File That a Server Fault Monitor Should Use	160
 6 Troubleshooting Support for Oracle RAC	 161
Verifying the Status of Support for Oracle RAC	161
▼ How to Verify the Status of Support for Oracle RAC	161
Examples of the Status of Support for Oracle RAC	162
Sources of Diagnostic Information	171
Common Problems and Their Solutions	172
Failure of an Oracle RAC Framework Resource Group	172
Failure of a Multiple-Owner Volume-Manager Framework Resource Group	175
SUNW.qfs Registration Fails Because the Registration File Is Not Found	178
Node Panic Caused by a Timeout	178
Failure of a SUNW.rac_framework or SUNW.vucmm_framework Resource to Start	179
SUNW.rac_framework Failure-to-Start Status Messages	179
SUNW.vucmm_framework Failure-to-Start Status Messages	180
▼ How to Recover From the Timing Out of the START Method	181

Failure of a Resource to Stop	181
7 Modifying an Existing Configuration of Support for Oracle RAC	183
Overview of Tasks for Modifying an Existing Configuration of Support for Oracle RAC	183
Modifying Online the Resource for a Scalable Device Group	184
▼ How to Modify Online the Resource for a Scalable Device Group	184
Extending an Existing Configuration of Support for Oracle RAC	185
▼ How to Add Support for Oracle RAC to Selected Nodes	185
▼ How to Add a Volume Manager Resource to the Framework Resource Group	192
Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group	195
▼ How to Migrate a Volume Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume-Manager Framework Resource Group	195
SPARC: Deploying Oracle Solaris Cluster Native SKGXN for Oracle RAC 11g Release 2 or 12c	198
▼ SPARC: How to Prepare the Cluster to Change the SKGXN Interfaces	199
▼ SPARC: How to Convert From UDLM to Oracle Solaris Cluster Native SKGXN	200
▼ SPARC: How to Convert SKGXN from Oracle Solaris Cluster Native SKGXN to UDLM	201
▼ SPARC: How to Bring Oracle RAC Online After Switching the SKGXN	202
Removing an Oracle Grid Infrastructure Resource	202
▼ How to Remove a Dependency	202
▼ How to Delete the <code>sun.resource</code> Resource	203
Removing Support for Oracle RAC	204
▼ How to Remove Support for Oracle RAC From a Cluster	204
▼ How to Remove Support for Oracle RAC From Selected Nodes	210
8 Upgrading Support for Oracle RAC	223
Upgrading Resources in Support for Oracle RAC	224
Information for Registering the New Versions of Support for Oracle RAC Resource Types	224
Adding Storage Resources for Oracle Files	226
Adding Resources for Interoperation With Oracle 10g Release 2, 11g, or 12c Oracle Clusterware	226

A	Sample Configurations of This Data Service	229
	Sample Oracle 10g, 11g, or 12c Configurations in the Global Cluster	230
	Sample Oracle 9i Configurations in the Global Cluster	236
	Sample Oracle 10g, 11g, or 12c Configurations in a Zone Cluster	239
	Sample Oracle 9i Configurations in a Zone Cluster	245
	Legacy Configurations	247
B	Preset Actions for DBMS Errors and Logged Alerts	257
C	Support for Oracle RAC Extension Properties	265
	SUNW.asm_diskgroup Extension Properties	266
	SUNW.crs_framework Extension Properties	269
	SPARC: SUNW.rac_cvm Extension Properties	269
	SUNW.rac_framework Extension Properties	272
	SUNW.rac_svm Extension Properties	272
	SPARC: SUNW.rac_udlm Extension Properties	274
	SUNW.scalable_acfs_proxy Extension Properties	277
	SUNW.scalable_asm_diskgroup_proxy Extension Properties	279
	SUNW.scalable_asm_instance Extension Properties	280
	SUNW.scalable_asm_instance_proxy Extension Properties	283
	SUNW.scalable_rac_listener Extension Properties	286
	SUNW.scalable_rac_server Extension Properties	287
	SUNW.scalable_rac_server_proxy Extension Properties	292
	SUNW.ScalDeviceGroup Extension Properties	295
	SUNW.ScalMountPoint Extension Properties	297
	SPARC: SUNW.vucmm_cvm Extension Properties	300
	SUNW.vucmm_framework Extension Properties	303
	SUNW.vucmm_svm Extension Properties	303
	SUNW.wait_zc_boot Extension Properties	305
D	Command-Line Alternatives	307
	Setting Support for Oracle RAC Extension Properties	307
	Registering and Configuring the Framework Resource Groups by Using Oracle Solaris Cluster Maintenance Commands	308
	Overview of the Framework Resource Groups	308

▼ How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands	309
▼ How to Register and Configure the Oracle RAC Framework Resource Group in a Zone Cluster by Using Oracle Solaris Cluster Maintenance Commands	314
Registering and Configuring Oracle ASM Resource Groups (CLI)	316
▼ How to Register and Configure Oracle ASM Resource Groups in the Global Cluster (CLI)	316
▼ How to Register and Configure Oracle ASM Resource Groups in a Zone Cluster (CLI) ..	320
Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands	324
Resources for Scalable Device Groups and Scalable File-System Mount Points	325
Resources for the Sun QFS Metadata Server	325
▼ How to Create a Resource for a Scalable Device Group in the Global Cluster	326
▼ How to Create a Resource for a Scalable Device Group in a Zone Cluster	327
▼ How to Register and Configure Resources for the Sun QFS Metadata Server in the Global Cluster	328
▼ How to Register and Configure Resources for the Sun QFS Metadata Server for a Zone Cluster	329
▼ How to Create a Resource for a File-System Mount Point in the Global Cluster	331
▼ How to Create a Resource for a File-System Mount Point in Zone Cluster	332
Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands	334
▼ How to Create an Oracle Clusterware Resource for Interoperation With Oracle Solaris Cluster	337
▼ How to Create an Oracle Grid Infrastructure Resource for Interoperation With Oracle Solaris Cluster	339
▼ How to Create an Oracle ASM Resource for Oracle Clusterware Interoperation With Oracle Solaris Cluster Software	340
▼ How to Create Oracle Solaris Cluster Resources in the Global Cluster for Interoperation With Oracle 10g, 11g, or 12c	343
▼ How to Create Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 10g, 11g, or 12c	345
Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i by Using Oracle Solaris Cluster Maintenance Commands	348
Oracle 9i RAC Server Resources	349
Oracle 9i Listener Resources	349
Logical Hostname Resources for Oracle 9i Listener Resources	350
▼ How to Register and Configure Oracle Solaris Cluster Resources in a Global Cluster for	

- Interoperation With Oracle 9i 351
- ▼ How to Register and Configure Oracle Solaris Cluster Resources in a Zone Cluster for
Interoperation With Oracle 9i 358
- Index** 363

Figures

FIGURE A-1	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster	230
FIGURE A-2	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System	231
FIGURE A-3	Configuration of Oracle 10g, 11g, or 12c With Sun QFS Shared File System and Hardware RAID	232
FIGURE A-4	Configuration of Oracle 10g, 11g, or 12c With a NAS Device	233
FIGURE A-5	Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Solaris Volume Manager for Sun Cluster	234
FIGURE A-6	Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Hardware RAID	235
FIGURE A-7	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster	236
FIGURE A-8	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System	237
FIGURE A-9	Configuration of Oracle 9i With Sun QFS Shared File System and Hardware RAID	238
FIGURE A-10	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster in a Zone Cluster	239
FIGURE A-11	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster	240
FIGURE A-12	Configuration of Oracle 10g, 11g, or 12c With Sun QFS Shared File System and Hardware RAID in a Zone Cluster	241
FIGURE A-13	Configuration of Oracle 10g, 11g, or 12c With a NAS Device in a Zone Cluster	242
FIGURE A-14	Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Solaris Volume Manager for Sun Cluster in a Zone Cluster	243
FIGURE A-15	Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Hardware RAID in a Zone Cluster	244
FIGURE A-16	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster in a Zone Cluster	245
FIGURE A-17	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and	

	Sun QFS Shared File System in a Zone Cluster	246
FIGURE A-18	Configuration of Oracle 9i With Sun QFS Shared File System and Hardware RAID in a Zone Cluster	247
FIGURE A-19	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster (Legacy)	248
FIGURE A-20	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System (Legacy)	249
FIGURE A-21	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster (Legacy)	250
FIGURE A-22	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System (Legacy)	251
FIGURE A-23	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster in a Zone Cluster (Legacy)	252
FIGURE A-24	Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster (Legacy)	253
FIGURE A-25	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster in a Zone Cluster (Legacy)	254
FIGURE A-26	Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster (Legacy)	255
FIGURE D-1	Proxy Resources for Configurations With a Volume Manager	335
FIGURE D-2	Proxy Resources for Configurations With a Shared File System	336

Tables

TABLE 1-1	Tasks for Installing Support for Oracle RAC	21
TABLE 1-2	Storage Management Schemes for Oracle Files	25
TABLE 2-1	Tasks for Configuring the Sun QFS Shared File System for Oracle Files in the Global Cluster	42
TABLE 2-2	Tasks for Configuring the Sun QFS Shared File System for Oracle Files in a Zone Cluster	43
TABLE 2-3	Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files in the Global Cluster	44
TABLE 2-4	Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files in a Zone Cluster	44
TABLE 2-5	Tasks for Configuring VxVM for Oracle Files	46
TABLE 2-6	Tasks for Configuring Hardware RAID Support for Oracle Files	46
TABLE 2-7	Tasks for Configuring ASM for Oracle Files	47
TABLE 2-8	Tasks for Configuring Qualified NAS Devices for Oracle Files	48
TABLE 2-9	Tasks for Configuring a PxFS-Based Cluster File System for Oracle Files	49
TABLE 2-10	Tasks for Configuring an Oracle ACFS File System for Oracle Files	49
TABLE 4-1	Tasks for Enabling Oracle RAC to Run in a Cluster	99
TABLE 5-1	Administration Tasks for Support for Oracle RAC	137
TABLE 5-2	Propagation of State Changes Between Oracle Solaris Cluster Resources and Oracle Clusterware Resources	140
TABLE 5-3	Comparisons of States for Oracle Solaris Cluster Resources and Oracle Clusterware Resources	141
TABLE 5-4	Resource Types for Support for Oracle RAC Fault Monitors	146
TABLE 7-1	Tasks for Modifying an Existing Configuration of Support for Oracle RAC ...	183
TABLE 8-1	Changes to Support for Oracle RAC Resource Types	224
TABLE 8-2	Support for Oracle RAC Resource Types	224
TABLE B-1	Preset Actions for DBMS Errors	257
TABLE B-2	Preset Actions for Logged Alerts	264

Examples

EXAMPLE 1-1	Creating the DBA Group and the DBA User Accounts	34
EXAMPLE 3-1	Creating a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster	79
EXAMPLE 4-1	Creating Node-Specific Directories	104
EXAMPLE 4-2	Creating Node-Specific Files	106
EXAMPLE 5-1	Setting the VxVM Component Reconfiguration Step 4 Timeout	143
EXAMPLE 5-2	Setting the Reservation Step Timeout	144
EXAMPLE 5-3	Setting the Communications Port Number for the UDLM	144
EXAMPLE 5-4	Changing the Response to a DBMS Error to Restart	155
EXAMPLE 5-5	Ignoring a DBMS Error	155
EXAMPLE 5-6	Changing the Response to a Logged Alert	157
EXAMPLE 5-7	Changing the Maximum Number of Consecutive Timed-Out Probes	158
EXAMPLE 6-1	Status of a Faulty Oracle RAC Framework Resource Group	163
EXAMPLE 6-2	Status of a Faulty Oracle RAC Database Resource Group	166
EXAMPLE 6-3	Status of an Operational Oracle RAC Configuration	168
EXAMPLE 7-1	Adding Support for Oracle RAC to Selected Nodes	190
EXAMPLE 7-2	Removing Support for Oracle RAC From a Cluster	208
EXAMPLE 7-3	Removing Support for Oracle RAC From Selected Nodes	217
EXAMPLE D-1	Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i	356

Preface

Oracle Solaris Cluster Data Service for Oracle Real Application Clusters Guide explains how to install and configure Oracle Solaris Cluster data services.

Note – This Oracle Solaris Cluster release supports systems that use the SPARC and x86 families of processor architectures: UltraSPARC, SPARC64, AMD64, and Intel 64. In this document, x86 refers to the larger family of 64-bit x86 compatible products. Information in this document pertains to all platforms unless otherwise specified.

This document is intended for system administrators with extensive knowledge of Oracle 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 book assume knowledge of the Oracle Solaris operating system and expertise with the volume-manager software that is used with Oracle Solaris Cluster software.

Using UNIX Commands

This document contains information about commands that are specific to installing and configuring Oracle Solaris 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 Oracle Solaris operating system
- Oracle Solaris operating system man pages
- Other software documentation that you received with your system

Typographic Conventions

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

TABLE P-1 Typographic Conventions

Typeface	Description	Example
AaBbCc123	The names of commands, files, and directories, and onscreen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>machine_name%</code> you have mail.
AaBbCc123	What you type, contrasted with onscreen computer output	<code>machine_name%</code> su Password:
<i>aabbcc123</i>	Placeholder: replace with a real name or value	The command to remove a file is <i>rm filename</i> .
<i>AaBbCc123</i>	Book titles, new terms, and terms to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . <i>A cache</i> is a copy that is stored locally. Do <i>not</i> save the file. Note: Some emphasized items appear bold online.

Shell Prompts in Command Examples

The following table shows the default UNIX system prompt and superuser prompt for shells that are included in the Oracle Solaris OS. Note that the default system prompt that is displayed in command examples varies, depending on the Oracle Solaris release.

TABLE P-2 Shell Prompts

Shell	Prompt
Bash shell, Korn shell, and Bourne shell	\$
Bash shell, Korn shell, and Bourne shell for superuser	#
C shell	machine_name%
C shell for superuser	machine_name#

Related Documentation

Information about related Oracle Solaris Cluster topics is available in the documentation that is listed in the following table. All Oracle Solaris Cluster documentation is available at http://www.oracle.com/technetwork/indexes/documentation/index.html#sys_sw.

Topic	Documentation
Concepts	<i>Oracle Solaris Cluster Concepts Guide</i>
Hardware installation and administration	<i>Oracle Solaris Cluster 3.3 Hardware Administration Manual</i> and individual hardware administration guides
Software installation	<i>Oracle Solaris Cluster Software Installation Guide</i>
Data service installation and administration	<i>Oracle Solaris Cluster Data Services Planning and Administration Guide</i> and individual data service guides
Data service development	<i>Oracle Solaris Cluster Data Services Developer's Guide</i>
System administration	<i>Oracle Solaris Cluster System Administration Guide</i> <i>Oracle Solaris Cluster Quick Reference</i>
Software upgrade	<i>Oracle Solaris Cluster Upgrade Guide</i>
Error messages	<i>Oracle Solaris Cluster Error Messages Guide</i>
Command and function references	<i>Oracle Solaris Cluster Reference Manual</i> <i>Oracle Solaris Cluster Data Services Reference Manual</i>

For a complete list of Oracle Solaris Cluster documentation, see the release notes for your version of Oracle Solaris Cluster software.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Getting Help

If you have problems installing or using Oracle Solaris 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 number and serial number of your systems
- The release number of the operating environment (for example, Oracle Solaris 10)
- The release number of Oracle Solaris Cluster (for example, Oracle Solaris Cluster 3.3)

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

Command	Function
<code>prtconf -v</code>	Displays the size of the system memory and reports information about peripheral devices
<code>psrinfo -v</code>	Displays information about processors
<code>showrev -p</code>	Reports which patches are installed
<code>prtdiag -v</code>	Displays system diagnostic information
<code>/usr/cluster/bin/clnode show-rev -v</code>	Displays Oracle Solaris Cluster release and package version information for each node

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

Installing Support for Oracle RAC

This chapter explains how to install Support for Oracle RAC on your Oracle Solaris Cluster nodes.

- “Overview of the Installation Process for Support for Oracle RAC” on page 21
- “Preinstallation Considerations” on page 22
- “Preparing the Oracle Solaris Cluster Nodes” on page 29
- “Installing the Support for Oracle RAC Packages” on page 38
- “SPARC: Installing the UDLM” on page 40

Overview of the Installation Process for Support for Oracle RAC

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 Support for Oracle RAC

Task	Instructions
Plan your installation	“Preinstallation Considerations” on page 22
Prepare the Oracle Solaris Cluster nodes	“Preparing the Oracle Solaris Cluster Nodes” on page 29
Install data service packages	“Installing the Support for Oracle RAC Packages” on page 38
SPARC: Install the UNIX Distributed Lock Manager	“SPARC: Installing the UDLM” on page 40

Preinstallation Considerations

Oracle Real Application Clusters (Oracle RAC) is an application that can run on more than one machine concurrently. Oracle RAC can run either in the global-cluster voting nodes of the global cluster or in a zone cluster. An Oracle RAC installation is entirely contained within one cluster, either a global cluster or a specific zone cluster. Keeping the Oracle RAC installation in one cluster ensures the support of multiple independent Oracle RAC installations concurrently, where each Oracle RAC installation can be of a different version or use different options, such as storage. Support for Oracle RAC enables you to run Oracle RAC on Oracle Solaris Cluster nodes and to manage Oracle RAC by using Oracle Solaris Cluster commands.

Configuring this data service involves configuring resources for the following components of an Oracle RAC installation with Oracle Solaris Cluster software:

- **The Oracle RAC framework.** These resources enable Oracle RAC to run with Oracle Solaris Cluster software. The resources also enable reconfiguration parameters to be set by using Oracle Solaris Cluster commands. You *must* configure resources for the Oracle RAC framework. For more information, see [“Registering and Configuring the Oracle RAC Framework Resource Group” on page 65](#).
- **Storage for Oracle files.** These resources provide fault monitoring and automatic fault recovery for volume managers and file systems that store Oracle files. Configuring storage resources for Oracle files is optional. For more information, see [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#).
- **Oracle RAC database instances.** The features that these resources provide depend on the version of Oracle that you are using:
 - **Oracle 10g release 2, 11g, and 12c.** These resource types enable Oracle Clusterware and Oracle Solaris Cluster software to interoperate. These resource types do *not* provide fault monitoring and automatic fault recovery for Oracle Solaris Cluster 10g release 2, 11g, or 12c. The Oracle Clusterware software provides this functionality. This statement is not applicable to Oracle 10g release 1.

Do not use Solaris project resource properties and resource-group properties with Oracle Solaris Cluster resource types for Oracle RAC 10g, 11g, or 12c. The proxy resource does not directly start the database instance. Instead, Oracle Clusterware starts the database instances, and Solaris Resource Manager abstractions do not work with these versions of Oracle RAC.

Note – Unless otherwise stated, instructions and information for Oracle 11g apply to both Oracle 11g release 1 and Oracle 11g release 2.

- **Oracle 9i.** These resource types provide fault monitoring and automatic fault recovery for Oracle RAC. The automatic fault recovery that these resource types provide supplements the automatic fault recovery that the Oracle RAC software provides.

Use Solaris project resource properties and resource group properties only with Oracle Solaris Cluster resource types for Oracle 9i RAC. For Oracle 9i RAC, if you put the Oracle RAC server resource group under the control of a specific project, for example Oracle, all databases are started under the control of that project.

Configuring resources, which enable Oracle Solaris Cluster software to administer Oracle RAC database instances, is optional. For more information, see [“Configuring Resources for Oracle RAC Database Instances” on page 113](#).

Note – When you use Oracle RAC in a zone cluster, ensure that the zone cluster is not configured with the /opt directory as an inherited read-only directory. For an Oracle RAC configuration in a zone cluster, the /opt file system must be writable and unique to each zone. If the zone cluster that you intended to use for Oracle RAC is configured with an `inherit-pkg-dir` resource for the /opt directory, destroy and recreate the zone cluster or create a new zone cluster to meet this requirement.

If your application deployment requires the zone cluster nodes to be accessible from the public network at their host names or to have concurrent outbound traffic from each node, you must have a fixed public network address for each zone cluster node. Examples of such deployments include running RAC in zone clusters or applications using the scalable services (the `SharedAddress` resource) in the zone clusters.

The following sections contain additional preinstallation information:

- [“Hardware and Software Requirements” on page 23](#)
- [“Storage Management Requirements for Oracle Files” on page 24](#)
- [“SPARC: Processor Architecture Requirements for Oracle Components” on page 29](#)
- [“Using Oracle Data Guard With Support for Oracle RAC” on page 29](#)

Hardware and Software Requirements

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

- [“Oracle Solaris Cluster Framework Requirements” on page 23](#)
- [“Software License Requirements” on page 24](#)
- [“Supported Topology Requirements” on page 24](#)
- [“Patch Installation Requirements” on page 24](#)

Oracle Solaris Cluster Framework Requirements

Support for Oracle RAC requires a functioning cluster with the initial cluster framework already installed. See [Oracle Solaris Cluster Software Installation Guide](#) for details about initial installation of cluster software.

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 the `vxlicrep` command.

Supported Topology Requirements

Check with a Sun Enterprise Services representative for the current supported topologies for Support for Oracle RAC, cluster interconnect, storage management scheme, and hardware configurations.

Patch Installation Requirements

Ensure that you have installed all the applicable software patches for the Solaris OS, Oracle Solaris Cluster, Oracle, and volume manager software. If you need to install any Support for Oracle RAC patches, you must apply these patches after you install the data service packages.

Storage Management Requirements for Oracle Files

This section provides the following information about storage management for Oracle RAC:

- [“Overview of Storage Management Schemes for Oracle Files” on page 24](#)
- [“Storage Management Requirements for Oracle Clusterware Disks” on page 26](#)
- [“Storage Management Requirements for the Oracle Clusterware Binaries” on page 26](#)
- [“Storage Management Requirements for the Oracle RAC Database” on page 27](#)
- [“Storage Management Schemes Supported by Zone Clusters” on page 28](#)

Overview of Storage Management Schemes for Oracle Files

Support for Oracle RAC enables you to use the storage management schemes for Oracle files that are listed in the following table. The table summarizes the types of Oracle files that each storage management scheme can store. Ensure that you choose a combination of storage management schemes that can store all types of Oracle files.

The meaning of each symbol in the table is as follows:

- | | |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| + | Indicates that the storage management scheme can store the type of Oracle file. |
| - | Indicates that the storage management scheme <i>cannot</i> store the type of Oracle file. |
| * | Indicates that, starting with Oracle 11g release 2, the storage management scheme <i>cannot</i> store the type of Oracle file. However, for Oracle versions 11g release 1 and before, the storage management scheme <i>can</i> store the type of Oracle file. |

~ Indicates that, starting with Oracle 12c, the storage management scheme *can* store the type of Oracle file. But for Oracle versions before 12c, the storage management scheme *cannot* store the type of Oracle file.

TABLE 1-2 Storage Management Schemes for Oracle Files

Oracle File Type	Storage Management Scheme								
	Solaris Volume Manager for Sun Cluster	VxVM	Hardware RAID	Sun QFS Shared File System	Qualified NAS Devices	Oracle ASM	Cluster File System	Oracle ACFS File System	Local Disks
RDBMS binary files	-	-	-	+	+	-	+	+	+
Oracle Clusterware binary files	-	-	-	*	+	-	*	-	+
Configuration files	-	-	-	+	+	-	+	+	+
System parameter file (SPFILE)	-	-	-	+	+	+	+	+	-
Alert files	-	-	-	+	+	-	+	+	+
Trace files	-	-	-	+	+	-	+	+	+
Data files	+	+	+	+	+	+	-	~	-
Control files	+	+	+	+	+	+	-	~	-
Online redo log files	+	+	+	+	+	+	-	~	-
Archived redo log files	-	-	-	+	+	+	+	~	-
Flashback log files	-	-	-	+	+	+	+	~	-
Recovery files ¹	-	-	-	+	+	+	-	~	-
OCR files	+	+	+	+	+	+	+	-	-
Oracle Clusterware voting disk	+	+	+	+	+	+	+	-	-

¹ The fast recovery area cannot reside on a cluster file system because this set of files includes online redo logs.

Note – Some types of files are not included in all releases of Oracle RAC. For information about which types of file are included in the release that you are using, see your Oracle documentation.

Storage Management Requirements for Oracle Clusterware Disks

Oracle Clusterware disks such as Oracle cluster registry (OCR) and voting disks are supported on the following storage management schemes:

- Solaris Volume Manager for Sun Cluster

Note – Solaris Volume Manager for Sun Cluster is supported *only* with Oracle RAC.

- Veritas Volume Manager (VxVM)

Note – VxVM is supported *only* on the SPARC platform.

- Hardware redundant array of independent disks (RAID) support
- Sun QFS shared file systems with hardware RAID support or with Solaris Volume Manager for Sun Cluster
- Qualified network-attached storage (NAS) devices

Storage Management Requirements for the Oracle Clusterware Binaries

You can use the following storage management schemes for the Oracle Clusterware binaries:

- Solaris Volume Manager for Sun Cluster

Note – Solaris Volume Manager for Sun Cluster is supported *only* with Oracle RAC.

- Veritas Volume Manager (VxVM) with the cluster feature

Note – VxVM is supported *only* on the SPARC platform.

- Hardware redundant array of independent disks (RAID) support
- Sun QFS shared file system with hardware RAID support or with Solaris Volume Manager for Sun Cluster

- Qualified network-attached storage (NAS) devices
- Oracle Automatic Storage Management (Oracle ASM)

Note – For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.

Storage Management Requirements for the Oracle RAC Database

You can install the Oracle RAC database on one of the following locations.

- The local disks of each cluster node. See [“Using Local Disks for Oracle Binary Files and Oracle Configuration Files” on page 27](#) for additional information.
- A shared file system from the following list:

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries can no longer reside on a PXFS-based cluster file system, an Oracle ACFS file system, or a Sun QFS shared file system.

- A Sun QFS shared file system
- A PxFS-based cluster file system
- An Oracle ACFS file system
- A file system on a qualified NAS device

See [“Using a Shared File System for Oracle Binary Files and Oracle Configuration Files” on page 28](#) for additional information.

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.

Note – Some versions of Oracle require you to shut down the data service during an upgrade. To determine whether you can upgrade the Oracle application without shutting down the data service, see your Oracle documentation.

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.

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries cannot reside on a cluster file system or a Sun QFS shared file system.

The following shared file systems are supported:

- A Sun QFS shared file system
- A PxFS-based cluster file system

If you use a PxFS-based cluster file system, decide which volume manager to use:

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

Note – VxVM is supported *only* on the SPARC platform.

- An Oracle ACFS file system
- A file system on a qualified NAS device

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 short period of downtime for upgrades is acceptable, place a single copy of the Oracle binary files and Oracle configuration files on a shared file system.

Storage Management Schemes Supported by Zone Clusters

You can use the following storage management schemes for running Oracle RAC in a zone cluster, depending on the version of Oracle RAC you are running.

If you are using Oracle RAC 10g, Oracle RAC 11g, or Oracle RAC 12c, the following storage management schemes are supported:

- A Sun QFS shared file system with Solaris Volume Manager
- A Sun QFS shared file system with hardware RAID support
- Solaris Volume Manager for Sun Cluster
- A file system on a qualified NAS device with fencing

If you are using Oracle RAC 9i, the following storage management schemes are supported:

- A Sun QFS shared file system with Solaris Volume Manager

- A Sun QFS shared file system with hardware RAID support
- Solaris Volume Manager for Sun Cluster
- A file system on a qualified NAS device with fencing

SPARC: Processor Architecture Requirements for Oracle Components

Before you decide which architecture to use for the UDLM (SPARC) 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 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 the nodes. For example, if you boot one node to use 32-bit architecture, you must boot all the nodes to use 32-bit architecture.

Using Oracle Data Guard With Support for Oracle RAC

You can use Support for Oracle RAC with Oracle Data Guard. To configure Support for Oracle RAC with Oracle Data Guard, perform the tasks in this guide. The tasks for clusters that are to be used in an Oracle Data Guard configuration are identical to the tasks for a standalone cluster.

For information about the installation, administration, and operation of Oracle Data Guard, see your Oracle documentation.

Preparing the Oracle Solaris Cluster Nodes

Preparing the Oracle Solaris Cluster nodes modifies the configuration of the operating system to enable Oracle RAC to run on Oracle Solaris Cluster nodes. Preparing the Oracle Solaris Cluster nodes and disks involves the following tasks:

- Bypassing the NIS name service
- Creating the database administrator (DBA) group and the DBA user accounts
- Configuring shared memory for the Oracle RAC software



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

To enable the Oracle RAC to run in a zone cluster, you need to perform the following additional tasks:

- Configuring shared memory for Oracle RAC software in a zone cluster
- Setting necessary privileges for Oracle RAC software in a zone cluster
- Configuring logical hostname resources for Oracle RAC software in a zone cluster

This section contains the following information:

- [“Before You Begin” on page 30](#)
- [“How to Bypass the NIS Name Service” on page 30](#)
- [“How to Create the DBA Group and the DBA User Accounts” on page 31](#)
- [“How to Configure Shared Memory for Oracle RAC Software in the Global Cluster” on page 34](#)
- [“How to Configure Shared Memory for Oracle RAC Software in a Zone Cluster” on page 35](#)
- [“How to Set the Necessary Privileges for Oracle RAC Software in a Zone Cluster” on page 37](#)
- [“How to Configure the Logical Hostname Resources or Virtual IP Addresses for Oracle RAC Software in a Zone Cluster” on page 37](#)

Before You Begin

Before you prepare the Oracle Solaris Cluster nodes, ensure that all preinstallation tasks for Oracle RAC are completed. For more information, see your Oracle RAC documentation.

▼ How to Bypass the NIS Name Service

Bypassing the NIS name service protects the Support for Oracle RAC 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 Support for Oracle RAC refers to the NIS name service, unavailability of the name service might cause the Support for Oracle RAC data service to fail.

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

1 Become superuser on all nodes where Support for Oracle RAC can run.

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

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

For more information about the `/etc/nsswitch.conf` file, see the [nsswitch.conf\(4\)](#) man page.

Next Steps Go to “[How to Create the DBA Group and the DBA User Accounts](#)” on page 31.

▼ How to Create the DBA Group and the DBA User Accounts

In installations of Oracle RAC with Oracle Solaris Cluster software, the DBA group is normally named `dba`. This group normally contains the root user and the `oracle` user.

Note – This configuration of users and groups differs from the configuration that is described in the Oracle documentation for a standalone installation of Oracle RAC. A standalone installation of Oracle RAC uses a primary DBA group that is named `oinstall` and a secondary group that is named `dba`. Some applications also require a secondary group that is named `oper`. For more information, see your Oracle documentation.

Perform this task on each cluster node.

- 1 On the cluster node where you are performing this task, become superuser.**
- 2 Add an entry for the DBA group and potential users in the group to the `/etc/group` file.**

```
# groupadd -g group-id group-name
```

group-name Specifies the name of the group for which you are adding an entry. This group is normally named `dba`.

group-id Specifies the group's unique numerical ID (GID) within the system.

Ensure that the command is identical on each node that can run Support for Oracle RAC.

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.

- 3 Create the home directory of each potential user in the DBA group that you defined in [Step 2](#).**

You are not required to create a home directory for the root user.

For each potential user whose home directory you are creating, type the following command:

```
# mkdir -p user-home
```

user-home Specifies the full path of the home directory that you are creating.

4 Add each potential user in the DBA group that you defined in [Step 2](#) to the system.

You are not required to add the root user.

Use the `useradd(1M)` command to add each user. Adding a user to the system adds an entry for the user to the following files:

- `/etc/passwd`
- `/etc/shadow`

```
# useradd -u user-id -g group-name -d user-home \  
[ -s user-shell] user-name
```

`-u user-id` Specifies the user's unique numerical ID (UID) within the system.

`-g group-name` Specifies the name of the user group of which the user is a member. You must specify the DBA group that you defined in [Step 2](#).

`-d user-home` Specifies the full path of the user's home directory. You must specify the home directory that you created for the user in [Step 3](#).

`-s user-shell` Optionally specifies the full path name of the program that is to be used as the user's shell when the user logs in. If you omit the `-s` option, the system uses the `/bin/sh` program by default. If you specify the `-s` option, *user-shell* must specify a valid executable file.

user-name Specifies the user name of the user that you are adding. You must specify the name of a potential user in the DBA group that you defined in [Step 2](#).

Ensure that each user is identical on each node that can run Support for Oracle RAC.

5 Set the password of each user that you added in [Step 4](#).

Use the `passwd(1)` command to set the password of each user.

a. Type the following command:

```
# password user-name
```

user-name Specifies the user name of the user whose password you are setting. You must specify the name of a user in the DBA group that you added in [Step 4](#).

The `passwd` command prompts you for the password.

b. In response to the prompt, type the password and press Return.

The `passwd` command prompts you to retype the password.

c. In response to the prompt, retype the password and press Return.

6 Change the ownership of each home directory that you created in [Step 3](#) as follows:

- Owner: the user for which you created the home directory
- Group: the DBA group that you defined in [Step 2](#)

For each home directory for which you are changing ownership, type the following command:

```
# chown user-name:group-name user-home
```

user-name Specifies the user name of the user for whose home directory you are changing ownership. You must specify the name of a user in the DBA group that you added in [Step 4](#).

group-name Specifies the name of the user group of which the user is a member. You must specify the DBA group that you defined in [Step 2](#).

user-home Specifies the full path of the user's home directory. You must specify the home directory that you created for the user in [Step 3](#).

7 Create a subdirectory of the `/var/opt` directory for each user in the DBA group that you added in [Step 4](#).

For each subdirectory that you are creating, type the following command:

```
# mkdir /var/opt/user-name
```

user-name Specifies the user name of the user whose subdirectory of the `/var/opt` directory you are creating. You must specify the name of a user in the DBA group that you added in [Step 4](#).

8 Change the ownership of each directory that you created in [Step 7](#) as follows:

- Owner: the user for which you created the directory
- Group: the DBA group that you defined in [Step 2](#)

For each directory for which you are changing ownership, type the following command:

```
# chown user-name:group-name /var/opt/user-name
```

user-name Specifies the user name of the user for whose home directory you are changing ownership. You must specify the name of a user in the DBA group that you added in [Step 4](#).

group-name Specifies the name of the user group of which the user is a member. You must specify the DBA group that you defined in [Step 2](#).

Example 1–1 Creating the DBA Group and the DBA User Accounts

This example shows the sequence of commands for creating the DBA group `dba`, which is to contain the users `root` and `oracle`.

The `dba` group and the `oracle` user are created as follows:

- The GID of the `dba` group is 520.
- The home directory of the `oracle` user is `/Oracle-home`.
- The UID of the `oracle` user is 120.
- The `oracle` user's login shell is the Korn shell.

```
# groupadd -g 520 dba
# mkdir /Oracle-home
# useradd -u 120 -g dba -d /Oracle-home -s /bin/ksh oracle
# passwd oracle
New Password:oracle
Re-enter new Password:oracle
passwd: password successfully changed for oracle
# chown oracle:dba /Oracle-home
# mkdir /var/opt/oracle
# chown oracle:dba /var/opt/oracle
```

See Also The following man pages:

- [passwd\(1\)](#)
- [useradd\(1M\)](#)
- [group\(4\)](#)
- [passwd\(4\)](#)
- [shadow\(4\)](#)

Next Steps Go to [“How to Configure Shared Memory for Oracle RAC Software in the Global Cluster”](#) on page 34.

▼ How to Configure Shared Memory for Oracle RAC Software in the Global Cluster

To enable the Oracle RAC software to run correctly, you must ensure that sufficient shared memory is available on all the cluster nodes. Perform this task on each cluster node.

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

2 Update the `/etc/system` or `/etc/project` file with the shared memory configuration information.

Follow the procedure for configuring kernel parameters in your Oracle Real Application Clusters installation guide.

You must configure these parameters on the basis of the resources that are available in the cluster. However, the value of each parameter must be sufficient to enable the Oracle RAC software to create a shared memory segment that conforms to its configuration requirements. For the minimum required value of each parameter, see your Oracle documentation.

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

```
*SHARED_MEMORY/ORACLE
set shmsys:shminfo_shmmax=4294967295
```

3 If you updated the `/etc/system` file, shut down and reboot each node whose `/etc/system` file you updated in [Step 2](#).

No reboot is necessary after updating an `/etc/project` file.



Caution – Before you reboot, you must ensure that any volume manager software that is already installed is completely installed. An incomplete installation of volume manager software causes a panic. If you use VxVM, also ensure that you have installed the software and that the license for the VxVM cluster feature is valid. Otherwise, a panic occurs when you reboot. For information about how to recover from a node panic during installation, see [“Node Panic During Initialization of Support for Oracle RAC”](#) on page 172.

For detailed instructions, see [“Shutting Down and Booting a Single Node in a Cluster”](#) in *Oracle Solaris Cluster System Administration Guide*.

Next Steps Go to [“Installing the Support for Oracle RAC Packages”](#) on page 38.

▼ How to Configure Shared Memory for Oracle RAC Software in a Zone Cluster

To configure shared memory for the Oracle RAC software in a zone cluster, perform the following steps:

1 Perform the steps to configure the shared memory in a global cluster.

For detailed instructions on configuring the shared memory in a global cluster, see [“How to Configure Shared Memory for Oracle RAC Software in the Global Cluster”](#) on page 34.

2 Perform the similar steps in each zone cluster.

Note – These steps do not affect the actual shared memory control for the zone cluster. You perform these steps to help the Oracle dbca utility enable you to set the database memory allocation. If the Oracle dbca utility is not used for Oracle RAC database creation, you can skip these steps in the zone cluster.

3 Perform the following steps, if you want to limit the memory used for the zone cluster.

- a. Become superuser on the global cluster node that hosts the zone cluster.
- b. Configure the capped-memory property attributes `physical`, `swap`, and `locked` by using the `clzonecluster` command.

```
#clzonecluster configure zcname
clzonecluster:zcname> add capped-memory
clzonecluster:cz1-2n:capped-memory> set physical=memsize
clzonecluster:cz1-2n:capped-memory> set swap=memsize
clzonecluster:cz1-2n:capped-memory> set locked=memsize
clzonecluster:cz1-2n:capped-memory> end
clzonecluster:cz1-2n>commit
```

`Physical=memsize` Specifies the physical memory size.

`swap=memsize` Specifies the swap memory size.

`locked=memsize` Specifies the limit of the shared memory segment size that the Oracle RAC database processes can request to lock in memory.

Note – In addition to the `locked` attribute of the capped-memory property, you can use the `max-shm-memory` property to directly configure the limit of the shared memory segment in a zone cluster. See also the Solaris man page [zonecfg\(1M\)](#).

- c. Reboot the zone cluster.

```
#clzonecluster reboot zcname
```

Note – You can perform the step to configure the capped-memory property attributes as part of the zone cluster creation. If you configure the capped-memory property attributes as part of the zone cluster creation, the memory-related properties immediately take effect after the first zone cluster boot. See “[How to Create a Zone Cluster](#)” in *Oracle Solaris Cluster Software Installation Guide*.

▼ How to Set the Necessary Privileges for Oracle RAC Software in a Zone Cluster

You should set the necessary privileges to enable Oracle RAC to run in a zone cluster configuration. You can use the `clzonecluster` command to include the necessary privileges in a zone cluster configuration by setting the `limitpriv` property. Perform the following steps to set the necessary privileges in a zone cluster to run Oracle RAC.

- 1 Become superuser on the global cluster node that hosts the zone cluster.
- 2 Configure the `limitpriv` property by using the `clzonecluster` command.


```
# clzonecluster configure zcname
clzonecluster:zcname>set limitpriv ="default,proc_priocntl,proc_clock_highres"
clzonecluster:zcname>commit
```
- 3 Beginning with Oracle RAC version 11g release 2, prevent Oracle Clusterware time synchronization from running in active mode.
 - a. Log in to the zone-cluster node as root.
 - b. Create an empty `/etc/inet/ntp.conf` file.


```
# touch /etc/inet/ntp.conf
```

▼ How to Configure the Logical Hostname Resources or Virtual IP Addresses for Oracle RAC Software in a Zone Cluster

To support logical hostname resources for an Oracle RAC 9i configuration and Oracle Clusterware virtual IP resources in Oracle RAC 10g, 11g, and 12c configurations in zone clusters, you should configure the failover-capable hostnames or IP addresses used by those resources in a given zone cluster using the `clzonecluster` command.

Perform the following steps to configure the virtual IP addresses in a zone cluster configuration for Oracle RAC 10g, 11g, or 12c.

- 1 Become superuser on the global cluster node that hosts the zone cluster.
- 2 Configure the virtual IP addresses using the `clzonecluster` command.


```
# clzonecluster configure zcname
clzonecluster:zcname>add net
clzonecluster:zcname:net>set address=racnode1-vip
clzonecluster:zcname:net>end
```

```
clzonecluster:zcname>add net
clzonecluster:zcname:net>set address=racnode2-vip
clzonecluster:zcname:net>end
clzonecluster:zcname>commit
```

3 Reboot the zone cluster.

```
# clzonecluster reboot zcname
```

Installing the Support for Oracle RAC Packages

If you did not install the Support for Oracle RAC packages during your initial Oracle Solaris Cluster installation, perform this procedure to install the packages. To install the packages, use the installer program.

Note – You need to install the Support for Oracle RAC packages in the global cluster and not in the zone cluster.

▼ How to Install the Support for Oracle RAC Packages

Perform this procedure on each cluster node where you want the Support for Oracle RAC software to run.

You can run the installer program with a command-line interface (CLI) or with a graphical user interface (GUI). The content and sequence of instructions in the CLI and the GUI are similar.

Note – Even if you plan to configure this data service to run in non-global zones, install the packages for this data service in the global zone. The packages are propagated to any existing non-global zones and to any non-global zones that are created after you install the packages.

Before You Begin Ensure that you have the Oracle Solaris Cluster installation media.

If you intend to run the installer program with a GUI, ensure that your DISPLAY environment variable is set.

1 On the cluster node where you are installing the data service packages, become superuser.

2 Load the Oracle Solaris Cluster installation media into the DVD-ROM drive.

If the Volume Management daemon `vold(1M)` is running and configured to manage DVD-ROM devices, the daemon automatically mounts the DVD-ROM on the `/cdrom` directory.

3 Change to the installation wizard directory of the DVD-ROM.

- If you are installing the data service packages on the SPARC platform, type the following command:

```
# cd /cdrom/cdrom0/Solaris_sparc
```

- If you are installing the data service packages on the x86 platform, type the following command:

```
# cd /cdrom/cdrom0/Solaris_x86
```

4 Start the installation wizard.

```
# ./installer
```

5 When you are prompted, accept the license agreement.**6 From the list of Oracle Solaris Cluster agents under Availability Services, select the data service for Oracle RAC.****7 If you require support for languages other than English, select the option to install multilingual packages.**

English language support is always installed.

8 When prompted whether to configure the data service now or later, choose Configure Later.

Choose Configure Later to perform the configuration after the installation.

9 Follow the instructions on the screen to install the data service packages on the node.

The installation wizard displays the status of the installation. When the installation is complete, the wizard displays an installation summary and the installation logs.

10 (GUI only) If you do not want to register the product and receive product updates, deselect the Product Registration option.

The Product Registration option is not available with the CLI. If you are running the installation wizard with the CLI, omit this step.

11 Exit the installation wizard.

12 Unload the installation media from the DVD-ROM drive.

a. To ensure that the DVD-ROM is not being used, change to a directory that does *not* reside on the DVD-ROM.

b. Eject the DVD-ROM.

```
# eject cdrom
```

SPARC: Installing the UDLM

For detailed instructions for installing the UNIX Distributed Lock Manager (UDLM), see the Oracle RAC documentation.



Caution – Before you install the UDLM, ensure that you have created the DBA group and DBA user accounts. For more information, see [“How to Create the DBA Group and the DBA User Accounts” on page 31.](#)

▼ SPARC: How to Install the UDLM

If your Oracle RAC release requires UDLM, you must install the UDLM software on the local disk of each node. To support Oracle RAC on a zone cluster node, install UDLM software on each zone cluster node.

Note – On Oracle RAC 11g release 2 or 12c only, to use native SKGXN instead of UDLM, do not install the UDLM software. Native SKGXN is automatically used if UDLM software is not installed in the cluster.

1 Become superuser on a cluster node.**2 Install the UDLM software.**

See the appropriate Oracle RAC installation documentation for instructions.

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

Next Steps Go to [Chapter 2, “Configuring Storage for Oracle Files.”](#)

Configuring Storage for Oracle Files

This chapter explains how to configure storage for Oracle files.

- [“Summary of Configuration Tasks for Storage for Oracle Files” on page 41](#)
- [“Installing Storage Management Software With Support for Oracle RAC” on page 49](#)

Summary of Configuration Tasks for Storage for Oracle Files

This section summarizes the following tasks for configuring each storage management scheme for Oracle files:

- [“Tasks for Configuring the Sun QFS Shared File System for Oracle Files” on page 41](#)
- [“Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files” on page 43](#)
- [“Tasks for Configuring VxVM for Oracle Files” on page 45](#)
- [“Tasks for Configuring Hardware RAID Support for Oracle Files” on page 46](#)
- [“Tasks for Configuring ASM for Oracle Files” on page 47](#)
- [“Tasks for Configuring Qualified NAS Devices for Oracle Files” on page 47](#)
- [“Tasks for Configuring a Cluster File System for Oracle Files” on page 48](#)

Tasks for Configuring the Sun QFS Shared File System for Oracle Files

The following tables summarize the tasks for configuring the Sun QFS shared file system and provides cross-references to detailed instructions for performing the tasks. The first table provides information on Oracle RAC running in the global cluster and the second table provide information on Oracle RAC running in a zone cluster.

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

TABLE 2-1 Tasks for Configuring the Sun QFS Shared File System for Oracle Files in the Global Cluster

Task	Instructions
Install and configure the Sun QFS shared file system	“Using the Sun QFS Shared File System” on page 53
Install and configure the other storage management scheme that you are using with the Sun QFS shared file system	<p>If you are using Solaris Volume Manager for Sun Cluster, see “Using Solaris Volume Manager for Sun Cluster” on page 50.</p> <p>If you are using hardware RAID support, see “Using Hardware RAID Support” on page 51.</p>
Register and configure the Oracle RAC framework resource group	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring the Oracle RAC Framework Resource Group” on page 65.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>
If you are using Solaris Volume Manager for Sun Cluster, create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle RAC database	“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75
Register and configure storage resources for Oracle files	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

TABLE 2-2 Tasks for Configuring the Sun QFS Shared File System for Oracle Files in a Zone Cluster

Task	Instructions
Install and configure the Sun QFS shared file system in the global cluster	“Using the Sun QFS Shared File System” on page 53
Install and configure the other storage management scheme that you are using with the Sun QFS shared file system in the global cluster	<p>If you are using Solaris Volume Manager for Sun Cluster, see “Using Solaris Volume Manager for Sun Cluster” on page 50.</p> <p>If you are using hardware RAID support, see “Using Hardware RAID Support” on page 51.</p>
Register and configure the Oracle RAC framework resource group in the global cluster	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring the Oracle RAC Framework Resource Group” on page 65.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>
If you are using Solaris Volume Manager for Sun Cluster, create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle RAC database in the global cluster	“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75
Configure Sun QFS shared file system for the zone cluster	See “How to Add a QFS Shared File System to a Zone Cluster” in <i>Oracle Solaris Cluster Software Installation Guide</i>
Register and configure the storage resources for Oracle files in the zone cluster	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files

The following tables summarize the tasks for configuring Solaris Volume Manager for Sun Cluster 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 2–3 Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files in the Global Cluster

Task	Instructions
Configure Solaris Volume Manager for Sun Cluster	“Using Solaris Volume Manager for Sun Cluster” on page 50
Register and configure the multiple-owner volume manager resource group	<p>If you are using the <code>clsetup</code> utility for this task, see “How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using <code>clsetup</code>” on page 71.</p> <p>If you are using Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>
Create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle RAC database	“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75
Register and configure storage resources for Oracle files	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

TABLE 2–4 Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files in a Zone Cluster

Task	Instructions
Configure Solaris Volume Manager for Sun Cluster in the global cluster	“Using Solaris Volume Manager for Sun Cluster” on page 50
Register and configure the multiple-owner volume manager framework resource group in the global cluster	<p>If you are using the <code>clsetup</code> utility for this task, see “How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using <code>clsetup</code>” on page 71.</p> <p>If you are using Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>

TABLE 2-4 Tasks for Configuring Solaris Volume Manager for Sun Cluster for Oracle Files in a Zone Cluster *(Continued)*

Task	Instructions
Create a multi-owner disk set in Solaris Volume Manager for Sun Cluster for the Oracle RAC database in the global cluster	“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75
Configure Solaris Volume Manager devices in a zone cluster	See “How to Add a Disk Set to a Zone Cluster (Solaris Volume Manager)” in <i>Oracle Solaris Cluster Software Installation Guide</i>
Register and configure storage resources for Oracle files in the zone cluster	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

Tasks for Configuring VxVM for Oracle Files

The following table summarizes the tasks for configuring VxVM 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 2-5 Tasks for Configuring VxVM for Oracle Files

Task	Instructions
Install and configure VxVM	“Using VxVM” on page 51
Register and configure the multiple-owner volume-manager framework resource group	<p>If you are using the <code>clsetup</code> utility for this task, see “How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using <code>clsetup</code>” on page 71.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>
Create a VxVM shared-disk group for the Oracle RAC database	“How to Create a VxVM Shared-Disk Group for the Oracle RAC Database” on page 81
Register and configure storage resources for Oracle files	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

Note – VxVM devices are currently not supported by zone clusters.

Tasks for Configuring Hardware RAID Support for Oracle Files

The following table summarizes the tasks for configuring hardware RAID support and provides cross-references to detailed instructions for performing the tasks.

TABLE 2-6 Tasks for Configuring Hardware RAID Support for Oracle Files

Task	Instructions
Configure hardware RAID support	“Using Hardware RAID Support” on page 51

Note – For information configuring hardware RAID for a zone cluster, see [“Adding Storage Devices to a Zone Cluster”](#) in *Oracle Solaris Cluster Software Installation Guide*.

Tasks for Configuring ASM for Oracle Files

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

TABLE 2-7 Tasks for Configuring ASM for Oracle Files

Task	Instructions
Configure devices for ASM	“Using Oracle ASM” on page 58

Note – For information about configuring ASM for a zone cluster, see [“Adding Storage Devices to a Zone Cluster”](#) in *Oracle Solaris Cluster Software Installation Guide*.

Tasks for Configuring Qualified NAS Devices for Oracle Files

The following table summarizes the tasks for configuring qualified NAS devices and provides cross-references to detailed instructions for performing the tasks. NAS devices are supported in both global and zone clusters.

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

TABLE 2–8 Tasks for Configuring Qualified NAS Devices for Oracle Files

Task	Instructions
Install and configure the qualified NAS device	<p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see the Oracle Solaris Cluster 3.3 With Network-Attached Storage Device Manual.</p> <p>If you are using the Oracle Solaris Cluster Manager for this task, see the online help.</p>
Register and configure the Oracle RAC framework resource group in a global cluster or zone cluster	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring the Oracle RAC Framework Resource Group” on page 65.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>
Register and configure storage resources for Oracle files, including Oracle RAC to support NAS NFS	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring Storage Resources for Oracle Files” on page 83.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324.</p>

Tasks for Configuring a Cluster File System for Oracle Files

Cluster file system types are the PxFS-based cluster file system and the Oracle ACFS file system. The following tables summarize the tasks for configuring a PxFS-based cluster file system or an Oracle ACFS file system, 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 2-9 Tasks for Configuring a PxFS-Based Cluster File System for Oracle Files

Task	Instructions
Install and configure the cluster file system	“Using a Cluster File System” on page 61
Register and configure the Oracle RAC framework resource group	<p>If you are using the <code>clsetup</code> utility for this task, see “Registering and Configuring the Oracle RAC Framework Resource Group” on page 65.</p> <p>If you are using the Oracle Solaris Cluster maintenance commands for this task, see “How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands” on page 309.</p>

TABLE 2-10 Tasks for Configuring an Oracle ACFS File System for Oracle Files

Task	Instructions
Install and configure the Oracle ACFS file system, and register and configure the Oracle RAC framework resource group	“Creating Oracle ACFS File Systems” in <i>Oracle Solaris Cluster Software Installation Guide</i>

Note – A PxFS-based cluster file system or an Oracle ACFS file system are currently not supported for Oracle RAC in zone clusters.

Installing Storage Management Software With Support for Oracle RAC

Install the software for the storage management schemes that you are using for Oracle files. For more information, see [“Storage Management Requirements for Oracle Files” on page 24](#).

Note – For information about how to install and configure qualified NAS devices with Support for Oracle RAC, see [Oracle Solaris Cluster 3.3 With Network-Attached Storage Device Manual](#).

This section contains the following information:

- [“Using Solaris Volume Manager for Sun Cluster” on page 50](#)
- [“Using VxVM” on page 51](#)
- [“Using Hardware RAID Support” on page 51](#)

- [“Using the Sun QFS Shared File System” on page 53](#)
- [“Using Oracle ASM” on page 58](#)
- [“Using a Cluster File System” on page 61](#)

Using Solaris Volume Manager for Sun Cluster

Solaris Volume Manager for Sun Cluster is always installed in the global cluster, even when supporting zone clusters. The `clzc` command configures Solaris Volume Manager for Sun Cluster devices from the global-cluster voting node into the zone cluster. All administration tasks for Solaris Volume Manager for Sun Cluster are performed in the global-cluster voting node, even when the Solaris Volume Manager for Sun Cluster volume is used in a zone cluster.

When an Oracle RAC installation inside a zone cluster uses a file system that exists on top of a Solaris Volume Manager for Sun Cluster volume, you should still configure the Solaris Volume Manager for Sun Cluster volume in the global cluster. In this case, the scalable device group resource belongs to this zone cluster.

When an Oracle RAC installation inside a zone cluster runs directly on the Solaris Volume Manager for Sun Cluster volume, you must first configure the Solaris Volume Manager for Sun Cluster in the global cluster and then configure the Solaris Volume Manager for Sun Cluster volume into the zone cluster. In this case, the scalable device group belongs to this zone cluster.

For information about the types of Oracle files that you can store by using Solaris Volume Manager for Sun Cluster, see [“Storage Management Requirements for Oracle Files” on page 24](#).

▼ How to Use Solaris Volume Manager for Sun Cluster

To use the Solaris Volume Manager for Sun Cluster software with Support for Oracle RAC, perform the following tasks. Solaris Volume Manager for Sun Cluster is installed during the installation of the Solaris Operating System.

- 1 Configure the Solaris Volume Manager for Sun Cluster software on the global-cluster nodes.**
For information about configuring Solaris Volume Manager for Sun Cluster in the global cluster, see [“Configuring Solaris Volume Manager Software” in *Oracle Solaris Cluster Software Installation Guide*](#).
- 2 If you are using a zone cluster, configure the Solaris Volume Manager for Sun Cluster volume into the zone cluster.**
For information on configuring Solaris Volume Manager for Sun Cluster volume into a zone cluster, see [“How to Add a Disk Set to a Zone Cluster \(Solaris Volume Manager\)” in *Oracle Solaris Cluster Software Installation Guide*](#).

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Using VxVM

For information about the types of Oracle files that you can store by using VxVM, see [“Storage Management Requirements for Oracle Files” on page 24.](#)

Note – Using VxVM for Oracle RAC in zone clusters is not supported in this release.

▼ SPARC: How to Use VxVM

To use the VxVM software with Support for Oracle RAC, 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 RAC support. Before you install the Oracle RAC 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 [Chapter 5, “Installing and Configuring Veritas Volume Manager,” in *Oracle Solaris Cluster Software Installation Guide*](#) and the VxVM documentation for more information.

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Using Hardware RAID Support

For information about the types of Oracle files that you can store by using hardware RAID support, see [“Storage Management Requirements for Oracle Files” on page 24.](#)

Oracle Solaris Cluster software provides hardware RAID support for several storage devices. To use this combination, configure raw device identities (`/dev/did/rdisk*`) on top of the disk arrays' logical unit numbers (LUNs). To set up the raw devices for Oracle RAC on a cluster that uses StorEdge SE9960 disk arrays with hardware RAID, perform the following task.

▼ How to Use Hardware RAID Support

1 Create LUNs on the disk arrays.

See the Oracle Solaris 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. clt5d0 <Symbios-StorEDGEA3000-0301 cyl 21541 alt 2 hd 64 sec 64>
  /pseudo/rdnexus@1/rdriver@5,0
3. clt5d1 <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 Determine the raw device identity (DID) that corresponds to the LUNs that you created in [Step 1](#).

Use the `cldevice(1CL)` command for this purpose.

The following example lists output from the `cldevice list -v` command.

```
# cldevice list -v

DID Device      Full Device Path
-----
d1              phys-schost-1:/dev/rdisk/c0t2d0
d2              phys-schost-1:/dev/rdisk/c0t3d0
d3              phys-schost-2:/dev/rdisk/c4t4d0
d3              phys-schost-1:/dev/rdisk/clt5d0
d4              phys-schost-2:/dev/rdisk/c3t5d0
d4              phys-schost-1:/dev/rdisk/c2t5d0
d5              phys-schost-2:/dev/rdisk/c4t4d1
d5              phys-schost-1:/dev/rdisk/clt5d1
d6              phys-schost-2:/dev/rdisk/c3t5d1
d6              phys-schost-1:/dev/rdisk/c2t5d1
d7              phys-schost-2:/dev/rdisk/c0t2d0
d8              phys-schost-2:/dev/rdisk/c0t3d0
```

In this example, the `cldevice` output identifies that the raw DID that corresponds to the disk arrays' shared LUNs is `d4`.

4 Obtain the full DID device name that corresponds to the DID device that you identified in [Step 3](#).

The following example shows the output from the `cldevice show` for the DID device that was identified in the example in [Step 3](#). The command is run from node `phys-schost-1`.

```
# cldevice show d4
```

```
=== DID Device Instances ===
```

```
DID Device Name:                /dev/did/rdisk/d4
Full Device Path:                phys-schost-1:/dev/rdisk/c2t5d0
Replication:                    none
default_fencing:                global
```

5 If you are using a zone cluster configure the DID devices into the zone cluster. Otherwise, proceed to [Step 6](#).

For information about configuring DID devices into a zone cluster, see “[How to Add a DID Device to a Zone Cluster](#)” in *Oracle Solaris Cluster Software Installation Guide*.

6 Create or modify a slice on each DID device to contain the disk-space allocation for the raw device.

Use the `format(1M)` command, `fmthard(1M)` command, or `prtvtoc(1M)` for this purpose. Specify the full device path from the node where you are running the command to create or modify the slice.

For example, if you choose to use slice `s0`, you might choose to allocate 100 GB of disk space in slice `s0`.

7 Change the ownership and permissions of the raw devices that you are using to allow access to these devices.

To specify the raw device, append `sN` to the DID device name that you obtained in [Step 4](#), where `N` is the slice number.

For example, the `cldevice` output in [Step 4](#) identifies that the raw DID that corresponds to the disk is `/dev/did/rdisk/d4`. If you choose to use slice `s0` on these devices, specify the raw device `/dev/did/rdisk/d4s0`.

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Using the Sun QFS Shared File System

The Sun QFS shared file system is always installed in the global-cluster voting node, even when a file system is used by a zone cluster. You configure specific Sun QFS shared file system into a

specific zone cluster using the `clzc` command. The scalable mount-point resource belongs to this zone cluster. The metadata server resource, `SUNW.qfs`, belongs to the global cluster.

You must use the Sun QFS shared file system with one storage management scheme from the following list:

- Hardware RAID support
- Solaris Volume Manager for Sun Cluster

Distributing Oracle Files Among Sun QFS Shared File Systems

You can store all the files that are associated with Oracle RAC on the Sun QFS shared file system.

Distribute these files among several file systems as explained in the subsections that follow.

- [“Sun QFS File Systems for RDBMS Binary Files and Related Files” on page 54](#)
- [“Sun QFS File Systems for Database Files and Related Files” on page 54](#)

Sun QFS File Systems for RDBMS Binary Files and Related Files

For RDBMS binary files and related files, create one file system in the cluster to store the files.

The RDBMS binary files and related files are as follows:

- Oracle relational database management system (RDBMS) binary files
- Oracle configuration files (for example, `init.ora`, `tnsnames.ora`, `listener.ora`, and `sqlnet.ora`)
- System parameter file (SPFILE)
- Alert files (for example, `alert_sid.log`)
- Trace files (`*.trc`)
- Oracle Clusterware binary files

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries cannot reside on Sun QFS shared file systems.

Sun QFS File Systems for Database Files and Related Files

For database files and related files, determine whether you require one file system for each database or multiple file systems for each database.

- For simplicity of configuration and maintenance, create one file system to store these files for all Oracle RAC instances of the database.
- To facilitate future expansion, create multiple file systems to store these files for all Oracle RAC instances of the database.

Note – If you are adding storage for an existing database, you must create additional file systems for the storage that you are adding. In this situation, distribute the database files and related files among the file systems that you will use for the database.

Each file system that you create for database files and related files must have its own metadata server. For information about the resources that are required for the metadata servers, see [“Resources for the Sun QFS Metadata Server” on page 325](#).

The database files and related files are as follows:

- Data files
- Control files
- Online redo log files
- Archived redo log files
- Flashback log files
- Recovery files
- Oracle cluster registry (OCR) files
- Oracle Clusterware voting disk

Optimizing the Performance of the Sun QFS Shared File System

For optimum performance with Solaris Volume Manager for Sun Cluster, configure the volume manager and the file system as follows:

- Use Solaris Volume Manager for Sun Cluster to mirror the logical unit numbers (LUNs) of your disk arrays.
- If you require striping, configure the striping by using the file system's stripe option.

Mirroring the LUNs of your disk arrays involves the following operations:

- Creating RAID-0 metadevices
- Using the RAID-0 metadevices or Solaris Volume Manager soft partitions of such metadevices as Sun QFS devices

The input/output (I/O) load on your system might be heavy. In this situation, ensure that the LUN for Solaris Volume Manager metadata or hardware RAID metadata maps to a different physical disk than the LUN for data. Mapping these LUNs to different physical disks ensures that contention is minimized.

▼ How to Install and Configure the Sun QFS Shared File System

Before You Begin

You might use Solaris Volume Manager metadevices as devices for the shared file systems. In this situation, ensure that the metaset and its metadevices are created and available on all nodes before configuring the shared file systems.

- 1 **Ensure that the Sun QFS software is installed on all nodes of the global cluster where Support for Oracle RAC is to run.**

For information about how to install Sun QFS, see [Using SAM-QFS With Sun Cluster](#).

- 2 **Ensure that each Sun QFS shared file system is correctly created for use with Support for Oracle RAC.**

For information about how to create a Sun QFS file system, see [Using SAM-QFS With Sun Cluster](#).

For each Sun QFS shared file system, set the correct mount options for the types of Oracle files that the file system is to store.

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

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries cannot reside on Sun QFS shared file systems.

- For the file systems that contain database data files, control files, online redo log files, and archived redo log files, or Oracle Clusterware OCR and Voting 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:

```
fs=fs-name
stripe=width
mh_write
qwrite
forcedirectio
rdlease=300    Set this value for optimum performance.
wrlease=300    Set this value for optimum performance.
aplease=300    Set this value for optimum performance.
```

`fs-name` Specifies the name that uniquely identifies the file system.

`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.

3 Mount each Sun QFS shared file system that you are using for Oracle files.

```
# mount mount-point
```

mount-point Specifies the mount point of the file system that you are mounting.

4 If you are using a zone cluster, configure the Sun QFS shared file system into the zone cluster. Otherwise, go to [Step 5](#).

For information about configuring Sun QFS shared file system into a zone cluster, see “[How to Add a QFS Shared File System to a Zone Cluster](#)” in *Oracle Solaris Cluster Software Installation Guide*.

5 Change the ownership of each file system that you are using for Oracle files.

Note – If you have configured Sun QFS shared file system for a zone cluster, perform this step in that zone cluster.

Change the file-system ownership as follows:

- Owner: the database administrator (DBA) user
- Group: the DBA group

The DBA user and the DBA group are created as explained in “[How to Create the DBA Group and the DBA User Accounts](#)” on page 31.

```
# chown user-name:group-name mount-point
```

user-name Specifies the user name of the DBA user. This user is normally named `oracle`.

group-name Specifies the name of the DBA group. This group is normally named `dba`.

mount-point Specifies the mount point of the file system whose ownership you are changing.

6 Grant to the owner of each file system whose ownership you changed in [Step 5](#) read access and write access to the file system.

Note – When Sun QFS shared file system is configured for a zone cluster, you need to perform this step in that zone cluster.

```
# chmod u+rw mount-point
```

mount-point Specifies the mount point of the file system to whose owner you are granting read access and write access.

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Using Oracle ASM

Use Oracle ASM with one storage management scheme from the following list:

- **Hardware RAID.** For more information, see [“How to Use Oracle ASM With Hardware RAID” on page 58.](#)
- **Solaris Volume Manager for Sun Cluster.** For more information, see [“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75.](#)
- **VxVM.** For more information, see [“How to Create a VxVM Shared-Disk Group for the Oracle RAC Database” on page 81.](#)

Note – For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.

For information about the types of Oracle files that you can store by using Oracle ASM, see [“Storage Management Requirements for Oracle Files” on page 24.](#)

Note – When an Oracle RAC installation in a zone cluster uses Oracle ASM, you must configure all the devices needed by that Oracle RAC installation into that zone cluster by using the `clzonecluster` command. When Oracle ASM runs inside a zone cluster, the administration of Oracle ASM occurs entirely within the same zone cluster.

▼ How to Use Oracle ASM With Hardware RAID

- 1 On a cluster member, log in as root or become superuser.
- 2 Determine the identities of device identity (DID) devices that correspond to shared disks that are available in the cluster.

Use the `cldevice(1CL)` command for this purpose.

The following example shows an extract from output from the `cldevice list -v` command.

```
# cldevice list -v
DID Device          Full Device Path
-----
...
d5                  phys-schost-3:/dev/rdisk/c3t216000C0FF084E77d0
```

```

d5          phys-schost-1:/dev/rdisk/c5t216000C0FF084E77d0
d5          phys-schost-2:/dev/rdisk/c4t216000C0FF084E77d0
d5          phys-schost-4:/dev/rdisk/c2t216000C0FF084E77d0
d6          phys-schost-3:/dev/rdisk/c4t216000C0FF284E44d0
d6          phys-schost-1:/dev/rdisk/c6t216000C0FF284E44d0
d6          phys-schost-2:/dev/rdisk/c5t216000C0FF284E44d0
d6          phys-schost-4:/dev/rdisk/c3t216000C0FF284E44d0
...

```

In this example, DID devices d5 and d6 correspond to shared disks that are available in the cluster.

3 Obtain the full DID device name for each DID device that you are using for the Oracle ASM disk group.

The following example shows the output from the `cldevice show` for the DID devices that were identified in the example in [Step 2](#). The command is run from node `phys-schost-1`.

```
# cldevice show d5 d6
```

```
=== DID Device Instances ===
```

```

DID Device Name:          /dev/did/rdisk/d5
Full Device Path:         phys-schost-1:/dev/rdisk/c5t216000C0FF084E77d0
Replication:              none
default_fencing:         global

DID Device Name:          /dev/did/rdisk/d6
Full Device Path:         phys-schost-1:/dev/rdisk/c6t216000C0FF284E44d0
Replication:              none
default_fencing:         global

```

4 If you are using a zone cluster, configure the DID devices into the zone cluster. Otherwise, proceed to [Step 5](#).

For information about configuring DID devices in a zone cluster, see “[How to Add a DID Device to a Zone Cluster](#)” in *Oracle Solaris Cluster Software Installation Guide*.

5 Create or modify a slice on each DID device to contain the disk-space allocation for the Oracle ASM disk group.

Use the `format(1M)` command, `fmthard(1M)` command, or `prtvtoc(1M)` for this purpose. Specify the full device path from the node where you are running the command to create or modify the slice.

For example, if you choose to use slice `s0` for the Oracle ASM disk group, you might choose to allocate 100 Gbytes of disk space in slice `s0`.

6 Prepare the raw devices that you are using for Oracle ASM.

- a. Change the ownership and permissions of each raw device that you are using for Oracle ASM, to allow access by Oracle ASM to these devices.

Note – If Oracle ASM on hardware RAID is configured for a zone cluster, perform this step in that zone cluster.

To specify the raw device, append sX to the DID device name that you obtained in [Step 3](#), where X is the slice number.

```
# chown oraasm:oinstall /dev/did/rdisk/dNsX
# chmod 660 /dev/disk/rdisk/dNsX
# ls -lhL /dev/did/rdisk/dNsX
crw-rw---- 1 oraasm oinstall 239, 128 Jun 15 04:38 /dev/did/rdisk/dNsX
```

For more information about changing the ownership and permissions of raw devices for use by Oracle ASM, see your Oracle documentation.

b. Clean out the disk headers for each raw device that you are using for Oracle ASM.

```
# dd if=/dev/zero of=/dev/did/rdisk/dNsX bs=1024k count=200
2000+0 records in
2000+0 records out
```

7 Modify the ASM_DISKSTRING Oracle ASM instance-initialization parameter to specify the devices that you are using for the Oracle ASM disk group.

Note – If Oracle ASM on hardware RAID is configured for a zone cluster, perform this step in that zone cluster.

For example, to use the /dev/did/ path for the Oracle ASM disk group, add the value /dev/did/rdisk/d* to the ASM_DISKSTRING parameter. If you are modifying this parameter by editing the Oracle initialization parameter file, edit the parameter as follows:

```
ASM_DISKSTRING = '/dev/did/rdisk/*'
```

For more information, see your Oracle documentation.

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Using a Cluster File System

Oracle RAC is supported on two types of cluster file systems:

- Cluster file systems that use the Oracle Solaris Cluster Proxy File System (PxFS)
For general information about how to create and mount PxFS-based cluster file systems, see the following documentation:
 - “Planning the Global Devices, Device Groups, and Cluster File Systems” in *Oracle Solaris Cluster Software Installation Guide*
 - “Creating Cluster File Systems” in *Oracle Solaris Cluster Software Installation Guide*
- Oracle Automatic Storage Management Cluster File System (Oracle ACFS)
For general information about how to create and mount an Oracle ACFS file system, see “Creating Oracle ACFS File Systems” in *Oracle Solaris Cluster Software Installation Guide*.

For information that is specific to the use of cluster file systems with Support for Oracle RAC, see the subsections that follow.

- “Types of Oracle Files That You Can Store on a PxFS-Based Cluster File System” on page 61
- “Types of Oracle Files That You Can Store on an Oracle ACFS File System” on page 62
- “Optimizing Performance and Availability When Using a PxFS-Based Cluster File System” on page 62
- “How to Use a PxFS-Based Cluster File System” on page 63
- “How to Use an Oracle ACFS File System” on page 64

Types of Oracle Files That You Can Store on a PxFS-Based Cluster File System

You can store only these files that are associated with Oracle RAC on a PxFS-based cluster file system:

- Oracle RDBMS binary files
- Oracle Clusterware binary files

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries cannot reside on a cluster file system.

- Oracle configuration files (for example, `init.ora`, `tnsnames.ora`, `listener.ora`, and `sqlnet.ora`)
- System parameter file (SPFILE)
- Alert files (for example, `alert_sid.log`)
- Trace files (`*.trc`)

- Archived redo log files
- Flashback log files
- Oracle cluster registry (OCR) files
- Oracle Clusterware voting disk

Note – You *must not* store data files, control files, online redo log files, or Oracle recovery files on a PxFs-based cluster file system.

Types of Oracle Files That You Can Store on an Oracle ACFS File System

You can store only these files that are associated with Oracle RAC on the Oracle ACFS file system:

- Oracle database–related files (beginning with Oracle version 12c)
- Oracle RDBMS binary files
- Oracle configuration files (for example, `init.ora`, `tnsnames.ora`, `listener.ora`, and `sqlnet.ora`)
- System parameter file (SPFILE)
- Alert files (for example, `alert_sid.log`)
- Trace files (`*.trc`)

Note – You *must not* store Oracle cluster registry (OCR) files or Oracle Clusterware voting disks on an Oracle ACFS file system.

For Oracle ACFS versions before Oracle ACFS 12c, you also *must not* store database–related files (including control files, online redo log files, archived redo log files, and flashback log files) or Oracle recovery files.

Optimizing Performance and Availability When Using a PxFs-Based Cluster File System

The 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 RAC database instance. This device group contains the file system that holds archived redo log files of the database instance.

To improve the availability of your cluster, consider increasing the desired number of secondary nodes for device groups. However, increasing the desired number of secondary nodes for device groups might also impair performance. To increase the desired number of

secondary nodes for device groups, change the numsecondaries property. For more information, see “Multiported Device Groups” in *Oracle Solaris Cluster Concepts Guide*.

▼ **How to Use a PxFS-Based Cluster File System**

1 Create and mount the cluster file system.

See “Creating Cluster File Systems” in *Oracle Solaris Cluster Software Installation Guide* for information about how to create and mount the cluster file system.

Note – Beginning with Oracle version 11g release 2, Oracle Clusterware binaries cannot reside on a 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
Oracle RDBMS binary files	global, logging
Oracle Clusterware binary files	global, logging
Oracle configuration files	global, logging
System parameter file (SPFILE)	global, logging
Alert files	global, logging
Trace files	global, logging
Archived redo log files	global, logging, forcedirectio
Flashback log files	global, logging, forcedirectio
OCR files	global, logging, forcedirectio
Oracle Clusterware voting disk	global, logging, forcedirectio

Next Steps Ensure that all other storage management schemes that you are using for Oracle files are installed.

After all storage management schemes that you are using for Oracle files are installed, go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

▼ How to Use an Oracle ACFS File System

- **Create and mount the Oracle ACFS file system.**

See “[Creating Oracle ACFS File Systems](#)” in *Oracle Solaris Cluster Software Installation Guide* for information about how to create and mount the Oracle ACFS file system.

Next Steps Go to [Chapter 3, “Registering and Configuring the Resource Groups.”](#)

Registering and Configuring the Resource Groups

This chapter explains how to register and configure the resource groups that are used in an Oracle RAC configuration.

- “Registering and Configuring the Oracle RAC Framework Resource Group” on page 65
- “Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group” on page 70
- “Creating a Global Device Group for the Oracle RAC Database” on page 75
- “Registering and Configuring Storage Resources for Oracle Files” on page 83
- “Registering and Configuring the Oracle ASM Resource Group” on page 90

Registering and Configuring the Oracle RAC Framework Resource Group

Registering and configuring the Oracle RAC framework resource group enables Oracle RAC to run with Oracle Solaris Cluster software.

Note – You *must* register and configure the Oracle RAC framework resource group. Otherwise, Oracle RAC cannot run with Oracle Solaris Cluster software.

The Oracle RAC framework resource in the global-cluster voting node can support any Oracle RAC installation running in the global cluster. The Oracle RAC framework resource in a zone cluster supports the Oracle RAC installation running in that specific zone cluster. Multiple Oracle RAC framework resource groups can exist in a single Oracle Solaris Cluster configuration.

This section contains the following information about registering the Oracle RAC framework resource group:

- “Tools for Registering and Configuring the Oracle RAC Framework Resource Group” on page 66
- “How to Register and Configure the Oracle RAC Framework Resource Group by Using `clsetup`” on page 66

Tools for Registering and Configuring the Oracle RAC Framework Resource Group

Oracle Solaris Cluster software provides the following tools for registering and configuring the Oracle RAC framework resource group in the global cluster or in a zone cluster:

- **The `clsetup` utility.** For more information, see “How to Register and Configure the Oracle RAC Framework Resource Group by Using `clsetup`” on page 66.
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.
- **Oracle Solaris Cluster maintenance commands.** For more information, see [Appendix D, “Command-Line Alternatives.”](#)

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring resources for the Oracle RAC framework resource group. The wizards reduce the possibility of configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

Note – Oracle Solaris Cluster Manager and the `clsetup` utility run only in a voting node of the global cluster.

▼ How to Register and Configure the Oracle RAC Framework Resource Group by Using `clsetup`

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

Perform this procedure during your initial setup of Support for Oracle RAC. Perform this procedure from one node only.

Before You Begin Ensure that the following prerequisites are met:

- All preinstallation tasks for Oracle RAC are completed.
- The Oracle Solaris Cluster nodes are prepared.

- The data services packages are installed.
- If used, UDLM software is installed.
Alternatively on Oracle RAC 11g release 2 or 12c, if you intend to use native SKGXN, ensure that UDLM software is *not* installed.

Ensure that you have the following information:

- The names of the nodes where you require Support for Oracle RAC to run.

1 Become superuser on any cluster node.

2 Start the clsetup utility.

```
# clsetup
```

The clsetup main menu is displayed.

3 Choose the menu item, Data Services.

The Data Services menu is displayed.

4 Choose the menu item, Oracle Real Application Clusters.

The clsetup utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The clsetup utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.

Note – The clsetup utility currently allows ongoing administration of an Oracle RAC framework running only in the global cluster. For ongoing administration of an Oracle RAC framework configured in a zone cluster, you need to instead use the Oracle Solaris Cluster maintenance commands.

6 Choose the menu item, Oracle RAC Create Configuration.

The clsetup utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.

7 Type the option number for the location of the Oracle RAC cluster and press Return.

- If you select the global cluster option, the clsetup utility displays the list of components of Oracle RAC to configure. Skip to [Step 9](#).
- If you select the zone cluster option, the clsetup utility prompts you to select the required zone cluster. Proceed to [Step 8](#).

8 Type the option number for the required zone cluster and press Return.

The `clsetup` utility displays a list of components of Oracle RAC to configure.

9 Choose the menu item, RAC Framework Resource Group .

The `clsetup` utility displays the list of prerequisites for performing this task.

10 Verify that the prerequisites are met, and press Return.

The `clsetup` utility displays a list of the cluster nodes on which the Support for Oracle RAC packages are installed.

11 Select the nodes where you require Support for Oracle RAC to run.

- **To accept the default selection of all listed nodes in an arbitrary order, type a and press Return.**
- **To select a subset of the listed nodes, type a comma-separated or space-separated list of the option numbers for the nodes you choose and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the Oracle RAC framework resource group's node list.
- **To select all nodes in a particular order, type a comma-separated or space-separated ordered list of the option numbers for the nodes you choose and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the Oracle RAC framework resource group's node list.

12 If needed to end the selection of nodes, type d and press Return.

The `clsetup` utility displays a list of vendor clusterware support choices for Oracle files.

13 Type the option number for the vendor clusterware support to use and press Return.

The vendor clusterware support can be UNIX Distributed Lock Manager based or (Oracle 11g release 2 or 12c only) native SKGXN. If UDLM software is installed (SPARC only), UDLM is automatically chosen.

14 To confirm your selection of storage management schemes, type d and press Return.

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create.

15 If you require a different name for any Oracle Solaris Cluster objects, change the name.

a. Type the option number for the object name to change and press Return.

The `clsetup` utility displays a screen where you can specify the new name.

b. At the New Value prompt, type the new name and press Return.

The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create.

16 To confirm your selection of Oracle Solaris Cluster object names, type d and press Return.

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

17 To create the configuration, type c and Press Return.

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

18 Press Return to continue.

The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.

19 (Optional) Type q and press Return repeatedly until you quit the clsetup utility.

If you prefer, you can leave the `clsetup` utility running while you perform other required tasks before using the utility again. If you choose to quit `clsetup`, the utility recognizes your existing Oracle RAC framework resource group when you restart the utility.

20 Determine whether the Oracle RAC framework resource group and its resources are online.

Use the `clresourcegroup(1CL)` utility for this purpose. By default, the `clsetup` utility assigns the name `rac-framework-rg` to the Oracle RAC framework resource group.

- In the global cluster, type the following command.

```
# clresourcegroup status rac-framework-rg
```

- In a zone cluster, type the following command.

```
# clresourcegroup status -Z zcname rac-framework-rg
```

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

- In the global cluster, type the following command.

```
# clresourcegroup online -emM rac-framework-rg
```

- In a zone cluster, type the following command.

```
# clresourcegroup online -emM -Z zcname rac-framework-rg
```

More Information Resource Configuration

The following table lists the default resource configuration that the `clsetup` utility creates when you complete this task.

Resource Name, Resource Type, and Resource Group	Dependencies	Description
Resource type: SUNW.rac_framework Resource name: rac-framework-rs Resource group: rac-framework-rg	None.	Oracle RAC framework resource.
SPARC: Resource type: SUNW.rac_udlm Resource name: rac-udlm-rs Resource group: rac-framework-rg	Strong dependency on the Oracle RAC framework resource.	UDLM resource.

Next Steps The next step depends on the volume manager that you are using, as shown in the following table.

Volume Manager	Next Step
Solaris Volume Manager for Sun Cluster or VxVM with the cluster feature	“Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group” on page 70
None	“Registering and Configuring Storage Resources for Oracle Files” on page 83

Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group

Registering and configuring the multiple-owner volume-manager framework resource group enables Oracle RAC to manage multiple-owner volume-manager resources with Oracle Solaris Cluster software.

The multiple-owner volume manager framework resource in the global-cluster voting node supports any volume manager used by Oracle RAC anywhere on the machine, including the global cluster and all zone clusters.

This section contains the following information about registering the multiple-owner volume-manager framework resource group:

- [“Tools for Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group” on page 71](#)
- [“How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using clsetup” on page 71](#)

Tools for Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group

Oracle Solaris Cluster software provides the following tools for registering and configuring the multiple-owner volume manager framework resource group in the global cluster or in a zone cluster:

- **The `clsetup` utility.** For more information, see [“How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using `clsetup`” on page 71.](#)
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.
- **Oracle Solaris Cluster maintenance commands.** For more information, see [Appendix D, “Command-Line Alternatives.”](#)

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring resources for the multiple-owner volume manager framework resource group. The wizards reduce the possibility of configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

Note – Oracle Solaris Cluster Manager and the `clsetup` utility run only in a voting node of the global cluster.

▼ How to Register and Configure the Multiple-Owner Volume-Manager Framework Resource Group by Using `clsetup`

When you register and configure the multiple-owner volume manager framework resource group for a cluster, the multiple-owner volume manager framework resource group is created.

Perform this procedure during your initial setup of Support for Oracle RAC. Perform this procedure from one node only.

- Before You Begin**
- Ensure that all storage management software that you intend to use is installed and configured on all nodes where Oracle RAC is to run.
 - Ensure that you have the list of storage management schemes that you are using for Oracle files.
- 1 Become superuser on any cluster node.**

2 Start the `clsetup` utility.

`clsetup`

The `clsetup` main menu is displayed.

3 Type the option number for Data Services and press Return.

The Data Services menu is displayed.

4 Type the option number for Oracle Real Application Clusters and press Return.

The `clsetup` utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The `clsetup` utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.

Note – The `clsetup` utility currently allows ongoing administration of an Oracle RAC framework running only in the global cluster. For ongoing administration of an Oracle RAC framework configured in a zone cluster, use instead the Oracle Solaris Cluster maintenance commands.

6 Type the option number for Oracle RAC Create Configuration and press Return.

The `clsetup` utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.

7 Type the option number for Global Cluster and press Return.

Note – Configure a multiple-owner volume-manager framework resource group only in the global cluster.

The `clsetup` utility displays the list of components of Oracle RAC to configure.

8 Type the option number for Multiple-Owner Volume-Manager Framework Resource Group and press Return.

The `clsetup` utility displays an overview about this task.

9 Press Return to continue.

The `clsetup` utility prompts you to select the multiple-owner volume managers to use. Only installed volume managers are listed.

10 Type the option numbers for the multiple-owner volume managers to use and press Return.

11 To confirm your selection of multiple-owner volume managers, type d and press Return.

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create.

12 If you require a different name for any Oracle Solaris Cluster objects, change the name.**a. Type the option number for the name to change and press Return.**

The `clsetup` utility displays a screen where you can specify the new name.

b. At the New Value prompt, type the new name and press Return.

The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create.

Note – If, after you configure the multiple-owner volume manager framework resource group, you again run this wizard to configure another volume manager, the names of the multiple-owner volume manager framework resource group and its existing resources are not available to rename.

13 To confirm your selection of Oracle Solaris Cluster object names, type d and press Return.

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

14 To create the configuration, type c and Press Return.

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

15 Press Return to continue.

The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.

16 (Optional) Type q and press Return repeatedly until you quit the clsetup utility.

If you prefer, you can leave the `clsetup` utility running while you perform other required tasks before using the utility again. If you choose to quit `clsetup`, the utility recognizes your existing multiple-owner volume-manager framework resource group when you restart the utility.

17 Determine whether the multiple-owner volume-manager framework resource group and its resources are online.

Use the `clresourcegroup(1CL)` utility for this purpose. By default, the `clsetup` utility assigns the name `vucmm_framework_rg` to the multiple-owner volume-manager framework resource group.

```
# clresourcegroup status vucmm_framework_rg
```

- 18
- If the multiple-owner volume-manager framework resource group and its resources are *not* online, bring them online.
- # clresourcegroup online vucmm_framework_rg

More Information Resource Configuration

The following table lists the default resource configuration that the `clsetup` utility creates when you complete this task.

Resource Name, Resource Type, and Resource Group	Dependencies	Description
Resource type: SUNW.vucmm_framework Resource name: vucmm_framework_rs Resource group: vucmm_framework_rg	None.	Multiple-owner volume-manager framework resource.
Resource type: SUNW.vucmm_svm Resource name: vucmm_svm_rs Resource group: vucmm_framework_rg	Strong dependency on the multiple-owner volume-manager framework resource.	Solaris Volume Manager for Sun Cluster resource. Created only if Solaris Volume Manager for Sun Cluster was selected.
SPARC: Resource type: SUNW.vucmm_cvm Resource name: vucmm_cvm_rs Resource group: vucmm_framework_rg	Strong dependency on the multiple-owner volume-manager framework resource.	VxVM resource. Created only if VxVM was selected.

Next Steps The next step depends on the volume manager that you are using, as shown in the following table.

Volume Manager	Next Step
Solaris Volume Manager for Sun Cluster	“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75
VxVM with the cluster feature	“How to Create a VxVM Shared-Disk Group for the Oracle RAC Database” on page 81
None	“Registering and Configuring Storage Resources for Oracle Files” on page 83

Creating a Global Device Group for the Oracle RAC Database

If you are using a volume manager for Oracle database files, the volume manager requires a global device group for the Oracle RAC database to use.

The type of global device group to create depends on the volume manager that you are using:

- If you are using Solaris Volume Manager for Sun Cluster, create a [Solaris Volume Manager for Sun Cluster multi-owner disk set](#). See “How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75.
- If you are using VxVM, create a [VxVM shared-disk group](#). See “How to Create a VxVM Shared-Disk Group for the Oracle RAC Database” on page 81.

▼ How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC 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 RAC database, the Sun QFS shared file system, or Oracle ASM to use. For information about Solaris Volume Manager for Sun Cluster multi-owner disk sets, see “[Multi-Owner Disk Set Concepts](#)” in *Solaris Volume Manager Administration Guide*.

Before You Begin Note the following points.

- Ensure that the required Support for Oracle RAC software packages are installed on each node. For more information, see “[Installing the Support for Oracle RAC Packages](#)” on page 38.
- Unless you are using the Sun QFS shared file system, do not create any file systems in the multi-owner disk set. In configurations without the Sun QFS shared file system, 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 the cluster nodes.

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 Support for Oracle RAC 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/dN, where N is the device number.

3 For the disk set that you created in [Step 1](#), create the volumes that the Oracle RAC database or Sun QFS shared file system will use.

Tip – If you are creating many volumes for Oracle data files, you can simplify this step by using soft partitions. However, if you are using the Sun QFS shared file system and the I/O load on your system is heavy, use separate partitions for data and metadata. Otherwise, the performance of your system might be impaired. For information about soft partitions, see [Chapter 12, “Soft Partitions \(Overview\),”](#) in *Solaris Volume Manager Administration Guide* and [Chapter 13, “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 dV, 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 If you are using mirrored devices, create the mirrors by using volumes that you created in [Step 3](#) as submirrors.

If you are not using mirrored devices, omit this step.

Use the `metainit` command to create each mirror as follows:

```
# metainit -s setname mirror -m submirror-list
```

-s setname Specifies that you are creating a mirror for the disk set that you created in [Step 1](#).

mirror Specifies the name of the mirror that you are creating in the form of an abbreviated volume name. An abbreviated volume name has the format `dV`, where `V` is the volume number.

submirror-list Specifies a space-separated list of submirrors that the mirror is to contain. Each submirror must be a volume that you created in [Step 3](#). Specify the name of each submirror in the form of an abbreviated volume name.

Note – For information on configuring a Solaris Volume Manager disk set in a zone cluster, see “How to Add a Disk Set to a Zone Cluster (Solaris Volume Manager)” in *Oracle Solaris Cluster Software Installation Guide*.

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

Use the `metaset` command for this purpose.

```
# metaset -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`.

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

```
# cldevicegroup show 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`.

7 Verify the online status of the multi-owner disk set.

```
# cldevicegroup status setname
```

This command displays the status of the multi-owner disk set on each node in the multi-owner disk set.

8 (Configurations *without* the Sun QFS shared file system only) On each node that can own the disk set, change the ownership of each volume that you created in [Step 3](#).

If you are using the Sun QFS shared file system, omit this step.

Note – For a zone cluster, perform this step in the zone cluster.

Change the volume ownership as follows:

- Owner: the DBA user
- Group: the DBA group

The DBA user and the DBA group are created as explained in “[How to Create the DBA Group and the DBA User Accounts](#)” on page 31.

Ensure that you change ownership only of volumes that the Oracle RAC database will use.

```
# chown user-name:group-name volume-list
```

user-name Specifies the user name of the DBA user. This user is normally named `oracle`.

group-name Specifies the name of the DBA group. This group is normally named `dba`.

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/dV`
- For raw devices: `/dev/md/setname/rdsk/dV`

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](#).

9 (Configurations *without* the Sun QFS shared file system only) Grant read access and write access to the owner of each volume whose ownership you changed in [Step 8](#).

If you are using the Sun QFS shared file system, omit this step.

Note – For a zone cluster, perform this step in the zone cluster.

Grant access to the volume on each node that can own the disk set. Ensure that you change access permissions only of volumes that the Oracle RAC database will use.

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

volume-list Specifies a space-separated list of the logical names of the volumes to whose owners you are granting read access and write access. Ensure that this list contains the volumes that you specified in [Step 8](#).

10 If you are using Oracle ASM, specify the raw devices that you are using for the Oracle ASM disk group.

Note – For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.

To specify the devices, modify the ASM_DISKSTRING Oracle ASM instance-initialization parameter.

For example, to use the /dev/md/*setname*/rdsk/d path for the Oracle ASM disk group, add the value /dev/md/*/rdsk/d* to the ASM_DISKSTRING parameter. If you are modifying this parameter by editing the Oracle initialization parameter file, edit the parameter as follows:

```
ASM_DISKSTRING = '/dev/md/*/rdsk/d*'
```

If you are using mirrored devices, specify external redundancy in the Oracle ASM configuration.

For more information, see your Oracle documentation.

Example 3–1 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 for a four-node cluster. The disk set uses mirrored devices.

The disk set is to be used with the Sun QFS shared file system. This example does not show the creation of the Sun QFS shared file system on the devices that are added to the disk set.

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

```
# metaset -s oradg -M -a -h pclus1 pclus2 pclus3 pclus4
```

The multi-owner disk set is named `oradg`. The nodes `pclus1`, `pclus2`, `pclus3`, and `pclus4` are added to this disk set.

2. To add global devices to the disk set, the following command is run:

```
# metaset -s oradg -a /dev/did/dsk/d8 /dev/did/dsk/d9 /dev/did/dsk/d15 \
/dev/did/dsk/d16
```

The preceding command adds the following global devices to the disk set:

- `/dev/did/dsk/d8`
- `/dev/did/dsk/d9`
- `/dev/did/dsk/d15`
- `/dev/did/dsk/d16`

3. To create volumes for the disk set, the following commands are run:

```
# metainit -s oradg d10 1 1 /dev/did/dsk/d9s0
# metainit -s oradg d11 1 1 /dev/did/dsk/d16s0
# metainit -s oradg d20 1 1 /dev/did/dsk/d8s0
# metainit -s oradg d21 1 1 /dev/did/dsk/d15s0
```

Each volume is created by a one-on-one concatenation of a slice as shown in the following table. The slices are *not* striped.

Volume	Slice
d10	/dev/did/dsk/d9s0
d11	/dev/did/dsk/d16s0
d20	/dev/did/dsk/d8s0
d21	/dev/did/dsk/d15s0

4. To create mirrors for the disk set, the following commands are run:

```
# metainit -s oradg d1 -m d10 d11
# metainit -s oradg d2 -m d20 d21
```

The preceding commands create a mirror that is named `d1` from volumes `d10` and `d11`, and a mirror that is named `d2` from volumes `d20` and `d21`.

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

```
# metaset -s oradgMulti-owner Set name = oradg, Set number = 1, Master = pclus2
```

Host	Owner	Member
pclus1	multi-owner	Yes
pclus2	multi-owner	Yes
pclus3	multi-owner	Yes
pclus4	multi-owner	Yes

Drive Dbase

d8 Yes

d9 Yes

d15 Yes

d16 Yes

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

```
# cldevicegroup show oradg
=== Device Groups ===
```

```
Device Group Name:          oradg
Type:                      Multi-owner_SVM
failback:                  false
Node List:                 pclus1, pclus2, pclus3, pclus4
preferenced:               false
numsecondaries:            0
diskset name:              oradg
```

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

```
# cldevicegroup status oradg
```

```
=== Cluster Device Groups ===
```

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

Device Group Name	Primary	Secondary	Status
-----	-----	-----	-----

```
--- Multi-owner Device Group Status ---
```

Device Group Name	Node Name	Status
-----	-----	-----
oradg	pclus1	Online
	pclus2	Online
	pclus3	Online
	pclus4	Online

Next Steps Go to [“Registering and Configuring Storage Resources for Oracle Files”](#) on page 83.

▼ How to Create a VxVM Shared-Disk Group for the Oracle RAC 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 RAC database or Oracle ASM to use.

Before You Begin Note the following points.

- Ensure that the required Support for Oracle RAC software packages are installed on each node. For more information, see [“Installing the Support for Oracle RAC 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 the cluster nodes.
- Ensure that your VxVM license is current. If your license expires, the node panics.

1 Use Veritas commands that are provided for creating a VxVM shared-disk group.

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

2 If you are using Oracle ASM, specify the raw devices that you are using for the Oracle ASM disk group.

Note – For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.

To specify the devices, modify the ASM_DISKSTRING Oracle ASM instance-initialization parameter.

For example, to use the `/dev/md/setname/rdisk/d` path for the Oracle ASM disk group, add the value `/dev/md/*/rdisk/d*` to the ASM_DISKSTRING parameter. If you are modifying this parameter by editing the Oracle initialization parameter file, edit the parameter as follows:

```
ASM_DISKSTRING = '/dev/md/*/rdisk/d*'
```

If you are using mirrored devices, specify external redundancy in the Oracle ASM configuration.

For more information, see your Oracle documentation.

Next Steps Go to [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#).

Registering and Configuring Storage Resources for Oracle Files

Storage resources provide fault monitoring and automatic fault recovery for global device groups and file systems.

If you are using global device groups or shared file systems for Oracle files, configure storage resources to manage the availability of the storage on which the Oracle software depends.

Configure the following types of storage resources:

- Global device groups:
 - Solaris Volume Manager for Sun Cluster multi-owner disk sets
 - VxVM shared-disk groups
- Shared file systems:
 - A Sun QFS shared file system with Solaris Volume Manager for Sun Cluster multi-owner disk sets
 - A Sun QFS shared file system with hardware RAID
 - Hardware RAID without a volume manager
 - A file system on a qualified NAS device with Oracle RAC:
 - Oracle's Sun NAS device
 - Oracle's Sun Storage 7000 Unified Storage Systems NAS device
 - Network Appliance NAS device

Note – You can configure a NAS NFS in a zone cluster with the existing tools. See [“Tasks for Configuring Qualified NAS Devices for Oracle Files” on page 47](#).

This section contains the following information about registering and configuring storage resources for Oracle files:

- [“Tools for Registering and Configuring Storage Resources for Oracle Files” on page 84](#)
- [“How to Register and Configure Storage Resources for Oracle Files by Using `clsetup`” on page 84](#)

Tools for Registering and Configuring Storage Resources for Oracle Files

Oracle Solaris Cluster provides the following tools for registering and configuring storage resources for Oracle files in a global cluster or a zone cluster:

- **The `clsetup(1CL)` utility.** For more information, see [“How to Register and Configure Storage Resources for Oracle Files by Using `clsetup`” on page 84](#).
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.
- **Oracle Solaris Cluster maintenance commands.** For more information, see [“Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324](#).

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring storage resources for Oracle files. The wizards reduce the possibility of configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

▼ How to Register and Configure Storage Resources for Oracle Files by Using `clsetup`

Perform this procedure from only one node of the cluster.

Before You Begin Ensure that the following prerequisites are met:

- The Oracle RAC framework resource group is created and is online. For more information, see [“Registering and Configuring the Oracle RAC Framework Resource Group” on page 65](#).
- The multiple-owner volume-manager framework resource group is created and is online. For more information, see [“Registering and Configuring the Multiple-Owner Volume-Manager Framework Resource Group” on page 70](#).
- Required volumes, global device groups, and file systems are created. For more information, see the following sections:
 - [“Installing Storage Management Software With Support for Oracle RAC” on page 49](#)
 - [“Creating a Global Device Group for the Oracle RAC Database” on page 75](#)
- Required file systems are mounted.

Ensure that you have the following information:

- The name of each scalable device group that you are using for Oracle files, if any
- The mount point of each shared file system that you are using for Oracle files, if any

- 1 On one node of the cluster, become superuser.**
- 2 Start the `clsetup` utility.**
`# clsetup`
 The `clsetup` main menu is displayed.
- 3 Choose the menu item, Data Services.**
 The Data Services menu is displayed.
- 4 Choose the menu item, Oracle Real Application Clusters.**
 The `clsetup` utility displays information about Support for Oracle RAC.
- 5 Press Return to continue.**
 The `clsetup` utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.
- 6 Choose the menu item, Oracle RAC Create Configuration.**
 The `clsetup` utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.
- 7 Type the option number for the location of the Oracle RAC cluster and press Return.**
 - If you select the global cluster option, the `clsetup` utility displays the list of components to configure. Skip to [Step 9](#).
 - If you select the zone cluster option, the `clsetup` utility prompts you to select the required zone cluster. Proceed to [Step 8](#).
- 8 Type the option number for the required zone cluster and press Return.**
 The `clsetup` utility displays the list of components of Oracle RAC to configure.
- 9 Choose the menu item, Storage Resources for Oracle Files.**
 The `clsetup` utility displays the list of prerequisites for performing this task.
- 10 Verify that the prerequisites are met, and press Return.**
 If you are prompted for resources for scalable device groups, omit this step.
- 11 If you are prompted to select a Storage Management Scheme for your Oracle files, select the appropriate scheme.**
 - Sun StorEdge QFS With Solaris Volume Manager for Oracle Solaris Cluster
 - Sun StorEdge QFS With Hardware RAID
 - NAS Device

- Hardware RAID Without a Volume Manager

12 If no suitable resources exist, or if no resource exists for a device group that you are using, add a resource to the list.

The `clsetup` utility displays a list of the resources for scalable device groups that are configured on the cluster. If no suitable resources exist, this list is empty.

If resources exist for all the device groups that you are using, omit this step.

For each resource that you are adding, perform the following steps:

a. Press Return.

The `clsetup` utility displays a list of the scalable device groups that are configured on the cluster.

b. Type the option number for the device group to use and press Return.

Once you select the device group, you can either select the entire disk group or choose to specify logical devices, or disks, in the disk group.

c. Choose whether you want to specify logical devices.

- To specify logical devices, type **yes**. Proceed to [Step d](#).
- To select the entire disk group, type **no**. Skip to [Step e](#).

d. Type a comma-separated list of numbers that corresponds to the logical devices or disks you choose or type a for all.

The `clsetup` utility returns you to the list of resources for scalable device groups that are configured on the cluster.

e. To confirm your selection of device groups, type d and press Return.

The `clsetup` utility returns you to the list of the resources for scalable device groups that are configured on the cluster. The resource that you are creating is added to the list.

13 Type the numbers that correspond to the resources that you require, if not already selected.

You can select existing resources, resources that are not yet created, or a combination of existing resources and new resources. If you select more than one existing resource, the selected resources must be in the same resource group.

14 To confirm your selection of resources for device groups, type d and press Return.

The `clsetup` utility displays a list of the resources for shared file-system mount points that are configured on the cluster. If no suitable resources exist, this list is empty.

- 15 If no suitable resources exist, or if no resource exists for a file-system mount point that you are using, add a resource to the list.**

If resources exist for all the file-system mount points that you are using, omit this step.

For each resource that you are adding, perform the following steps:

- a. Press Return.**

The `clsetup` utility displays a list of the shared file systems that are configured on the cluster.

- b. Type a comma-separated or space-separated list of numbers that correspond to the file systems that you are using for Oracle files and press Return.**

- c. To confirm your selection of file systems, type `d` and press Return.**

The `clsetup` utility returns you to the list of the resources for file-system mount points that are configured on the cluster. The resource that you are creating is added to the list.

- 16 Type the option numbers for the resources that you require, if not already selected.**

You can select existing resources, resources that are not yet created, or a combination of existing resources and new resources. If you select more than one existing resource, the selected resources must be in the same resource group.

- 17 To confirm your selection of resources for file-system mount points, type `d` and press Return.**

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create or add to your configuration.

- 18 If you need to modify an Oracle Solaris Cluster object that the utility will create, modify the object.**

- a. Type the option number for the Oracle Solaris Cluster object that you are modifying and press Return.**

The `clsetup` utility displays a list of properties that are set for the object.

- b. Modify each property that you are changing as follows:**

- i. Type the option number for the property that you are changing and press Return.**

The `clsetup` utility prompts you for the new value.

- ii. At the prompt, type the new value and press Return.**

The `clsetup` utility returns you to the list of properties that are set for the object.

- c. When you have modified all the properties that you need to change, type `d` and press Return.**

The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create or add to your configuration.

- 19 When you have modified all the Oracle Solaris Cluster objects that you need to change, type `d` and press Return.**

The `clsetup` utility displays information about the Oracle RAC framework resource group for which storage resources will be configured.

- 20 To create the configuration, type `c` and press Return.**

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

- 21 Press Return to continue.**

The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.

- 22 (Optional) Type `q` and press Return repeatedly until you quit the `clsetup` utility.**

If you prefer, you can leave the `clsetup` utility running while you perform other required tasks before using the utility again. If you choose to quit `clsetup`, the utility recognizes your existing Oracle RAC framework resource group when you restart the utility.

- 23 Determine whether the resource groups that the wizard created are online.**

```
# clresourcegroup status
```

- 24 If a resource group that the wizard created is *not* online, bring the resource group online.**

For each resource group that you are bringing online, type the following command:

```
# clresourcegroup online -emM rac-storage-rg
```

`rac-storage-rg` Specifies the name of the resource group that you are bringing online.

More Information Resource Configuration

The following table lists the default resource configuration that the `clsetup` utility creates when you complete this task.

Resource Type, Resource Name, and Resource Group	Dependencies	Description
Resource type: SUNW.ScalDeviceGroup Resource name: <i>scal_{dg-name}-rs</i> , where <i>dg-name</i> is the name of the device group that the resource represents Resource group: <i>scal_{dg}-rg</i>	Strong dependency on the resource in the multiple-owner volume-manager framework resource group for the volume manager that is associated with the device group: either the Solaris Volume Manager for Sun Cluster resource or the VxVM resource.	Scalable device-group resource. One resource is created for each scalable device group that you are using for Oracle files.
Resource type: SUNW.qfs Resource name: <i>qfs-mp-dir-rs</i> , where <i>mp-dir</i> is the mount point of the file system, with / replaced by – Resource group: <i>qfs_mds-rg</i>	Strong dependency on the scalable <i>wait_zc_boot</i> resource and scalable device-group resource, if any. If you are using Sun QFS without a volume manager, this resource does not depend on any other resources.	Resource for the Sun QFS metadata server. One resource is created for each Sun QFS shared file system that you are using for Oracle files.
Resource type: SUNW.ScalMountPoint Resource name: <i>scal-mp-dir-rs</i> , where <i>mp-dir</i> is the mount point of the file system, with / replaced by – Resource group: <i>scal_{mnt}-rg</i>	Strong dependency on the resource for the Sun QFS metadata server, if any. Offline-restart dependency on the scalable device-group resource, if any. If you are using a file system on a qualified NAS device without a volume manager, this resource does not depend on any other resources.	Scalable file system mount point resource. One resource is created for each shared file system that you are using for Oracle files.
Resource type: SUNW.wait_zc_boot Resource name: <i>wait-zc-rs</i> , where <i>zc</i> is the zone cluster name. Resource group: <i>scal_{mnt}-rg</i>	None	Resource to ensure that the Sun QFS shared file system configured to the zone cluster is mounted only after the zone cluster is booted.

Note – For detailed information for the resource configuration for zone clusters, see the figures in [Appendix A, “Sample Configurations of This Data Service.”](#)

Next Steps If you are using Oracle Automatic Storage Management (Oracle ASM), go to [“Registering and Configuring the Oracle ASM Resource Group”](#) on page 90.

Otherwise, go to [Chapter 4, “Enabling Oracle RAC to Run in a Cluster.”](#)

Registering and Configuring the Oracle ASM Resource Group

Oracle Automatic Storage Management (Oracle ASM) manages the storage that used by the Oracle database. This wizard creates an Oracle ASM instance resource for the Oracle database.

This section contains the following information about registering the Oracle ASM resource group:

- “Tools for Registering and Configuring the Oracle ASM Resource Group” on page 90
- “How to Register and Configure the Oracle ASM Resource Group by Using `clsetup`” on page 90

Tools for Registering and Configuring the Oracle ASM Resource Group

Oracle Solaris Cluster software provides the following tools for registering and configuring the Oracle ASM resource group in the global cluster or in a zone cluster:

- **The `clsetup` utility.** For more information, see “How to Register and Configure the Oracle ASM Resource Group by Using `clsetup`” on page 90.
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.
- **Oracle Solaris Cluster maintenance commands.** For more information, see [Appendix D, “Command-Line Alternatives.”](#)

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring resources for the Oracle ASM resource group. The wizards reduce the possibility of configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

Note – Oracle Solaris Cluster Manager and the `clsetup` utility run only in a voting node of the global cluster.

▼ How to Register and Configure the Oracle ASM Resource Group by Using `clsetup`

When you register and configure the Oracle ASM resource group for a cluster, the Oracle ASM resource group is created.

Perform this procedure from one node only.

- Before You Begin**
- Ensure that Oracle ASM disk groups are configured. For more information, see [“Using Oracle ASM” on page 58](#).

Ensure that you have the following information:

- The name of the Oracle ASM home directory.
- The list of Oracle ASM systems identifiers (SID).
- The names of the Oracle ASM disk groups to use.

1 Become superuser on any cluster node.

2 Start the c1setup utility.

```
# c1setup
```

The c1setup main menu is displayed.

3 Type the option number for Data Services and press Return.

The Data Services menu is displayed.

4 Type the option number for Oracle Real Application Clusters and press Return.

The c1setup utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The c1setup utility prompts you to select whether to create the configuration of Support for Oracle RAC or administer an existing configuration.

Note – The c1setup utility currently allows ongoing administration of an Oracle RAC framework running only in the global cluster. For ongoing administration of an Oracle RAC framework configured in a zone cluster, use instead the Oracle Solaris Cluster maintenance commands.

6 Type the option number for Oracle RAC Create Configuration and press Return.

The c1setup utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.

7 Type the option number for the location of the Oracle RAC cluster and press Return.

- If you select the global cluster option, the c1setup utility displays the list of components of Oracle RAC to configure. Skip to [Step 9](#).
- If you select the zone cluster option, the c1setup utility prompts you to select the required zone cluster. Proceed to [Step 8](#).

- 8 Type the option number for the required zone cluster and press Return.**
The `clsetup` utility displays a list of components of Oracle RAC to configure.
- 9 Type the option number for Automatic Storage Management (ASM) and press Return.**
The `clsetup` utility displays a list of the cluster nodes to select.
- 10 Select the nodes where you require Oracle ASM to run.**
 - **To accept the default selection of all listed nodes in an arbitrary order, type a and press Return.**
 - **To select a subset of the listed nodes, type a comma-separated or space-separated list of the option numbers for the nodes you choose and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the Oracle RAC framework resource group's node list.
 - **To select all nodes in a particular order, type a comma-separated or space-separated ordered list of the option numbers for the nodes you choose and press Return.**
Ensure that the nodes are listed in the order in which the nodes are to appear in the Oracle RAC framework resource group's node list.
- 11 If needed to end the selection of nodes, type d and press Return.**
The `clsetup` utility displays a list of Oracle ASM instance resources.
- 12 Type the option number that corresponds to the Oracle ASM instance resource to use.**
If no Oracle ASM instance resource is available and you are prompted to create a resource, press Return. Skip to [Step 14](#).
- 13 To confirm your selection of an Oracle ASM instance resource, type d and press Return.**
The `clsetup` utility displays the selection screen for the Oracle ASM home directory.
- 14 Type the option number to choose a listed directory or to specify a directory explicitly and press Return.**
The `clsetup` utility displays a list of Oracle ASM system identifiers (SID) that are discovered in the cluster.
- 15 Review the list of SIDs.**
 - **If the list is correct, type d and press Return.**
 - **If the list is not correct, type the option number for the SID to change and press Return.**The `clsetup` utility displays information about Oracle ASM disk-group resources.

16 Respond to the prompt that asks whether to create a disk-group resource.

- **To create a new disk-group resource, type `y` and press Return.**

The `clsetup` utility displays a list of existing Oracle ASM disk groups. Proceed to [Step 17](#).

- **If you do not want to create a new disk-group resource, type `n` and press Return.**

The `clsetup` utility displays a list of discovered storage resources. Skip to [Step 19](#).

17 Specify the Oracle ASM disk groups.

Type the option number for each disk group to use and press Return. When all disk groups are selected, type `d` and press Return.

The selected Oracle ASM disk groups are added to the Oracle ASM disk-group resources selection panel.

18 Review the list of Oracle ASM disk-group resources.

- **If the list is correct, type `d` and press Return.**

- **If the list is not correct, type the option number or letter to edit the list of resources and press Return.**

When the list of disk-group resources is correct, type `d` and press Return.

The `clsetup` utility displays a list of discovered storage resources.

19 Review the list of storage resources to manage the file-system mount point where the Oracle ASM home is installed.

- **If the list is correct, type `d` and press Return.**

- **If no storage resource is listed, type `d` and press Return.**

The `clsetup` utility will create a new resource when you complete Oracle ASM configuration.

- **If the list is not correct, type the option number for the correct storage resource and press Return.**

The `clsetup` utility displays a list of Oracle ASM disk-group resources that manage Oracle ASM disk groups.

- 20 If no suitable disk-group resources exist, or if no resource exists for an Oracle ASM disk group that you are using, add a resource to the list.**

- a. Type y and press Return.**

The `clsetup` utility discovers Oracle ASM disk groups.

- b. Type a comma-separated or space-separated list of the option numbers for the Oracle ASM disk groups to use and press Return.**

- c. To confirm your selection of disk groups, type d and press Return.**

The `clsetup` utility returns you to the list of Oracle ASM disk-group resources. The resource that you are creating is added to the list.

- 21 Type the option numbers for the resources that you require, if not already selected.**

You can select existing resources, resources that are not yet created, or a combination of existing resources and new resources. If you select more than one existing resource, the selected resources must be in the same resource group.

- 22 To confirm your selection of resources for Oracle ASM disk groups, type d and press Return.**

The `clsetup` utility displays a list of discovered underlying disk sets or disk groups.

- 23 Type a comma-separated list of the option numbers for the Oracle ASM disk groups to use and press Return.**

- 24 To confirm your selection of Oracle ASM disk groups, type d and press Return.**

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects for Oracle ASM that the utility will create or add to your configuration.

- 25 If you need to modify an Oracle Solaris Cluster object, modify the object.**

- a. Type the option number for the object to modify and press Return.**

The `clsetup` utility prompts you for the new value.

- b. At the prompt, type the new value and press Return.**

The `clsetup` utility returns you to the list of properties that are set for the object.

- 26 When you have modified all the Oracle Solaris Cluster objects that you need to change, type d and press Return.**

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

27 To create the configuration, type c and Press Return.

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

28 Press Return to continue.

The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.

29 (Optional) Type q and press Return repeatedly until you quit the clsetup utility.

If you prefer, you can leave the `clsetup` utility running while you perform other required tasks before using the utility again.

More Information Resource Configuration

The following table lists the default resource configuration that the `clsetup` utility creates when you complete this task.

Resource Name, Resource Type, and Resource Group	Dependencies	Description
Resource type: <code>SUNW.scalable_rac_server_proxy</code>	Strong dependency on the Oracle RAC framework resource.	Oracle RAC instance proxy resource
Resource name: <code>rac_server_proxy-rs</code>	Offline-restart dependency on the clustered Oracle ASM disk-group resource.	
Resource group: <code>rac_server_proxy-rg</code>	Offline-restart dependency on the Oracle Clusterware framework resource.	
	When configured with Solaris Volume Manager for Sun Cluster, strong positive affinity by the Oracle RAC instance proxy resource group for the Oracle RAC framework resource group.	
	When configured with hardware RAID, strong positive affinity by the Oracle RAC instance proxy resource group for the clustered Oracle ASM disk-group resource group.	

Resource Name, Resource Type, and Resource Group	Dependencies	Description
Resource type: SUNW.oracle_asm_diskgroup Resource name: asm-dg-rs Resource group: asm-dg-rg	<p>Strong positive affinity by the clustered Oracle ASM disk-group resource group for the clustered Oracle ASM instance resource group.</p> <p>When configured with Solaris Volume Manager for Sun Cluster:</p> <ul style="list-style-type: none"> ■ Strong dependency on the clustered Oracle ASM instance resource. ■ Offline-restart dependency on the scalable device-group resource for database files. <p>When configured with hardware RAID, offline-restart dependency on the clustered Oracle ASM disk-group resource.</p>	Clustered Oracle ASM disk-group resource
SPARC: Resource type: SUNW.scalable_oracle_asm_instance_proxy Resource name: asm-inst-rs Resource group: asm-inst-rg	<p>Offline-restart dependency on the Oracle Clusterware resource.</p> <p>When configured with hardware RAID, strong positive affinity by the clustered Oracle ASM instance resource group for the Oracle Clusterware framework resource group.</p>	Clustered Oracle ASM instance resource
SPARC: Resource type: SUNW.sqfs Resource name: asm-home-sqfs-rs Resource group: asm-home-sqfs-rg	<p>Strong dependency on the scalable wait_zc_boot resource and scalable device-group resource, if any.</p> <p>If you are using Sun QFS without a volume manager, this resource does not depend on any other resources.</p>	Resource for the Oracle ASM home on a Sun QFS metadata server. One resource is created for each Sun QFS shared file system that you are using for Oracle files.
Resource type: SUNW.ScalMountPoint Resource name: asm-mp-rs Resource group: asm-mp-rg	<p>Strong dependency on the resource for the Sun QFS metadata server, if any.</p> <p>Offline-restart dependency on the scalable device-group resource, if any.</p> <p>If you are using a file system on a qualified NAS device without a volume manager, this resource does not depend on any other resources.</p>	Resource for the Oracle ASM home on a scalable file system mount point. One resource is created for each shared file system that you are using for Oracle files.

Resource Name, Resource Type, and Resource Group	Dependencies	Description
Resource type: SUNW.ScalDeviceGroup Resource name: <code>scaldg-name-rs</code> , where dg -name is the name of the device group that the resource represents Resource group: <code>scaldg-rg</code>	Strong dependency on the resource in the multiple-owner volume-manager framework resource group for the volume manager that is associated with the device group: either the Solaris Volume Manager for Sun Cluster resource or the VxVM resource.	Scalable device-group resource. One resource is created for each scalable device group that you are using for Oracle files.

Next Steps Go to [Chapter 4, “Enabling Oracle RAC to Run in a Cluster.”](#)

Enabling Oracle RAC to Run in a Cluster

This chapter explains how to enable Oracle RAC to run on your Oracle Solaris Cluster nodes.

- “Overview of Tasks for Enabling Oracle RAC to Run in a Cluster” on page 99
- “Installing Oracle RAC Software” on page 100
- “Creating Node-Specific Files and Directories for a Shared File System” on page 101
- “Verifying the Installation of Oracle RAC” on page 107
- “Creating an Oracle ASM Instance and Disk Groups” on page 108
- “Creating an Oracle Clusterware Framework Resource” on page 108
- “Creating an Oracle Database” on page 111
- “Configuring Resources for Oracle RAC Database Instances” on page 113
- “Verifying the Installation and Configuration of Support for Oracle RAC” on page 126

Overview of Tasks for Enabling Oracle RAC to Run in a Cluster

Table 4–1 summarizes the tasks for enabling Oracle RAC to run in a cluster.

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

TABLE 4–1 Tasks for Enabling Oracle RAC to Run in a Cluster

Task	Instructions
Install the Oracle RAC software	“Installing Oracle RAC Software” on page 100
Create node-specific files and directories that the Support for Oracle RAC software requires	“Creating Node-Specific Files and Directories for a Shared File System” on page 101
Verify the installation of the Oracle RAC software	“Verifying the Installation of Oracle RAC” on page 107
Create an Oracle ASM instance	“Creating an Oracle ASM Instance and Disk Groups” on page 108

TABLE 4-1 Tasks for Enabling Oracle RAC to Run in a Cluster (Continued)

Task	Instructions
Create an Oracle Clusterware framework resource.	“Creating an Oracle Clusterware Framework Resource” on page 108
Create your Oracle database	“Creating an Oracle Database” on page 111
(Not required for Oracle 10g release 1) Configure resources for Oracle RAC database instances	“Configuring Resources for Oracle RAC Database Instances” on page 113
Verify the Support for Oracle RAC installation and configuration	“Verifying the Installation and Configuration of Support for Oracle RAC” on page 126

Installing Oracle RAC Software

This section contains the following information:

- [“Installing Binary Files and Configuration Files on a Shared File System” on page 100](#)
- [“Overriding Networking Defaults for Oracle 10g, 11g, or 12c Oracle Clusterware” on page 101](#)
- [“Installing Oracle Clusterware on a Subset of Oracle Solaris Cluster Nodes” on page 101](#)
- [“Next Steps” on page 101](#)

For detailed instructions for installing Oracle RAC, see your Oracle documentation.

Installing Binary Files and Configuration Files on 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 QFS shared file system
- The PxFS-based cluster file system
- The Oracle ACFS file system
- A file system on a qualified NAS device

If you are installing the Oracle binary files and Oracle configuration files on a shared file system, specify the absolute paths to the file system when the Oracle installation tool requests this information. Do *not* use a symbolic link whose target is the shared file system.

To install Oracle binary files and configuration files on a local file system, follow the usual procedures as described in your Oracle Database documentation.

Overriding Networking Defaults for Oracle 10g, 11g, or 12c Oracle Clusterware

By default, the network interfaces panel of the Oracle 10g, 11g, or 12c Universal Installer shows all interfaces as private. If you are installing Oracle 10g, 11g, or 12c RAC for use with Oracle Solaris Cluster software, override these defaults as follows:

- Ensure that `clprivnet0` is the only private interface.
- Set the public network interfaces to public.
- Ensure that all other interfaces are not used. These interfaces represent the underlying network interfaces for the cluster interconnects.

Installing Oracle Clusterware on a Subset of Oracle Solaris Cluster Nodes

By default, the Oracle installer installs Oracle Clusterware on all nodes in a cluster. Instructions for installing Oracle Clusterware on a subset of Oracle Solaris Cluster nodes are available at the [Oracle MetaLink web site \(http://metalink.oracle.com/\)](http://metalink.oracle.com/). See Oracle MetaLink note 280589.1 *How to install Oracle 10g CRS on a cluster where one or more nodes are not to be configured to run CRS*.

Next Steps

The next steps depend on the location of your Oracle binary files and Oracle configuration files. See the following table.

File Location	Next Step
Shared file system	“Creating Node-Specific Files and Directories for a Shared File System” on page 101
Local disks of each node	“Verifying the Installation of Oracle RAC” on page 107

Creating Node-Specific Files and Directories for a Shared 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.

The administrator creates the file system on a global-cluster voting node, even when a zone cluster uses the file system. The administrator configures the node-specific file system into the zone cluster node using the `zonectfg` command.

This section contains the following procedures:

- [“How to Create a Node-Specific Directory for a Shared File System” on page 102](#)
- [“How to Create a Node-Specific File for a Shared File System” on page 105](#)

▼ How to Create 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:

- `$ORACLE_HOME/rdbms/audit`
- `$ORACLE_HOME/rdbms/log`
- `$ORACLE_HOME/network/agent`
- `$ORACLE_HOME/network/log`
- `$ORACLE_HOME/network/trace`
- `$ORACLE_HOME/srvn/log`
- `$ORACLE_HOME/apache`

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

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 4-1 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:

```
# 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
```


▼ How to Create 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.

- 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.

<i>local-file</i>	Specifies that the file that you copied in Step 2 is the source of the link.
<i>global-file</i>	Specifies that the global version of the file that you removed in Step a is the target of the link.

Example 4–2 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:
2. To make a local copy of the global files that are to maintain node-specific information, the following commands are run:

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

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

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

# 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
```

Next Steps Go to [“Verifying the Installation of Oracle RAC”](#) on page 107.

Verifying the Installation of Oracle RAC

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

This section contains the following procedures:

- [“How to Verify the Installation of Oracle 10g, 11g, or 12c RAC” on page 107](#)
- [“How to Verify the Installation of Oracle 9i RAC” on page 107](#)

▼ How to Verify the Installation of Oracle 10g, 11g, or 12c RAC

- **Confirm that the tests that the Oracle installer runs to verify the cluster were passed.**

If the results of these tests are no longer available for review, run the Oracle utility `cluvfy` to repeat the tests.

For more information, see your Oracle documentation.

▼ How to Verify the Installation of Oracle 9i RAC

- 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.**

Next Steps Go to [“Creating an Oracle Database” on page 111](#).

Creating an Oracle ASM Instance and Disk Groups

Oracle ASM installation consists of installing and creating an Oracle ASM instance and configuring the required Oracle ASM disk groups. An Oracle ASM disk group is a collection of disk devices to store data files that Oracle ASM instances manage as a unit. Oracle ASM instances mount disk groups to make Oracle ASM files available to database instances.

▼ How to Create an Oracle ASM Instance and Disk Groups

- Before You Begin**
- Ensure that the Oracle Clusterware software is already installed.
 - Ensure that the Oracle RAC framework is running on all nodes where the Oracle ASM instance is to be created.
 - Ensure that the file system where the Oracle ASM \$ORACLE_HOME directory will reside is already created.

1 Become superuser on a cluster node.

2 Install and configure an Oracle ASM instance and create disk groups.

See the appropriate Oracle RAC installation documentation for instructions.

When you run Oracle Universal Installer, you have the option to configure and install Oracle ASM and create disk groups. For detailed information about installing and configuring Oracle ASM, see the Oracle documentation corresponding to the Oracle database version you are using.

Creating an Oracle Clusterware Framework Resource

The Oracle Clusterware framework resource is a resource of the type `SUNW.crs_framework`. This resource is created within the Oracle RAC framework resource group whenever Oracle Clusterware is present on the cluster. This resource enables Oracle Solaris Cluster software to control the starting and stopping of Oracle Clusterware through the resource dependencies in Oracle Solaris Cluster. This ensures that Oracle Clusterware is only started when the resources it depends on are also available, and that it is stopped cleanly when any resource it depends on is no longer available.

Note – When the Oracle Clusterware framework resource is created in an Oracle Solaris Cluster configuration, it disables the automatic startup of Oracle Clusterware itself. The removal of the Oracle Clusterware framework resource does not by itself re-enable automatic startup of Oracle Clusterware. To re-enable automatic startup of Oracle Clusterware, see the Oracle Clusterware documentation for your release of Oracle Clusterware software.

- [“How to Create an Oracle Clusterware Framework Resource” on page 109](#)

▼ How to Create an Oracle Clusterware Framework Resource

Before You Begin Ensure that the following prerequisites are met:

- The [Oracle RAC framework resource group](#) is created and is online.
- [Storage resources for Oracle files](#) are configured.
- The [Oracle RAC software is installed](#).
- [Node-specific files and directories](#) for a shared file system are created.
- The [installation of the Oracle RAC software is verified](#).

Ensure that you have the following information:

- The full path to the Oracle Clusterware home directory

1 On one node of the cluster, become superuser.

2 Start the `clsetup` utility.

```
# clsetup
```

The `clsetup` main menu is displayed.

3 Choose the menu item, Data Services.

The Data Services menu is displayed.

4 Choose the menu item, Oracle Real Application Clusters.

The `clsetup` utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The `clsetup` utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.

6 Choose the menu item, Oracle RAC Create Configuration.

The `clsetup` utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.

7 Type the option number for the location of the Oracle RAC cluster and press Return.

- If you select the global cluster option, the `clsetup` utility displays the list of components of Oracle RAC to configure. Skip to [Step 9](#).
- If you select the zone cluster option, the `clsetup` utility prompts you to select the required zone cluster. Proceed to [Step 8](#).

8 Type the option number for the required zone cluster and press Return.

The `clsetup` utility displays the list of components of Oracle RAC to configure.

9 Choose the menu item, Oracle Clusterware Framework Resource.

The `clsetup` utility displays the list of prerequisites for performing this task.

10 Verify that the prerequisites are met, and press Return.

The `clsetup` utility displays a list of Oracle Clusterware home directories that exist on the cluster.

11 Specify the Oracle Clusterware home directory for your installation of the Oracle Clusterware software.

- If the directory is listed, type the option number for the directory that you are selecting and press Return.
- If the directory is not listed, type the full path to the Oracle Clusterware home directory and press Return.

12 Specify the Oracle Clusterware OCR and voting disks.

- If a desired name is listed, type the number that corresponds to the name that you are selecting and press Return.

The `clsetup` utility displays a list of Oracle home directories that exist on the cluster.

- If a desired name is not listed, specify the name explicitly:

a. Type e and press Return.

The `clsetup` utility prompts you for the full path for the OCR and voting disk.

b. Type the full path of the file-system mount point or disk group and press Return.

The `clsetup` utility prompts you whether to enter more values. Type `yes` to specify another path name or `no` if you have no more path names to add and press Return.

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create.

13 If you require a different name for any Oracle Solaris Cluster objects, change the name.

a. Type the option number for the name to change and press Return.

The `clsetup` utility displays a screen where you can specify the new name.

b. At the New Value prompt, type the new name and press Return.

The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create.

14 To confirm your selection of Oracle Solaris Cluster object names, press Return.

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

15 To create the configuration, type `c` and Press Return.

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

16 Press Return to continue.

The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.

17 (Optional) Type `q` and press Return repeatedly until you quit the `clsetup` utility.

Creating an Oracle Database

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

To create the database, use one command from the following list:

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

Note – You must create the Oracle database to be administrator managed, not policy managed. This ensures that Oracle Solaris Cluster software controls on which servers the database is started.

For detailed instructions for creating an Oracle database, see your Oracle documentation.

The way to specify to the dbca command the location of data files on a shared file system depends on your release of Oracle.

Note – An Oracle ACFS file system cannot be used for data files.

- “How to Specify the Location of Data Files on a Shared File System for Oracle 10g, 11g, or 12c” on page 112
- “How to Specify the Location of Data Files on a Shared File System for Oracle 9i” on page 112

▼ How to Specify the Location of Data Files on a Shared File System for Oracle 10g, 11g, or 12c

- 1 When dbca prompts you for a storage option, select Cluster File System.
- 2 When dbca prompts you for the location, select the option for common location.
- 3 After selecting the option for a common location, type the name of the directory on the shared file system and press Return.

Next Steps After you have created the Oracle database, go to “[Configuring Resources for Oracle RAC Database Instances](#)” on page 113.

▼ How to Specify the Location of Data Files on a Shared File System for Oracle 9i

- Specify the `-datafileDestination path` option of the dbca command.
path specifies the path to a directory on a shared file system where the data files are to be stored.

Next Steps After you have created the Oracle database, go to “[Configuring Resources for Oracle RAC Database Instances](#)” on page 113.

Configuring Resources for Oracle RAC Database Instances

Resources for Oracle RAC database instances enable the database instances to be administered from Oracle Solaris Cluster.

If you are using Oracle 10g release 2, 11g, or 12c RAC, these resources also enable Oracle Solaris Cluster and Oracle Clusterware to interoperate.

The software architectures of Oracle 9i, Oracle 10g release 1, and Oracle 10g release 2, 11g, or 12c are different. As a result of these differences, the resources for Oracle RAC database instances that Oracle Solaris Cluster requires depend on the version of Oracle that you are using.

Note – If you are using Oracle 10g release 1, omit this task. In Oracle 10g release 1, Oracle Clusterware and Oracle Solaris Cluster cannot interoperate. Instead, Oracle Clusterware start and shut down Oracle RAC database instances.

This section contains the following information about configuring resources for Oracle RAC database instances:

- [“Tools for Registering and Configuring Resources for Oracle RAC Database Instances” on page 113](#)
- [“How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate” on page 114](#)
- [“How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances” on page 120](#)

Tools for Registering and Configuring Resources for Oracle RAC Database Instances

Oracle Solaris Cluster provides the following tools for registering and configuring resources for Oracle RAC database instances in the global cluster or in a zone cluster:

- **The `clsetup(1CL)` utility.** For more information, see the following sections:
 - [“How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate” on page 114](#)
 - [“How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances” on page 120](#)
- **Oracle Solaris Cluster Manager.** For more information, see the Oracle Solaris Cluster Manager online help.

- **Oracle Solaris Cluster maintenance commands.** For more information, see the following sections:
 - “Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands” on page 334
 - “Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i by Using Oracle Solaris Cluster Maintenance Commands” on page 348

The `clsetup` utility and Oracle Solaris Cluster Manager each provide a wizard for configuring resources for Oracle RAC database instances. The wizards reduce the possibility of configuration errors that might result from command syntax errors or omissions. These wizards also ensure that all required resources are created and that all required dependencies between resources are set.

▼ How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate

When you perform this task, the `clsetup` utility creates the following resources for interoperation with Oracle 10g Release 2, 11g, or 12c:

- An Oracle Solaris Cluster resource to act as a proxy for the Oracle RAC database
- An Oracle Solaris Cluster resource to represent the Oracle Clusterware framework
- One of the following storage choices:
 - Oracle Clusterware resources to represent scalable device groups and scalable file-system mount points
 - Oracle Clusterware resources to represent Oracle ASM disk groups

Before You Begin Ensure that the following prerequisites are met:

- The [Oracle RAC framework resource group](#) is created and is online.
- [Storage resources for Oracle files](#) are configured.
- The [Oracle RAC software is installed](#).
- [Node-specific files and directories](#) for a shared file system are created.
- The [installation of the Oracle RAC software is verified](#).
- The [Oracle database is created](#).
- The Oracle database is running.

To determine whether the Oracle database is running, use the Oracle `srvctl` command as follows:

```
$ srvctl status database -d db-name
```

db-name specifies the name of the Oracle database.

Ensure that you have the following information:

- The full path to the Oracle Clusterware home directory
- The full path to the Oracle home directory
- The Oracle system identifier (SID) for each instance of the database for which you are configuring resources
- The names of all Oracle Solaris Cluster storage resources for Oracle files that you are using

1 On one node of the cluster, become superuser.

2 Start the `clsetup` utility.

```
# clsetup
```

The `clsetup` main menu is displayed.

3 Choose the menu item, Data Services.

The Data Services menu is displayed.

4 Choose the menu item, Oracle Real Application Clusters.

The `clsetup` utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The `clsetup` utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.

6 Choose the menu item, Oracle RAC Create Configuration.

The `clsetup` utility prompts you to select the Oracle RAC cluster location. This location can be the global cluster or a zone cluster.

7 Type the option number for the location of the Oracle RAC cluster and press Return.

- If you select the global cluster option, the `clsetup` utility displays the list of components of Oracle RAC to configure. Skip to [Step 9](#).
- If you select the zone cluster option, the `clsetup` utility prompts you to select the required zone cluster. Proceed to [Step 8](#).

8 Type the option number for the required zone cluster and press Return.

The `clsetup` utility displays the list of components of Oracle RAC to configure.

9 Choose the menu item, Resources for Oracle Real Application Clusters Database Instances.

The `clsetup` utility displays the list of prerequisites for performing in this task.

10 Verify that the prerequisites are met, and press Return.

The `clsetup` utility displays a list of versions of Oracle that you can configure by using this utility.

11 Choose the menu item, Oracle 10gR2, 11g, 12c.

The `clsetup` utility displays a list of Oracle home directories that exist on the cluster.

12 Specify the Oracle home directory for your installation of the Oracle database software.

- **If the directory is listed, type the option number for the directory that you are selecting and press Return.**
- **If the directory is not listed, type the full path to the Oracle Clusterware home directory and press Return.**

The `clsetup` utility displays a list of names of Oracle RAC databases that are configured on the cluster.

13 Specify the name of the Oracle RAC database that you are configuring.

- **If the name is listed, type the number that corresponds to the name that you are selecting and press Return.**

The `clsetup` utility displays a list of Oracle home directories that exist on the cluster.

- **If the name is not listed, specify the name explicitly:**

- a. **Type e and press Return.**

The `clsetup` utility prompts you for the name of the Oracle RAC database that you are configuring.

- b. **Type the name of the Oracle RAC database that you are configuring and press Return.**

The `clsetup` utility displays a list of Oracle home directories that exist on the cluster.

14 Specify the Oracle home directory for your installation of the Oracle RAC software.

- **If the directory is listed, type the number that corresponds to the directory that you are selecting and press Return.**

The `clsetup` utility displays a list of Oracle system identifiers that are configured on the cluster. The utility also prompts you to specify the system identifier for the first node in the list of nodes where Oracle RAC is to run.

- **If the directory is not listed, specify the directory explicitly:**

- a. **Type `e` and press Return.**

The `clsetup` utility prompts you for the Oracle home directory.

- b. **Type the full path to the Oracle home directory and press Return.**

The `clsetup` utility displays a list of Oracle system identifiers that are configured on the cluster. The utility also prompts you to specify the system identifier for the first node in the list of nodes where Oracle RAC is to run.

15 Specify the Oracle SID of the Oracle RAC database instance for the node that you are configuring.

Perform this step for each node in the list of nodes where Oracle RAC is to run.

Note – You must specify a unique Oracle SID for each node. If you specify a duplicate SID, the `clsetup` utility warns you that the SID is a duplicate and prompts you to specify the SID again.

- **If the SID is listed, type the number that corresponds to the SID that you are selecting and press Return.**

The response of the `clsetup` utility depends on whether you have specified the Oracle SID for all nodes where Oracle RAC is to run.

- If you have *not* specified the Oracle SID for all nodes, the `clsetup` utility prompts you for the SID of the next node in the node list.
 - If you have specified the Oracle SID for all nodes, the `clsetup` utility displays a list of Oracle Solaris Cluster storage resources for Oracle files that are configured. For information about these resources, see [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#).

- **If the SID is not listed, specify the SID explicitly.**

- a. **Type `e` and press Return.**

The `clsetup` utility prompts you for the SID.

- b. **Type the SID and press Return.**

The response of the `clsetup` utility depends on whether you have specified the Oracle SID for all nodes where Oracle RAC is to run.

- If you have *not* specified the Oracle SID for all nodes, the `clsetup` utility prompts you for the SID of the next node in the node list.
- If you have specified the Oracle SID for all nodes, the `clsetup` utility displays a list of Oracle Solaris Cluster storage resources for Oracle files that are configured. For information about these resources, see [“Registering and Configuring Storage Resources for Oracle Files”](#) on page 83.

16 Type a comma-separated or space-separated list of the numbers that correspond to the storage resources that you are using, and press Return.

- If you choose Oracle Automatic Storage Management (Oracle ASM), the `clsetup` utility displays the names of the Oracle ASM disk group resources.
- If you choose Other, the `clsetup` utility displays available scalable device group and scalable mount point resources.

17 Type the option number for the storage resources to use.

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create.

18 If you require a different name for any Oracle Solaris Cluster objects, change the name.

a. Type the option number for the name to change and press Return.

The `clsetup` utility displays a screen where you can specify the new name.

b. At the New Value prompt, type the new name and press Return.

The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create.

19 To confirm your selection of Oracle Solaris Cluster object names, press Return.

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

20 To create the configuration, type c and Press Return.

The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.

- 21 Press Return to continue.
- The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.
- 22 (Optional) Type `q` and press Return repeatedly until you quit the `clsetup` utility.

More Information Resource Configuration

The following table lists the default configuration of Oracle Solaris Cluster resources that the `clsetup` utility creates when you complete this task.

Resource Type, Resource Name, and Resource Group	Dependencies	Description
Resource type: <code>SUNW.crs_framework</code> Resource name: <code>crs_framework-rs</code> Resource group: <code>rac-framework-rg</code>	Strong dependency on the Oracle RAC framework resource. Offline-restart dependencies on all scalable device-group resources for Oracle files, if any. If you are using a shared file system without a volume manager, this resource has an offline-restart dependency on all scalable file-system mount-point resources for Oracle files. If you are not using a shared file system or a volume manager, this resource has no offline-restart dependencies on any other resources.	Oracle Clusterware framework resource.
Resource type: <code>SUNW.scalable_rac_server_proxy</code> Resource name: <code>rac_server_proxy-rs</code> Resource group: <code>rac_server_proxy-rg</code>	Strong dependency on the Oracle RAC framework resource. Offline-restart dependency on the Oracle Clusterware framework resource.	Proxy resource for the Oracle RAC database server.

Note – For detailed information for the resource configuration for zone clusters, see the figures in [Appendix A, “Sample Configurations of This Data Service.”](#)

The `clsetup` utility also creates an Oracle Clusterware resource for each Oracle Solaris Cluster resource for scalable device groups and scalable file-system mount points on which Oracle components depend.

The name of each Oracle Clusterware resource that the `clsetup` utility creates is as follows:

`sun.node.sc-rs`

The replaceable items in this name are as follows:

- *node* specifies the name of the node where the Oracle Clusterware resource is to run.
- *sc-rs* specifies the name of the Oracle Solaris Cluster resource that the Oracle Clusterware resource represents. This resource is created when the task in [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#) is performed.

The Oracle Clusterware resource for the database instance on *node* depends on the Oracle Clusterware resource that the *clsetup* utility creates for that node. Oracle Clusterware resources for database instances are created during the installation and configuration of the Oracle RAC

The name of the Oracle Clusterware resource for the database instance on a node is as follows:

`ora.dbname.sid.inst`

The replaceable items in this name are as follows:

- *dbname* specifies the database name of the database instance that the Oracle Clusterware resource represents.
- *sid* specifies the Oracle SID of the database instance that the Oracle Clusterware resource represents.

Next Steps Go to [“Verifying the Installation and Configuration of Support for Oracle RAC” on page 126](#).

▼ How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances

Before You Begin Ensure that the following prerequisites are met:

- The [Oracle RAC framework resource group](#) is created and is online.
- [Storage resources for Oracle files](#) are configured.
- The [Oracle RAC software is installed](#).
- [Node-specific files and directories](#) for a shared file system are created.
- The [installation of the Oracle RAC software is verified](#).
- The [Oracle database is created](#).

Ensure that you have the following information:

- The full path to the Oracle home directory
- The Oracle system identifier (SID) for each instance of the database for which you are configuring resources
- The names of all Oracle Solaris Cluster storage resources for Oracle files that you are using
- The logical hostnames, or the names of the logical hostname resources, that you are using for Oracle listeners

1 On one node of the cluster, become superuser.

2 Start the `clsetup` utility.

```
# clsetup
```

The `clsetup` main menu is displayed.

3 Choose the menu item, Data Services.

The Data Services menu is displayed.

4 Choose the menu item, Oracle Real Application Clusters.

The `clsetup` utility displays information about Support for Oracle RAC.

5 Press Return to continue.

The `clsetup` utility prompts you to select whether you are performing the initial configuration of Support for Oracle RAC or administering an existing configuration.

6 Choose the menu item, Oracle RAC Create Configuration.

The `clsetup` utility prompts you to choose the global cluster or a zone cluster.

7 Type the option number for the location of the Oracle RAC cluster and press Return.

- If you select the global cluster option, the `clsetup` utility displays the list of components of Oracle RAC to configure. Skip to [Step 9](#).

- If you select the zone cluster option, the `clsetup` utility prompts you to select the required zone cluster. Proceed to [Step 8](#).

8 Type the option number for the required zone cluster, and press Return.

The `clsetup` utility displays the list of components of Oracle RAC to configure.

9 Choose the menu item, Resources for Oracle Real Application Clusters Database Instances.

The `clsetup` utility displays the list of prerequisites for performing in this task.

10 Verify that the prerequisites are met and press Return.

The `clsetup` utility displays a list of versions of Oracle that you can configure by using this utility.

11 Choose the menu item, Oracle 9i.

12 Type the option number to configure both the listener and the server.

The `clsetup` utility displays a list of Oracle home directories that exist on the cluster.

13 Specify the Oracle home directory for your installation of the Oracle RAC software.

- **If the directory is listed, type the number that corresponds to the directory that you are selecting and press Return.**

The `clsetup` utility displays a list of Oracle system identifiers that are configured on the cluster. The utility also prompts you to specify the system identifier for the first node in the list of nodes where Oracle RAC is to run.

- **If the directory is not listed, specify the directory explicitly.**

- a. **Type `e` and press Return.**

The `clsetup` utility prompts you for the Oracle home directory.

- b. **Type the full path to the Oracle home directory and press Return.**

The `clsetup` utility displays a list of Oracle system identifiers that are configured on the cluster. The utility also prompts you to specify the system identifier for the first node in the list of nodes where Oracle RAC is to run.

14 Specify the Oracle SID of the Oracle RAC database instance for the node that you are configuring.

The wizard prompts you to perform this step for each node in the list of nodes where Oracle RAC is to run.

Note – You must specify a unique Oracle SID for each node. If you specify a duplicate SID, the `clsetup` utility warns you that the SID is a duplicate and prompts you to specify the SID again.

- **If the SID is listed, type the number that corresponds to the SID that you are selecting and press Return.**

The `clsetup` utility displays the values of properties for the node of the Oracle Solaris Cluster resources that the utility will create.

- **If the SID is not listed, specify the SID explicitly.**

- a. **Type `e` and press Return.**

The `clsetup` utility prompts you for the SID.

- b. **Type the SID and press Return.**

The `clsetup` utility displays the values of properties for the node of the Oracle Solaris Cluster resources that the utility will create.

15 If you require a different value for any Oracle Solaris Cluster resource properties, change the property.

The wizard prompts you to perform this step for each node in the list of nodes where Oracle RAC is to run.

a. Type the option number for the property to change and press Return.

The `clsetup` utility displays a screen where you can specify the new value.

b. At the New Value prompt, type the new value and press Return.

The `clsetup` utility returns you to the values of properties for the node.

c. To confirm your selection of Oracle Solaris Cluster resource properties, press Return.

The response of the `clsetup` utility depends on whether you have specified the Oracle Solaris Cluster resource properties for all nodes where Oracle RAC is to run.

- If you have *not* specified Oracle Solaris Cluster resource properties for all nodes, the `clsetup` utility prompts you to specify the system identifier for the next node in the list of nodes.
- If you have specified the Oracle Solaris Cluster resource properties for all nodes, the `clsetup` utility displays a list of logical hostname resources that are configured.

16 Configure a logical hostname resource for each node where Oracle RAC is to run.

The Oracle listener uses the logical hostname resource for a node to connect to the Oracle RAC database instance on the node.

The wizard prompts you to perform this step for each node in the list of nodes where Oracle RAC is to run.

▪ **If the logical hostname resource is listed, type the option number for the resource to select and press Return.**

The response of the `clsetup` utility depends on whether you have configured a logical hostname resource for all nodes where Oracle RAC is to run.

- If you have *not* configured a resource for all nodes, the `clsetup` utility prompts you to configure a resource for the next node.
- If you have configured a resource for all nodes, the `clsetup` utility displays a list of Oracle Solaris Cluster storage resources for Oracle files that are configured. For information about these resources, see [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#).

- **If the logical hostname resource is not listed, create the resource as follows:**

- a. **Type `c` and press Return.**

- The `clsetup` utility prompts you for the logical hostname that the resource is to make available.

- b. **Type the logical hostname and press Return.**

- The `clsetup` utility returns you to the list of logical hostname resources. An entry for the logical hostname resource that the wizard will create is added to the list.

- c. **Type the option number for the resource to create and press Return.**

- The response of the `clsetup` utility depends on whether you have configured a logical hostname resource for all nodes where Oracle RAC is to run.

- If you have *not* configured a resource for all nodes, the `clsetup` utility prompts you to configure a resource for the next node.
 - If you have configured a resource for all nodes, the `clsetup` utility displays a list of Oracle Solaris Cluster storage resources for Oracle files that are configured. For information about these resources, see [“Registering and Configuring Storage Resources for Oracle Files”](#) on page 83.

17 Type a comma-separated or space-separated list of the numbers that correspond to the storage resources that you are using and press Return.

The `clsetup` utility displays the names of the Oracle Solaris Cluster objects that the utility will create.

18 If you require a different name for any Oracle Solaris Cluster objects, change the name.

- a. **Type the option number for the name to change and press Return.**

- The `clsetup` utility displays a screen where you can specify the new name.

- b. **At the New Value prompt, type the new name and press Return.**

- The `clsetup` utility returns you to the list of the names of the Oracle Solaris Cluster objects that the utility will create.

19 To confirm your selection of Oracle Solaris Cluster object names, press Return.

The `clsetup` utility displays information about the Oracle Solaris Cluster configuration that the utility will create.

- 20 To create the configuration, type **c** and Press Return.
- The `clsetup` utility displays a progress message to indicate that the utility is running commands to create the configuration. When configuration is complete, the `clsetup` utility displays the commands that the utility ran to create the configuration.
- 21 Press Return to continue.
- The `clsetup` utility returns you to the list of options for configuring Support for Oracle RAC.
- 22 (Optional) Type **q** and press Return repeatedly until you quit the `clsetup` utility.

More Information Resource Configuration

The following table lists the default resource configuration that the `clsetup` utility creates when you complete this task.

Resource Type, Resource Name, and Resource Group	Dependencies	Description
Resource type: <code>SUNW.LogicalHostname</code> Resource name: <i>lh-name</i> , where <i>lh-name</i> is the logical hostname that you specified when you created the resource Resource group: <code>rac-lhN-rg</code> , where <i>N</i> is an integer in the range 1 to the number of nodes where Oracle RAC is to run. These integers are assigned in the order in which the resource groups are created.	None.	Logical hostname resource. One logical hostname resource is created for each node where Oracle RAC is to run.
Resource type: <code>SUNW.scalable_rac_listener</code> Resource name: <code>rac-listener-rs</code> Resource group: <code>ora-sid-rg</code> , where <i>ora-sid</i> is the SID on the primary node without any numbers in the SID	Strong dependency on each logical hostname resource.	Scalable RAC listener resource.

Resource Type, Resource Name, and Resource Group	Dependencies	Description
Resource type: <code>SUNW.scalable_rac_server</code> Resource name: <code>ora-sid-rs</code> , where <code>ora-sid</code> is the SID on the primary node without any numbers in the SID Resource group: <code>ora-sid-rg</code> , where <code>ora-sid</code> is the SID on the primary node without any numbers in the SID	Strong dependency on the Oracle RAC framework resource. Weak dependency on the scalable RAC listener resource. Offline-restart dependencies on all scalable device-group resources for Oracle files, if any. Offline-restart dependencies on all scalable file-system mount-point resources for Oracle files. If you are not using a shared file system or a volume manager, this resource has no offline-restart dependencies on any other resources.	Scalable Oracle RAC server resource.

Note – For detailed information for the resource configuration for zone clusters, see the figures in [Appendix A, “Sample Configurations of This Data Service.”](#)

Next Steps Go to [“Verifying the Installation and Configuration of Support for Oracle RAC”](#) on page 126.

Verifying the Installation and Configuration of Support for Oracle RAC

After you install, register, and configure Support for Oracle RAC, verify the installation and configuration. Verifying the Support for Oracle RAC installation and configuration determines if resources and resource groups for Oracle RAC behave as required.

Offline-restart dependencies between resources ensure that if the independent resource is about to be taken offline, the dependent resource is taken offline first. The dependent resource remains offline until the independent resource is restarted. The procedures in this section explain how to verify that these dependencies are correctly set. For detailed information about offline-restart dependencies, see the description of the `resource_dependencies_offline_restart` resource property in the [r_properties\(5\)](#) man page.

Verifying the installation and configuration of Support for Oracle RAC involves the following tasks:

1. [Verifying the configuration of the Oracle RAC framework resource group](#) and, if used, [verifying the configuration of the multiple-owner volume-manager framework resource group](#)
2. [Verifying the configuration of storage resources for Oracle files](#)
3. (Oracle 10g release 2, Oracle 11g, Oracle 12c, and Oracle 9i only) [Verifying the configuration of resources for Oracle RAC database instances](#)

Note – If you are using Oracle 10g release 1, no resources for Oracle RAC database instances are configured.

The task to perform depends on the version of Oracle RAC that you are using:

- **Oracle 10g release 2, 11g, or 12c.** Perform the task in “[How to Verify the Configuration of Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances](#)” on page 130.
 - **Oracle 9i.** Perform the task in “[How to Verify the Configuration of Resources for Oracle 9i RAC Database Instances](#)” on page 133.
4. [Verifying the correct behavior for shutdown and booting of the cluster](#)

▼ How to Verify the Configuration of the Oracle RAC Framework Resource Group

The Oracle RAC framework resource group is created when the task in “[Registering and Configuring the Oracle RAC Framework Resource Group](#)” on page 65 is performed.

- 1 **Become superuser on a cluster node or assume a role that provides `solaris.cluster.read` and `solaris.cluster.admin` RBAC authorizations.**
- 2 **Verify that the Oracle RAC framework resource group is correctly configured.**

```
# clresourcegroup show rac-fmk-rg
```

rac-fmk-rg Specifies the name of the Oracle RAC framework resource group.
- 3 **If the Oracle RAC framework resource group is not already online, bring online the Oracle RAC framework resource group.**

```
# clresourcegroup online rac-fmwk-rg
```

rac-fmk-rg Specifies the name of the Oracle RAC framework resource group.
- 4 **Verify that the Oracle RAC framework resource group is online.**

```
# clresourcegroup status
```

▼ How to Verify the Configuration of the Multiple-Owner Volume-Manager Framework Resource Group

Perform this procedure if you use a multiple-owner volume-manager framework resource group to contain the volume manager resources that are used by your RAC configuration.

- 1 **Become superuser on a cluster node or assume a role that provides `solaris.cluster.read` and `solaris.cluster.admin` RBAC authorizations.**

- 2 **Verify that the multiple-owner volume-manager framework resource group is correctly configured.**

```
# clresourcegroup show vucmm-fmk-rg
```

vucmm-fmk-rg Specifies the name of the multiple-owner volume-manager framework resource group.

- 3 **If the multiple-owner volume-manager framework resource group is not already online, bring online the multiple-owner volume-manager framework resource group.**

```
# clresourcegroup online vucmm-fmwk-rg
```

vucmm-fmk-rg Specifies the name of the multiple-owner volume-manager framework resource group.

- 4 **Verify that the RAC resource group is online.**

```
# clresourcegroup status
```

▼ How to Verify the Configuration of Storage Resources for Oracle Files

Perform this task only if your configuration of storage management schemes requires storage resources for Oracle files.

- 1 **Become superuser on a cluster node.**
- 2 **Verify that all resource groups that contain storage resources for Oracle files are correctly configured.**

```
# clresourcegroup show rac-storage-rg-list
```

rac-storage-rg-list Specifies a comma-separated list of resource groups that contain storage resources for Oracle files.

3 Take offline the resource group that contains the resources on which the RAC database resource depends.

```
# clresourcegroup offline rac-storage-rg
```

rac-storage-rg Specifies the name of the resource group that contains the resources on which the RAC database resource depends. The resource group to take offline depends on your choice of storage management schemes for Oracle files.

- If you are using a shared file system for Oracle files, take offline the resource group that contains scalable file-system mount-point resources.
- If you are using a volume manager without a file system for Oracle files, take offline the resource group that contains scalable device-group resources.

This step might require several minutes to complete.

4 Verify that the resource groups for Oracle RAC behave as follows:

- The status of the resource group that you took offline in [Step 3](#) is offline.
- The status of the Oracle RAC database resource group is offline.
- The status of the Oracle RAC framework resource group depends on the version of Oracle that you are using:
 - If you are using Oracle 10g release 2, 11g, or 12c, the status of the Oracle RAC framework resource group is pending online blocked.
 - If you are using Oracle 10g release 1 or Oracle 9i, the status of the Oracle RAC framework resource group remains online.

```
# clresourcegroup status
```

5 (Oracle 10g release 2, 11g, or 12c only) Verify that the Oracle Clusterware resources are offline.

To verify that the Oracle Clusterware resources are offline, consult the system messages file to find messages to indicate that Oracle Clusterware resources are being shut down.

6 Bring online the resource group that you took offline in [Step 3](#).

```
# clresourcegroup online rac-storage-rg
```

rac-storage-rg Specifies the name of the resource group that you took offline in [Step 3](#).

This step might require several minutes to complete.

7 (Oracle 10g release 2, 11g, or 12c only) On each node, restart the Oracle Clusterware.

```
# /etc/init.d/init.crs start
```

Startup will be queued to init within 30 seconds.

This step might require several minutes to complete.

- 8 (Oracle 10g release 2, 11g, or 12c only) On each node, verify that the Oracle Clusterware resources are online.**

Use the Oracle command `crs stat` for this purpose.

`Grid_home/bin/crs_stat`

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

Note – The startup of Oracle Clusterware on all nodes might require several minutes to complete. If you perform this step before the Oracle Clusterware resources are online on all nodes, the status on some nodes might be offline. In this situation, repeat this step until the status of the Oracle Clusterware is online on all nodes.

- 9 Verify that all resource groups for Oracle RAC are online.**

`clresourcegroup status`

Note – Bringing online the resource group that contains the resources on which the RAC database resource depends also brings online the RAC database resource group. If you perform this step before the RAC database resource group is online on all nodes, the status on some nodes might be online faulted. In this situation, repeat this step until the status of the RAC database resource group is online on all nodes.

▼ **How to Verify the Configuration of Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances**

Resources for Oracle 10g Release 2, 11g, or 12c RAC database instances are created when the tasks in one of the following sections are performed:

- [“How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate” on page 114](#)
- [“Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands” on page 334](#)

- 1 Become superuser on a cluster node.**
- 2 Verify that the RAC database resource group is correctly configured.**

`clresourcegroup show rac-db-rg`

rac-db-rg Specifies the name of the RAC database resource group.

3 If required, verify that the Oracle Clusterware resources to represent Oracle Solaris Cluster storage resources are correctly configured.

Perform this step only if your configuration of storage management schemes requires storage resources for Oracle files.

a. Confirm that the Oracle Clusterware resources to represent Oracle Solaris Cluster storage resources exist.

Use the Oracle command `crstat` for this purpose.

```
# Grid_home/bin/crs_stat | grep NAME=sun.
```

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

b. For each Oracle Clusterware resource that represents an Oracle RAC database instance, confirm that the required dependencies are set.

Each Oracle Clusterware resource that represents an Oracle RAC database instance requires a dependency on a resource that is listed in [Step a](#).

```
# Grid_home/bin/crs_stat crs-resource | grep REQUIRED_RESOURCE
```

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

crs-resource Specifies the name of an Oracle Clusterware resource that represents an Oracle RAC database instance. The format of this name is `ora.dbname.sid.inst`. The replaceable items in this format are as follows:

dbname Specifies the database name of the instance.

sid Specifies the Oracle SID of the instance.

4 Disable the Oracle Clusterware framework resource.

```
# clresource disable -t SUNW.crs_framework +
```

This step might require several minutes to complete.

5 Verify that the Oracle Clusterware resources are offline.

a. Attempt to obtain the status of Oracle Clusterware resources.

Use the Oracle command `crstat` for this purpose.

```
# Grid_home/bin/crs_stat -t
```

CRS-0184: Cannot communicate with the CRS daemon.

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

- b. Consult the system messages file to find messages to indicate that Oracle Clusterware resources are being shut down.

6 Verify that the following resources are offline on all nodes:

- The Oracle Clusterware framework resource
- The RAC database resource

```
# clresource status -t SUNW.crs_framework,SUNW.scalable_rac_server_proxy +
```

7 On each node, restart the Oracle Clusterware.

```
# /etc/init.d/init.crs start
```

Startup will be queued to init within 30 seconds.

This step might require several minutes to complete.

8 On each node, verify that the Oracle Clusterware resources are online.

Use the Oracle command `crstat` for this purpose.

```
# Grid_home/bin/crs_stat
```

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

Note – The startup of Oracle Clusterware on all nodes might require several minutes to complete. If you perform this step before the Oracle Clusterware resources are online on all nodes, the status on some nodes might be offline. In this situation, repeat this step until the status of the Oracle Clusterware is online on all nodes.

9 Enable the Oracle Clusterware framework resource.

```
# clresource enable -t SUNW.crs_framework +
```

This step might require several minutes to complete.

10 Verify that the following resources are online on all nodes:

- The Oracle Clusterware framework resource
- The RAC database resource

```
# clresource status -t SUNW.crs_framework,SUNW.scalable_rac_server_proxy +
```

Note – Enabling the Oracle Clusterware framework resource also enable the RAC database resource. If you perform this step before the RAC database resource is enabled on all nodes, the status on some nodes might be offline. In this situation, repeat this step until the status of the RAC database resource is online on all nodes.

▼ How to Verify the Configuration of Resources for Oracle 9i RAC Database Instances

Resources for Oracle 9i RAC database instances are created when the tasks in one of the following sections are performed:

- “How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances” on page 120
- “Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i by Using Oracle Solaris Cluster Maintenance Commands” on page 348

- 1 **Become superuser on a cluster node, or assume a role that provides `solaris.cluster.read` and `solaris.cluster.admin` RBAC authorizations.**

- 2 **Verify that the Oracle RAC database resource group and the resource groups for logical hostname resources are correctly configured.**

```
# clresourcegroup show rac-db-rg,lhrg-list
```

rac-db-rg Specifies the name of the Oracle RAC database resource group.

lhrg-list Specifies a comma-separated list of resource groups for logical hostname resources.

- 3 **Take offline the Oracle RAC database resource group.**

```
# clresourcegroup offline rac-db-rg
```

rac-db-rg Specifies the name of the Oracle RAC database resource group.

- 4 **Verify that the Oracle RAC database resource group is offline.**

```
# clresourcegroup status rac-db-rg
```

rac-db-rg Specifies the name of the Oracle RAC database resource group.

- 5 **Verify that the resources in the Oracle RAC database resource group are offline on all nodes.**

The Oracle RAC database resource group contains the following resources:

- The scalable Oracle RAC server resource
- The scalable Oracle listener resource

```
# clresource status -t SUNW.scalable_rac_server,SUNW.scalable_rac_listener +
```

- 6 **Bring online again the Oracle RAC database resource group.**

```
# clresourcegroup online rac-db-rg
```

rac-db-rg Specifies the name of the Oracle RAC database resource group.

7 Verify that the Oracle RAC database resource group is online.

```
# clresourcegroup status rac-db-rg
```

rac-db-rg Specifies the name of the Oracle RAC database resource group.

8 Verify that the resources in the Oracle RAC database resource group are online on all nodes.

The Oracle RAC database resource group contains the following resources:

- The scalable Oracle RAC server resource
- The scalable RAC listener resource

```
# clresource status -t SUNW.scalable_rac_server,SUNW.scalable_rac_listener +
```

▼ How to Verify the Correct Behavior for Shutdown and Booting of the Cluster

If your configuration of Support for Oracle RAC is correct, Oracle Solaris Cluster ensures that Oracle RAC is stopped and started correctly when you shut down and boot the cluster.



Caution – This task requires downtime. If you are verifying the installation and configuration of Support for Oracle RAC on a production cluster where other data services are running, omit this task.

1 Shut down the cluster.

For instructions for performing this task, see “[How to Shut Down a Cluster](#)” in *Oracle Solaris Cluster System Administration Guide*.

2 Confirm that the cluster shuts down correctly.**3 Boot the cluster.**

For instructions for performing this task, see “[How to Boot a Cluster](#)” in *Oracle Solaris Cluster System Administration Guide*.

4 Confirm that the cluster starts correctly.**5 Verify that all Oracle RAC resource groups and their resources are online.**

```
# clresourcegroup status
```

Note – The bringing online of all Oracle RAC resource groups might require several minutes to complete. If you perform this step before the resource groups are enabled on all nodes, the status on some nodes might be offline. In this situation, repeat this step until the status of all Oracle RAC resource groups is online on all nodes.

Administering Support for Oracle RAC

This chapter explains how to administer Support for Oracle RAC on your Oracle Solaris Cluster nodes.

- “Overview of Administration Tasks for Support for Oracle RAC” on page 137
- “Automatically Generated Names for Oracle Solaris Cluster Objects” on page 138
- “Administering Oracle RAC Databases From Oracle Solaris Cluster Software” on page 139
- “Tuning Support for Oracle RAC” on page 142
- “Tuning the Support for Oracle RAC Fault Monitors” on page 146
- “Customizing the Oracle 9i RAC Server Fault Monitor” on page 151

Overview of Administration Tasks for Support for Oracle RAC

Table 5–1 summarizes the administration tasks for Support for Oracle RAC.

Perform these tasks whenever they are required.

TABLE 5–1 Administration Tasks for Support for Oracle RAC

Task	Instructions
Administer Oracle RAC databases from Oracle Solaris Cluster	“Administering Oracle RAC Databases From Oracle Solaris Cluster Software” on page 139
Tune Support for Oracle RAC extension properties	“Tuning Support for Oracle RAC” on page 142
Tune Support for Oracle RAC fault monitors	“Tuning the Support for Oracle RAC Fault Monitors” on page 146
Customize the Oracle 9i RAC server fault monitor	“Customizing the Oracle 9i RAC Server Fault Monitor” on page 151
Troubleshoot Support for Oracle RAC	Chapter 6, “Troubleshooting Support for Oracle RAC”

Automatically Generated Names for Oracle Solaris Cluster Objects

When the `clsetup` utility or Oracle Solaris Cluster Manager is used to create resources, these tools assign preset names to the resources. If you are administering resources that were created by using the `clsetup` utility or Oracle Solaris Cluster Manager, see the following table for these names.

Resource Type	Resource Name
SUNW.rac_svm	rac-svm-rs
SPARC: SUNW.rac_cvm	rac-cvm-rs
SPARC: SUNW.rac_udlm	rac-udlm-rs
SUNW.rac_framework	rac-framework-rs
SUNW.scalable_rac_server	<i>ora-sid</i> -rs, where <i>ora-sid</i> is the SID on the primary node without any numbers in the SID
SUNW.scalable_rac_listener	rac-listener-rs
SUNW.scalable_rac_server_proxy	rac_server_proxy-rs
SUNW.crs_framework	crs_framework-rs
SUNW.ScalDeviceGroup	scal <i>dg-name</i> -rs, where <i>dg-name</i> is the name of the device group that the resource represents
SUNW.ScalMountPoint	scal- <i>mp-dir</i> -rs, where <i>mp-dir</i> is the mount point of the file system, with / replaced by – asm-mp-rs
SUNW.qfs	qfs- <i>mp-dir</i> -rs, where <i>mp-dir</i> is the mount point of the file system, with / replaced by – asm-home-sqfs-rs
SUNW.scalable_rac_server_proxy	rac_server_proxy_rs
SUNW.oracle_asm_diskgroup	asm-dg-rs
SUNW.scalable_oracle_asm_instance_proxy	asm-inst-rs
SUNW.LogicalHostname	<i>lh-name</i> , where <i>lh-name</i> is the logical hostname that you specified when you created the resource

Administering Oracle RAC Databases From Oracle Solaris Cluster Software

Administering Oracle RAC databases from Oracle Solaris Cluster software involves using Oracle Solaris Cluster administration tools to modify the states of Oracle Solaris Cluster resources for Oracle RAC database instances. For information about how to create these resources, see [“Configuring Resources for Oracle RAC Database Instances” on page 113](#).

In an Oracle Solaris Cluster configuration, with one exception, there are no general restrictions on the use of the Oracle database software command line interface (CLI) to manage Oracle Clusterware or on the Oracle `svctl` command to manage the Oracle database and its services. The exception is that, with Oracle 11g release 2 or 12c, `autostart` must remain disabled in an Oracle Solaris Cluster configuration. Otherwise, you can use Oracle database software commands as you would in a configuration that does not include Oracle Solaris Cluster. The Oracle Solaris Cluster software detects the changes made by the Oracle database CLI and reacts appropriately.

The software architectures of Oracle 9i, Oracle 10g release 1, and Oracle 10g release 2, 11g, or 12c are different. As a result of these differences, the resources for Oracle RAC database instances that Oracle Solaris Cluster software requires depend on the version of Oracle that you are using. Consequently, the administration of Oracle RAC databases from Oracle Solaris Cluster software also depends on the version of Oracle that you are using.

Note – If you are using Oracle 10g release 1, you cannot administer Oracle RAC databases from Oracle Solaris Cluster software. Instead, use Oracle Clusterware utilities to start and shut down Oracle RAC database instances.

Each cluster, such as the global cluster or a specific zone cluster, constitutes an independent name space for resource groups and resources. Thus, there is no name collision between names in these different name spaces. You register resource types independently for each cluster.

You can administer the resource groups and resources belonging to the global cluster only from the global-cluster voting node. You can administer the resource groups and resources belonging to a zone cluster from that zone cluster. In the global-cluster voting node, you can also administer the resource groups and resources in a zone cluster by using the `-Z` option to specify the zone cluster. You can set up inter-cluster resource dependencies or affinities only from the global-cluster voting node. The examples in the following sections typically explain the situations when the command is issued in the cluster where the resource group or resource resides.

The effects of changes to the states of Oracle Solaris Cluster resources on Oracle database components are explained in the subsections that follow:

- [“Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances” on page 140](#)

- “Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 9i RAC Database Instances” on page 142

Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 10g Release 2, 11g, or 12c RAC Database Instances

In Oracle 10g, 11g, or 12c, Oracle Clusterware manages the startup and shutdown of Oracle database instances, listeners, and other components that are configured in the Oracle Clusterware. Oracle Clusterware is a mandatory component of Oracle 10g, 11g, or 12c. Oracle Clusterware also monitors components that are started by Oracle Clusterware and, if failures are detected, perform actions to recover from failures.

Because Oracle Clusterware manages the startup and shutdown of Oracle database components, these components cannot be stopped and started exclusively under the control of the Oracle Solaris Cluster RGM. Instead, Oracle Clusterware and the RGM interoperate so that when Oracle RAC database instances are started and stopped by Oracle Clusterware, the state of the database instances is propagated to Oracle Solaris Cluster resources.

The following table describes the state changes that occur between Oracle Solaris Cluster resources and Oracle Clusterware resources.

TABLE 5-2 Propagation of State Changes Between Oracle Solaris Cluster Resources and Oracle Clusterware Resources

Trigger	Initial State		Resulting State	
	Oracle Solaris Cluster Resource	Oracle Clusterware Resource	Oracle Solaris Cluster Resource	Oracle Clusterware Resource
Oracle Solaris Cluster command to take offline a resource	Enabled and online	Enabled and online	Enabled and offline	Enabled and offline
Oracle Clusterware command to stop a resource	Enabled and online	Enabled and online	Enabled and offline	Enabled and offline
Oracle Solaris Cluster command to bring online a resource	Enabled and offline	Enabled and offline	Enabled and online	Enabled and online
Oracle Clusterware command to start a resource	Enabled and offline	Enabled and offline	Enabled and online	Enabled and online

TABLE 5-2 Propagation of State Changes Between Oracle Solaris Cluster Resources and Oracle Clusterware Resources *(Continued)*

Trigger	Initial State		Resulting State	
	Oracle Solaris Cluster Resource	Oracle Clusterware Resource	Oracle Solaris Cluster Resource	Oracle Clusterware Resource
Oracle Solaris Cluster command to disable a resource	Enabled and online	Enabled and online	Disabled and offline	Disabled and offline
Oracle Clusterware command to disable a resource	Enabled and online	Enabled and online	Enabled and online	Disabled and online
Oracle SQLPLUS command to shut down the database	Enabled and online	Enabled and online	Enabled and offline	Enabled and offline
Oracle Solaris Cluster command to enable a resource	Disabled and offline	Disabled and offline	Enabled and online or offline	Enabled and online or offline
Oracle Clusterware command to enable a resource	Disabled and offline	Disabled and offline	Disabled and offline	Enabled and offline

The names of the states of Oracle Solaris Cluster resources and Oracle Clusterware resources are identical. However, the meaning of each state name is different for Oracle Solaris Cluster resources and Oracle Clusterware resources. For more information, see the following table.

TABLE 5-3 Comparisons of States for Oracle Solaris Cluster Resources and Oracle Clusterware Resources

State	Meaning for Oracle Solaris Cluster Resources	Meaning for Oracle Clusterware Resources
Enabled	The resource is available to the Oracle Solaris Cluster RGM for automatic startup, failover, or restart. A resource that is enabled can also be in either the online state or the offline state.	The resource is available to run under Oracle Clusterware for automatic startup, failover, or restart. A resource that is enabled can also be in either the online state or the offline state.
Disabled	The resource is unavailable to the Oracle Solaris Cluster RGM for automatic startup, failover, or restart. A resource that is disabled is also offline.	The resource is unavailable to run under the Oracle Clusterware for automatic startup, failover, or restart. A resource that is disabled can also be in either the online state or the offline state.
Online	The resource is running and providing service.	The resource is running and providing service. A resource that is online must also be enabled.

TABLE 5-3 Comparisons of States for Oracle Solaris Cluster Resources and Oracle Clusterware Resources
(Continued)

State	Meaning for Oracle Solaris Cluster Resources	Meaning for Oracle Clusterware Resources
Offline	The resource is stopped and not providing service.	The resource is stopped and not providing service. A resource that is offline can also be in either the disabled state or the enabled state.

For detailed information about the state of Oracle Solaris Cluster resources, see “[Resource and Resource Group States and Settings](#)” in *Oracle Solaris Cluster Concepts Guide*.

For detailed information about the state of Oracle Clusterware resources, see your Oracle documentation.

Effects of State Changes to Oracle Solaris Cluster Resources for Oracle 9i RAC Database Instances

In Oracle 9i, Oracle database components can be stopped and started exclusively under the control of the Oracle Solaris Cluster RGM. The effects of state changes to Oracle Solaris Cluster resources for Oracle 9i RAC database instances are as follows:

- Bringing online a resource for an Oracle 9i RAC database component starts the component on the nodes where the resource is brought online.
- Taking offline a resource for an Oracle 9i RAC database component stops the component on the nodes where the resource is taken offline.

Tuning Support for Oracle RAC

To tune the Support for Oracle RAC data service, you modify the extension properties of the resources for this data service. For details about these extension properties, see [Appendix C, “Support for Oracle RAC Extension Properties.”](#) Typically, you use the option `-p property=value` of the `clresource(1CL)` command to set extension properties of Support for Oracle RAC resources. You can also use the procedures in [Chapter 2, “Administering Data Service Resources,”](#) in *Oracle Solaris Cluster Data Services Planning and Administration Guide* to configure the resources later.

This section contains the following information about tuning the Support for Oracle RAC data service:

- “[Guidelines for Setting Timeouts](#)” on page 143
- “[SPARC: Guidelines for Setting the Communications Port Range for the UDLM](#)” on page 144
- “[How to Modify an Extension Property That Is Tunable Only When a Resource Is Disabled](#)” on page 145

Guidelines for Setting Timeouts

Many of the extension properties for Support for Oracle RAC 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 timeout properties to accommodate your cluster configuration.

This section describes the following timeouts:

- [“SPARC: VxVM Component Reconfiguration Step 4 Timeout” on page 143](#)
- [“Reservation Step Timeout” on page 143](#)

SPARC: VxVM Component Reconfiguration Step 4 Timeout

The time that is required for step 4 of a reconfiguration of the VxVM component of Support for Oracle RAC 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 [“SPARC: SUNW.rac_cvm Extension Properties” on page 269](#).

EXAMPLE 5-1 Setting the VxVM Component Reconfiguration Step 4 Timeout

```
# clresource set -p cvm_step4_timeout=1200 rac-cvm-rs
```

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-rs`.

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 Support for Oracle RAC 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 `SUNW.rac_framework` resource.

For more information, see [“SUNW.rac_framework Extension Properties” on page 272](#).

EXAMPLE 5-2 Setting the Reservation Step Timeout

```
# clresource set -p reservation_timeout=350 rac-framework-rs
```

This example sets the timeout for the reservation step of a reconfiguration of Support for Oracle RAC to 350 seconds. This example assumes that Oracle RAC framework component is represented by an instance of the `SUNW.rac_framework` resource type that is named `rac-framework-rs`.

SPARC: Guidelines for Setting the Communications Port Range for the UDLM

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

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

For more information, see [“SPARC: SUNW.rac_udlm Extension Properties” on page 274](#).

EXAMPLE 5-3 Setting the Communications Port Number for the UDLM

```
# clresource set -p port=7000 rac-udlm-rs
```

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

- The UDLM component is represented by an instance of the `SUNW.rac_udlm` resource type that is named `rac-udlm-rs`.
- 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 145](#).

▼ 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:

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

1 Disable each resource that the Oracle RAC framework resource group contains and bring the Oracle 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 Oracle RAC framework resource group contains. The other resources in the Oracle 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 *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

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

3 Use the `clresource` command to set the property to its new value.

```
# clresource set -p property=value resource
```

property Specifies the name of the property that you are changing.

value The new value of the property.

resource Specifies the name of the resource for which you are modifying an extension property. If this resource was created by using the `clsetup` utility, the name depends on the resource type, as shown in “[Automatically Generated Names for Oracle Solaris Cluster Objects](#)” on page 138.

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

```
# clresourcegroup online resource-group
```

resource-group Specifies the name of the Oracle 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 `clsetup` utility, the name of the resource group is `rac-framework-rg`.

Tuning the Support for Oracle RAC Fault Monitors

Fault monitoring for the Support for Oracle RAC data service is provided by fault monitors for the following resources:

- Scalable device group resource
- Scalable file-system mount-point resource
- Oracle 9i RAC server resource
- Oracle 9i RAC listener resource

Each fault monitor is contained in a resource whose resource type is shown in the following table.

TABLE 5-4 Resource Types for Support for Oracle RAC Fault Monitors

Fault Monitor	Resource Type
Scalable device group	SUNW.ScalDeviceGroup
Scalable file-system mount point	SUNW.ScalMountPoint
Oracle 9i RAC server	SUNW.scalable_rac_server
Oracle 9iRAC listener	SUNW.scalable_rac_listener

System properties and extension properties of these resources control the behavior of the fault monitors. The default values of these properties determine the preset behavior of the fault monitors. The preset behavior should be suitable for most Oracle Solaris Cluster installations. Therefore, you should tune the Support for Oracle RAC fault monitors *only* if you need to modify this preset behavior.

Tuning the Support for Oracle RAC fault monitors involves the following tasks:

- Setting the interval between fault monitor probes
- Setting the timeout for fault monitor probes
- Defining the criteria for persistent faults
- Specifying the failover behavior of a resource

For more information, see “[Tuning Fault Monitors for Oracle Solaris Cluster Data Services](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*. Information about the Support for Oracle RAC fault monitors that you need to perform these tasks is provided in the subsections that follow:

- “[Operation of the Fault Monitor for a Scalable Device Group](#)” on page 147
- “[Operation of the Fault Monitor for Scalable File-System Mount Points](#)” on page 147
- “[Operation of the Oracle 9i RAC Server Fault Monitor](#)” on page 148
- “[Operation of the Oracle 9i RAC Listener Fault Monitor](#)” on page 150
- “[Obtaining Core Files for Troubleshooting DBMS Timeouts](#)” on page 150

Operation of the Fault Monitor for a Scalable Device Group

By default, the fault monitor monitors all logical volumes in the device group that the resource represents. If you require only a subset of the logical volumes in a device group to be monitored, set the `LogicalDeviceList` extension property.

The status of the device group is derived from the statuses of the individual logical volumes that are monitored. If all monitored logical volumes are healthy, the device group is healthy. If any monitored logical volume is faulty, the device group is faulty. If a device group is discovered to be faulty, monitoring of the resource that represents the group is stopped and the resource is put into the disabled state.

The status of an individual logical volume is obtained by querying the volume's volume manager. If the status of a Solaris Volume Manager for Sun Cluster volume cannot be determined from a query, the fault monitor performs file input/output (I/O) operations to determine the status.

Note – For mirrored disks, if one submirror is faulty, the device group is still considered to be healthy.

If reconfiguration of userland cluster membership causes an I/O error, the monitoring of device group resources by fault monitors is suspended while userland cluster membership monitor (UCMM) reconfigurations are in progress.

Operation of the Fault Monitor for Scalable File-System Mount Points

To determine if the mounted file system is available, the fault monitor performs I/O operations such as opening, reading, and writing to a test file on the file system. If an I/O operation is not completed within the timeout period, the fault monitor reports an error. To specify the timeout for I/O operations, set the `IOTimeout` extension property.

The response to an error depends on the type of the file system, as follows:

- If the file system is an NFS file system on a qualified NAS device, the response is as follows:
 - Monitoring of the resource is stopped on the current node.
 - The resource is placed into the disabled state on the current node, causing the file system to be unmounted from that node.
- If the file system is a Sun QFS shared file system, the response is as follows:
 - If the node on which the error occurred is hosting the metadata server resource, the metadata server resource is failed over to another node.

- The file system is unmounted.

If the failover attempt fails, the file system remains unmounted and a warning is given.

Operation of the Oracle 9i RAC Server Fault Monitor

The fault monitor for the Oracle 9i RAC server uses a request to the server to query the health of the server.

The server fault monitor is started through `pmfadm` to make the monitor highly available. If the monitor is killed for any reason, the Process Monitor Facility (PMF) automatically restarts the monitor.

The server fault monitor consists of the following processes.

- A main fault monitor process
- A database client fault probe

This section contains the following information about the server fault monitor:

- [“Operation of the Main Fault Monitor” on page 148](#)
- [“Operation of the Database Client Fault Probe” on page 148](#)
- [“Actions by the Server Fault Monitor in Response to a Database Transaction Failure” on page 149](#)
- [“Scanning of Logged Alerts by the Server Fault Monitor” on page 150](#)

Operation of the Main Fault Monitor

The main fault monitor determines that an operation is successful if the database is online and no errors are returned during the transaction.

Operation of the Database Client Fault Probe

The database client fault probe performs the following operations:

1. Monitoring the partition for archived redo logs. See [“Operations to Monitor the Partition for Archived Redo Logs” on page 149](#).
2. If the partition is healthy, determining whether the database is operational. See [“Operations to Determine Whether the Database is Operational” on page 149](#).

The probe uses the timeout value that is set in the resource property `Probe_timeout` to determine how much time to allocate to successfully probe Oracle.

Operations to Monitor the Partition for Archived Redo Logs

The database client fault probe queries the dynamic performance view `v$archive_dest` to determine all possible destinations for archived redo logs. For every active destination, the probe determines whether the destination is healthy and has sufficient free space for storing archived redo logs.

- If the destination is healthy, the probe determines the amount of free space in the destination's file system. If the amount of free space is less than 10% of the file system's capacity and is less than 20 Mbytes, the probe prints a message to `syslog`.
- If the destination is in `ERROR` status, the probe prints a message to `syslog` and disables operations to determine whether the database is operational. The operations remain disabled until the error condition is cleared.

Operations to Determine Whether the Database is Operational

If the partition for archived redo logs is healthy, the database client fault probe queries the dynamic performance view `v$sysstat` to obtain database performance statistics. Changes to these statistics indicate that the database is operational. If these statistics remain unchanged between consecutive queries, the fault probe performs database transactions to determine if the database is operational. These transactions involve the creation, updating, and dropping of a table in the user table space.

The database client fault probe performs all its transactions as the Oracle user. The ID of this user is specified during the preparation of the nodes or zones as explained in [“How to Create the DBA Group and the DBA User Accounts” on page 31](#).

Actions by the Server Fault Monitor in Response to a Database Transaction Failure

If a database transaction fails, the server fault monitor performs an action that is determined by the error that caused the failure. To change the action that the server fault monitor performs, customize the server fault monitor as explained in [“Customizing the Oracle 9i RAC Server Fault Monitor” on page 151](#).

If the action requires an external program to be run, the program is run as a separate process in the background.

Possible actions are as follows:

- **Ignore.** The server fault monitor ignores the error.
- **Stop monitoring.** The server fault monitor is stopped without shutting down the database.
- **Restart.** The server fault monitor stops and restarts the Oracle 9i RAC server resource.

Scanning of Logged Alerts by the Server Fault Monitor

The Oracle software logs alerts in an alert log file. The absolute path of this file is specified by the `alert_log_file` extension property of the `SUNW.scalable_rac_server` resource. The server fault monitor scans the alert log file for new alerts at the following times:

- When the server fault monitor is started
- Each time that the server fault monitor queries the health of the server

If an action is defined for a logged alert that the server fault monitor detects, the server fault monitor performs the action in response to the alert.

Preset actions for logged alerts are listed in [Table B–2](#). To change the action that the server fault monitor performs, customize the server fault monitor as explained in “[Customizing the Oracle 9i RAC Server Fault Monitor](#)” on page 151.

Operation of the Oracle 9i RAC Listener Fault Monitor

The Oracle 9i RAC listener fault monitor checks the status of an Oracle listener.

If the listener is running, the Oracle 9i RAC listener fault monitor considers a probe successful. If the fault monitor detects an error, the listener is restarted.

Note – The listener resource does not provide a mechanism for setting the listener password. If Oracle listener security is enabled, a probe by the listener fault monitor might return Oracle error TNS-01169. Because the listener is able to respond, the listener fault monitor treats the probe as a success. This action does not cause a failure of the listener to remain undetected. A failure of the listener returns a different error, or causes the probe to time out.

The listener probe is started through `pmfadm` to make the probe highly available. If the probe is killed, PMF automatically restarts the probe.

If a problem occurs with the listener during a probe, the probe tries to restart the listener. The value that is set for the resource property `retry_count` determines the maximum number of times that the probe attempts the restart. If, after trying for the maximum number of times, the probe is still unsuccessful, the probe stops the fault monitor.

Obtaining Core Files for Troubleshooting DBMS Timeouts

To facilitate troubleshooting of unexplained DBMS timeouts, you can enable the fault monitor to create a core file when a probe timeout occurs. The contents of the core file relate to the fault

monitor process. The fault monitor creates the core file in the / directory. To enable the fault monitor to create a core file, use the `coreadm` command to enable set-id core dumps. For more information, see the [coreadm\(1M\)](#) man page.

Customizing the Oracle 9i RAC Server Fault Monitor

Customizing the Oracle 9i RAC server fault monitor enables you to modify the behavior of the server fault monitor as follows:

- Overriding the preset action for an error
- Specifying an action for an error for which no action is preset



Caution – Before you customize the Oracle 9i RAC server fault monitor, consider the effects of your customizations, especially if you change an action from restart or switch over to ignore or stop monitoring. If errors remain uncorrected for long periods, the errors might cause problems with the database. If you encounter problems with the database after customizing the Oracle 9i RAC server fault monitor, revert to using the preset actions. Reverting to the preset actions enables you to determine if the problem is caused by your customizations.

Customizing the Oracle 9i RAC server fault monitor involves the following activities:

1. [Defining custom behavior for errors](#)
2. [Propagating a custom action file to all nodes in a cluster](#)
3. [Specifying the custom action file that a server fault monitor should use](#)

Defining Custom Behavior for Errors

The Oracle 9i RAC server fault monitor detects the following types of errors:

- DBMS errors that occur during a probe of the database by the server fault monitor
- Alerts that Oracle logs in the alert log file
- Timeouts that result from a failure to receive a response within the time that is set by the `Probe_timeout` extension property

To define custom behavior for these types of errors, create a custom action file. This section contains the following information about custom action files:

- [“Custom Action File Format” on page 152](#)
- [“Changing the Response to a DBMS Error” on page 154](#)
- [“Changing the Response to Logged Alerts” on page 156](#)
- [“Changing the Maximum Number of Consecutive Timed-Out Probes” on page 157](#)

Custom Action File Format

A custom action file is a plain text file. The file contains one or more entries that define the custom behavior of the Oracle 9i RAC server fault monitor. Each entry defines the custom behavior for a single DBMS error, a single timeout error, or several logged alerts. A maximum of 1024 entries is allowed in a custom action file.

Note – Each entry in a custom action file overrides the preset action for an error, or specifies an action for an error for which no action is preset. Create entries in a custom action file *only* for the preset actions that you are overriding or for errors for which no action is preset. Do *not* create entries for actions that you are not changing.

An entry in a custom action file consists of a sequence of keyword-value pairs that are separated by semicolons. Each entry is enclosed in braces.

The format of an entry in a custom action file is as follows:

```
{  
[ERROR_TYPE=DBMS_ERROR|SCAN_LOG|TIMEOUT_ERROR;]  
ERROR=error-spec;  
[ACTION=RESTART|STOP|NONE;]  
[CONNECTION_STATE=co|di|on|*;]  
[NEW_STATE=co|di|on|*;]  
[MESSAGE="message-string"]  
}
```

White space may be used between separated keyword-value pairs and between entries to format the file.

The meaning and permitted values of the keywords in a custom action file are as follows:

ERROR_TYPE

Indicates the type of the error that the server fault monitor has detected. The following values are permitted for this keyword:

DBMS_ERROR	Specifies that the error is a DBMS error.
SCAN_LOG	Specifies that the error is an alert that is logged in the alert log file.
TIMEOUT_ERROR	Specifies that the error is a timeout.

The ERROR_TYPE keyword is optional. If you omit this keyword, the error is assumed to be a DBMS error.

ERROR

Identifies the error. The data type and the meaning of *error-spec* are determined by the value of the ERROR_TYPE keyword as shown in the following table.

ERROR_TYPE	Data Type	Meaning
DBMS_ERROR	Integer	The error number of a DBMS error that is generated by Oracle
SCAN_LOG	Quoted regular expression	A string in an error message that Oracle has logged to the Oracle alert log file
TIMEOUT_ERROR	Integer	The number of consecutive timed-out probes since the server fault monitor was last started or restarted

You must specify the **ERROR** keyword. If you omit this keyword, the entry in the custom action file is ignored.

ACTION

Specifies the action that the server fault monitor is to perform in response to the error. The following values are permitted for this keyword:

- NONE** Specifies that the server fault monitor ignores the error.
- STOP** Specifies that the server fault monitor is stopped.
- RESTART** Specifies that the server fault monitor stops and restarts the Oracle 9i RAC server resource.

The **ACTION** keyword is optional. If you omit this keyword, the server fault monitor ignores the error.

CONNECTION_STATE

Specifies the required state of the connection between the database and the server fault monitor when the error is detected. The entry applies only if the connection is in the required state when the error is detected. The following values are permitted for this keyword:

- *** Specifies that the entry always applies, regardless of the state of the connection.
- co** Specifies that the entry applies only if the server fault monitor is attempting to connect to the database.
- on** Specifies that the entry applies only if the server fault monitor is online. The server fault monitor is online if it is connected to the database.
- di** Specifies that the entry applies only if the server fault monitor is disconnecting from the database.

The **CONNECTION_STATE** keyword is optional. If you omit this keyword, the entry always applies, regardless of the state of the connection.

NEW_STATE

Specifies the state of the connection between the database and the server fault monitor that the server fault monitor must attain after the error is detected. The following values are permitted for this keyword:

- * Specifies that the state of the connection must remain unchanged.
- co Specifies that the server fault monitor must disconnect from the database and reconnect immediately to the database.
- di Specifies that the server fault monitor must disconnect from the database. The server fault monitor reconnects when it next probes the database.

The **NEW_STATE** keyword is optional. If you omit this keyword, the state of the database connection remains unchanged after the error is detected.

MESSAGE

Specifies an additional message that is printed to the resource's log file when this error is detected. The message must be enclosed in double quotes. This message is additional to the standard message that is defined for the error.

The **MESSAGE** keyword is optional. If you omit this keyword, no additional message is printed to the resource's log file when this error is detected.

Changing the Response to a DBMS Error

The action that the server fault monitor performs in response to each DBMS error is preset as listed in [Table B-1](#). To determine whether you need to change the response to a DBMS error, consider the effect of DBMS errors on your database to determine if the preset actions are appropriate. For examples, see the subsections that follow:

- [“Responding to an Error Whose Effects Are Major” on page 154](#)
- [“Ignoring an Error Whose Effects Are Minor” on page 155](#)

To change the response to a DBMS error, create an entry in a custom action file in which the keywords are set as follows:

- **ERROR_TYPE** is set to **DBMS_ERROR**.
- **ERROR** is set to the error number of the DBMS error.
- **ACTION** is set to the action that you require.

Responding to an Error Whose Effects Are Major

If an error that the server fault monitor ignores affects more than one session, action by the server fault monitor might be required to prevent a loss of service.

For example, no action is preset for Oracle error 4031: unable to allocate *num-bytes* bytes of shared memory. However, this Oracle error indicates that the shared global area (SGA) has

insufficient memory, is badly fragmented, or both states apply. If this error affects only a single session, ignoring the error might be appropriate. However, if this error affects more than one session, consider specifying that the server fault monitor restart the database.

The following example shows an entry in a custom action file for changing the response to a DBMS error to restart.

EXAMPLE 5-4 Changing the Response to a DBMS Error to Restart

```
{
ERROR_TYPE=DBMS_ERROR;
ERROR=4031;
ACTION=restart;
CONNECTION_STATE=*;
NEW_STATE=*;
MESSAGE="Insufficient memory in shared pool.";
}
```

This example shows an entry in a custom action file that overrides the preset action for DBMS error 4031. This entry specifies the following behavior:

- In response to DBMS error 4031, the action that the server fault monitor performs is restart.
- This entry applies regardless of the state of the connection between the database and the server fault monitor when the error is detected.
- The state of the connection between the database and the server fault monitor must remain unchanged after the error is detected.
- The following message is printed to the resource's log file when this error is detected:
 Insufficient memory in shared pool.

Ignoring an Error Whose Effects Are Minor

If the effects of an error to which the server fault monitor responds are minor, ignoring the error might be less disruptive than responding to the error.

For example, the preset action for Oracle error 4030: out of process memory when trying to allocate *num-bytes* bytes is restart. This Oracle error indicates that the server fault monitor could not allocate private heap memory. One possible cause of this error is that insufficient memory is available to the operating system. If this error affects more than one session, restarting the database might be appropriate. However, this error might not affect other sessions because these sessions do not require further private memory. In this situation, consider specifying that the server fault monitor ignore the error.

The following example shows an entry in a custom action file for ignoring a DBMS error.

EXAMPLE 5-5 Ignoring a DBMS Error

```
{
ERROR_TYPE=DBMS_ERROR;
ERROR=4030;
```

EXAMPLE 5-5 Ignoring a DBMS Error *(Continued)*

```
ACTION=none;  
CONNECTION_STATE=*;  
NEW_STATE=*;  
MESSAGE="";  
}
```

This example shows an entry in a custom action file that overrides the preset action for DBMS error 4030. This entry specifies the following behavior:

- The server fault monitor ignores DBMS error 4030.
- This entry applies regardless of the state of the connection between the database and the server fault monitor when the error is detected.
- The state of the connection between the database and the server fault monitor must remain unchanged after the error is detected.
- No additional message is printed to the resource's log file when this error is detected.

Changing the Response to Logged Alerts

The Oracle software logs alerts in a file that is identified by the `alert_log_file` extension property. The server fault monitor scans this file and performs actions in response to alerts for which an action is defined.

Logged alerts for which an action is preset are listed in [Table B-2](#). Change the response to logged alerts to change the preset action, or to define new alerts to which the server fault monitor responds.

To change the response to logged alerts, create an entry in a custom action file in which the keywords are set as follows:

- `ERROR_TYPE` is set to `SCAN_LOG`.
- `ERROR` is set to a quoted regular expression that identifies a string in an error message that Oracle has logged to the Oracle alert log file.
- `ACTION` is set to the action that you require.

The server fault monitor processes the entries in a custom action file in the order in which the entries occur. Only the first entry that matches a logged alert is processed. Later entries that match are ignored. If you are using regular expressions to specify actions for several logged alerts, ensure that more specific entries occur before more general entries. Specific entries that occur after general entries might be ignored.

For example, a custom action file might define different actions for errors that are identified by the regular expressions `ORA-65` and `ORA-6`. To ensure that the entry that contains the regular expression `ORA-65` is not ignored, ensure that this entry occurs before the entry that contains the regular expression `ORA-6`.

The following example shows an entry in a custom action file for changing the response to a logged alert.

EXAMPLE 5-6 Changing the Response to a Logged Alert

```
{
ERROR_TYPE=SCAN_LOG;
ERROR="ORA-00600: internal error";
ACTION=RESTART;
}
```

This example shows an entry in a custom action file that overrides the preset action for logged alerts about internal errors. This entry specifies the following behavior:

- In response to logged alerts that contain the text `ORA-00600: internal error`, the action that the server fault monitor performs is restart.
- This entry applies regardless of the state of the connection between the database and the server fault monitor when the error is detected.
- The state of the connection between the database and the server fault monitor must remain unchanged after the error is detected.
- No additional message is printed to the resource's log file when this error is detected.

Changing the Maximum Number of Consecutive Timed-Out Probes

By default, the server fault monitor restarts the database after the second consecutive timed-out probe. If the database is lightly loaded, two consecutive timed-out probes should be sufficient to indicate that the database is hanging. However, during periods of heavy load, a server fault monitor probe might time out even if the database is functioning correctly. To prevent the server fault monitor from restarting the database unnecessarily, increase the maximum number of consecutive timed-out probes.



Caution – Increasing the maximum number of consecutive timed-out probes increases the time that is required to detect that the database is hanging.

To change the maximum number of consecutive timed-out probes allowed, create one entry in a custom action file for each consecutive timed-out probe that is allowed *except* the first timed-out probe.

Note – You are not required to create an entry for the first timed-out probe. The action that the server fault monitor performs in response to the first timed-out probe is preset.

For the last allowed timed-out probe, create an entry in which the keywords are set as follows:

- `ERROR_TYPE` is set to `TIMEOUT_ERROR`.

- ERROR is set to the maximum number of consecutive timed-out probes that are allowed.
- ACTION is set to RESTART.

For each remaining consecutive timed-out probe except the first timed-out probe, create an entry in which the keywords are set as follows:

- ERROR_TYPE is set to TIMEOUT_ERROR.
- ERROR is set to the sequence number of the timed-out probe. For example, for the second consecutive timed-out probe, set this keyword to 2. For the third consecutive timed-out probe, set this keyword to 3.
- ACTION is set to NONE.

Tip – To facilitate debugging, specify a message that indicates the sequence number of the timed-out probe.

The following example shows the entries in a custom action file for increasing the maximum number of consecutive timed-out probes to five.

EXAMPLE 5-7 Changing the Maximum Number of Consecutive Timed-Out Probes

```
{
ERROR_TYPE=TIMEOUT;
ERROR=2;
ACTION=NONE;
CONNECTION_STATE=*;
NEW_STATE=*;
MESSAGE="Timeout #2 has occurred.";
}

{
ERROR_TYPE=TIMEOUT;
ERROR=3;
ACTION=NONE;
CONNECTION_STATE=*;
NEW_STATE=*;
MESSAGE="Timeout #3 has occurred.";
}

{
ERROR_TYPE=TIMEOUT;
ERROR=4;
ACTION=NONE;
CONNECTION_STATE=*;
NEW_STATE=*;
MESSAGE="Timeout #4 has occurred.";
}

{
ERROR_TYPE=TIMEOUT;
ERROR=5;
ACTION=RESTART;
```

EXAMPLE 5-7 Changing the Maximum Number of Consecutive Timed-Out Probes (Continued)

```

CONNECTION_STATE=*;
NEW_STATE=*;
MESSAGE="Timeout #5 has occurred. Restarting.";
}

```

This example shows the entries in a custom action file for increasing the maximum number of consecutive timed-out probes to five. These entries specify the following behavior:

- The server fault monitor ignores the second consecutive timed-out probe through the fourth consecutive timed-out probe.
- In response to the fifth consecutive timed-out probe, the action that the server fault monitor performs is restart.
- The entries apply regardless of the state of the connection between the database and the server fault monitor when the timeout occurs.
- The state of the connection between the database and the server fault monitor must remain unchanged after the timeout occurs.
- When the second consecutive timed-out probe through the fourth consecutive timed-out probe occurs, a message of the following form is printed to the resource's log file:

```
Timeout #number has occurred.
```

- When the fifth consecutive timed-out probe occurs, the following message is printed to the resource's log file:

```
Timeout #5 has occurred. Restarting.
```

Propagating a Custom Action File to All Nodes in a Cluster

A server fault monitor must behave consistently on all cluster nodes. Therefore, the custom action file that the server fault monitor uses must be identical on all cluster nodes. After creating or modifying a custom action file, ensure that this file is identical on all cluster nodes by propagating the file to all cluster nodes. To propagate the file to all cluster nodes, use the method that is most appropriate for your cluster configuration:

- Locating the file on a file system that all nodes share
- Locating the file on a highly available local file system
- Copying the file to the local file system of each cluster node by using operating system commands such as the `rcp(1)` command or the `rdist(1)` command

Specifying the Custom Action File That a Server Fault Monitor Should Use

To apply customized actions to a server fault monitor, you must specify the custom action file that the fault monitor should use. Customized actions are applied to a server fault monitor when the server fault monitor reads a custom action file. A server fault monitor reads a custom action file when the you specify the file.

Specifying a custom action file also validates the file. If the file contains syntax errors, an error message is displayed. Therefore, after modifying a custom action file, specify the file again to validate the file.



Caution – If syntax errors in a modified custom action file are detected, correct the errors before the fault monitor is restarted. If the syntax errors remain uncorrected when the fault monitor is restarted, the fault monitor reads the erroneous file, ignoring entries that occur after the first syntax error.

▼ How to Specify the Custom Action File That a Server Fault Monitor Should Use

- 1 On a cluster node, become superuser or assume a role that provides `solaris.cluster.modify RBAC` authorization.

- 2 Set the `Custom_action_file` extension property of the `SUNW.scalable_rac_server` resource. Set this property to the absolute path of the custom action file.

```
# clresource set -p custom_action_file=filepath server-resource
```

```
-p custom_action_file=filepath
```

Specifies the absolute path of the custom action file.

```
server-resource
```

Specifies the `SUNW.scalable_rac_server` resource.

Troubleshooting Support for Oracle RAC

If you encounter a problem with Support for Oracle RAC, troubleshoot the problem by using the techniques that are described in the following sections.

- “Verifying the Status of Support for Oracle RAC” on page 161
- “Sources of Diagnostic Information” on page 171
- “Common Problems and Their Solutions” on page 172

Verifying the Status of Support for Oracle RAC

The status of resource groups and resources for Support for Oracle RAC indicates the status of Oracle RAC in your cluster. Use Oracle Solaris Cluster maintenance commands to obtain this status information.

- To obtain status information for resource groups, use the `clresourcegroup(1CL)` command.
- To obtain status information for resources, use the `clresource(1CL)` command.

▼ How to Verify the Status of Support for Oracle RAC

- 1 Become superuser or assume a role that provides `solaris.cluster.read` RBAC authorization.
- 2 Display status information for the Oracle Solaris Cluster objects in which you are interested.

For example:

- To display status information for all resource groups in your cluster, type the following command:
- ```
clresourcegroup status +
```

- **To display status information for all resources in a resource group, type the following command:**  

```
clresource status -g resource-group + resource-group
```

 Specifies the resource group that contains the resources whose status information you are displaying.

**See Also** For information about options that you can specify to filter the status information that is displayed, see the following man pages:

- [clresource\(1CL\)](#)
- [clresourcegroup\(1CL\)](#)

## Examples of the Status of Support for Oracle RAC

The following examples show the status of resource groups and resources for a configuration of Support for Oracle RAC on a four-node cluster. Each node is a machine that uses the SPARC processor.

The cluster in this example is running version 10g Release 2, 11g, or 12c of Oracle RAC. The configuration in this example uses a Sun QFS shared file system on Solaris Volume Manager for Sun Cluster to store Oracle files. The configuration includes a multiple-owner volume-manager framework resource group to contain the volume manager resource.

The resource groups and resources for this configuration are shown in the following table.

| Resource Group     | Purpose                                                | Resource Group Contents |                        |
|--------------------|--------------------------------------------------------|-------------------------|------------------------|
|                    |                                                        | Resource Type           | Resource Instance Name |
| rac-framework-rg   | Oracle RAC framework resource group                    | SUNW.rac_framework      | rac-framework-rs       |
|                    |                                                        | SUNW.rac_udlm           | rac-udlm-rs            |
|                    |                                                        | SUNW.crs_framework      | crs_framework-rs       |
| vucmm-framework-rg | multiple-owner volume-manager framework resource group | SUNW.vucmm_framework    | vucmm-framework-rs     |
|                    |                                                        | SUNW.vucmm_svm          | vucmm-svm-rs           |
| scaldg-rg          | Resource group for scalable device-group resources     | SUNW.ScalDeviceGroup    | scaloradg-rs           |

| Resource Group      | Purpose                                                       | Resource Group Contents        |                                                  |
|---------------------|---------------------------------------------------------------|--------------------------------|--------------------------------------------------|
|                     |                                                               | Resource Type                  | Resource Instance Name                           |
| qfsmnds-rg          | Resource group for Sun QFS metadata server resources          | SUNW.qfs                       | qfs-db_qfs-OraHome-rs<br>qfs-db_qfs-OraData-rs   |
| scalmnt-rg          | Resource group for scalable file-system mount-point resources | SUNW.ScalMountPoint            | scal-db_qfs-OraHome-rs<br>scal-db_qfs-OraData-rs |
| rac_server_proxy-rg | Oracle RAC database resource group                            | SUNW.scalable_rac_server_proxy | rac_server_proxy-rs                              |

**EXAMPLE 6-1** Status of a Faulty Oracle RAC Framework Resource Group

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

- A reconfiguration error has prevented the `rac_framework` resource from starting on cluster node `pclus1`.
- The effects of this reconfiguration error on resource groups and other resources are as follows:
  - The `rac-framework-rg` resource group is offline and in the start failed state on cluster node `pclus1`.
  - The `rac_udlm` resource, the `rac_svm` resource, and the `crs_framework` resource are offline on cluster node `pclus1`.
  - All other multi-master resource groups and the resources that the groups contain are offline on cluster node `pclus1`.
  - All failover resource groups have failed over from cluster node `pclus1` to a secondary node.
- All multi-master resource groups and the resources that the groups contain are online on the remaining nodes.

```
clresourcegroup status +
```

```
=== Cluster Resource Groups ===
```

```
Group Name Node Name Suspended Status

rac-framework-rg pclus1 No Online faulted
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

vucmm-framework-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
```

**EXAMPLE 6-1** Status of a Faulty Oracle RAC Framework Resource Group *(Continued)*

```

 pclus4 No Online
scaldg-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online
qfsmds-rg pclus1 No Offline
 pclus2 No Online
 pclus3 No Offline
 pclus4 No Offline
scalmnt-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online
rac_server_proxy-rg pclus1 No Pending online blocked
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

clresource status -g rac-framework-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

rac-framework-rs pclus1 Start failed Faulted - Error in previous reconfiguration.
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

rac-udlm-rs pclus1 Offline Offline
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

crs_framework-rs pclus1 Offline Offline
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

clresource status -g vucmm-framework-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

vucmm-framework-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

vucmm-svm-rs pclus1 Offline Offline
 pclus2 Online Online

```

**EXAMPLE 6-1** Status of a Faulty Oracle RAC Framework Resource Group (Continued)

```

pclus3 Online Online
pclus4 Online Online

clresource status -g scaldg-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

scalordg-rs pclus1 Online Online - Diskgroup online
 pclus2 Online Online - Diskgroup online
 pclus3 Online Online - Diskgroup online
 pclus4 Online Online - Diskgroup online

clresource status -g qfsmnds-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

qfs-db_qfs-OraHome-rs pclus1 Offline Offline
 pclus2 Online Online - Service is online.
 pclus3 Offline Offline
 pclus4 Offline Offline

qfs-db_qfs-OraData-rs pclus1 Offline Offline
 pclus2 Online Online - Service is online.
 pclus3 Offline Offline
 pclus4 Offline Offline

clresource status -g scalmnt-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

scal-db_qfs-OraHome-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

scal-db_qfs-OraData-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

clresource status -g rac_server_proxy-rg +

=== Cluster Resources ===

Resource Name Node Name State Status Message

rac_server_proxy-rs pclus1 Offline Offline
 pclus2 Online Online - Oracle instance UP
 pclus3 Online Online - Oracle instance UP
 pclus4 Online Online - Oracle instance UP

```

**EXAMPLE 6-2** Status of a Faulty Oracle RAC Database Resource Group

This example provides the following status information for an Oracle RAC database resource group that is faulty:

- The Oracle RAC database on `pclus1` has failed to start. The effects of this failure are as follows:
  - The `rac_server_proxy-rg` resource group is online, but faulted on node `pclus1`.
  - The `rac_server_proxy-rs` resource is offline on node `pclus1`.
- All other multi-master resource groups and the resources that the groups contain are online on all nodes.
- All failover resource groups and the resources that the groups contain are online on their primary nodes and offline on the remaining nodes.

```
clresourcegroup status +
=== Cluster Resource Groups ===

Group Name Node Name Suspended Status

rac-framework-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

vucmm-framework-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

scaldg-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

qfsmds-rg pclus1 No Online
 pclus2 No Offline
 pclus3 No Offline
 pclus4 No Offline

scalmnt-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

rac_server_proxy-rg pclus1 No Online faulted
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

clresource status -g rac_server_proxy-rg +
=== Cluster Resources ===
```

**EXAMPLE 6-2** Status of a Faulty Oracle RAC Database Resource Group (Continued)

| Resource Name       | Node Name | State   | Status Message                 |
|---------------------|-----------|---------|--------------------------------|
| rac_server_proxy-rs | pclus1    | Offline | Offline - Oracle instance DOWN |
|                     | pclus2    | Online  | Online - Oracle instance UP    |
|                     | pclus3    | Online  | Online - Oracle instance UP    |
|                     | pclus4    | Online  | Online - Oracle instance UP    |

```
clresource status -g rac-framework-rg +
```

```
=== Cluster Resources ===
```

| Resource Name    | Node Name | State  | Status Message |
|------------------|-----------|--------|----------------|
| rac-framework-rs | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |
| rac-udlm-rs      | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |
| crs_framework-rs | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |

```
clresource status -g vucmm-framework-rg +
```

```
=== Cluster Resources ===
```

| Resource Name      | Node Name | State  | Status Message |
|--------------------|-----------|--------|----------------|
| vucmm-framework-rs | pclus1    | Online | Online         |
|                    | pclus2    | Online | Online         |
|                    | pclus3    | Online | Online         |
|                    | pclus4    | Online | Online         |
| vucmm-svm-rs       | pclus1    | Online | Online         |
|                    | pclus2    | Online | Online         |
|                    | pclus3    | Online | Online         |
|                    | pclus4    | Online | Online         |

```
clresource status -g scaldg-rg +
```

```
=== Cluster Resources ===
```

| Resource Name | Node Name | State  | Status Message            |
|---------------|-----------|--------|---------------------------|
| scalordg-rs   | pclus1    | Online | Online - Diskgroup online |
|               | pclus2    | Online | Online - Diskgroup online |
|               | pclus3    | Online | Online - Diskgroup online |
|               | pclus4    | Online | Online - Diskgroup online |

**EXAMPLE 6-2** Status of a Faulty Oracle RAC Database Resource Group (Continued)

```
clresource status -g qfsmds-rg +
```

```
=== Cluster Resources ===
```

| Resource Name         | Node Name | State   | Status Message              |
|-----------------------|-----------|---------|-----------------------------|
| qfs-db_qfs-OraHome-rs | pclus1    | Online  | Online - Service is online. |
|                       | pclus2    | Offline | Offline                     |
|                       | pclus3    | Offline | Offline                     |
|                       | pclus4    | Offline | Offline                     |
| qfs-db_qfs-OraData-rs | pclus1    | Online  | Online - Service is online. |
|                       | pclus2    | Offline | Offline                     |
|                       | pclus3    | Offline | Offline                     |
|                       | pclus4    | Offline | Offline                     |

```
clresource status -g scalmnt-rg +
```

```
=== Cluster Resources ===
```

| Resource Name          | Node Name | State  | Status Message |
|------------------------|-----------|--------|----------------|
| scal-db_qfs-OraHome-rs | pclus1    | Online | Online         |
|                        | pclus2    | Online | Online         |
|                        | pclus3    | Online | Online         |
|                        | pclus4    | Online | Online         |
| scal-db_qfs-OraData-rs | pclus1    | Online | Online         |
|                        | pclus2    | Online | Online         |
|                        | pclus3    | Online | Online         |
|                        | pclus4    | Online | Online         |

**EXAMPLE 6-3** Status of an Operational Oracle RAC Configuration

This example shows the status of an Oracle RAC configuration that is operating correctly. The example indicates that the status of resource groups and resources in this configuration is as follows:

- All multi-master resource groups and the resources that the groups contain are online on all nodes.
- All failover resource groups and the resources that the groups contain are online on their primary nodes and offline on the remaining nodes.

```
clresourcegroup status +
```

```
=== Cluster Resource Groups ===
```

| Group Name       | Node Name | Suspended | Status |
|------------------|-----------|-----------|--------|
| rac-framework-rg | pclus1    | No        | Online |
|                  | pclus2    | No        | Online |
|                  | pclus3    | No        | Online |
|                  | pclus4    | No        | Online |



**EXAMPLE 6-3** Status of an Operational Oracle RAC Configuration (Continued)

```

vucmm-framework-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

scaldg-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

qfsmds-rg pclus1 No Online
 pclus2 No Offline
 pclus3 No Offline
 pclus4 No Offline

scalmt-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

rac_server_proxy-rg pclus1 No Online
 pclus2 No Online
 pclus3 No Online
 pclus4 No Online

```

```
clresource status -g rac-framework-rg +
```

```
=== Cluster Resources ===
```

| Resource Name    | Node Name | State  | Status Message |
|------------------|-----------|--------|----------------|
| -----            | -----     | ----   | -----          |
| rac-framework-rs | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |
| rac-udlm-rs      | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |
| crs_framework-rs | pclus1    | Online | Online         |
|                  | pclus2    | Online | Online         |
|                  | pclus3    | Online | Online         |
|                  | pclus4    | Online | Online         |

```
clresource status -g vucmm-framework-rg +
```

```
=== Cluster Resources ===
```

| Resource Name      | Node Name | State  | Status Message |
|--------------------|-----------|--------|----------------|
| -----              | -----     | ----   | -----          |
| vucmm-framework-rs | pclus1    | Online | Online         |
|                    | pclus2    | Online | Online         |
|                    | pclus3    | Online | Online         |

EXAMPLE 6-3    Status of an Operational Oracle RAC Configuration    (Continued)

```

 pclus4 Online Online
vucmm-svm-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

clresource status -g scaldg-rg +
=== Cluster Resources ===

Resource Name Node Name State Status Message

scalordg-rs pclus1 Online Online - Diskgroup online
 pclus2 Online Online - Diskgroup online
 pclus3 Online Online - Diskgroup online
 pclus4 Online Online - Diskgroup online

clresource status -g qfsmds-rg +
=== Cluster Resources ===

Resource Name Node Name State Status Message

qfs-db_qfs-OraHome-rs pclus1 Online Online - Service is online.
 pclus2 Offline Offline
 pclus3 Offline Offline
 pclus4 Offline Offline

qfs-db_qfs-OraData-rs pclus1 Online Online - Service is online.
 pclus2 Offline Offline
 pclus3 Offline Offline
 pclus4 Offline Offline

clresource status -g scalmnt-rg +
=== Cluster Resources ===

Resource Name Node Name State Status Message

scal-db_qfs-OraHome-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

scal-db_qfs-OraData-rs pclus1 Online Online
 pclus2 Online Online
 pclus3 Online Online
 pclus4 Online Online

clresource status -g rac_server_proxy-rg +
=== Cluster Resources ===

Resource Name Node Name State Status Message

```

EXAMPLE 6-3 Status of an Operational Oracle RAC Configuration (Continued)

|                     |        |        |                             |
|---------------------|--------|--------|-----------------------------|
| rac_server_proxy-rs | pclus1 | Online | Online - Oracle instance UP |
|                     | pclus2 | Online | Online - Oracle instance UP |
|                     | pclus3 | Online | Online - Oracle instance UP |
|                     | pclus4 | Online | Online - Oracle instance UP |

## Sources of Diagnostic Information

If the state of a scalable device group resource or a file-system mount-point resource changes, the new state is logged through the `syslog(3C)` function.

The directories `/var/cluster/ucmm` and `/var/cluster/vucmm` contain the sources of diagnostic information that are shown in the following table.

| Source                                                                              | Location                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Log files for previous multiple-owner volume-manager reconfigurations               | <code>/var/cluster/vucmm/vucmm_reconf.log.0(0,1,...)</code>                                                                                                                                |
| Log file for the current userland cluster membership monitor (UCMM) reconfiguration | <code>/var/cluster/ucmm/ucmm_reconf.log</code>                                                                                                                                             |
| Log files for previous UCMM reconfigurations                                        | <code>/var/cluster/ucmm/ucmm_reconf.log.0(0,1,...)</code>                                                                                                                                  |
| SPARC: UNIX Distributed Lock Manager (UDLM) core files                              | <code>/var/cluster/ucmm/dlm_nodename/cores</code><br><br>This location is dependent on the UDLM package. If you cannot find the Oracle log files at this location, contact Oracle support. |
| SPARC: Log files for UDLMevents                                                     | <code>/var/cluster/ucmm/dlm_nodename/logs</code><br><br>This location is dependent on the UDLM package. If you cannot find the Oracle log files at this location, contact Oracle support.  |

The directory `/var/opt/SUNWscor/oracle_server/proxyresource` contains log files for the resource that represents the Oracle 10g Release 2, 11g, or 12c RAC proxy server. Messages for server-side components and client-side components of the proxy server resource are written to separate files:

- Messages for server-side components are written to the file `message_log.resource`.
- Messages for client-side components are written to the file `message_log.client.resource`.

In these file names and directory names, *resource* is the name of the resource that represents the Oracle RAC server component.

The directory `/var/opt/SUNWscor/oracle_server` contains log files for the Oracle 9i RAC server resource. Each file is named `/var/opt/SUNWscor/oracle_server/message_log.resource`.

The system messages file also contains diagnostic information.

If a problem occurs with Support for Oracle RAC, 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 Support for Oracle RAC. Each subsection provides information about the cause of the problem and a solution to the problem.

- [“Failure of an Oracle RAC Framework Resource Group” on page 172](#)
- [“Failure of a Multiple-Owner Volume-Manager Framework Resource Group” on page 175](#)
- [“SUNW.qfs Registration Fails Because the Registration File Is Not Found” on page 178](#)
- [“Node Panic Caused by a Timeout” on page 178](#)
- [“Failure of a SUNW.rac\\_framework or SUNW.vucmm\\_framework Resource to Start” on page 179](#)
- [“SUNW.rac\\_framework Failure-to-Start Status Messages” on page 179](#)
- [“SUNW.vucmm\\_framework Failure-to-Start Status Messages” on page 180](#)
- [“How to Recover From the Timing Out of the START Method” on page 181](#)
- [“Failure of a Resource to Stop” on page 181](#)

## Failure of an Oracle RAC Framework Resource Group

This section describes problems that can affect the Oracle RAC framework resource group.

- [“Node Panic During Initialization of Support for Oracle RAC” on page 172](#)
- [“Failure of the ucmm daemon to start” on page 173](#)
- [“How to Recover From a Failure of the ucmm daemon or a related component” on page 173](#)

## Node Panic During Initialization of Support for Oracle RAC

If a fatal problem occurs during the initialization of Support for Oracle RAC, the node panics with an error messages similar to the following error message:

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

**Description:** A component that the UCMM controls returned an error to the UCMM during a reconfiguration.

**Cause:** The most common causes of this problem are as follows:

- SPARC: The `ORCLudlm` package that contains the UDLM is not installed.

- SPARC: The version of the UDLM is incompatible with the version of Support for Oracle RAC.
- SPARC: The amount of shared memory is insufficient to enable the UDLM to start.

A node might also panic during the initialization of Support for Oracle RAC because a reconfiguration step has timed out. For more information, see [“Node Panic Caused by a Timeout” on page 178](#).

**Solution:** For instructions to correct the problem, see [“How to Recover From a Failure of the ucmmmd Daemon or a Related Component” on page 173](#).

---

**Note** – When the node is a global-cluster voting node of the global cluster, the node panic brings down the entire machine. When the node is a zone-cluster node, the node panic brings down only that specific zone and other zones remain unaffected.

---

## Failure of the ucmmmd Daemon to Start

The UCMM daemon, ucmmmd, manages the reconfiguration of Support for Oracle RAC. When a cluster is booted or rebooted, this daemon is started only after all components of Support for Oracle RAC are validated. If the validation of a component on a node fails, the ucmmmd daemon fails to start on the node.

The most common causes of this problem are as follows:

- SPARC: The ORCLudlm package that contains the UDLM is not installed.
- An error occurred during a previous reconfiguration of a component Support for Oracle RAC.
- A step in a previous reconfiguration of Support for Oracle RAC timed out, causing the node on which the timeout occurred to panic.

For instructions to correct the problem, see [“How to Recover From a Failure of the ucmmmd Daemon or a Related Component” on page 173](#).

## ▼ How to Recover From a Failure of the ucmmmd Daemon or a Related Component

Perform this task to correct the problems that are described in the following sections:

- [“Node Panic During Initialization of Support for Oracle RAC” on page 172](#)
- [“Failure of the ucmmmd Daemon to Start” on page 173](#)

### 1 To determine the cause of the problem, examine the log files for UCMM reconfigurations and the system messages file.

For the location of the log files for UCMM reconfigurations, see [“Sources of Diagnostic Information” on page 171](#).

When you examine these files, start at the most recent message and work backward until you identify the cause of the problem.

For more information about error messages that might indicate the cause of reconfiguration errors, see *Oracle Solaris Cluster Error Messages Guide*.

## 2 Correct the problem that caused the component to return an error to the UCMM.

For example:

- **SPARC: If your Oracle release requires UDLM and the ORCLudlm package that contains the UDLM is not installed, ensure that the package is installed.**

---

**Note** – UDLM is required only when it is actually used.

---

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

The procedures that you must complete are listed in [Table 1–1](#).

- b. **Ensure that the UDLM software is correctly installed and configured.**

For more information, see “[SPARC: Installing the UDLM](#)” on page 40.

- **SPARC: If the version of the UDLM is incompatible with the version of Support for Oracle RAC, install a compatible version of the package.**

For more information, see “[SPARC: Installing the UDLM](#)” on page 40.

- **SPARC: If the amount of shared memory is insufficient to enable the UDLM to start, increase the amount of shared memory.**

For more information, see “[How to Configure Shared Memory for Oracle RAC Software in the Global Cluster](#)” on page 34.

- **If a reconfiguration step has timed out, increase the value of the extension property that specifies the timeout for the step.**

For more information, see “[Node Panic Caused by a Timeout](#)” on page 178.

## 3 If the solution to the problem requires a reboot, reboot the node where the problem occurred.

The solution to only certain problems requires a reboot. For example, increasing the amount of shared memory requires a reboot. However, increasing the value of a step timeout does *not* require a reboot.

For more information about how to reboot a node, see “[Shutting Down and Booting a Single Node in a Cluster](#)” in *Oracle Solaris Cluster System Administration Guide*.

- 4 On the node where the problem occurred, take offline and bring online the Oracle RAC framework resource group.

This step refreshes the resource group with the configuration changes you made.

- a. Become superuser or assume a role that provides `solaris.cluster.admin` RBAC authorization.

- b. Type the command to take offline the Oracle RAC framework resource group and its resources.

```
clresourcegroup offline -n node rac-fmwk-rg
```

`-n node` Specifies the node name or node identifier (ID) of the node where the problem occurred.

`rac-fmwk-rg` Specifies the name of the resource group that is to be taken offline.

- c. Type the command to bring online and in a managed state the Oracle RAC framework resource group and its resources.

```
clresourcegroup online -emM -n node rac-fmwk-rg
```

## Failure of a Multiple-Owner Volume-Manager Framework Resource Group

This section describes problems that can affect the multiple-owner volume-manager framework resource group.

- [“Node Panic During Initialization of the Multiple-Owner Volume-Manager Framework” on page 175](#)
- [“Failure of the vucmmd Daemon to Start” on page 176](#)
- [“How to Recover From a Failure of the vucmmd Daemon or a Related Component” on page 176](#)

### Node Panic During Initialization of the Multiple-Owner Volume-Manager Framework

If a fatal problem occurs during the initialization of the multiple-owner volume-manager framework, the node panics with an error messages similar to the following error message:

---

**Note** – When the node is a global-cluster voting node of the global cluster, the node panic brings down the entire machine.

---

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

**Description:** A component that the multiple-owner volume-manager framework controls returned an error to the multiple-owner volume-manager framework during a reconfiguration.

**Cause:** The most common causes of this problem is that the license for Veritas Volume Manager (VxVM) is missing or has expired.

A node might also panic during the initialization of the multiple-owner volume-manager framework because a reconfiguration step has timed out. For more information, see [“Node Panic Caused by a Timeout” on page 178](#).

**Solution:** For instructions to correct the problem, see [“How to Recover From a Failure of the vucmmd Daemon or a Related Component” on page 176](#).

## Failure of the vucmmd Daemon to Start

The multiple-owner volume-manager framework daemon, vucmmd, manages the reconfiguration of the multiple-owner volume-manager framework. When a cluster is booted or rebooted, this daemon is started only after all components of the multiple-owner volume-manager framework are validated. If the validation of a component on a node fails, the vucmmd daemon fails to start on the node.

The most common causes of this problem are as follows:

- An error occurred during a previous reconfiguration of a component of the multiple-owner volume-manager framework.
- A step in a previous reconfiguration of the multiple-owner volume-manager framework timed out, causing the node on which the timeout occurred to panic.

For instructions to correct the problem, see [“How to Recover From a Failure of the vucmmd Daemon or a Related Component” on page 176](#).

## ▼ How to Recover From a Failure of the vucmmd Daemon or a Related Component

Perform this task to correct the problems that are described in the following sections:

- [“Node Panic During Initialization of the Multiple-Owner Volume-Manager Framework” on page 175](#)
- [“Failure of the vucmmd Daemon to Start” on page 176](#)



- 1 **To determine the cause of the problem, examine the log files for multiple-owner volume-manager framework reconfigurations and the system messages file.**

For the location of the log files for multiple-owner volume-manager framework reconfigurations, see [“Sources of Diagnostic Information” on page 171](#).

When you examine these files, start at the most recent message and work backward until you identify the cause of the problem.

For more information about error messages that might indicate the cause of reconfiguration errors, see [Oracle Solaris Cluster Error Messages Guide](#).

- 2 **Correct the problem that caused the component to return an error to the multiple-owner volume-manager framework .**

For example:

- **If the license for VxVM is missing or has expired, ensure that VxVM is correctly installed and licensed.**
  - a. **Verify that you have correctly installed your volume manager packages.**
  - b. **If you are using VxVM, check that you have installed the software and check that the license for the VxVM cluster feature is valid.**

---

**Note** – A zone cluster does not support VxVM.

---

- **If a reconfiguration step has timed out, increase the value of the extension property that specifies the timeout for the step.**

For more information, see [“Node Panic Caused by a Timeout” on page 178](#).

- 3 **If the solution to the problem requires a reboot, reboot the node where the problem occurred.**

The solution to only certain problems requires a reboot. For example, increasing the amount of shared memory requires a reboot. However, increasing the value of a step timeout does *not* require a reboot.

For more information about how to reboot a node, see [“Shutting Down and Booting a Single Node in a Cluster” in Oracle Solaris Cluster System Administration Guide](#).

- 4 **On the node where the problem occurred, take offline and bring online the multiple-owner volume-manager framework resource group.**

This step refreshes the resource group with the configuration changes you made.

- a. **Become superuser or assume a role that provides `solaris.cluster.admin` RBAC authorization.**

- b. **Type the command to take offline the multiple-owner volume-manager framework resource group and its resources.**

```
clresourcegroup offline -n node vucmm-fmwk-rg
```

-n *node* Specifies the node name or node identifier (ID) of the node where the problem occurred.

*vucmm-fmwk-rg* Specifies the name of the resource group that is to be taken offline.

- c. **Type the command to bring online and in a managed state the multiple-owner volume-manager framework resource group and its resources.**

```
clresourcegroup online -emM -n node vucmm-fmwk-rg
```

## SUNW.qfs Registration Fails Because the Registration File Is Not Found

Oracle Solaris Cluster resource-type registration files are located in the `/opt/cluster/lib/rgm/rtreg/` or `/usr/cluster/lib/rgm/rtreg/` directory. The `SUNW.qfs` resource-type registration file is located in the `/opt/SUNWsamfs/sc/etc/` directory.

If Oracle Solaris Cluster software is already installed when you install Sun QFS software, the necessary mapping to the `SUNW.qfs` registration file is automatically created. But if Oracle Solaris Cluster software is not already installed when you install Sun QFS software, the necessary mapping to the `SUNW.qfs` registration file is not made, even when Sun Cluster software is later installed. Attempts to register the `SUNW.qfs` resource type therefore fail because the Oracle Solaris Cluster software is unaware of the location of its registration file.

To enable Oracle Solaris Cluster software to locate the `SUNW.qfs` resource type, create a symbolic link to the directory:

```
cd /usr/cluster/lib/rgm/rtreg
ln -s /opt/SUNWsamfs/sc/etc/SUNW.qfs SUNW.qfs
```

## Node Panic Caused by a Timeout

The timing out of any step in the reconfiguration of Support for Oracle RAC 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 143](#).

If a reconfiguration step times out, use the Oracle Solaris Cluster maintenance commands to increase the value of the extension property that specifies the timeout for the step. For more information, see [Appendix C, “Support for Oracle RAC Extension Properties.”](#)

After you have increased the value of the extension property, bring online the Oracle RAC framework resource group on the node that panicked.

## Failure of a SUNW.rac\_framework or SUNW.vucmm\_framework Resource to Start

If a `SUNW.rac_framework` or `SUNW.vucmm_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 Support for Oracle RAC” on page 161.](#)

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.

This section contains the following information:

### SUNW.rac\_framework Failure-to-Start Status Messages

The following status messages are associated with the failure of a `SUNW.rac_framework` resource to start:

Faulted - ucmm is not running

**Description:** The ucmm daemon is not running on the node where the resource resides.

**Solution:** For information about how to correct this problem, see [“Failure of the ucmm Daemon to Start” on page 173.](#)

Degraded - reconfiguration in progress

**Description:** The UCMM is undergoing a reconfiguration. This message indicates a problem only if the reconfiguration of the UCMM is not completed and the status of this resource persistently remains degraded.

**Cause:** If this message indicates a problem, the cause of the failure is a configuration error in one or more components of Support for Oracle RAC.

**Solution:** The solution to this problem depends on whether the message indicates a problem:

- If the message indicates a problem, correct the problem as explained in [“How to Recover From a Failure of the ucmmmd Daemon or a Related Component” on page 173.](#)
- If the message does not indicate a problem, no action is required.

#### Online

**Description:** Reconfiguration of Oracle RAC was not completed until after the START method of the SUNW.rac\_framework resource timed out.

**Solution:** For instructions to correct the problem, see [“How to Recover From the Timing Out of the START Method” on page 181.](#)

## SUNW.vucmm\_framework Failure-to-Start Status Messages

The following status messages are associated with the failure of a SUNW.vucmm\_framework resource to start:

#### Faulted - vucmmd is not running

**Description:** The vucmmd daemon is not running on the node where the resource resides.

**Solution:** For information about how to correct this problem, see [“Failure of the vucmmd Daemon to Start” on page 176.](#)

#### Degraded - reconfiguration in progress

**Description:** The multiple-owner volume-manager framework is undergoing a reconfiguration. This message indicates a problem only if the reconfiguration of the multiple-owner volume-manager framework is not completed and the status of this resource persistently remains degraded.

**Cause:** If this message indicates a problem, the cause of the failure is a configuration error in one or more components of the volume manager reconfiguration framework.

**Solution:** The solution to this problem depends on whether the message indicates a problem:

- If the message indicates a problem, correct the problem as explained in [“How to Recover From a Failure of the vucmmd Daemon or a Related Component” on page 176.](#)
- If the message does not indicate a problem, no action is required.

#### Online

**Description:** Reconfiguration of Oracle RAC was not completed until after the START method of the SUNW.vucmm\_framework resource timed out.

**Solution:** For instructions to correct the problem, see [“How to Recover From the Timing Out of the START Method” on page 181.](#)

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

- 1 Become superuser or assume a role that provides `solaris.cluster.admin` RBAC authorization.
- 2 On the node where the START method timed out, take offline the framework resource group that failed to start.

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

```
clresourcegroup offline -n nodelist resource-group
```

*-n 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.

*resource-group* Specifies the name of the framework resource group.

If your configuration uses both a multiple-owner volume-manager framework resource group and an Oracle RAC framework resource group, first take offline the multiple-owner volume-manager framework resource group. When the multiple-owner volume-manager framework resource group is offline, then take offline the Oracle RAC framework resource group.

If the Oracle RAC framework resource group was created by using the `clsetup` utility, the name of the resource group is `rac-framework-rg`.

- 3 On all cluster nodes that can run Support for Oracle RAC, bring online the framework resource group that failed to come online.

```
clresourcegroup online resource-group
```

*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 *Oracle Solaris Cluster Data Services Planning and Administration Guide*.



# Modifying an Existing Configuration of Support for Oracle RAC

This chapter explains how to modify an existing configuration of Support for Oracle RAC.

- “Overview of Tasks for Modifying an Existing Configuration of Support for Oracle RAC” on page 183
- “Modifying Online the Resource for a Scalable Device Group” on page 184
- “Extending an Existing Configuration of Support for Oracle RAC” on page 185
- “Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group” on page 195
- “SPARC: Deploying Oracle Solaris Cluster Native SKGXN for Oracle RAC 11g Release 2 or 12c” on page 198
- “Removing an Oracle Grid Infrastructure Resource” on page 202
- “Removing Support for Oracle RAC” on page 204

## Overview of Tasks for Modifying an Existing Configuration of Support for Oracle RAC

Table 7–1 summarizes the administration tasks for Support for Oracle RAC.

Perform these tasks whenever they are required.

TABLE 7–1 Tasks for Modifying an Existing Configuration of Support for Oracle RAC

| Task                                                       | Instructions                                                                |
|------------------------------------------------------------|-----------------------------------------------------------------------------|
| Modify online the resource for a scalable device group     | “Modifying Online the Resource for a Scalable Device Group” on page 184     |
| Extend an existing configuration of Support for Oracle RAC | “Extending an Existing Configuration of Support for Oracle RAC” on page 185 |

TABLE 7-1 Tasks for Modifying an Existing Configuration of Support for Oracle RAC (Continued)

| Task                                                                                                                | Instructions                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Migrate a legacy RAC configuration to use a multiple-owner volume-manager framework resource group                  | <a href="#">“Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group” on page 195</a> |
| SPARC: (Oracle 11g release 2 or 12c only)<br>Migrate an existing configure from UDLM to native SKGXN or vice versa. | <a href="#">“SPARC: Deploying Oracle Solaris Cluster Native SKGXN for Oracle RAC 11g Release 2 or 12c” on page 198</a>                                                    |
| Remove Support for Oracle RAC                                                                                       | <a href="#">“Removing Support for Oracle RAC” on page 204</a>                                                                                                             |

# Modifying Online the Resource for a Scalable Device Group

Modifying online the resource for a scalable device group involves changing the list of logical volumes that are to be monitored. The LogicalDeviceList extension property of the SUNW.ScalDeviceGroup resource type specifies the list of logical volumes in a global device group that are to be monitored.

## ▼ How to Modify Online the Resource for a Scalable Device Group

- 1 Become superuser or assume a role that provides `solaris.cluster.modify` RBAC authorization.
- 2 Modify the LogicalDeviceList extension property of the ScalDeviceGroup resource.
  - To add device groups to a ScalDeviceGroup resource, type the following command:  

```
clresource set -p LogicalDeviceList+=logical-device-listscal-mp-rs
```

The addition of the logical volume is effective immediately.
  - To remove device groups from a ScalDeviceGroup resource, type the following command:  

```
clresource set -p LogicalDeviceList-=logical-device-listscal-mp-rs
```

The removal of the logical volume is effective immediately.



# Extending an Existing Configuration of Support for Oracle RAC

Extend an existing configuration of Support for Oracle RAC in any of the following situations:

- You are adding nodes to a cluster and you require Support for Oracle RAC to run on the nodes. See [“How to Add Support for Oracle RAC to Selected Nodes” on page 185](#).
- You are adding a volume manager. See [“How to Add a Volume Manager Resource to the Framework Resource Group” on page 192](#).

## ▼ How to Add Support for Oracle RAC to Selected Nodes

Perform this procedure if you are adding nodes to a cluster and you require Support for Oracle RAC to run on the nodes. Perform this procedure from only one node.

This task involves adding the selected nodes from the following resource groups in the following order:

- Resource groups for scalable file-system mount-point resources
- The multiple-owner volume-manager framework resource group, if used.
- The Oracle RAC framework resource group
- Resource groups for scalable device group resources
- Resource groups that contain resources for the Sun QFS metadata server
- Resource groups for logical hostname resources
- The resource group for the Oracle RAC database

### Before You Begin

- Ensure that the required Support for Oracle RAC software packages are installed on each node to which you are adding Support for Oracle RAC. For more information, see [“Installing the Support for Oracle RAC Packages” on page 38](#).
- Ensure that the node that you add is connected to the shared storage that is used by the Oracle RAC configuration.

### 1 Become superuser on any cluster node.

### 2 Add the nodes to any resource groups that contain scalable file-system mount-point resources.

If no resource groups that contain scalable file-system mount-point resources are configured, omit this step.

For each resource group to which you are adding nodes, run the following command:

```
clresourcegroup add-node -S -n nodelist scal-mp-rg
-n nodelist
```

Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*scal-mp-rg*

Specifies the name of the resource group to which you are adding nodes.

**3 Add the nodes to the multiple-owner volume-manager framework resource group, if used.**

```
clresourcegroup add-node -S -n nodelist vucmm-fmwk-rg
```

*-n nodelist*

Specifies a comma-separated list of cluster nodes to which you are adding the resource group.

*vucmm-fmwk-rg*

Specifies the name of the resource group to which you are adding nodes.

**4 Add the nodes to the Oracle RAC framework resource group.**

```
clresourcegroup add-node -S -n nodelist rac-fmwk-rg
```

*-n nodelist*

Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*rac-fmwk-rg*

Specifies the name of the resource group to which you are adding nodes.

**5 Add the nodes to any scalable device groups that you are using for Oracle files.**

If you are not using any scalable device groups for Oracle files, omit this step.

How to perform this step depends on the type of the scalable device group.

- **For each Solaris Volume Manager for Sun Cluster multi-owner disk set, type the following command:**

```
metaset -s set-name -M -a -h nodelist
```

*-s set-name*

Specifies the Solaris Volume Manager for Sun Cluster multi-owner disk set to which you are adding nodes.

*-h nodelist*

Specifies a *space-separated* list of cluster nodes that you are adding to the multi-owner disk set.

- **For each VxVM shared-disk group, use Veritas commands to add the nodes to the VxVM shared-disk group.**

For more information, see your VxVM documentation.

**6 Add the nodes to any resource groups that contain scalable device group resources.**

If no resource groups that contain scalable device group resources are configured, omit this step.

For each resource group to which you are adding nodes, run the following command:

```
clresourcegroup add-node -S -n nodelist scal-dg-rg
```

*-n nodelist*

Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*scal-dg-rg*

Specifies the name of the resource group to which you are adding nodes.

## 7 Mount each shared file system that is to be accessed from the nodes that you are adding.

If no shared file systems are to be accessed from the nodes that you are adding, omit this step.

For each file system that you are mounting, type the following command:

```
mount mount-point
```

*mount-point* Specifies the mount point of the file system that you are mounting.

## 8 Add the nodes to any resource groups that contain resources for the Sun QFS metadata server.

If no resource groups that contain resources for the Sun QFS metadata server are configured, omit this step.

For each resource group to which you are adding nodes, run the following command:

```
clresourcegroup add-node -n nodelist qfs-mds-rg
```

*-n nodelist*

Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*qfs-mds-rg*

Specifies the name of the resource group to which you are adding nodes.

## 9 Bring online all resource groups to which you added nodes in [Step 6](#).

These resource groups contain scalable device group resources.

If no resource groups that contain scalable device group resources are configured, omit this step.

For each resource group that you are bringing online, type the following command:

```
clresourcegroup online scal-dg-rg
```

*scal-dg-rg* Specifies the name of the resource group that you are bringing online.

## 10 (Oracle 10g release 2, 11g, or 12c only) Start the Oracle Clusterware.

If you are using Oracle 9i or Oracle 10g release 1, omit this step.

```
/etc/init.d/init.crs start
```

Startup will be queued to init within 30 seconds.

**11 (Oracle 9i only) Add the nodes to all resource groups that contain logical hostname resources for each Oracle RAC database that is to run on the nodes.**

If you are using Oracle 10g release 1, 10g release 2, 11g, or 12c, omit this step. For Oracle 10g release 1, 10g release 2, 11g, or 12c, no resource groups for logical hostname resources are configured.

For each resource group to which you are adding nodes, run the following command:

```
clresourcegroup add-node -n nodelist lh-rg
```

*-n nodelist* Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*lh-rg* Specifies the name of the resource group to which you are adding nodes.

**12 (Oracle 9i, 10g release 2, 11g, or 12c only) Add the nodes to the resource group for each Oracle RAC database that is to run on the nodes.**

If you are using Oracle 10g release 1, omit this step. For Oracle 10g release 1, no resource groups for Oracle RAC databases are configured.

For each resource group to which you are adding nodes, run the following command:

```
clresourcegroup add-node -S -n nodelist rac-db-rg
```

*-n nodelist* Specifies a comma-separated list of cluster nodes to which you are adding Support for Oracle RAC.

*rac-db-rg* Specifies the name of the resource group to which you are adding nodes.

**13 (Oracle 10g release 2, 11g, or 12c only) For each node that you are adding, create the Oracle Clusterware resources that are required to represent Oracle Solaris Cluster resources.**

Create an Oracle Clusterware resource for each Oracle Solaris Cluster resource for scalable device groups and scalable file-system mount points on which Oracle components depend. For more information, see [“How to Create an Oracle Clusterware Resource for Interoperation With Oracle Solaris Cluster” on page 337](#).

**14 (Oracle 9i, 10g release 2, 11g, or 12c only) Modify each resource for Oracle RAC databases to set a value of each per-node property for each node that you are adding.**

If you are using Oracle 10g release 1, omit this step. For Oracle 10g release 1, no resource groups for Oracle RAC databases are configured.

For each resource that you are modifying, perform these steps:

**a. Disable the resource.**

```
clresource disable rac-db-rs
```

*rac-db-rs* Specifies the name of the Oracle RAC database resource that you are disabling.

**b. Set a value of each per-node property for each node that you are adding.**

The per-node properties of each resource type for Oracle RAC databases are shown in the following table.

| Resource Type                  | Properties     |
|--------------------------------|----------------|
| SUNW.scalable_rac_server_proxy | oracle_sid     |
| SUNW.scalable_rac_listener     | listener_name  |
| SUNW.scalable_rac_server       | alert_log_file |
|                                | oracle_sid     |

For information about extension properties of resource types for Oracle RAC databases, see the following sections:

- “SUNW.scalable\_rac\_server\_proxy Extension Properties” on page 292
- “SUNW.scalable\_rac\_listener Extension Properties” on page 286
- “SUNW.scalable\_rac\_server Extension Properties” on page 287

```
clresource set \
-p property{node}=value[...] \
[-p property{node}=value[...]][...] \
rac-db-rs
```

*property* Specifies the name of a per-node property that you are setting.

*node* Specifies the node for which you are setting a value for *property*.

*value* Specifies the value to which you are setting *property* for *node*.

*rac-db-rs* Specifies the name of the Oracle RAC database resource whose per-node properties you are setting.

**c. Enable the resource.**

```
clresource enable rac-db-rs
```

*rac-db-rs* Specifies the name of the Oracle RAC database resource that you are enabling.

**15 (Oracle 9i, 10g release 2, 11g, 12c only) Bring online each resource group for Oracle RAC databases.**

If you are using Oracle 10g release 1, omit this step. For Oracle 10g release 1, no resource groups for Oracle RAC databases are configured.

For each resource group that you are bringing online, run the following command:

```
clresourcegroup online rac-db-rg
```

*rac-db-rg* Specifies the name of the resource group that you are bringing online.

**Example 7–1**    Adding Support for Oracle RAC to Selected Nodes

This example shows the sequence of operations that is required to add Support for Oracle RAC to nodes `pc1us3` and `pc1us4` of a four-node cluster.

The configuration of Support for Oracle RAC in this example is as follows:

- The version of Oracle RAC is 10g Release 2.
- Sun QFS shared file system on Solaris Volume Manager for Sun Cluster is used to store Oracle files.
- The mount points of file systems that are used for Oracle files are as follows:
  - Oracle database files: `/db_qfs/OraData`
  - Oracle binary files and related files: `/db_qfs/OraHome`
- The `oradg` disk set is used only by the Oracle RAC database.
- The name of the Oracle RAC database is `swb`.
- The Sun QFS shared file systems use a Solaris Volume Manager for Sun Cluster multi-owner disk set that is named `oradg`. The creation of this disk set is shown in [Example 3–1](#).
- The configuration uses a multiple-owner volume-manager framework resource group.

The configuration of resource groups in this example is shown in the following table.

| Resource Group                   | Purpose                                                        |
|----------------------------------|----------------------------------------------------------------|
| <code>vucmm-framework-rg</code>  | Multiple-owner volume-manager resource group.                  |
| <code>rac-framework-rg</code>    | Oracle RAC framework resource group.                           |
| <code>scaldg-rg</code>           | Resource group for scalable device-group resources.            |
| <code>qfsmds-rg</code>           | Resource group for Sun QFS metadata server resources.          |
| <code>scalmnt-rg</code>          | Resource group for scalable file-system mount-point resources. |
| <code>rac_server-proxy-rg</code> | Oracle RAC database resource group.                            |

The resource groups that are required for this configuration are shown in [Figure A–2](#).

1. To add the nodes to the resource group that contains scalable file-system mount-point resources, the following command is run:  

```
clresourcegroup add-node -S -n pc1us3,pc1us4 scalmnt-rg
```
2. To add the nodes to the multiple-owner volume-manager framework resource group, the following command is run:  

```
clresourcegroup add-node -S -n pc1us3,pc1us4 vucmm-framework-rg
```

3. To add the nodes to the Oracle RAC framework resource group, the following command is run:

```
clresourcegroup add-node -S -n pclus3,pclus4 rac-framework-rg
```

4. To add the nodes to the Solaris Volume Manager for Sun Cluster multi-owner disk set oradg, the following command is run:

```
metaset -s oradg -M -a -h pclus3 pclus4
```

5. To add the nodes to the resource group that contains scalable device group resources, the following command is run:

```
clresourcegroup add-node -S -n pclus3,pclus4 scaldg-rg
```

6. To mount the shared file systems that are to be accessed from the nodes that are being added, the following commands are run:

```
mount /db_qfs/OraData
mount /db_qfs/OraHome
```

7. To add the nodes to the resource group that contains resources for the Sun QFS metadata server, the following command is run:

```
clresourcegroup add-node -n pclus3,pclus4 qfsmads-rg
```

8. To bring online the resource group that contains scalable device group resources, the following command is run:

```
clresourcegroup online scaldg-rg
```

9. To start the Oracle Clusterware and to verify the correct startup of the Oracle Clusterware, the following commands are run:

```
/etc/init.d/init.crs start
Startup will be queued to init within 30 seconds.
/db_qfs/OraHome/crs/bin/crsctl check crs
CSS appears healthy
CRS appears healthy
EVM appears healthy
```

10. To add the nodes to the resource group for the Oracle RAC database, the following command is run:

```
clresourcegroup add-node -S -n pclus3,pclus4 rac_server_proxy-rg
```

After the addition of the nodes to the resource group for the Oracle RAC database, the required Oracle Clusterware resources are created. The creation of these Oracle Clusterware resources is beyond the scope of this example.

11. To set required per-node properties for the Oracle RAC database resource, the following commands are run:

```
clresource disable rac_server_proxy-rs
clresource set -p oracle_sid\{3\}=swb3 -p \
oracle_sid\{4\}=swb4 rac_server_proxy-rs
clresource enable rac_server_proxy-rs
```

The per-node property `oracle_sid` is set to `swb3` on node `pclus3` and to `swb4` on node `pclus4`.

12. To bring online the resource group for the Oracle RAC database, the following command is run:

```
clresourcegroup online rac_server_proxy-rg
```

## ▼ How to Add a Volume Manager Resource to the Framework Resource Group

Perform this task if you are adding a volume manager to an existing configuration of Support for Oracle RAC. The framework resource group must contain a resource that represents the volume manager that you are adding. You can add a volume manager resource only if the framework resource is disabled and if the framework daemon is stopped on all cluster nodes.

- If the cluster contains a `SUNW.vucmm_f` framework based resource group, you add an instance of the `SUNW.vucmm_svm` or `SUNW.vucmm_cvm` resource type to that resource group.

Do not add an instance of the `SUNW.rac_svm` or `SUNW.rac_cvm` resource type to the `SUNW.rac_f` framework based resource group when a `SUNW.vucmm_f` framework based resource group exists in the cluster.

- If the cluster does not contain a `SUNW.vucmm_f` framework based resource group, you add an instance of the `SUNW.rac_svm` or `SUNW.rac_cvm` resource type to the `SUNW.rac_f` framework based resource group.



**Caution** – This task requires downtime because you must disable the framework resource and reboot the nodes where Oracle RAC is running.

**Before You Begin** Ensure that the volume manager for which you are adding a resource is installed and configured on all nodes where Oracle RAC is to run.

- 1 **Become superuser on any cluster node.**
- 2 **Disable the framework resource in the framework resource group and any other resources that depend on this resource.**

```
clresource disable -r fmwk-rs
```

*fmwk-rs* Specifies the name of the resource of type `SUNW.vucmm_f` framework or `SUNW.rac_f` framework that you are disabling.

- 3 **Reboot all the nodes that are in the node list of the framework resource group.**



#### 4 Register and add an instance of the resource type that represents the volume manager that you are adding.

- If you are adding Solaris Volume Manager for Sun Cluster, register and add the instance as follows:

##### a. Register the Solaris Volume Manager for Sun Cluster resource type.

- For a `SUNW.vucmm_framework` based resource group, register the `SUNW.vucmm_svm` resource type.

```
clresourcetype register SUNW.vucmm_svm
```

- For a `SUNW.rac_framework` based resource group, register the `SUNW.rac_svm` resource type.

```
clresourcetype register SUNW.rac_svm
```

##### b. Add an instance of the Solaris Volume Manager for Sun Cluster resource type to the framework resource group.

Ensure that this instance depends on the resource that you disabled in [Step 2](#).

```
clresource create -g fmwk-rg \
 -t svm-rt \
 -p resource_dependencies=fmwk-rs svm-rs
```

*-g fmwk-rg*

Specifies the name of the framework resource group. This resource group contains the resource of type `SUNW.vucmm_framework` or `SUNW.rac_framework` that you disabled in [Step 2](#).

*svm-rt*

Specifies the name of the Solaris Volume Manager for Sun Cluster resource type.

```
-p resource_dependencies=fmwk-rs
```

Specifies that this instance depends on the resource that you disabled in [Step 2](#).

*svm-rs*

Specifies the name that you are assigning to the resource of type `SUNW.vucmm_svm` or `SUNW.rac_svm`.

- SPARC: If you are adding VxVM with the cluster feature, register and add the instance as follows.

##### a. Register the VxVM volume manager resource type.

- For a `SUNW.vucmm_framework` based resource group, register the `SUNW.vucmm_cvm` resource type.

```
clresourcetype register SUNW.vucmm_cvm
```

- For a `SUNW.rac_framework` based resource group, register the `SUNW.rac_cvm` resource type.

```
clresourcetype register SUNW.rac_cvm
```

- b. Add an instance of the VxVM volume manager resource type to the resource group that you disabled in [Step 2](#).

Ensure that this instance depends on the resource that you disabled in [Step 2](#).

```
clresource create -g fmwk-rg \
-t cvm-rt \
-p resource_dependencies=fmwk-rs cvm-rs
```

`-g fmwk-rg`  
Specifies the name of the framework resource group. This resource group contains the resource that you disabled in [Step 2](#).

`cvm-rt`  
Specifies the name of the Solaris Volume Manager for Sun Cluster resource type.

`-p resource_dependencies=fmwk-rs`  
Specifies that this instance depends on the resource that you disabled in [Step 2](#).

`cvm-rs`  
Specifies the name that you are assigning to the resource of type `SUNW.vucmm_cvm` or `SUNW.rac_cvm`.

5 Bring online and in a managed state the framework resource group and its resources.

```
clresourcegroup online -emM fmwk-rg
```

`fmwk-rg` Specifies that the framework resource group is to be moved to the MANAGED state and brought online. This resource group contains the resource that you disabled in [Step 2](#).

**Next Steps** The next step depends on the volume manager that you are adding, as shown in the following table.

| Volume Manager                         | Next Step                                                                                                                               |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Solaris Volume Manager for Sun Cluster | <a href="#">“How to Create a Multi-Owner Disk Set in Solaris Volume Manager for Sun Cluster for the Oracle RAC Database” on page 75</a> |
| SPARC: VxVM with the cluster feature   | <a href="#">“How to Create a VxVM Shared-Disk Group for the Oracle RAC Database” on page 81</a>                                         |

# Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group

Starting in the Sun Cluster 3.2 11/09 release, a new set of resource types manage multiple-owner volume manager resources in an Oracle RAC configuration. A resource that is based on the `SUNW.vucmm_svm` or `SUNW.vucmm_cvm` resource type is configured in a resource group that is based on the multiple-owner volume-manager framework resource type, `SUNW.vucmm_framework`. The `SUNW.rac_framework` resource group continues to contain other RAC resources, such as Oracle Clusterware and UDLM.

The `SUNW.vucmm_framework` resource type is a single-instance resource type. You can create only one resource of this type in the cluster.

## ▼ How to Migrate a Volume Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume-Manager Framework Resource Group

Perform this procedure to use the multiple-owner volume manager framework to manage volume-manager resources in the Oracle RAC configuration.

- 1 Become superuser on any cluster node.
- 2 Create a scalable multiple-owner volume-manager framework resource group.

```
clresourcegroup create -n nodelist-S vucmm-fmwk-rg
-n nodelist=nodelist
```

Specifies a comma-separated list of cluster nodes on which Support for Oracle RAC is to be enabled. The Support for Oracle RAC software packages must be installed on each node in this list.

---

**Note** – This node list must contain all nodes that are configured in the node list of the Oracle RAC framework resource group.

---

*vucmm-fmwk-rg*

Specifies the name that you are assigning to the resource group.

- 3 Register the `SUNW.vucmm_framework` resource type.
- ```
# clresourcetype register SUNW.vucmm_framework
```

- 4 Add an instance of the `SUNW.vucmm_framework` resource type to the resource group that you created in [Step 2](#).

```
# clresource create -g vucmm-fmwk-rg -t SUNW.vucmm_framework vucmm-fmwk-rs
```

vucmm-fmwk-rs Specifies the name that you are assigning to the `SUNW.vucmm_framework` resource.

- 5 Set the `reservation_timeout` property of the volume-manager resource type.

Set the property to the same value as in the `SUNW.rac_framework` resource group.

- a. Display the value of the `reservation_timeout` extension property for the `SUNW.rac_framework` resource type.

```
# clresource show -p reservation_timeout -t resource-type
```

resource-type

Specifies the resource type of the resource in the RAC resource group for which the `reservation_timeout` extension property is set. This resource type is `SUNW.rac_svm` or `SUNW.rac_cvm`.

- b. Set the `reservation_timeout` extension property of the `SUNW.vucmm_framework` resource type.

```
# clresource set -p type_version=version \
```

```
-p reservation_timeout=timeout vucmm-framework-rs
```

version

Specifies the value of the `type_version` property for the version of `SUNW.rac_framework` to which you are migrating the instance.

timeout

Specifies the value to which you are setting the `reservation_timeout` extension property.

vucmm-framework-rs

Specifies the name of the resource of type `SUNW.vucmm_framework` on your cluster.

- 6 Register and add an instance of the resource type that represents the volume manager that you are using for Oracle files, if any.

- If you are using Solaris Volume Manager for Sun Cluster, register and add the instance as follows:

- a. Register the `SUNW.vucmm_svm` resource type.

```
# clresourcetype register SUNW.vucmm_svm
```

b. Add an instance of the SUNW.vucmm_svm resource type to the resource group that you created in Step 2.

Ensure that this instance depends on the vucmm_f framework resource that you created in Step 4.

```
# clresource create -g vucmm-fwk-rg \
-t SUNW.vucmm_svm \
-p resource_dependencies=vucmm-fwk-rs vucmm-svm-rs
```

```
-p resource_dependencies=vucmm-fwk-rs
```

Specifies that this instance depends on the SUNW.vucmm_f framework resource that you created in Step 4.

```
vucmm-svm-rs
```

Specifies the name that you are assigning to the SUNW.vucmm_svm resource.

■ **SPARC: If you are using VxVM with the cluster feature, register and add the instance as follows.**

a. Register the SUNW.vucmm_cvm resource type.

```
# clresourcetype register SUNW.vucmm_cvm
```

b. Add an instance of the SUNW.vucmm_cvm resource type to the resource group that you created in Step 2.

Ensure that this instance depends on the vucmm_f framework resource that you created in Step 4.

```
# clresource create -g vucmm-fwk-rg \
-t SUNW.vucmm_cvm \
-p resource_dependencies=vucmm-fwk-rs vucmm-cvm-rs
```

```
-p resource_dependencies=vucmm-fwk-rs
```

Specifies that this instance depends on the SUNW.vucmm_f framework resource that you created in Step 4.

```
vucmm-cvm-rs
```

Specifies the name that you are assigning to the SUNW.vucmm_cvm resource.

7 Verify the configuration of the multiple-owner volume-manager framework resource group.

```
# clresourcegroup show vucmm-fwk-rg
```

8 Verify that the multiple-owner volume-manager framework resource group and its resources are online.

```
# clresourcegroup status
```

9 Bring online and in a managed state the multiple-owner volume-manager framework resource group and its resources.

```
# clresourcegroup online -emM vucmm-fwk-rg
```

vucmm-fmwk-rg Specifies the name of the SUNW.vucmm_ framework based resource group.

- 10 If your Oracle RAC configuration includes a ScalDeviceGroup resource that depends on a RAC volume manager resource, change the dependency to the equivalent multiple-owner volume-manager resource.**

```
# clresource set -p resource_dependencies=vucmm-vol-mgr-rs{local_node} scal-dg-rs
```

vucmm-vol-mgr-rs

Specifies the name of the multiple-owner volume-manager resource.

- For Solaris Volume Manager for Sun Cluster, use the SUNW.vucmm_svm resource type.
- For VxVM with the cluster feature, use the SUNW.vucmm_cvm resource type.

scal-dg-rs

Specifies the SUNW.ScalDeviceGroup resource whose dependency you move to the *vucmm-vol-mgr-rs* resource.

- 11 Disable the Oracle RAC volume manager resource.**

```
# clresource disable rac-vol-mgr-rs
```

rac-vol-mgr-rs

Specifies the SUNW.rac_svm or SUNW.rac_cvm resource that is used by the SUNW.rac_ framework based resource group.

- 12 Delete the Oracle RAC volume manager resource from the Oracle RAC framework resource group.**

```
# clresource delete -t rac-vol-mgr-rs rac-fmwk-rg
```

rac-fmwk-rg Specifies the name of the SUNW.rac_ framework based resource group.

- 13 Verify that all resource groups for Oracle RAC are online.**

```
# clresourcegroup status
```

- 14 Reboot each node, one node at a time.**

The reboot refreshes the Oracle RAC framework with the configuration changes.

SPARC: Deploying Oracle Solaris Cluster Native SKGXN for Oracle RAC 11g Release 2 or 12c

Oracle RAC specifies a set of APIs for distributed process monitoring and cluster configuration services. This set of APIs is known as System Kernel Generic Interface Node membership (SKGXN). Oracle Solaris Cluster and other cluster software use this API to communicate with Oracle RAC.

In previous releases of Sun Cluster software, configurations with Oracle RAC on a SPARC machine implement SKGXN through the UDLM package that is provided by Oracle. In this release of Oracle Solaris Cluster software for SPARC, with Oracle RAC 11g release 2 or 12c you can deploy the Oracle Solaris Cluster native SKGXN instead of UDLM. This section provides information about how to deploy Oracle Solaris Cluster native SKGXN on an existing Oracle RAC 11g release 2 or 12c configuration.

To configure a new Oracle RAC 11g release 2 configuration to use native SKGXN, follow the procedures in this manual without adding an UDLM resource to the Oracle RAC framework resource group. Native SKGXN is automatically used when the Oracle RAC framework resource group does not contain an UDLM resource.

- [“SPARC: How to Prepare the Cluster to Change the SKGXN Interfaces” on page 199](#)
- [“SPARC: How to Convert From UDLM to Oracle Solaris Cluster Native SKGXN” on page 200](#)
- [“SPARC: How to Convert SKGXN from Oracle Solaris Cluster Native SKGXN to UDLM” on page 201](#)
- [“SPARC: How to Bring Oracle RAC Online After Switching the SKGXN” on page 202](#)

▼ SPARC: How to Prepare the Cluster to Change the SKGXN Interfaces

(Oracle 11g release 2 or 12c only) Perform this procedure to prepare a cluster to change the SKGXN interface.

Note – Migrating from one implementation of SKGXN to the other requires downtime for the Oracle RAC data service. You should plan downtime to perform this migration.

- 1 **Become superuser.**
- 2 **Upgrade the Oracle RAC framework resource type to the latest installed version.**

```
# grep -i RT_VERSION /usr/cluster/lib/rgm/SUNW.rac_framework
RT_VERSION = "N";
# clresource type register SUNW.rac_framework:N
```

Alternatively, to upgrade the resource type in the global zone, use Oracle Solaris Cluster Manager or the Resource Group option of the `clsetup` utility.

- 3 **On the existing resource of type `SUNW.rac_framework`, set the value of the `Type_version` property to the version you upgraded to in [Step 2](#).**

In the following command example, replace *rac-fwk-rs* with the actual name of your resource of type `SUNW.rac_framework` and replace *N* with the resource-type version you upgraded to.

```
# clresource set -p Type_version=N rac-fwk-rs
```

- 4 **Disable Oracle Clusterware to prevent it from automatically starting on all nodes.**

```
# ${CRS_HOME}/bin/crsctl disable crs
```

- 5 **Stop Oracle Clusterware and all DBMS processes on all nodes.**

```
# ${CRS_HOME}/bin/crsctl stop crs
```

- 6 **Unmanage the Oracle RAC framework resource group.**

```
# clresource disable -g rac-fmwk-rg
# clresourcegroup offline rac-fmwk-rg
# clresourcegroup unmanage rac-fmwk-rg
```

- 7 **Reboot the cluster to ensure that the Oracle RAC framework processes have exited.**

Alternatively, reboot one node at a time, to allow clustered data services other than Oracle RAC to continue to provide service.

```
# scshutdn -g0 -y
```

▼ **SPARC: How to Convert From UDLM to Oracle Solaris Cluster Native SKGXN**

(Oracle 11g release 2 or 12c only) Perform this procedure to convert the SKGXN interface from UDLM to Oracle Solaris Cluster native SKGXN.

Before You Begin Ensure that you prepare the cluster to change the SKGXN interface. See [“SPARC: How to Prepare the Cluster to Change the SKGXN Interfaces”](#) on page 199.

- 1 **Become superuser.**
- 2 **Remove the UDLM resource from the Oracle RAC framework resource group.**

```
# clresource delete rac-udlm-rs
```

rac-udlm-rs The name of the SUNW.rac_udlm resource

- 3 **Remove the UDLM package from all nodes.**

```
# pkgrm ORCLudlm
```

- 4 **Enable the resources in the Oracle RAC framework resource group.**

```
# clresource enable -g rac-fmwk-rg
```

-g rac-fmwk-rg Specifies the name of the Oracle RAC framework resource group

- 5 **Manage the Oracle RAC framework resource group.**

```
# clresourcegroup manage -g rac-fmwk-rg
```


6 Bring the Oracle RAC framework resource group online.

```
# clresourcegroup online -g rac-fmwk-rg
```

Next Steps Bring Oracle RAC online. Go to [“SPARC: How to Bring Oracle RAC Online After Switching the SKGXN” on page 202.](#)

▼ **SPARC: How to Convert SKGXN from Oracle Solaris Cluster Native SKGXN to UDLM**

(Oracle 11g release 2 or 12c only) Perform this procedure to convert the SKGXN interface from Oracle Solaris Cluster native SKGXN to UDLM.

Before You Begin Prepare the cluster to change the SKGXN interface. See [“SPARC: How to Prepare the Cluster to Change the SKGXN Interfaces” on page 199.](#)

1 Become superuser.**2 Install the Oracle UDLM package on all nodes.**

```
# pkgadd -d pkgdir ORCLudlm
```

3 Create the UDLM resource in the Oracle RAC framework resource group.

```
# clresource create -g rac-fmwk-rg -t SUNW.rac_udlm \
-y resource_dependencies=rac-fmwk-rg rac-udlm-rs
```

-g *rac-fmwk-rg* Specifies the name of the Oracle RAC framework resource group

rac-udlm-rs The name of the SUNW.rac_udlm resource

4 Enable the resources.

```
# clresource enable -g rac-fmwk-rg
```

5 Manage the resource groups.

```
# clresourcegroup manage -g rac-fmwk-rg
```

6 Bring the resource groups online.

```
# clresourcegroup online -g rac-fmwk-rg
```

Next Steps Bring Oracle RAC online. Go to [“SPARC: How to Bring Oracle RAC Online After Switching the SKGXN” on page 202.](#)

▼ SPARC: How to Bring Oracle RAC Online After Switching the SKGXN

(Oracle 11g release 2 or 12c only) Perform this procedure to bring Oracle RAC online after switching the SKGXN interface. Also refer to the Oracle documentation that corresponds to your version of Oracle RAC for information about bringing Oracle RAC online.

- 1 Become superuser.
- 2 Enable Oracle Clusterware to start automatically in the future.
`{CRS_HOME}/bin/crsctl enable crs`
- 3 Start Oracle Clusterware and all DBMS processes.
`{CRS_HOME}/bin/crsctl stop crs`

Removing an Oracle Grid Infrastructure Resource

This section contains the following procedures to remove an Oracle Grid Infrastructure resource:

- [“How to Remove a Dependency” on page 202](#)
- [“How to Delete the `sun.resource` Resource” on page 203](#)

▼ How to Remove a Dependency

This procedure shows how to set the offline-restart dependency to remove a dependency.

- 1 Become superuser.
- 2 Display the current start dependency that the database has on the Oracle Grid Infrastructure `storage_proxy` resource.

```
# Grid_home/bin/crsctl stat res ora.testdb.db -p | grep START_DEPENDENCIES
START_DEPENDENCIES=hard(sun.grid-storage-proxy-rs) weak(type:ora.listener.type,global:type:ora.scan_listener.type,uniform:
# clresource show -p resource_dependencies_offline_restart rac-server-proxy-rs
=== Resources ===
```

```
Resource: rac-server-proxy-rs
Resource_dependencies_offline_restart: crs-fw-rs scal-dg1-rs
```

- 3 Remove the offline-restart dependency on the `SUNW.ScalDeviceGroup` or `SUNW.ScalMountPoint` resource from the Oracle RAC instance proxy resource.

This command clears the dependencies that the Oracle Grid Infrastructure database resource has on the Oracle Grid Infrastructure `storage_proxy` resource. Note that the command includes the minus (-) symbol.

```
# clresource set -p resource_dependencies_offline_restart-=scal-dg1-rs rac-server-proxy-rs
```

- 4 Verify that the start dependency on the Oracle Grid Infrastructure resource is removed.

```
# Grid_home/bin/crsctl stat res ora.testdb.db -p | grep START_DEPENDENCIES
START_DEPENDENCIES=weak(type:ora.listener.type,global:type:ora.scan_listener.type,uniform:ora.ons,uniform:ora.eon
```

```
# clresource show -p resource_dependencies_offline_restart rac-server-proxy-rs
```

```
=== Resources ===
```

```
Resource: rac-server-proxy-rs
```

```
Resource_dependencies_offline_restart: crs-fw-rs
```

▼ How to Delete the `sun.resource` Resource

- 1 Become superuser.
- 2 Ensure that the dependency is removed, as described in [How to Remove a Dependency](#), and that `sun.resource` is stopped.

```
# Grid_home/bin/crsctl stop res sun.scal-dg1-rs
CRS-2673: Attempting to stop 'sun.scal-dg1-rs' on 'pnsx3'
CRS-2673: Attempting to stop 'sun.scal-dg1-rs' on 'pnsx1'
CRS-2673: Attempting to stop 'sun.scal-dg1-rss' on 'pnsx2'
CRS-2677: Stop of 'sun.scal-dg1-rs' on 'pnsx3' succeeded
CRS-2677: Stop of 'sun.scal-dg1-rs' on 'pnsx1' succeeded
CRS-2677: Stop of 'sun.scal-dg1-rs' on 'pnsx2' succeeded
```

- 3 Delete `sun.resource`.

```
# Grid_home/bin/crsctl delete res sun.scal-dg1-rs
```

- 4 Verify that `sun.resource` is deleted.

```
# Grid_home/bin/crsctl stat res sun.scal-dg1-rs -p
CRS-210: Could not find resource 'sun.scal-dg1-rs'.
```

Removing Support for Oracle RAC

You can remove Support for Oracle RAC from the following entities:

- **A cluster.** See [“How to Remove Support for Oracle RAC From a Cluster”](#) on page 204.
- **Selected nodes in a cluster.** See [“How to Remove Support for Oracle RAC From Selected Nodes”](#) on page 210.

▼ How to Remove Support for Oracle RAC From a Cluster

Perform this task to remove Support for Oracle RAC from all nodes in a cluster.

On a cluster where multiple Oracle RAC databases are running, perform this task to remove an Oracle RAC database from the cluster. The remaining Oracle RAC databases continue to run in the cluster.

This task involves removing the following resource groups from the cluster in the following order:

- The resource group for the Oracle RAC database
- Resource groups for logical hostname resources
- Resource groups for scalable file-system mount-point resources
- Resource groups that contain resources for the Sun QFS metadata server
- Resource groups for scalable device group resources
- The Oracle RAC framework resource group
- The multiple-owner volume-manager framework resource group, if used.



Caution – You might perform this task to remove an Oracle RAC database from a cluster where multiple Oracle RAC databases are running. In this situation, do *not* remove any resource group on whose resources the remaining Oracle RAC databases depend.

For example, you might have configured multiple database file systems to depend on a single device group. In this situation, do *not* remove the resource group that contains the resource for the scalable device group.

Similarly, if multiple databases depend on the Oracle RAC framework resource group, do *not* remove this resource group.

Before You Begin Ensure that the cluster node from which you perform this task is booted in cluster mode.

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

2 (Oracle 9i, 10g release 2, 11g, or 12c only) Remove the resource group for each Oracle RAC database that you are removing.

If you are using Oracle 10g release 1, omit this step. For Oracle 10g release 1, no resource groups for Oracle RAC databases are configured.

For each Oracle RAC database that you are removing, type the following command:

```
# clresourcegroup delete -F rac-db-rg
```

rac-db-rg Specifies the resource group that you are removing.

3 (Oracle 9i only) Remove all resource groups for logical hostname resources that are used by each Oracle RAC database that you are removing.

If you are using Oracle 10g release 1, 10g release 2, 11g, or 12c, omit this step. For Oracle 10g release 1, 10g release 2, 11g, and 12c, no resource groups for logical hostname resources are configured.

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

```
# clresourcegroup delete -F lh-rg
```

lh-rg Specifies the resource group that you are removing.

4 Use Oracle utilities to remove from the cluster each Oracle RAC database that you no longer require.

5 If you are removing Support for Oracle RAC entirely, use Oracle utilities to remove the following items from all nodes in a cluster:

- The Oracle RAC software
- The Oracle Clusterware software

6 (Oracle 10g release 2, 11g, or 12c only) Disable the Oracle Clusterware framework resource.

If you are using Oracle 9i or Oracle 10g release 1, omit this step. For Oracle 9i and Oracle 10g release 1, no Oracle Clusterware framework resource is configured.

```
# clresource disable crs-framework-rs
```

crs-framework-rs Specifies the name of the resource that you are disabling. This resource is the instance of the SUNW.crs_framework resource type that is configured in the cluster.

7 Remove any resource groups that contain scalable file-system mount-point resources.

If no resource groups that contain scalable file-system mount-point resources are configured, omit this step.

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

```
# clresourcegroup delete -F scal-mp-rg
```

scal-mp-rg Specifies the resource group that you are removing.

8 Remove any resource groups that contain resources for the Sun QFS metadata server.

If no resource groups that contain resources for the Sun QFS metadata server are configured, omit this step.

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

```
# clresourcegroup delete -F qfs-mds-rg
```

qfs-mds-rg Specifies the resource group that you are removing.

9 Remove the Sun QFS shared file systems that were represented by resources in the resource group that you deleted in [Step 8](#).

For instructions for performing this task, see [Using SAM-QFS With Sun Cluster](#).

10 Remove any resource groups that contain scalable device group resources.

If no resource groups that contain scalable device group resources are configured, omit this step.

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

```
# clresourcegroup delete -F scal-dg-rg
```

scal-dg-rg Specifies the resource group that you are removing.

11 Destroy any scalable device groups that were affected by the removal of resource groups in [Step 10](#).

How to perform this step depends on the type of the scalable device group.

- **For each Solaris Volume Manager for Sun Cluster multi-owner disk set, destroy the disk set as follows:**

a. Remove all metadevices such as volumes, soft partitions, and mirrors from the disk set.

Use the [metaclear\(1M\)](#) command for this purpose.

```
# metaclear -s scal-dg-ms -a
```

-s scal-dg-ms Specifies the name of the disk set from which you are removing metadevices.

b. Remove all global devices from the disk set.

```
# metaset -s scal-dg-ms -d -f alldevices
```

-s scal-dg-ms Specifies the name of the disk set from which you are removing global devices.

alldevices Specifies a space-separated list that contains *all* global devices that were added to the disk set when the disk set was created. The format of

each device ID path name is `/dev/did/dsk/dN`, where *N* is the device number.

c. Remove all nodes from the disk set that you are destroying.

The removal of all nodes from a disk set destroys the disk set.

```
# metaset -s scal-dg-ms -d -h allnodes
```

`-s scal-dg-ms` Specifies the name of the disk set that you are destroying.

`-h allnodes` Specifies a space-separated list that contains *all* nodes that were added to the disk set when the disk set was created.

■ **For each VxVM shared-disk group, use Veritas commands to destroy the VxVM shared-disk group.**

For more information, see your VxVM documentation.

Note – If you are removing an Oracle RAC database from a cluster where multiple Oracle RAC databases are running, omit the remaining steps in this procedure.

12 Remove the Oracle RAC framework resource group.

```
# clresourcegroup delete -F rac-fmwk-rg
```

`rac-fmwk-rg` Specifies the resource group that you are removing.

13 Remove the multiple-owner volume-manager framework resource group, if used.

```
# clresourcegroup delete -F vucmm-fmwk-rg
```

`vucmm-fmwk-rg` Specifies the resource group that you are removing.

14 Unregister the resource type of each resource that you removed in this procedure.

```
# clresourcetype unregister resource-type-list
```

`resource-type-list` Specifies a comma-separated list of the names of the resource types that you are unregistering. For a list of the resource types that are associated with Support for Oracle RAC, see [“Automatically Generated Names for Oracle Solaris Cluster Objects”](#) on page 138.

15 (Optional) From each node in the cluster, uninstall the Support for Oracle RAC software packages.

Use the uninstaller program for this purpose. For more information, see [Chapter 8, “Uninstalling,”](#) in *Sun Java Enterprise System 5 Update 1 Installation Guide for UNIX*.

16 Reboot each node in the cluster.

Example 7–2 Removing Support for Oracle RAC From a Cluster

This example shows the sequence of operations that is required to remove Support for Oracle RAC from all nodes of a four-node cluster. The nodes in this cluster are named `pc1us1`, `pc1us2`, `pc1us3`, and `pc1us4`. Only one Oracle RAC database is configured on the cluster.

The configuration of Support for Oracle RAC in this example is as follows:

- The version of Oracle RAC is 10g Release 2.
- Sun QFS shared file system on Solaris Volume Manager for Sun Cluster is used to store Oracle files.
- The mount points of file systems that are used for Oracle files are as follows:
 - Oracle database files: `/db_qfs/OraData`
 - Oracle binary files and related files: `/db_qfs/OraHome`
- The `oradg` disk set is used only by the Oracle RAC database.
- The name of the Oracle RAC database is `swb`.
- The Sun QFS shared file systems use a Solaris Volume Manager for Sun Cluster multi-owner disk set that is named `oradg`. The creation of this disk set is shown in [Example 3–1](#).
- The configuration uses a multiple-owner volume-manager framework resource group.

The configuration of resource groups in this example is shown in the following table.

Resource Group	Purpose
<code>vucmm-framework-rg</code>	Multiple-owner volume-manager resource group.
<code>rac-framework-rg</code>	Oracle RAC framework resource group.
<code>scaldg-rg</code>	Resource group for scalable device-group resources.
<code>qfsmds-rg</code>	Resource group for Sun QFS metadata server resources.
<code>scalmnt-rg</code>	Resource group for scalable file-system mount-point resources.
<code>rac_server-proxy-rg</code>	Oracle RAC database resource group.

The resource groups that are required for this configuration are shown in [Figure A–2](#).

1. To remove the resource group for the Oracle RAC database, the following command is run:

```
# clresourcegroup delete -F rac_server-proxy-rg
```

After the removal of this resource group, Oracle utilities are used to remove the following items:

- The Oracle RAC database
- The Oracle RAC software

- The Oracle Clusterware software

The removal of these items is beyond the scope of this example.

2. To disable the Oracle Clusterware framework resource, the following command is run:

```
# clresource disable crs_framework-rs
```

3. To remove the resource group that contains scalable file-system mount-point resources, the following command is run:

```
# clresourcegroup delete -F scalmnt-rg
```

4. To remove the resource group that contains resources for the Sun QFS metadata server, the following command is run:

```
# clresourcegroup delete -F qfsmnds-rg
```

After the removal of this resource group, Sun QFS utilities are used to remove the Sun QFS shared file systems that are used for Oracle files. The removal of these file systems is beyond the scope of this example.

5. To remove the resource group that contains scalable device group resources, the following command is run:

```
# clresourcegroup delete -F scaldg-rg
```

6. To destroy the Solaris Volume Manager for Sun Cluster multi-owner disk set oradg, the following commands are run:

```
# metaclear -s oradg -a
# metaset -s oradg -d \
-f /dev/did/dsk/d8 /dev/did/dsk/d9 /dev/did/dsk/d15 /dev/did/dsk/d16
# metaset -s oradg -d -h pclus1 pclus2 pclus3 pclus4
```

The following global devices are removed from the disk set:

- /dev/did/dsk/d8
- /dev/did/dsk/d9
- /dev/did/dsk/d15
- /dev/did/dsk/d16

7. To remove the Oracle RAC framework resource group, the following command is run:

```
# clresourcegroup delete -F rac-framework-rg
```

8. To remove the multiple-owner volume-manager framework resource group, the following command is run:

```
# clresourcegroup delete -F vucmm-framework-rg
```

9. To unregister the resource type of each resource that was removed, the following command is run:

```
# clresourcetype unregister \
SUNW.scalable_rac_server_proxy,\
SUNW.ScalMountPoint,\
SUNW.qfs,\
```

```
SUNW.ScalDeviceGroup,\
SUNW.rac_svm,\
SUNW.crs_framework,\
SUNW.rac_udlm,\
SUNW.rac_framework
```

This configuration is running on the SPARC platform. Therefore, `SUNW.rac_udlm` is in the list of resource types that are unregistered.

After the unregistration of these resource types, the following operations are performed:

- The removal of the Support for Oracle RAC software packages
- The reboot of each node in the cluster

These operations are beyond the scope of this example.

▼ How to Remove Support for Oracle RAC From Selected Nodes

Perform this task to remove Support for Oracle RAC from selected nodes.

On a cluster where multiple Oracle RAC databases are running, perform this task to remove an Oracle RAC database from selected nodes. The Oracle RAC database that you remove continues to run on the other cluster nodes. The remaining Oracle RAC databases continue to run on the selected nodes.

This task involves removing the selected nodes from the following resource groups in the following order:

- The resource group for the Oracle RAC database
- Resource groups for logical hostname resources
- Resource groups for scalable file-system mount-point resources
- Resource groups that contain resources for the Sun QFS metadata server
- Resource groups for scalable device group resources
- The Oracle RAC framework resource group



Caution – You might perform this task to remove an Oracle RAC database from selected nodes of a cluster where multiple Oracle RAC databases are running. In this situation, do *not* remove the nodes from any resource group on whose resources the remaining Oracle RAC databases depend. For example, you might have configured multiple database file systems to depend on a single device group. In this situation, do *not* remove the nodes from the resource group that contains the resource for the scalable device group. Similarly, if multiple databases depend on the Oracle RAC framework resource group, do *not* remove the nodes from this resource group.

1 Become superuser.

2 (Oracle 9i, 10g release 2, 11g, or 12c only) Remove the nodes from the resource group for each Oracle RAC database that you are removing.

If you are using Oracle 10g release 1, omit this step. For Oracle 10g release 1, no resource groups for Oracle RAC databases are configured.

For each Oracle RAC database that you are removing, perform the following steps:

a. Take offline the resource group for the Oracle RAC database on the nodes from which you are removing Support for Oracle RAC.

```
# clresourcegroup offline -n nodelist rac-db-rg
```

-n nodelist

Specifies a comma-separated list of cluster nodes from which you are taking offline the resource group.

rac-db-rg

Specifies the name of the resource group that you are taking offline.

b. Remove the nodes from the node list of the resource group for the Oracle RAC database.

```
# clresourcegroup remove-node -n nodelist rac-db-rg
```

-n nodelist

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

rac-db-rg

Specifies the name of the resource group from which you are removing nodes.

3 (Oracle 9i only) Remove the nodes from all resource groups for logical hostname resources that are used by each Oracle RAC database that you are removing.

If you are using Oracle 10g release 1, Oracle 10g release 2, 11g, or 12c, omit this step. For Oracle 10g release 1, 10g release 2, 11g, and 12c, no resource groups for logical hostname resources are configured.

For each resource group from which you are removing nodes, perform the following steps:

a. Switch the resource group to a node from which you are *not* removing Support for Oracle RAC.

```
# clresourcegroup switch -n node-to-stay lh-rg
```

node-to-stay

Specifies the node to which you are switching the resource group. This node must be a node from which you are *not* removing Support for Oracle RAC.

lh-rg

Specifies the name of the resource group that you are switching to another node.

b. Remove the nodes from the node list of the resource group.

```
# clresourcegroup remove-node -n nodelist lh-rg
```

-n nodelist

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

lh-rg

Specifies the name of the resource group from which you are removing nodes.

4 (Oracle 9i only) Remove each resource group for logical hostname resources whose primary node you removed from resource groups in [Step 3](#).

These resource groups are no longer required because the Oracle RAC database instances that the groups serve are being removed.

Do *not* remove any resource groups from which you removed *only* secondary nodes in [Step 3](#).

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

```
# clresourcegroup remove -F lh-rg-rm-prim
```

lh-rg-rm-prim Specifies the name of the resource group that you are removing.

5 (Oracle 10g release 2, 11g, or 12c only) Remove each node that you are removing from the list of nodes where the Oracle Clusterware resource for the Oracle database runs.

If you are using Oracle 9i or Oracle 10g release 1, omit this step. For Oracle 9i and Oracle 10g release 1, no Oracle Clusterware resources that represent Oracle Solaris Cluster resources are configured.

Note – In this step, the syntax of Oracle commands for Oracle 10g release 2, 11g, or 12c is provided. If you are using an Oracle version other than 10g release 2, 11g or 12c, see your Oracle documentation for the correct command syntax.

```
# Grid_home/bin/crs_register ora.dbname.sid.inst \
-update -r "ora.node-name.vip"
```

Grid_home Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.

dbname Specifies the database name of the database instance that the Oracle Clusterware resource represents.

sid Specifies the Oracle SID of the database instance that the Oracle Clusterware resource represents.

node-name Specifies the host name of the node where the Oracle Clusterware resource runs.

- 6 (Oracle 10g release 2, 11g, or 12c only) From each node that you are removing, remove each Oracle Clusterware resource that represents an Oracle Solaris Cluster resource from whose resource group you are removing nodes.**

An Oracle Clusterware resource is configured for each Oracle Solaris Cluster resource for scalable device groups and scalable file-system mount points on which Oracle components depend.

If you are using Oracle 9i or Oracle 10g release 1, omit this step. For Oracle 9i and Oracle 10g release 1, no Oracle Clusterware resources that represent Oracle Solaris Cluster resources are configured.

Note – In this step, the syntax of Oracle commands for Oracle 10g release 2, 11g, or 12c is provided. If you are using an Oracle version other than 10g release 2, 11g, or 12c, see your Oracle documentation for the correct command syntax.

For each Oracle Clusterware resource that you are removing, perform the following steps on each node from which you are removing the resource:

a. Stop the Oracle Clusterware resource that you are removing.

```
# Grid_home/bin/crs_stop sun.node-name.sc-rs
```

<i>Grid_home</i>	Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.
<i>node-name</i>	Specifies the host name of the node where the Oracle Clusterware resource runs.
<i>sc-rs</i>	Specifies the name of the Oracle Solaris Cluster resource that the Oracle Clusterware resource represents.

b. Unregister the Oracle Clusterware resource that you are removing.

```
# Grid_home/bin/crs_unregister sun.node-name.sc-rs
```

<i>Grid_home</i>	Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.
<i>node-name</i>	Specifies the host name of the node where the Oracle Clusterware resource runs.
<i>sc-rs</i>	Specifies the name of the Oracle Solaris Cluster resource that the Oracle Clusterware resource represents.

c. Delete the profile for the Oracle Clusterware resource that you are removing.

```
# Grid_home/bin/crs_profile -delete sun.node-name.sc-rs \
-dir /var/cluster/ucmm/profile
```

<i>Grid_home</i>	Specifies the Oracle Clusterware home directory. This directory contains the Oracle Clusterware binary files and Oracle Clusterware configuration files.
<i>node-name</i>	Specifies the host name of the node where the Oracle Clusterware resource runs.
<i>sc-rs</i>	Specifies the name of the Oracle Solaris Cluster resource that the Oracle Clusterware resource represents.

7 Use Oracle utilities to remove the following items from each node from which you are removing Support for Oracle RAC:

- The Oracle RAC database
- Oracle Clusterware

8 Switch any resource groups that contain resources for the Sun QFS metadata server to a node from which you are *not* removing Support for Oracle RAC.

If no configured resource groups contain resources for the Sun QFS metadata server, omit this step.

```
# clresourcegroup switch -n node-to-stay qfs-mds-rg
```

node-to-stay Specifies the node to which you are switching the resource group. This node must be a node from which you are *not* removing Support for Oracle RAC.

qfs-mds-rg Specifies the name of the resource group that you are switching to another node.

9 Remove the nodes from any resource groups that contain scalable file-system mount-point resources.

If no resource groups that contain scalable file-system mount-point resources are configured, omit this step.

For each resource group from which you are removing nodes, perform the following steps:

a. Take offline the resource group on the nodes from which you are removing Support for Oracle RAC.

```
# clresourcegroup offline -n nodelist scal-mp-rg
```

-n nodelist

Specifies a comma-separated list of cluster nodes from which you are taking offline the resource group.

scal-mp-rg

Specifies the name of the resource group that you are taking offline.

b. Remove the nodes from the node list of the resource group.

```
# clresourcegroup remove-node -n nodelist scal-mp-rg
```

```
-n nodelist
```

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

```
scal-mp-rg
```

Specifies the name of the resource group from which you are removing nodes.

10 Remove the nodes from the node list of any resource groups that contain resources for the Sun QFS metadata server.

If no resource groups that contain resources for the Sun QFS metadata server are configured, omit this step.

The resource groups to modify are the resource groups that you switched to another node in [Step 8](#).

```
# clresourcegroup remove-node -n nodelist qfs-mds-rg
```

```
-n nodelist
```

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

```
qfs-mds-rg
```

Specifies the name of the resource group from which you are removing nodes.

11 Remove the configuration of the Sun QFS shared file systems from the nodes.

For instructions for performing this task, see [Using SAM-QFS With Sun Cluster](#).

12 Remove the nodes from any resource groups that contain scalable device group resources.

If no resource groups that contain scalable device group resources are configured, omit this step.

For each resource group from which you are removing nodes, perform the following steps:

a. Take offline the resource group on the nodes from which you are removing Support for Oracle RAC.

```
# clresourcegroup offline -n nodelist scal-dg-rg
```

```
-n nodelist
```

Specifies a comma-separated list of cluster nodes from which you are taking offline the resource group.

```
scal-dg-rg
```

Specifies the name of the resource group that you are taking offline.

b. Remove the nodes from the node list of the resource group.

```
# clresourcegroup remove-node -n nodelist scal-dg-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

scal-dg-rg

Specifies the name of the resource group from which you are removing nodes.

13 Remove the nodes from any scalable device groups that were affected by the removal of nodes from resource groups in [Step 12](#).

How to perform this step depends on the type of the scalable device group.

- **For each Solaris Volume Manager for Sun Cluster multi-owner disk set, type the following command:**

```
# metaset -s scal-dg-ms -d -h nodelist
```

-s *scal-dg-ms* Specifies the name of the disk set from which you are removing nodes.

-h *nodelist* Specifies a space-separated list of the nodes that you are removing from the disk set.

- **For each VxVM shared-disk group, use Veritas commands to remove the nodes from the VxVM shared-disk group.**

For more information, see your VxVM documentation.

Note – If you are removing an Oracle RAC database from selected nodes of a cluster where multiple Oracle RAC databases are running, omit the remaining steps in this procedure.

14 Remove the nodes from the Oracle RAC framework resource group.

- a. **Take offline the resource group on the nodes from which you are removing Support for Oracle RAC.**

```
# clresourcegroup offline -n nodelist rac-fwk-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes from which you are taking offline the resource group.

rac-fwk-rg

Specifies the name of the resource group that you are taking offline.

- b. **Remove the nodes from the node list of the resource group.**

```
# clresourcegroup remove-node -n nodelist rac-fwk-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

rac-fmwk-rg

Specifies the name of the resource group from which you are removing nodes.

15 Remove the nodes from the multiple-owner volume-manager framework resource group, if used.

a. Take offline the resource group on the nodes from which you are removing Support for Oracle RAC.

```
# clresourcegroup offline -n nodelist vucmm-fmwk-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes from which you are taking offline the resource group.

vucmm-fmwk-rg

Specifies the name of the resource group that you are taking offline.

b. Remove the nodes from the node list of the resource group.

```
# clresourcegroup remove-node -n nodelist vucmm-fmwk-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes that you are removing from the resource group.

vucmm-fmwk-rg

Specifies the name of the resource group from which you are removing nodes.

16 (Optional) From each node that you removed, uninstall the Support for Oracle RAC software packages.

Use the uninstaller program for this purpose. For more information, see [Chapter 8, “Uninstalling”](#) in *Sun Java Enterprise System 5 Update 1 Installation Guide for UNIX*.

17 Reboot each node from which you removed Support for Oracle RAC.

Example 7–3 Removing Support for Oracle RAC From Selected Nodes

This example shows the sequence of operations that is required to remove Support for Oracle RAC from nodes `pc1us3` and `pc1us4` of a four-node cluster.

The configuration of Support for Oracle RAC in this example is as follows:

- The version of Oracle RAC is 10g Release 2.
- Sun QFS shared file system on Solaris Volume Manager for Sun Cluster is used to store Oracle files.
- The mount points of file systems that are used for Oracle files are as follows:
 - Oracle database files: `/db_qfs/OraData`

- Oracle binary files and related files: /db_qfs/OraHome
- The oradg disk set is used only by the Oracle RAC database.
- The name of the Oracle RAC database is swb.
- The Sun QFS shared file systems use a Solaris Volume Manager for Sun Cluster multi-owner disk set that is named oradg. The creation of this disk set is shown in [Example 3–1](#).
- The configuration uses a multiple-owner volume-manager framework resource group.

The configuration of resource groups in this example is shown in the following table.

Resource Group	Purpose
vucmm-framework-rg	Multiple-owner volume-manager resource group.
rac-framework-rg	Oracle RAC framework resource group.
scaldg-rg	Resource group for scalable device-group resources.
qfsmnds-rg	Resource group for Sun QFS metadata server resources.
scalmnt-rg	Resource group for scalable file-system mount-point resources.
rac_server_proxy-rg	Oracle RAC database resource group.

The resource groups that are required for this configuration are shown in [Figure A–2](#).

1. To remove nodes pclus3 and pclus4 from the resource group for the Oracle RAC database, the following commands are run:

```
# clresourcegroup offline -n pclus3,pclus4 rac_server_proxy-rg
# clresourcegroup remove-node -n pclus3,pclus4 rac_server_proxy-rg
```

2. To remove nodes pclus3 and pclus4 from the node list of the Oracle Clusterware resource for the Oracle RAC database, the following commands are run:

```
# /db_qfs/OraHome/crs/bin/crs_register ora.swb.swb3.inst \
-update -r "ora.pclus3.vip"
# /db_qfs/OraHome/crs/bin/crs_register ora.swb.swb4.inst \
-update -r "ora.pclus4.vip"
```

3. To remove from nodes pclus3 and pclus4 the Oracle Clusterware resources that represent Oracle Solaris Cluster resources, the following commands are run:

```
Removal of resource for Oracle database files from node pclus3
# /db_qfs/OraHome/crs/bin/crs_stop sun.pclus3.scaloramnt-OraData-rs
# /db_qfs/OraHome/crs/bin/crs_unregister sun.pclus3.scaloramnt-OraData-rs
# /db_qfs/OraHome/crs/bin/crs_profile -delete sun.pclus3.scaloramnt-OraData-rs \
-dir /var/cluster/ucmm/profile
```

```
Removal of resource for Oracle binary files from node pclus3
# /db_qfs/OraHome/crs/bin/crs_stop sun.pclus3.scaloramnt-OraHome-rs
# /db_qfs/OraHome/crs/bin/crs_unregister sun.pclus3.scaloramnt-OraHome-rs
```

```
# /db_qfs/OraHome/crs/bin/crs_profile -delete sun.pclus3.scaloramnt-OraHome-rs \
-dir /var/cluster/ucmm/profile
```

Removal of resource for Oracle database files from node pclus4

```
# /db_qfs/OraHome/crs/bin/crs_stop sun.pclus4.scaloramnt-OraData-rs
# /db_qfs/OraHome/crs/bin/crs_unregister sun.pclus4.scaloramnt-OraData-rs
# /db_qfs/OraHome/crs/bin/crs_profile -delete sun.pclus4.scaloramnt-OraData-rs \
-dir /var/cluster/ucmm/profile
```

Removal of resource for Oracle binary files from node pclus4

```
# /db_qfs/OraHome/crs/bin/crs_stop sun.pclus4.scaloramnt-OraHome-rs
# /db_qfs/OraHome/crs/bin/crs_unregister sun.pclus4.scaloramnt-OraHome-rs
# /db_qfs/OraHome/crs/bin/crs_profile -delete sun.pclus4.scaloramnt-OraHome-rs \
-dir /var/cluster/ucmm/profile
```

The commands remove Oracle Clusterware resources that represent the following Oracle Solaris Cluster resources:

- scaloramnt-OraData-rs – A resource of type SUNW.ScalMountPoint that represents the mount point of the file system for database files
- scaloramnt-OraHome-rs – A resource of type SUNW.ScalMountPoint that represents the mount point of the file system for binary files and associated files

After the resource is removed from nodes pclus3 and pclus4, Oracle utilities are used to remove the following items from these nodes:

- The Oracle RAC database
- The Oracle RAC software
- The Oracle Clusterware software

The removal of these items is beyond the scope of this example.

4. To switch the resource group that contains resources for the Sun QFS metadata server to node pclus1, the following command is run:

```
# clresourcegroup switch -n pclus1 qfsmnds-rg
```

5. To remove nodes pclus3 and pclus4 from the resource group that contains scalable file-system mount-point resources, the following commands are run:

```
# clresourcegroup offline -n pclus3,pclus4 scalmnt-rg
# clresourcegroup remove-node -n pclus3,pclus4 scalmnt-rg
```

6. To remove nodes pclus3 and pclus4 from the node list of the resource group that contains resources for the Sun QFS metadata server, the following command is run:

```
# clresourcegroup remove-node -n pclus3,pclus4 qfsmnds-rg
```

After nodes pclus3 and pclus4 are removed from the node list, the configuration of the Sun QFS shared file systems is removed from these nodes. This operation is beyond the scope of this example.

7. To remove nodes pclus3 and pclus4 from the resource group that contains scalable device group resources, the following commands are run:

```
# clresourcegroup offline -n pclus3,pclus4 scaldg-rg
# clresourcegroup remove-node -n pclus3,pclus4 scaldg-rg
```

8. To remove nodes pclus3 and pclus4 from the Solaris Volume Manager for Sun Cluster multi-owner disk set oradg, the following command is run:

```
# metaset -s oradg -d -h pclus3 pclus4
```

9. To remove nodes pclus3 and pclus4 from the Oracle RAC framework resource group, the following commands are run:

```
# clresourcegroup offline -n pclus3,pclus4 rac-framework-rg
# clresourcegroup remove-node -n pclus3,pclus4 rac-framework-rg
```

10. To remove nodes pclus3 and pclus4 from the multiple-owner volume-manager framework resource group, the following commands are run:

```
# clresourcegroup offline -n pclus3,pclus4 vucmm-framework-rg
# clresourcegroup remove-node -n pclus3,pclus4 vucmm-framework-rg
```

After the removal of nodes pclus3 and pclus4 from the framework resource groups, the Support for Oracle RAC software packages can optionally be removed from the nodes.

After the removal is complete, the status of resource groups and resources is as follows:

```
# clresourcegroup status
```

=== Cluster Resource Groups ===

Group Name	Node Name	Suspended	Status
-----	-----	-----	-----
rac-framework-rg	pclus1	No	Online
	pclus2	No	Online
vucmm-framework-rg	pclus1	No	Online
	pclus2	No	Online
scaldg-rg	pclus1	No	Online
	pclus2	No	Online
qfsmds-rg	pclus1	No	Online
	pclus2	No	Offline
scalmnt-rg	pclus1	No	Online
	pclus2	No	Online
rac_server_proxy-rg	pclus1	No	Online
	pclus2	No	Online

```
# clresource status
```

=== Cluster Resources ===

Resource Name	Node Name	State	Status Message
-----	-----	-----	-----

rac-framework-rs	pclus1	Online	Online
	pclus2	Online	Online
rac-udlm-rs	pclus1	Online	Online
	pclus2	Online	Online
crs_framework-rs	pclus1	Online	Online
	pclus2	Online	Online
vucmm-svm-rs	pclus1	Online	Online
	pclus2	Online	Online
scaloradg-rs	pclus1	Online	Online - Diskgroup online
	pclus2	Online	Online - Diskgroup online
qfs-mds-rs	pclus1	Online	Online - Service is online.
	pclus2	Offline	Offline
scaloramnt-OraData-rs	pclus1	Online	Online
	pclus2	Online	Online
scaloramnt-OraHome-rs	pclus1	Online	Online
	pclus2	Online	Online
rac_server_proxy-rs	pclus1	Online	Online - Oracle instance UP
	pclus2	Online	Online - Oracle instance UP

Upgrading Support for Oracle RAC

This chapter explains how to upgrade a configuration of Oracle Solaris Cluster Support for Oracle Real Application Clusters (Support for Oracle RAC).

If you upgrade Oracle Solaris Cluster core software, you must also upgrade the Support for Oracle RAC software. For more information, see [Oracle Solaris Cluster Upgrade Guide](#).

Your existing configuration of Support for Oracle RAC might not include the Oracle RAC framework resource group. In this situation, you *must* register and configure the Oracle RAC framework resource group after upgrading Oracle Solaris Cluster software. Otherwise, Oracle RAC cannot run with Oracle Solaris Cluster software. For more information, see “[Registering and Configuring the Oracle RAC Framework Resource Group](#)” on page 65.

Information about how to upgrade an existing configuration is provided in the subsections that follow:

- “[Upgrading Resources in Support for Oracle RAC](#)” on page 224
- “[Adding Storage Resources for Oracle Files](#)” on page 226
- “[Adding Resources for Interoperation With Oracle 10g Release 2, 11g, or 12c Oracle Clusterware](#)” on page 226

Note – The `SUNW.oracle_rac_server` resource type and the `SUNW.oracle_listener` resource type are unchanged in Oracle Solaris Cluster 3.3 software. If you choose to continue to use the `SUNW.oracle_rac_server` resource type and the `SUNW.oracle_listener` resource type for Oracle 9i RAC database instances, no upgrade of these resource types is required.

Upgrading Resources in Support for Oracle RAC

Changes to resource types of resources in Oracle Solaris Cluster 3.3 5/11 Support for Oracle RAC are summarized in the following table.

TABLE 8–1 Changes to Support for Oracle RAC Resource Types

Resource Type	Changes
SUNW.scalable_rac_server_proxy	Range of the client_retry_interval extension property is increased to 1–3600. Range of the monitor_probe_interval extension property is increased to 1–3600, and the default is changed to 300. Range of the proxy_probe_timeout extension property is increased to 5–3600, and the default is changed to 120.
SUNW.crs_framework	New methods now enable Support for Oracle RAC to control Oracle Clusterware starts and stops and to disable Oracle Clusterware autostart.

Upgrade these resource types if you are upgrading from an earlier version of Support for Oracle RAC.

For general instructions that explain how to upgrade a resource type, see “[Upgrading a Resource Type](#)” in *Oracle Solaris Cluster Data Services Planning and Administration Guide*.

Information for Registering the New Versions of Support for Oracle RAC Resource Types

The following table lists the name of each Support for Oracle RAC resource type and its Resource Type Registration (RTR) file name.

TABLE 8–2 Support for Oracle RAC Resource Types

Resource Type	RTR File
(Oracle 10g and 11g release 1 only) SUNW.asm_diskgroup	/opt/cluster/lib/rgm/rtreg/SUNW.asm_diskgroup
SUNW.crs_framework	/usr/cluster/lib/rgm/rtreg/SUNW.crs_framework
SUNW.qfs ¹	/usr/cluster/lib/rgm/rtreg/SUNW.qfs
SPARC: SUNW.rac_cvm ²	/usr/cluster/lib/rgm/rtreg/SUNW.rac_cvm

¹ Delivered in the Sun QFS product

² Deprecated. Instead use SUNW.vucmm_cvm in a SUNW.vucmm_framework resource group. See “[Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group](#)” on page 195.

TABLE 8-2 Support for Oracle RAC Resource Types (Continued)

Resource Type	RTR File
SUNW.rac_framework	/usr/cluster/lib/rgm/rtreg/SUNW.rac_framework
SUNW.rac_svm ²	/usr/cluster/lib/rgm/rtreg/SUNW.rac_svm
SPARC: SUNW.rac_udlm	/usr/cluster/lib/rgm/rtreg/SUNW.rac_udlm
(Oracle 11g release 2 or 12c only) SUNW.scalable_acfs_proxy	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_acfs_proxy
(Oracle 11g release 2 or 12c only) SUNW.scalable_asm_diskgroup_proxy	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_asm_diskgroup_proxy
SUNW.scalable_asm_instance	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_asm_instance
SUNW.scalable_asm_instance_proxy	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_asm_instance_proxy
SUNW.scalable_rac_listener	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_rac_listener
SUNW.scalable_rac_server	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_rac_server
SUNW.scalable_rac_server_proxy	/opt/cluster/lib/rgm/rtreg/SUNW.scalable_rac_server_proxy
SUNW.ScalDeviceGroup	/opt/cluster/lib/rgm/rtreg/SUNW.ScalDeviceGroup
SUNW.ScalMountPoint	/opt/cluster/lib/rgm/rtreg/SUNW.ScalMountPoint
SPARC: SUNW.vucmm_cvm	/usr/cluster/lib/rgm/rtreg/SUNW.vucmm_cvm
SUNW.vucmm_framework	/usr/cluster/lib/rgm/rtreg/SUNW.vucmm_framework
SUNW.vucmm_svm	/usr/cluster/lib/rgm/rtreg/SUNW.vucmm_svm
SUNW.wait_zc_boot	/usr/cluster/lib/rgm/rtreg/SUNW.wait_zc_boot

² Deprecated. Instead use SUNW.vucmm_cvm in a SUNW.vucmm_framework resource group. See “[Migrating a Volume-Manager Resource From an Oracle RAC Framework Resource Group to a Multiple-Owner Volume Manager Framework Resource Group](#)” on page 195.

To determine the version of the resource type that is currently registered, use the following command:

```
# clresourcetype show resource-type
resource-type    Specifies the resource type whose version you are determining.
```

To determine the version of the latest installed version of a resource type, whether it is registered or not, use the following command:

```
# grep -i RT_VERSION /path/RTRfilename
```

If the version of the latest installed resource type is later than the registered version, migrate to the newer version to ensure full functionality.

Note – In the global zone, Oracle Solaris Cluster Manager or the Resource Group option of `clsetup` locates for you the available resource type versions you can upgrade to.

Adding Storage Resources for Oracle Files

Oracle Solaris Cluster 3.3 5/11 software includes resource types that provide fault monitoring and automatic fault recovery for global device groups and file systems.

If you are using global device groups or shared file systems for Oracle files, add storage resources to manage the availability of the storage on which the Oracle software depends.

Before adding storage resources for Oracle files, ensure that you have upgraded resources in the Oracle RAC framework resource group. For more information, see [“Upgrading Resources in Support for Oracle RAC” on page 224](#).

For detailed instructions for adding storage resources for Oracle files, see [“Registering and Configuring Storage Resources for Oracle Files” on page 83](#).

Follow these instructions only if you are adding storage resources to an existing configuration of storage management schemes. If you are extending an existing configuration of Support for Oracle RAC by supporting additional storage management schemes, see the following sections:

- [Chapter 2, “Configuring Storage for Oracle Files”](#)
- [“How to Add a Volume Manager Resource to the Framework Resource Group” on page 192](#)

Adding Resources for Interoperation With Oracle 10g Release 2, 11g, or 12c Oracle Clusterware

Oracle Solaris Cluster 3.3 5/11 software includes resource types that enable Oracle Solaris Cluster software and Oracle 10g release 2, 11g, or 12c Oracle Clusterware to interoperate. These resource types also enable Oracle RAC database instances to be administered from Oracle Solaris Cluster.

Note – Oracle Solaris Cluster resource types cannot be used to interoperate with Oracle Clusterware version 10g release 1. Instead, use version 10g release 1 Oracle Clusterware commands to start and shut down Oracle RAC database instances.

Before adding resources for interoperation with Oracle Clusterware version 10g release 2, 11g, or 12c, ensure that you have performed the tasks in the following sections:

- [“Upgrading Resources in Support for Oracle RAC” on page 224](#)
- [“Adding Storage Resources for Oracle Files” on page 226](#)

For detailed instructions for adding resources for interoperation with Oracle Clusterware version 10g release 2, 11g, or 12c, see [“Configuring Resources for Oracle RAC Database Instances” on page 113](#).

Sample Configurations of This Data Service

The software architectures of Oracle 9i and Oracle 10g, 11g, or 12c are different. As a result of these differences, the configuration of resources and resource groups for the Support for Oracle RAC depends on the version of Oracle that you are using. For each version of Oracle that this data service supports, the configuration of resources and resource groups also depends on the combination of storage management schemes that you are using for Oracle files.

The sections that follow illustrate the configuration of resources and resource groups for typical combinations of storage management schemes for Oracle 9i and Oracle 10g, 11g, or 12c on the SPARC platform for both the global cluster and a zone cluster. On the x86 platform, no UDLM resource is required.

Note – These diagrams reflect, where applicable, the use of the multiple-owner volume-manager framework, `SUNW.vucmm_framework`. This framework was introduced in the Sun Cluster 3.2 11/09 release to contain volume-manager resources, if used by the Oracle RAC configuration, instead of using the Oracle RAC framework resource group.

Oracle RAC configurations that configure volume-manager resources with the Oracle RAC framework, `SUNW.rac_framework`, are still supported in this release. The use of `SUNW.rac_framework` to contain volume-manager resources might become deprecated in a future Oracle Solaris Cluster release. See [“Legacy Configurations” on page 247](#) for all diagrams that use `SUNW.rac_framework` instead of `SUNW.vucmm_framework` for volume-manager resources.

- [“Sample Oracle 10g, 11g, or 12c Configurations in the Global Cluster” on page 230](#)
- [“Sample Oracle 9i Configurations in the Global Cluster” on page 236](#)
- [“Sample Oracle 10g, 11g, or 12c Configurations in a Zone Cluster” on page 239](#)
- [“Sample Oracle 9i Configurations in a Zone Cluster” on page 245](#)
- [“Legacy Configurations” on page 247](#)

Sample Oracle 10g, 11g, or 12c Configurations in the Global Cluster

FIGURE A-1 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster

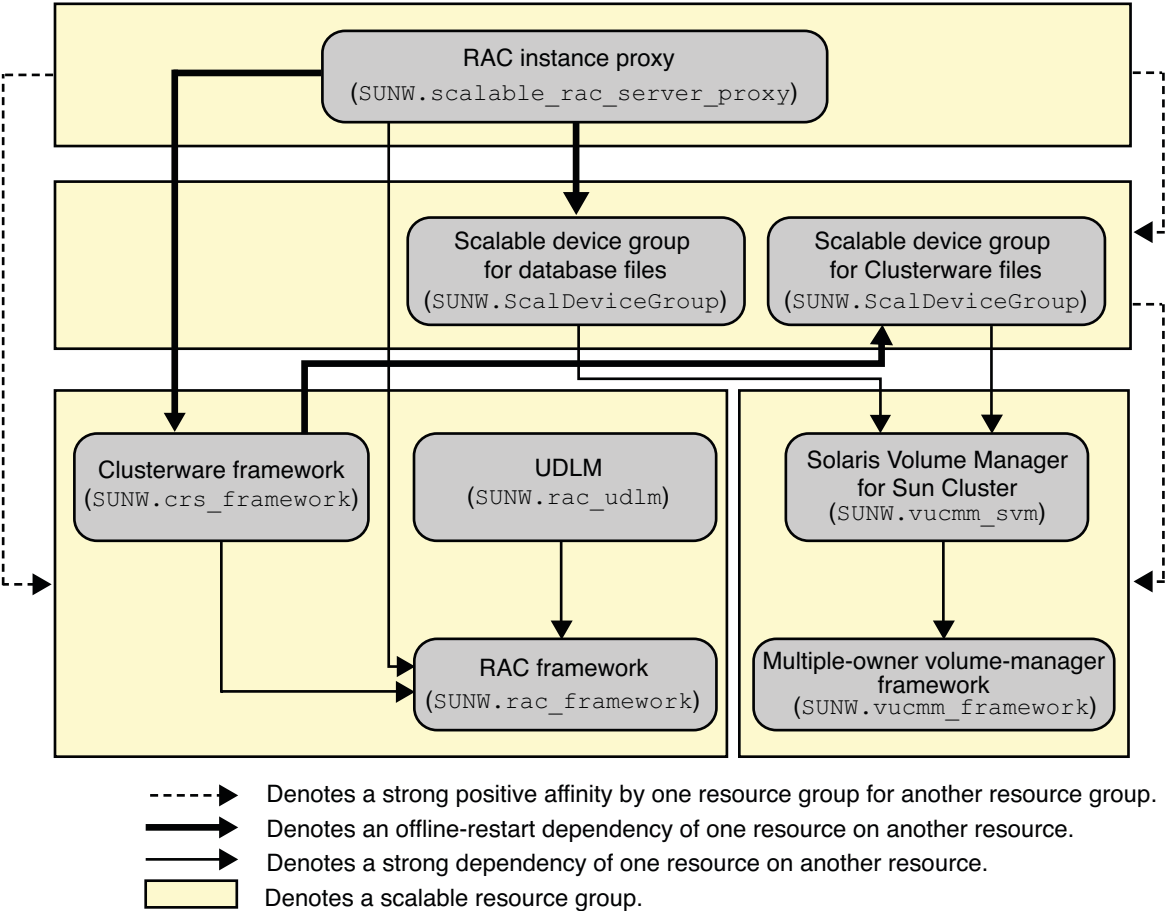


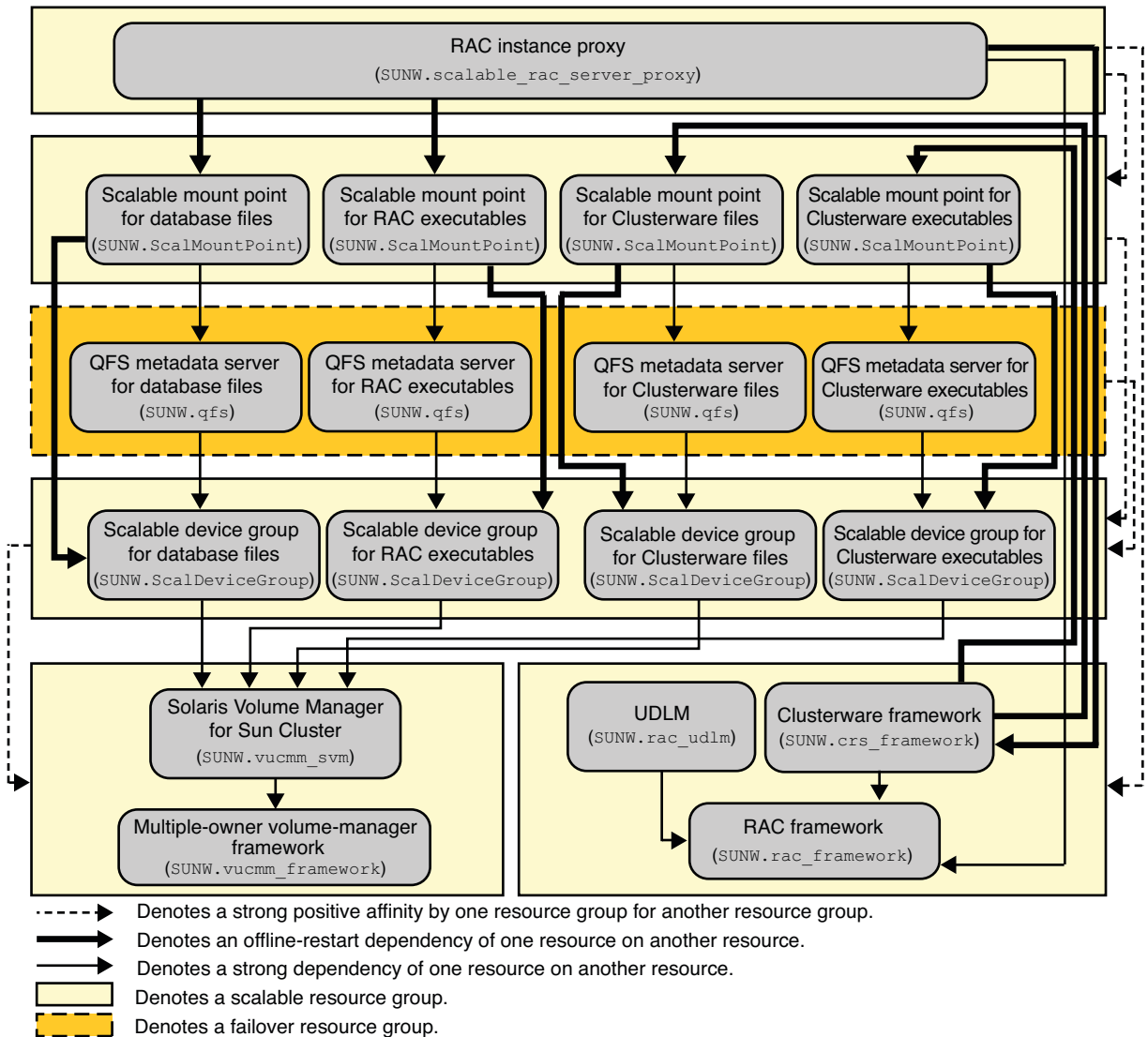
FIGURE A-2 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System

FIGURE A-3 Configuration of Oracle 10g, 11g, or 12c With Sun QFS Shared File System and Hardware RAID

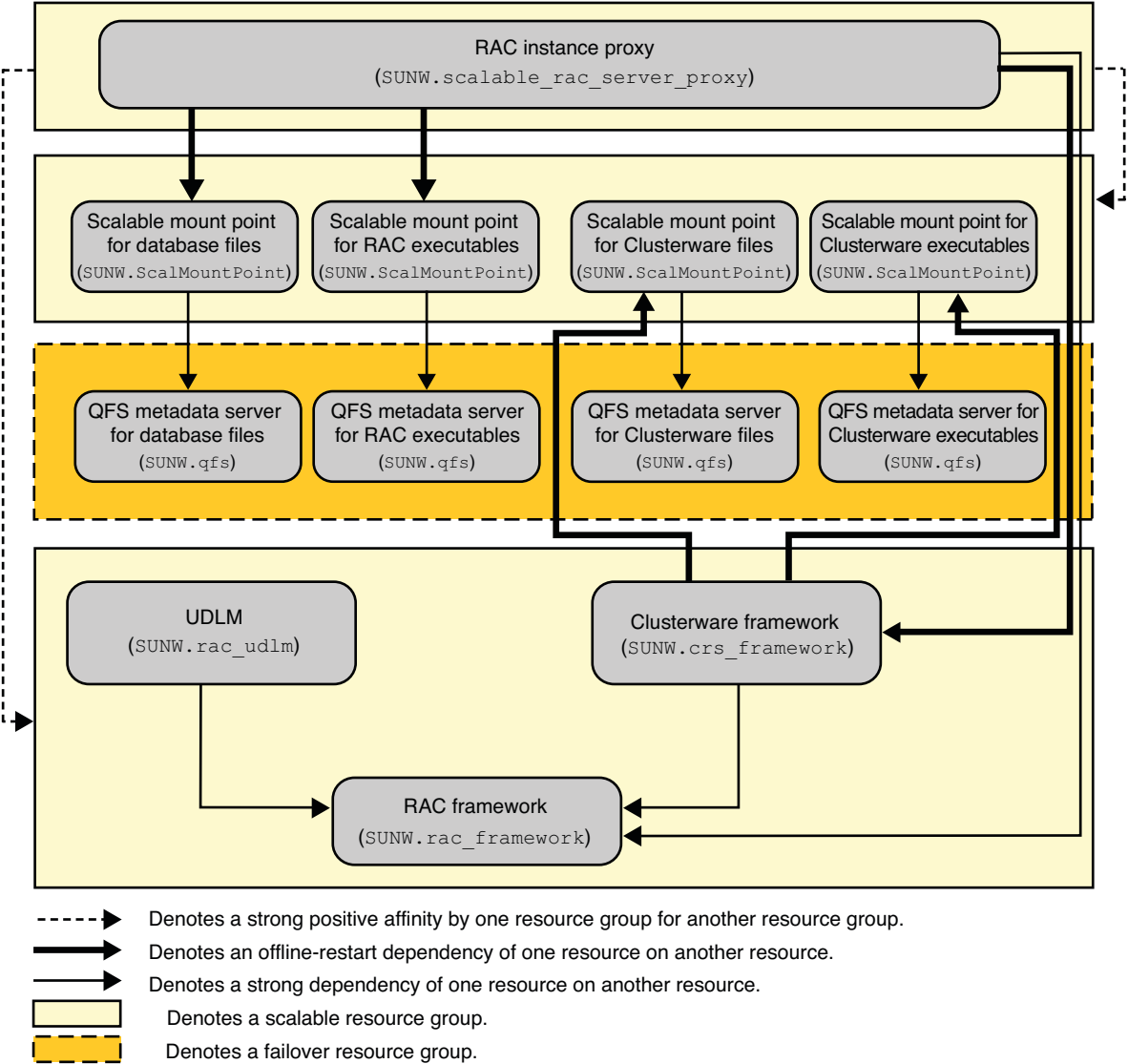
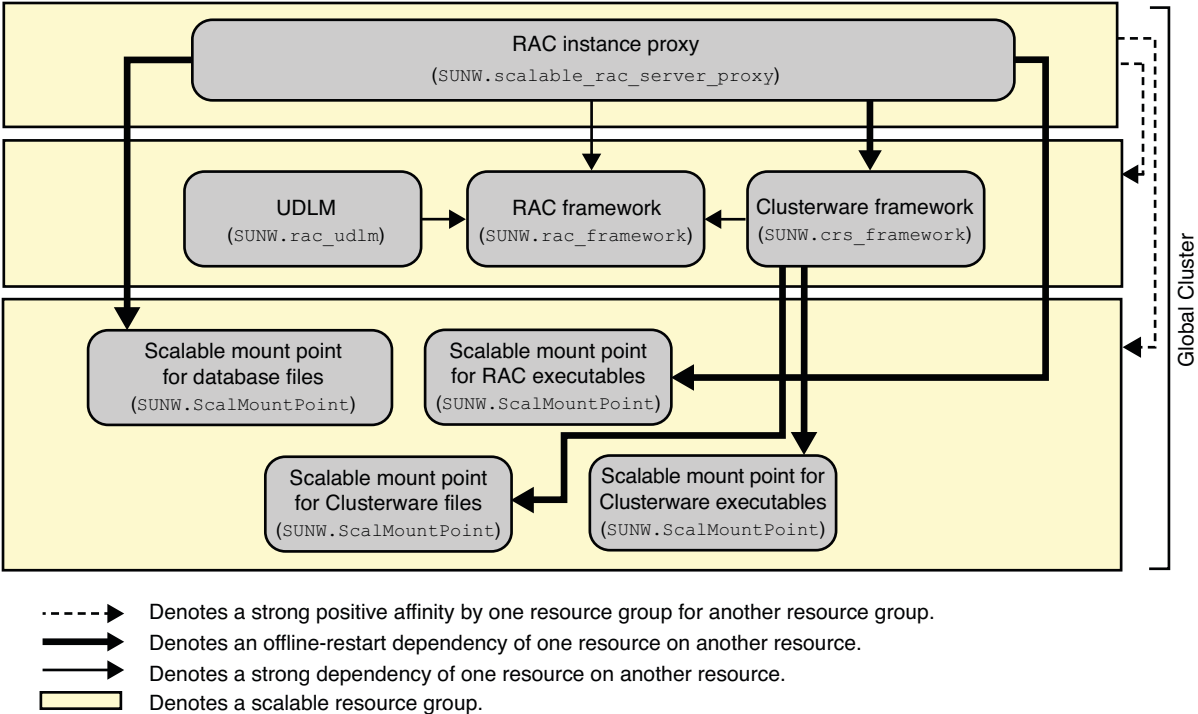


FIGURE A-4 Configuration of Oracle 10g, 11g, or 12c With a NAS Device



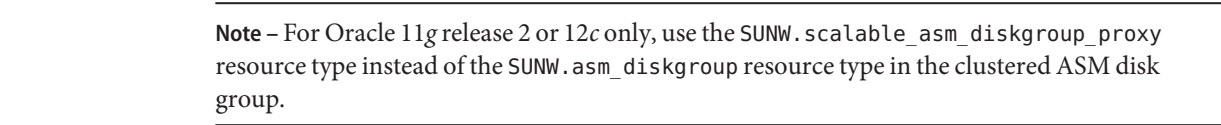
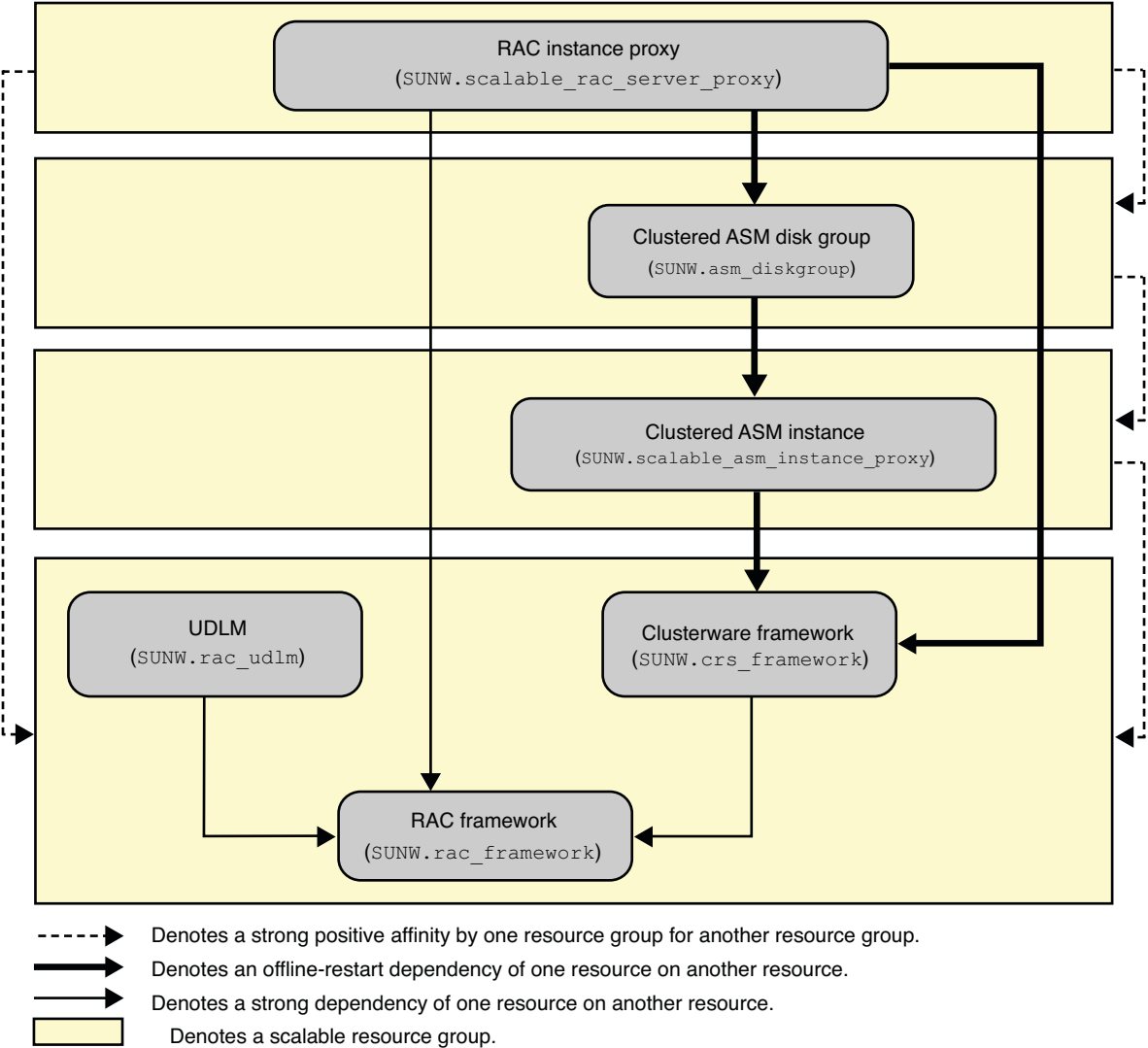


FIGURE A-6 Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Hardware RAID



Note – For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type instead of the `SUNW.asm_diskgroup` resource type in the clustered ASM disk group.

Sample Oracle 9i Configurations in the Global Cluster

FIGURE A-7 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster

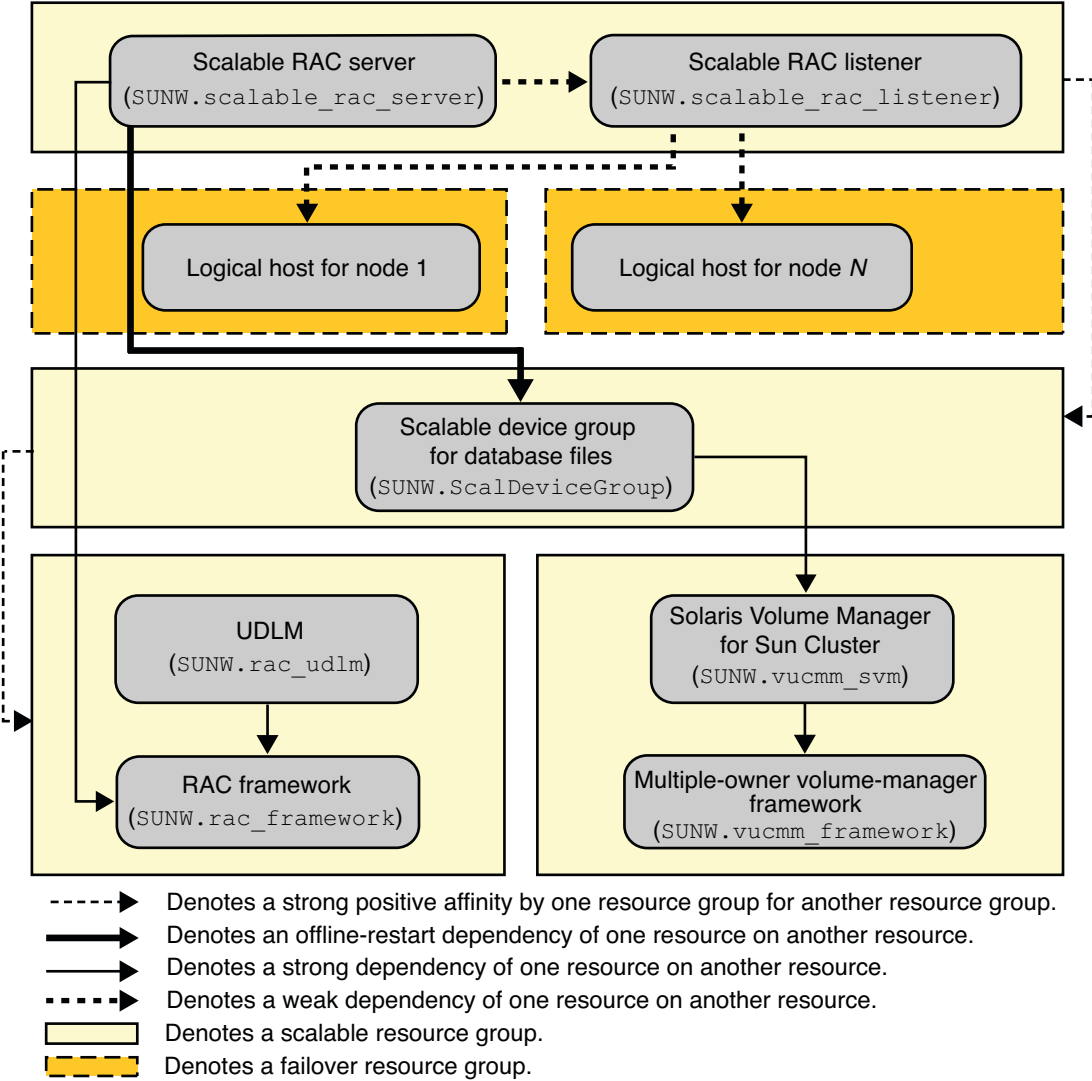


FIGURE A-8 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System

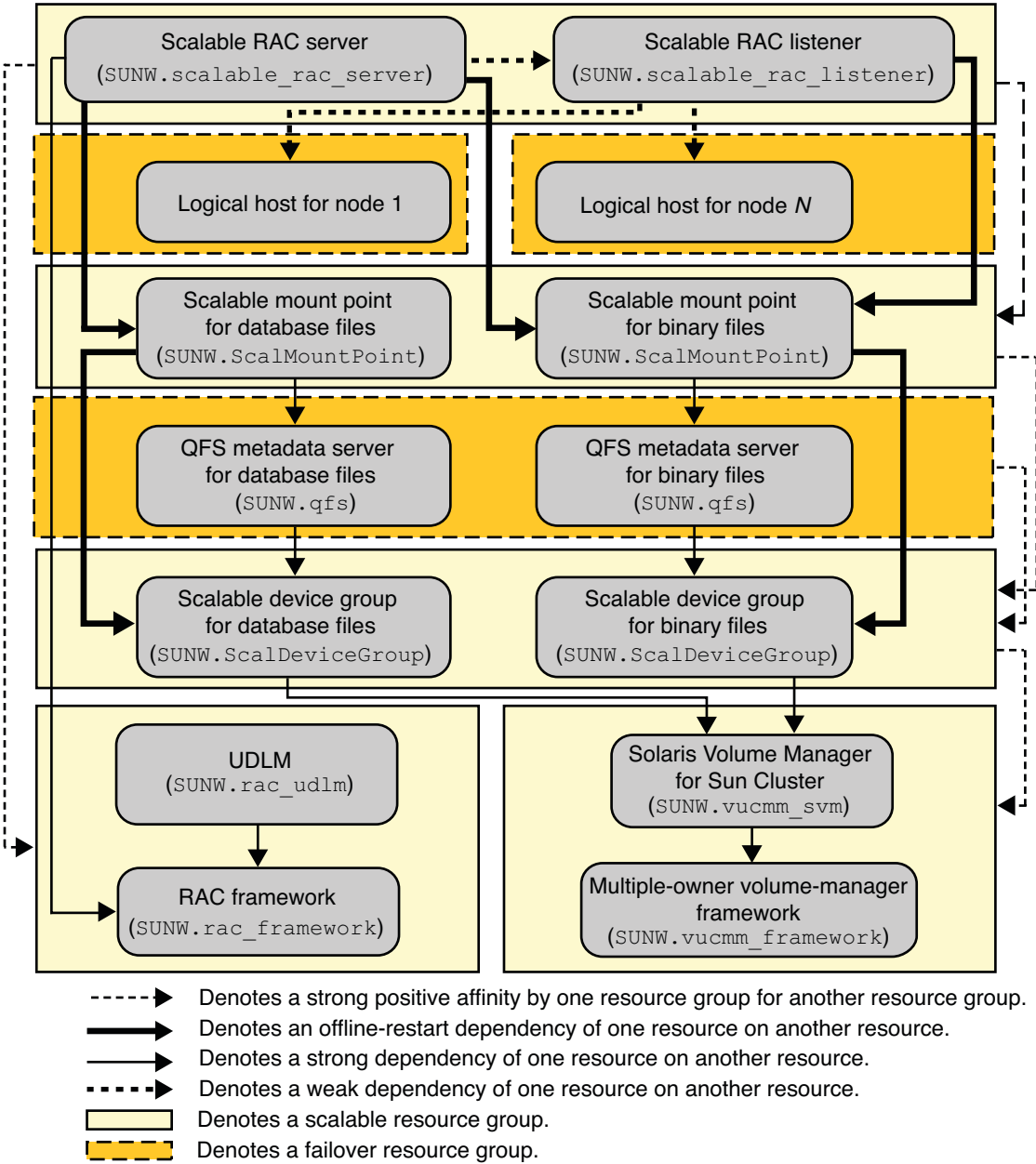
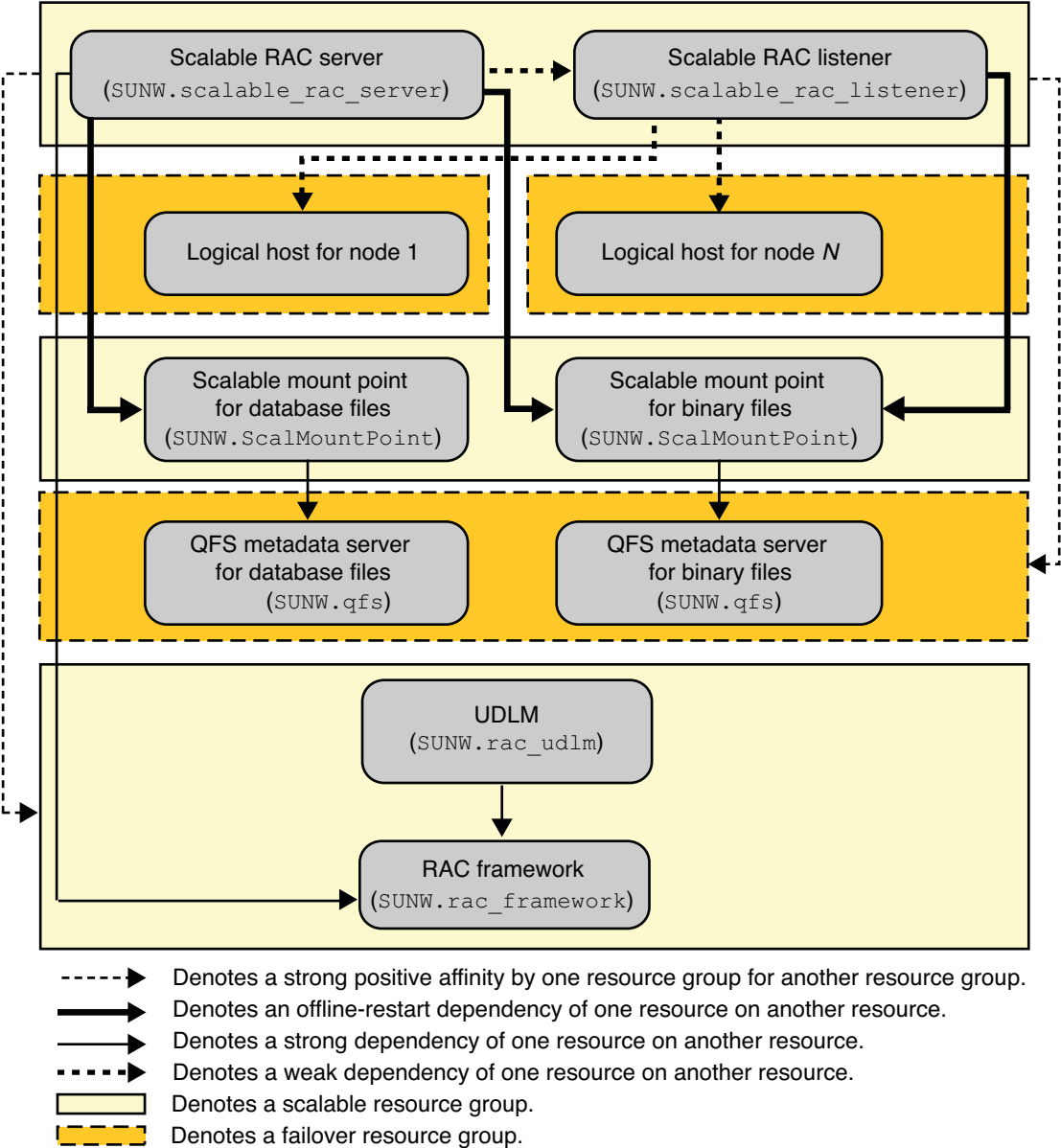


FIGURE A-9 Configuration of Oracle 9i With Sun QFS Shared File System and Hardware RAID



Sample Oracle 10g, 11g, or 12c Configurations in a Zone Cluster

FIGURE A-10 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster in a Zone Cluster

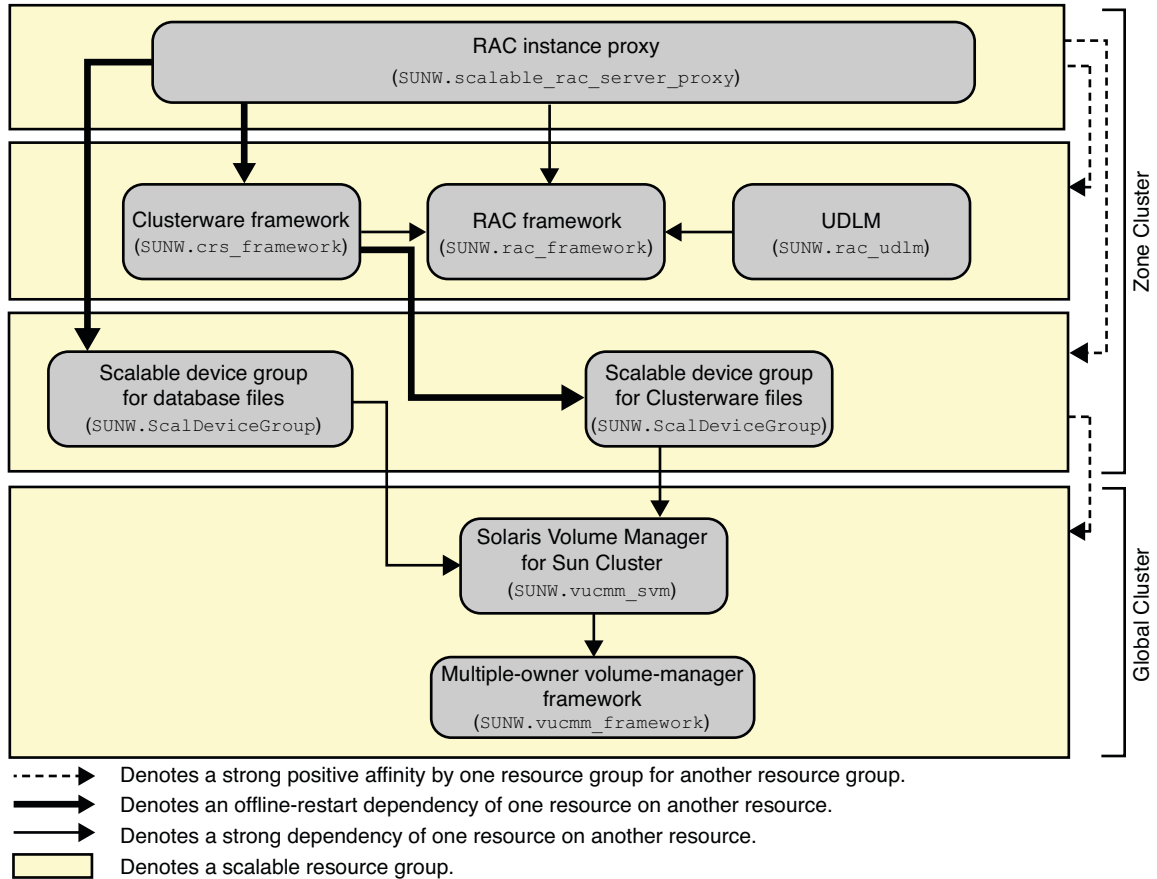


FIGURE A-11 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster

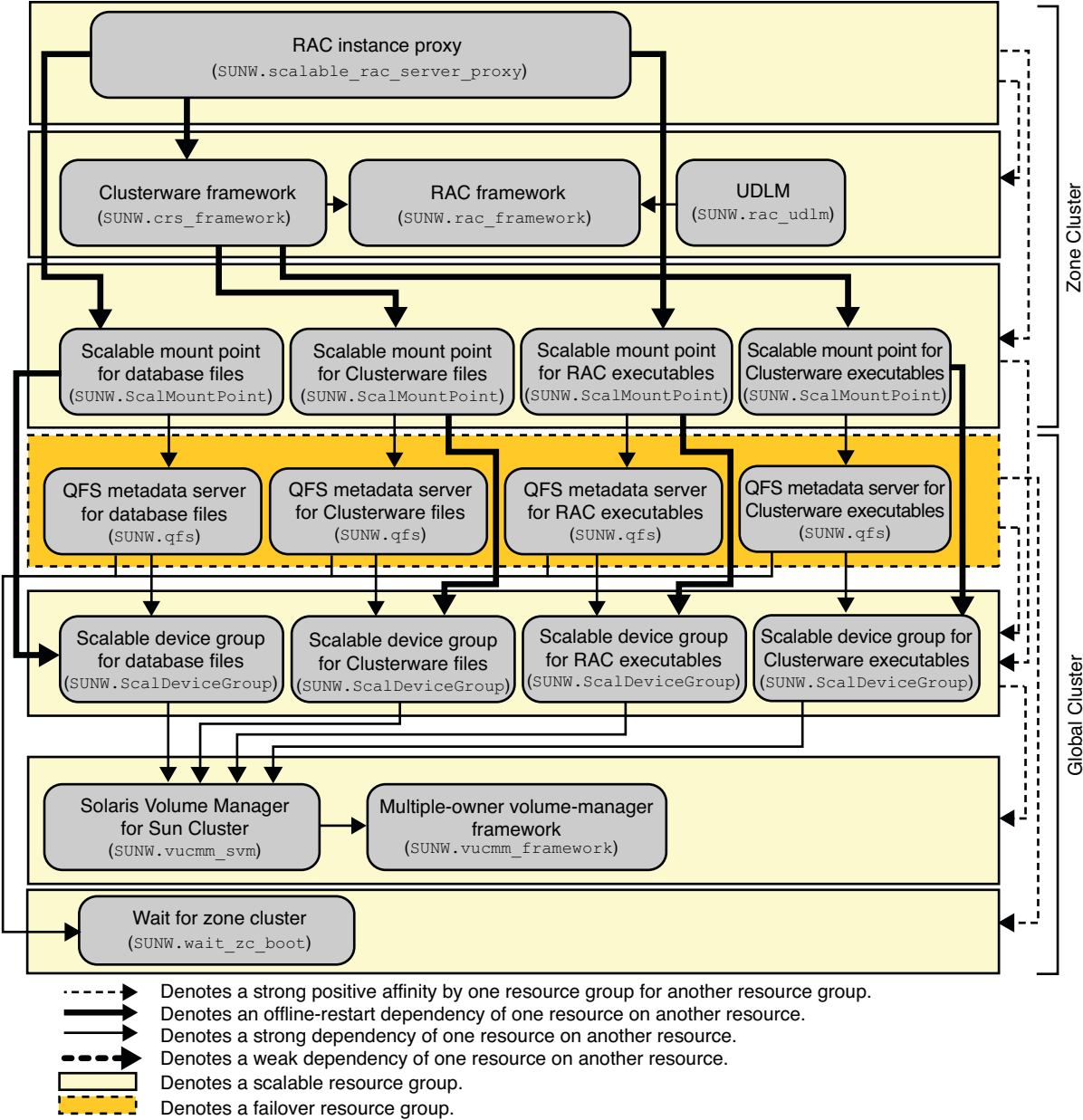


FIGURE A-12 Configuration of Oracle 10g, 11g, or 12c With Sun QFS Shared File System and Hardware RAID in a Zone Cluster

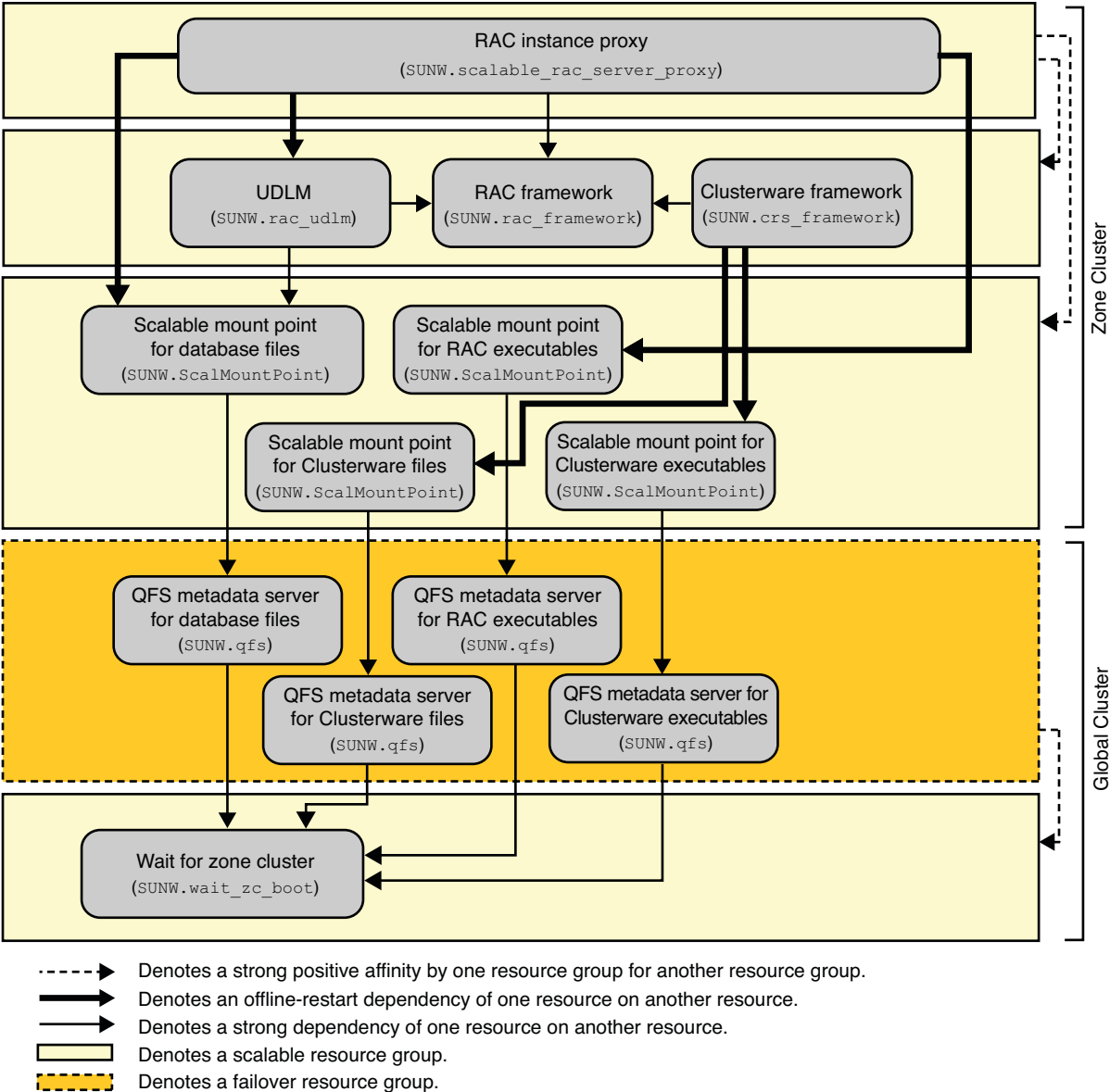


FIGURE A-13 Configuration of Oracle 10g, 11g, or 12c With a NAS Device in a Zone Cluster

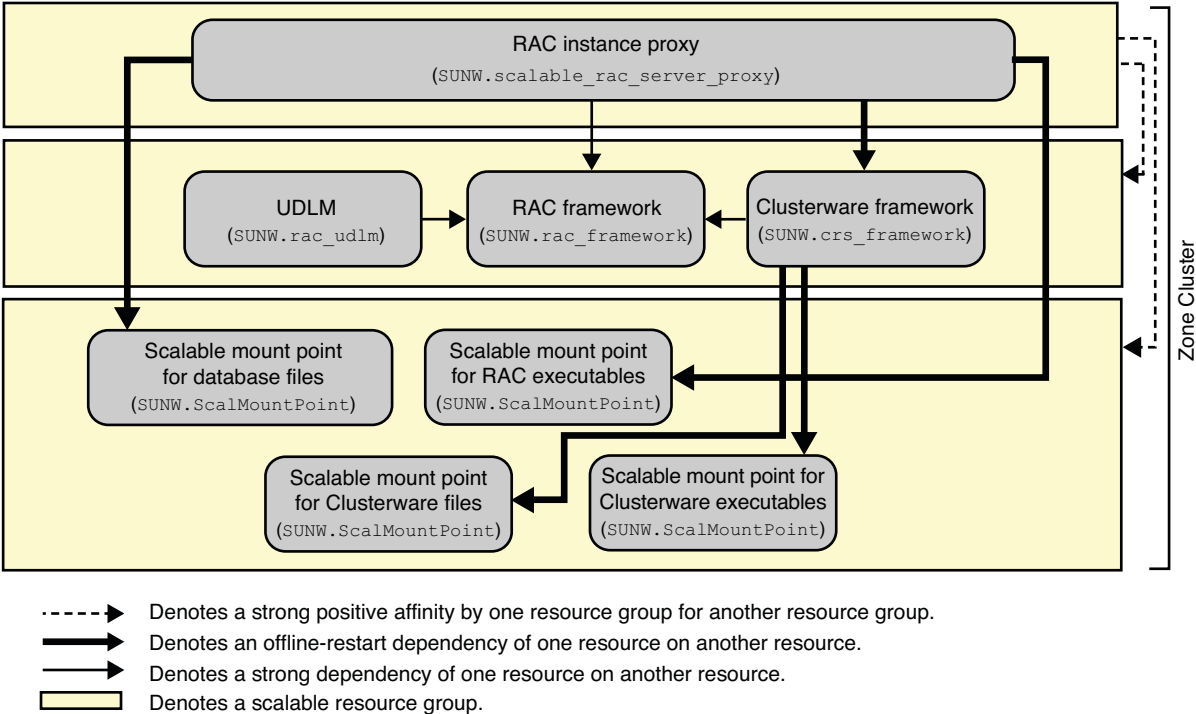
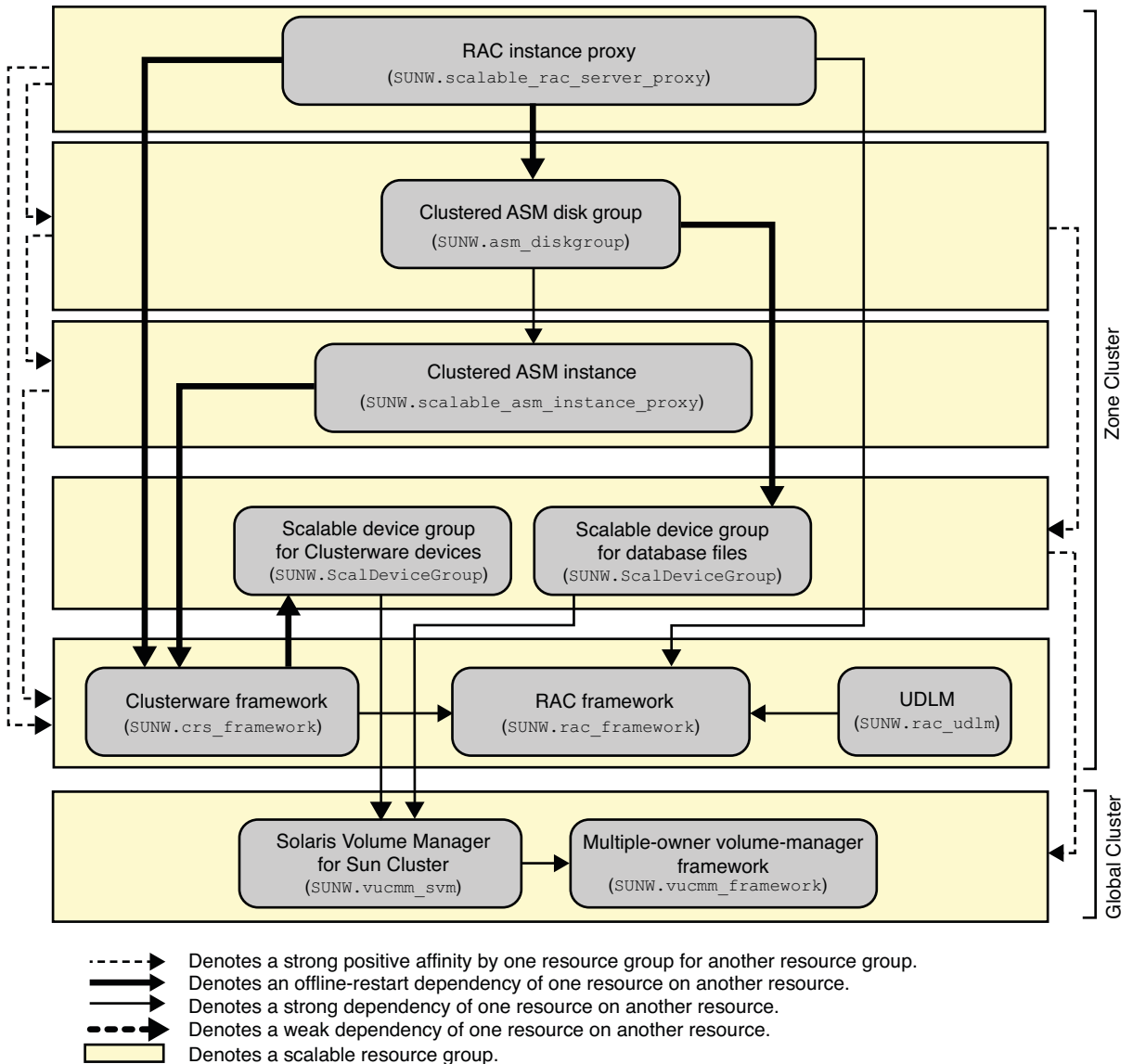
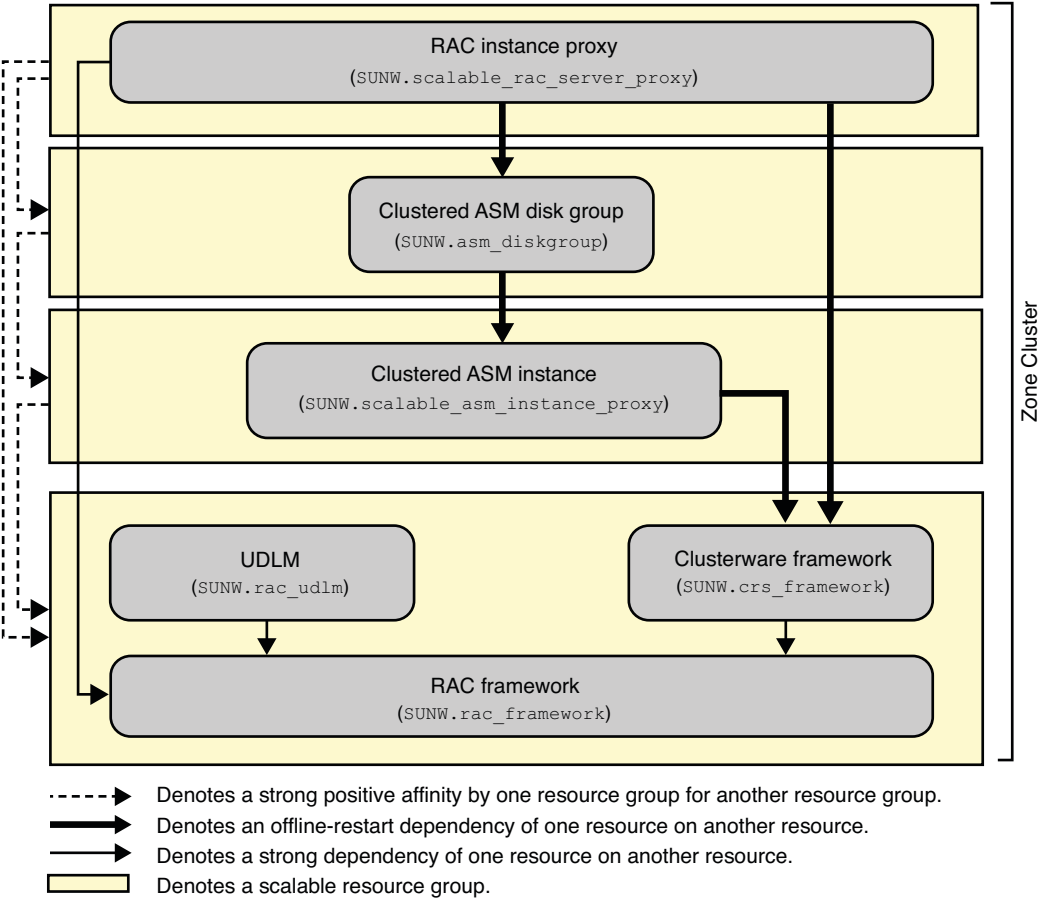


FIGURE A-14 Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Solaris Volume Manager for Sun Cluster in a Zone Cluster

Note – For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type instead of the `SUNW.asm_diskgroup` resource type in the clustered ASM disk group.

FIGURE A-15 Configuration of Oracle 10g, 11g, or 12c With Oracle ASM and Hardware RAID in a Zone Cluster



Note – For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type instead of the `SUNW.asm_diskgroup` resource type in the clustered ASM disk group.

Sample Oracle 9i Configurations in a Zone Cluster

FIGURE A-16 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster in a Zone Cluster

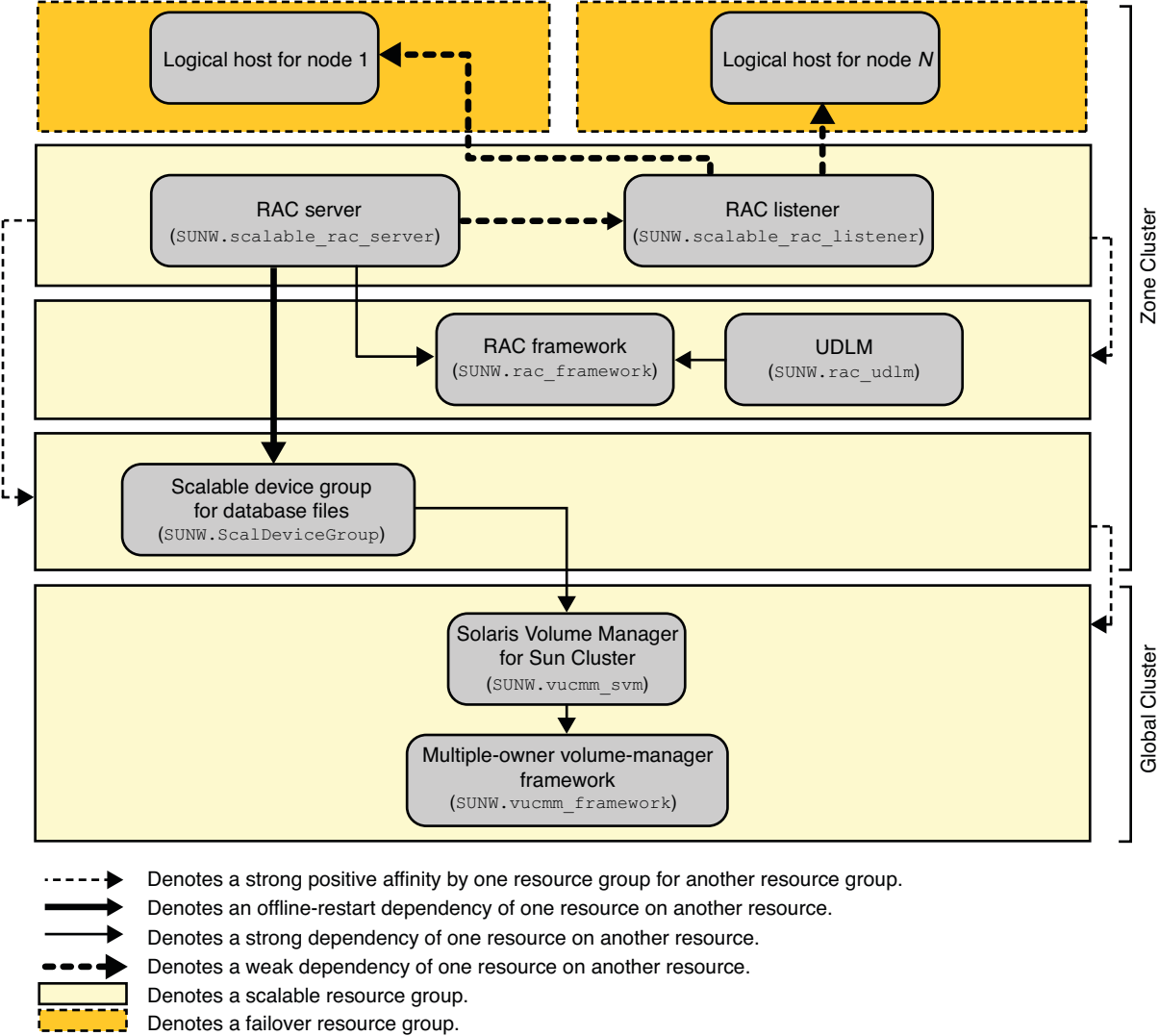


FIGURE A-17 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster

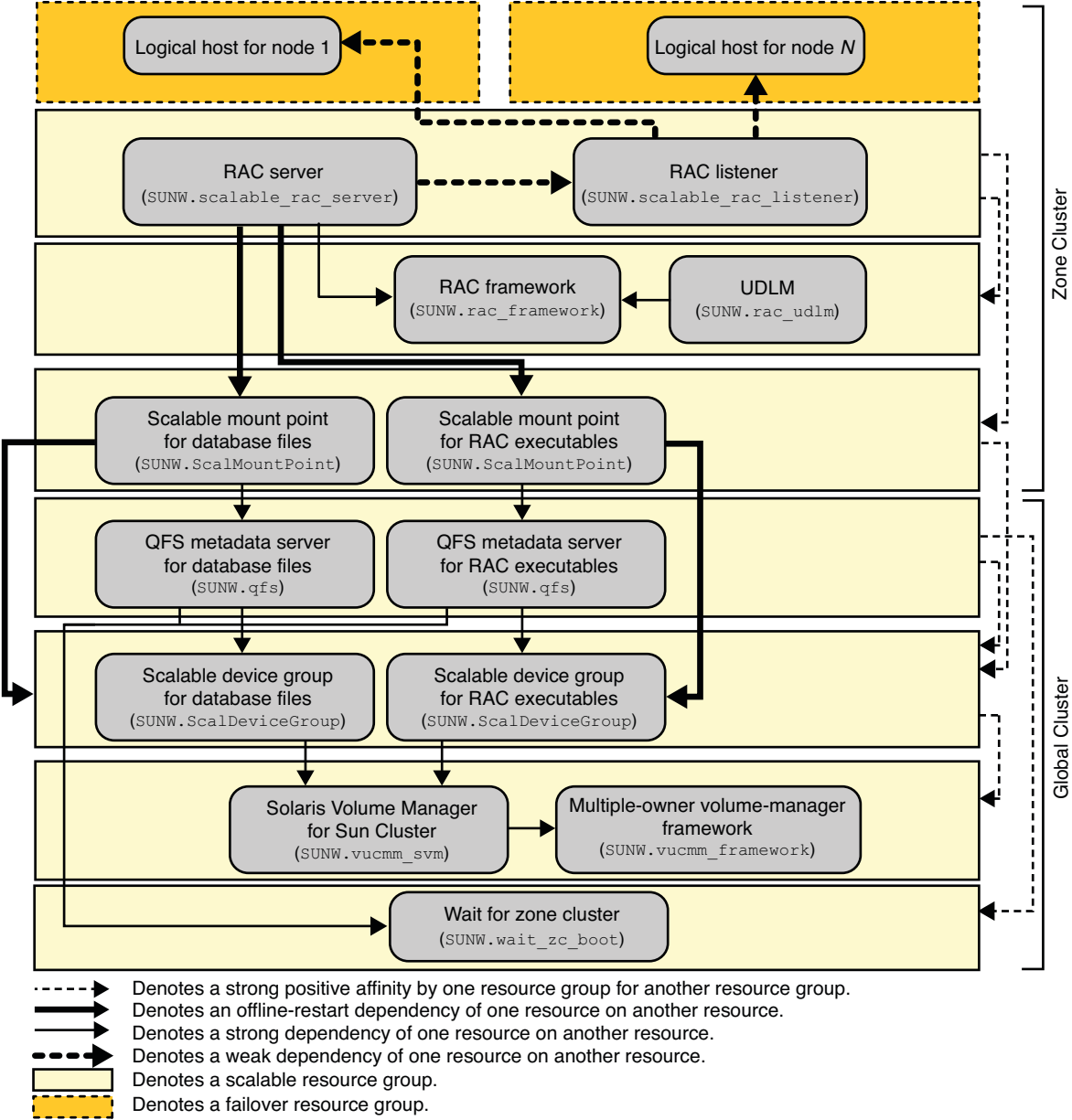
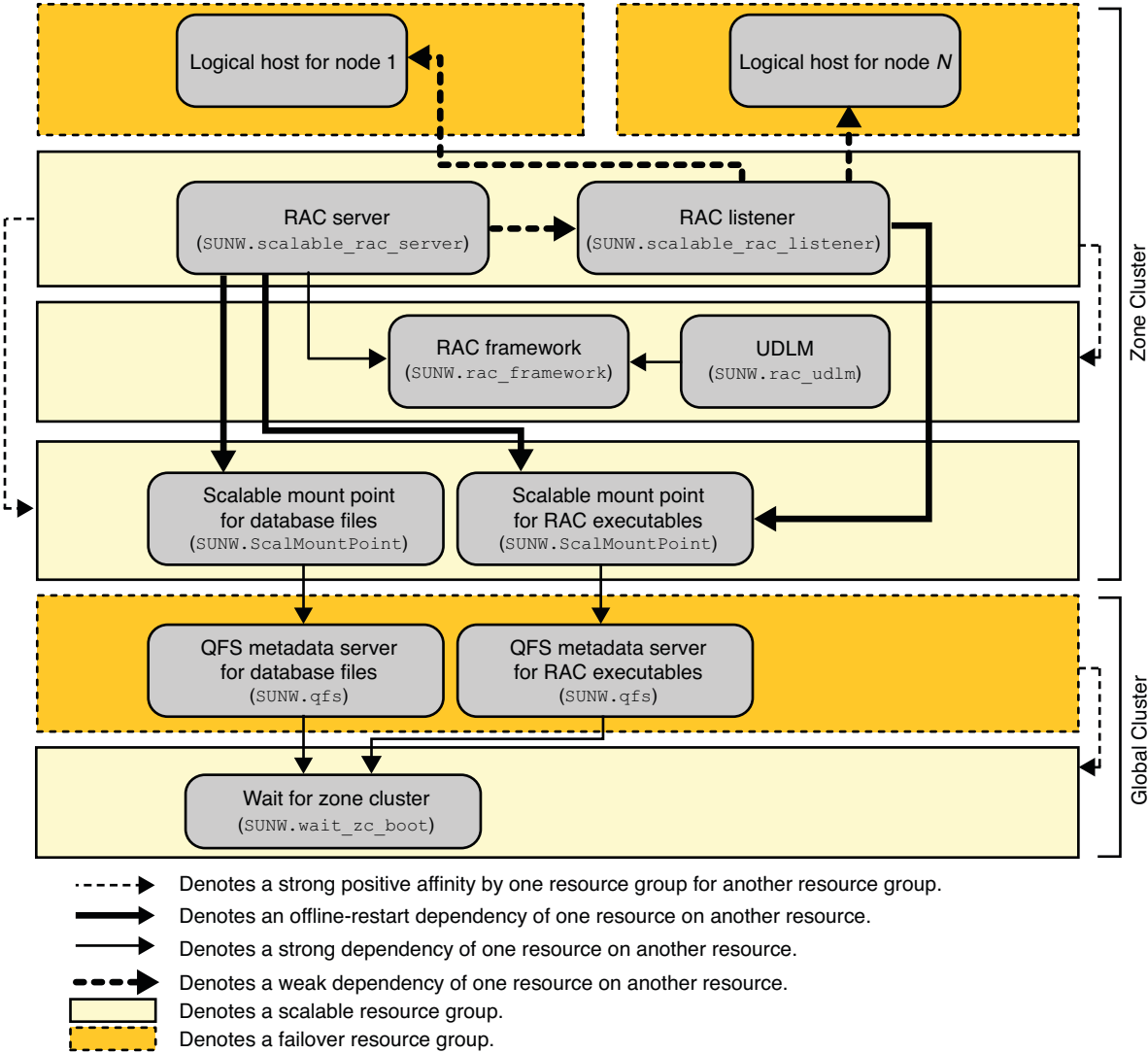


FIGURE A-18 Configuration of Oracle 9i With Sun QFS Shared File System and Hardware RAID in a Zone Cluster



Legacy Configurations

This section illustrates configurations that use the Oracle RAC framework resource group (SUNW.rac_framework) to contain the multiple-owner volume-manager resources, rather than the multiple-owner volume-manager framework resource group (SUNW.vucmm_framework). These configurations are still supported in this release, but might become deprecated in a future Oracle Solaris Cluster release.

FIGURE A-19 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster (Legacy)

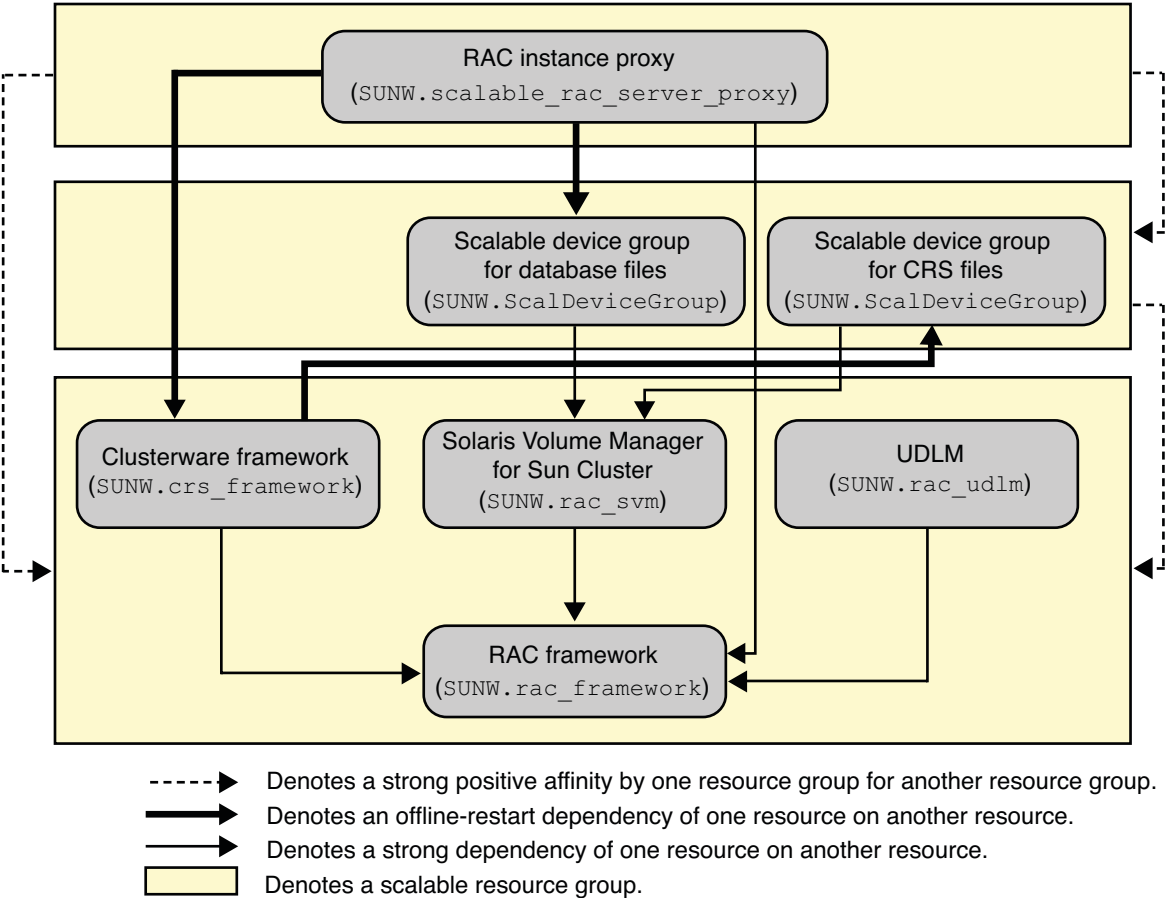


FIGURE A-20 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System (Legacy)

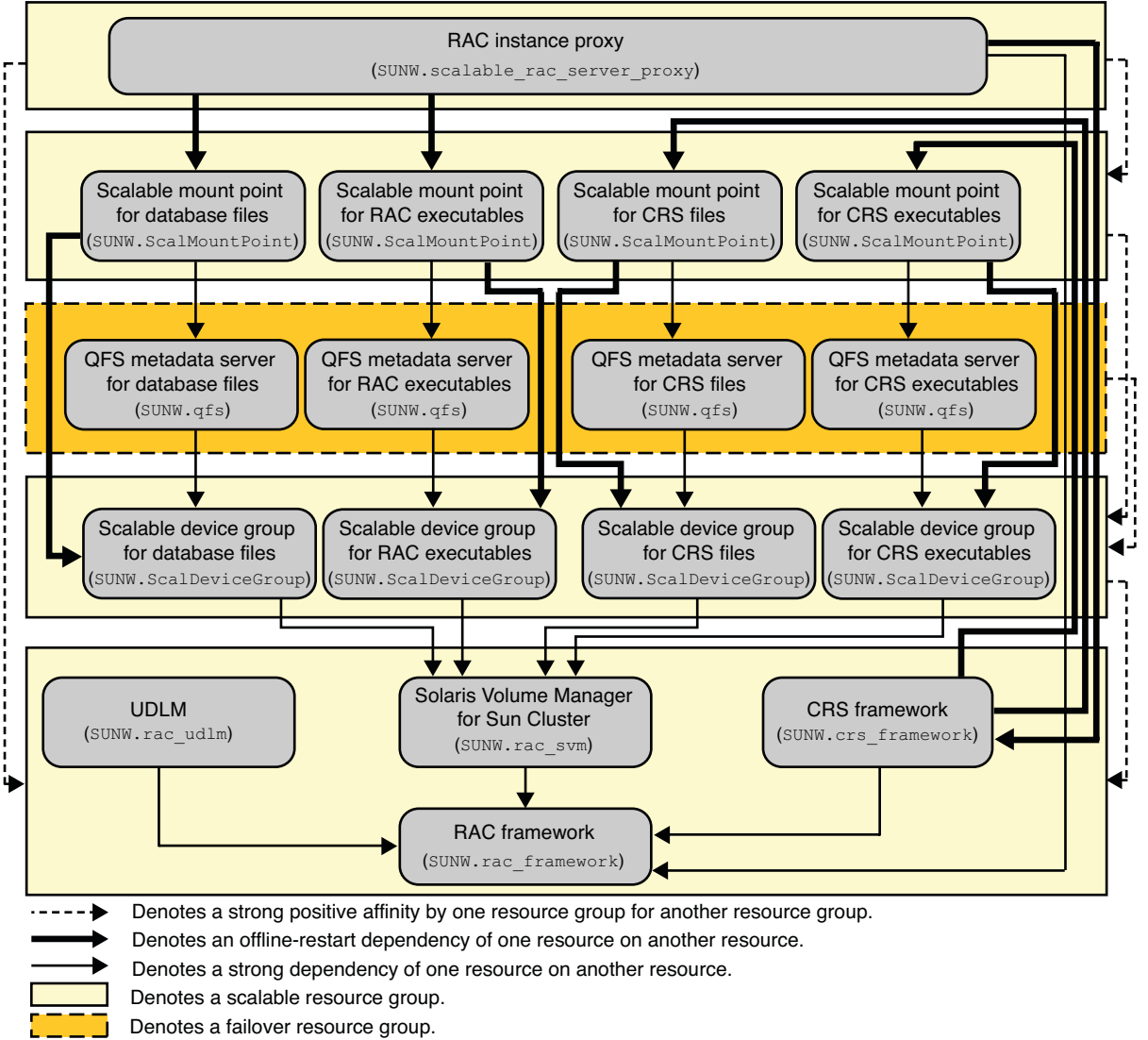


FIGURE A-21 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster (Legacy)

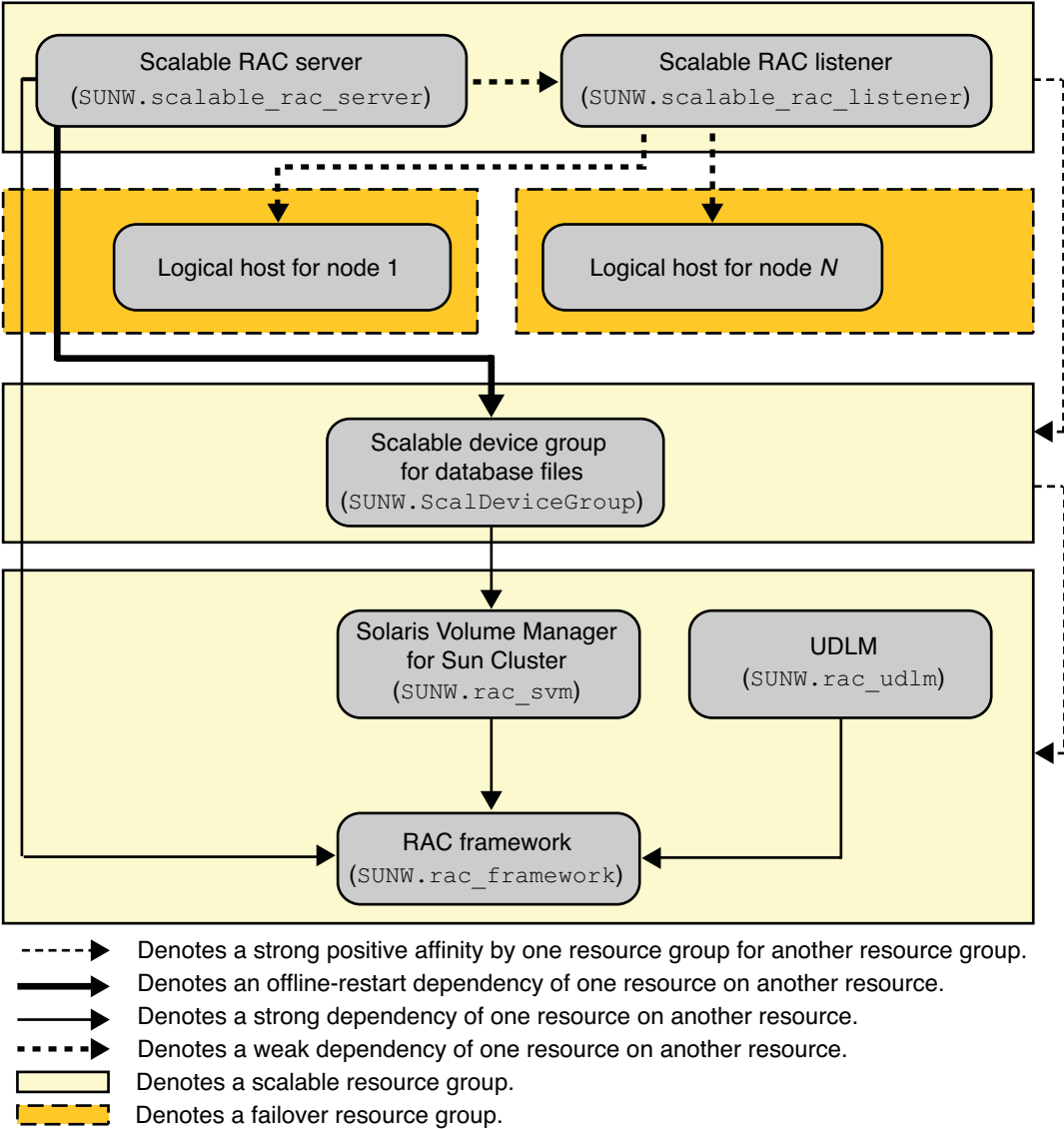


FIGURE A-22 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System (Legacy)

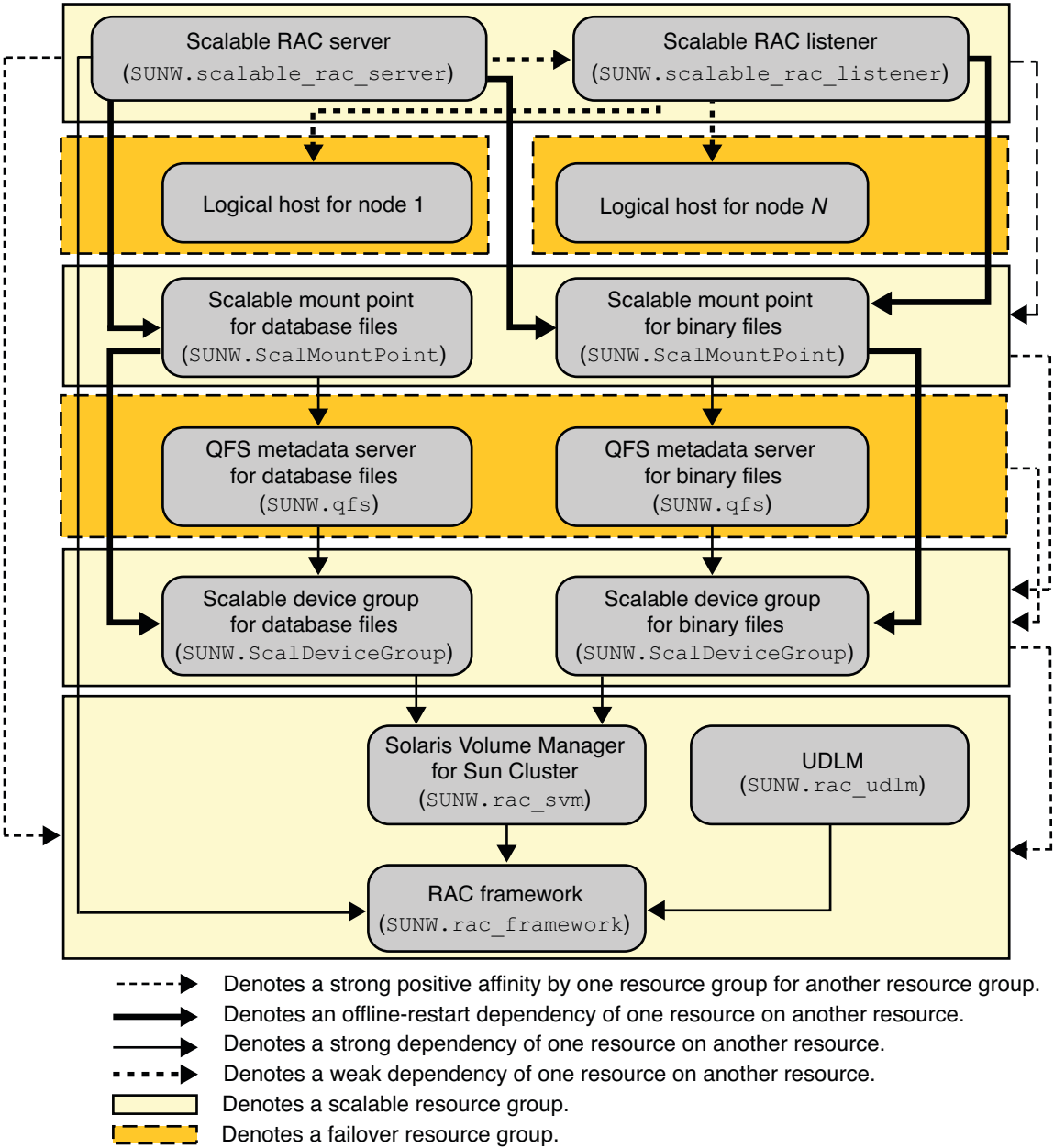


FIGURE A-23 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster in a Zone Cluster (Legacy)

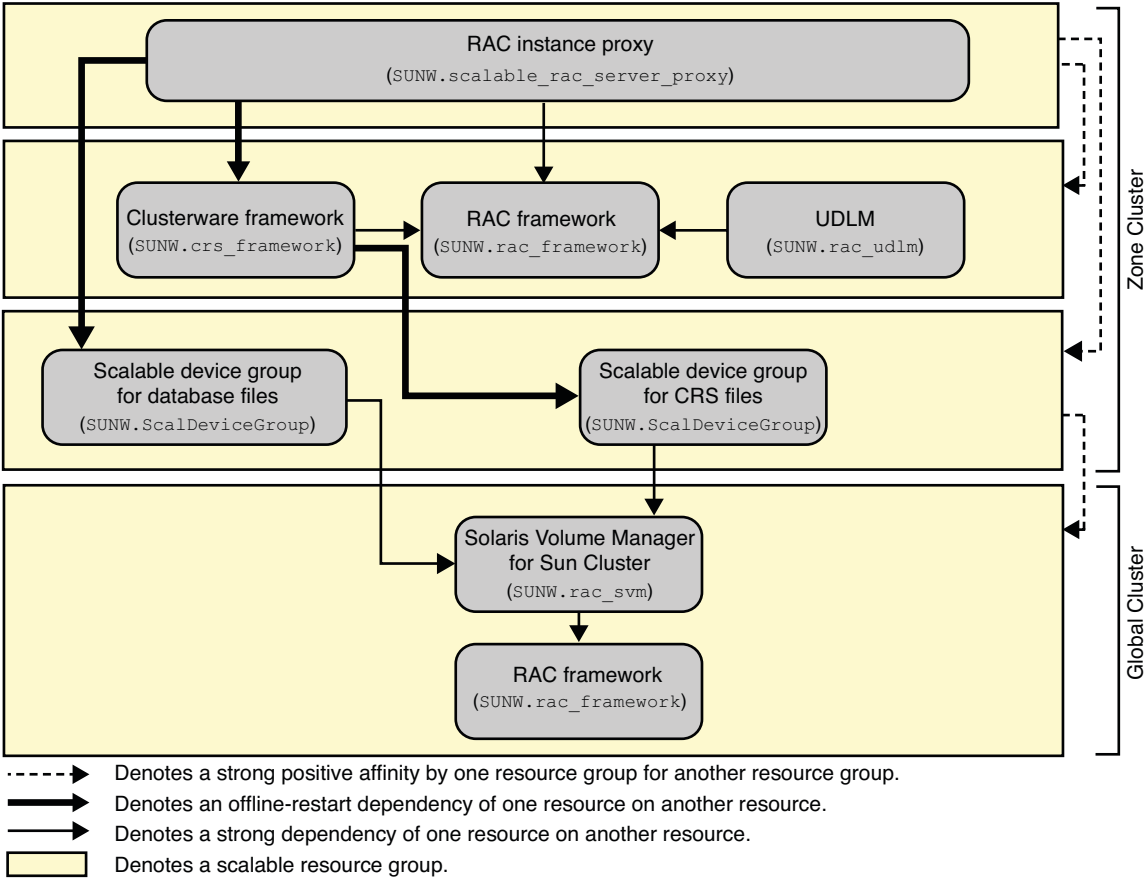


FIGURE A-24 Configuration of Oracle 10g, 11g, or 12c With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster (Legacy)

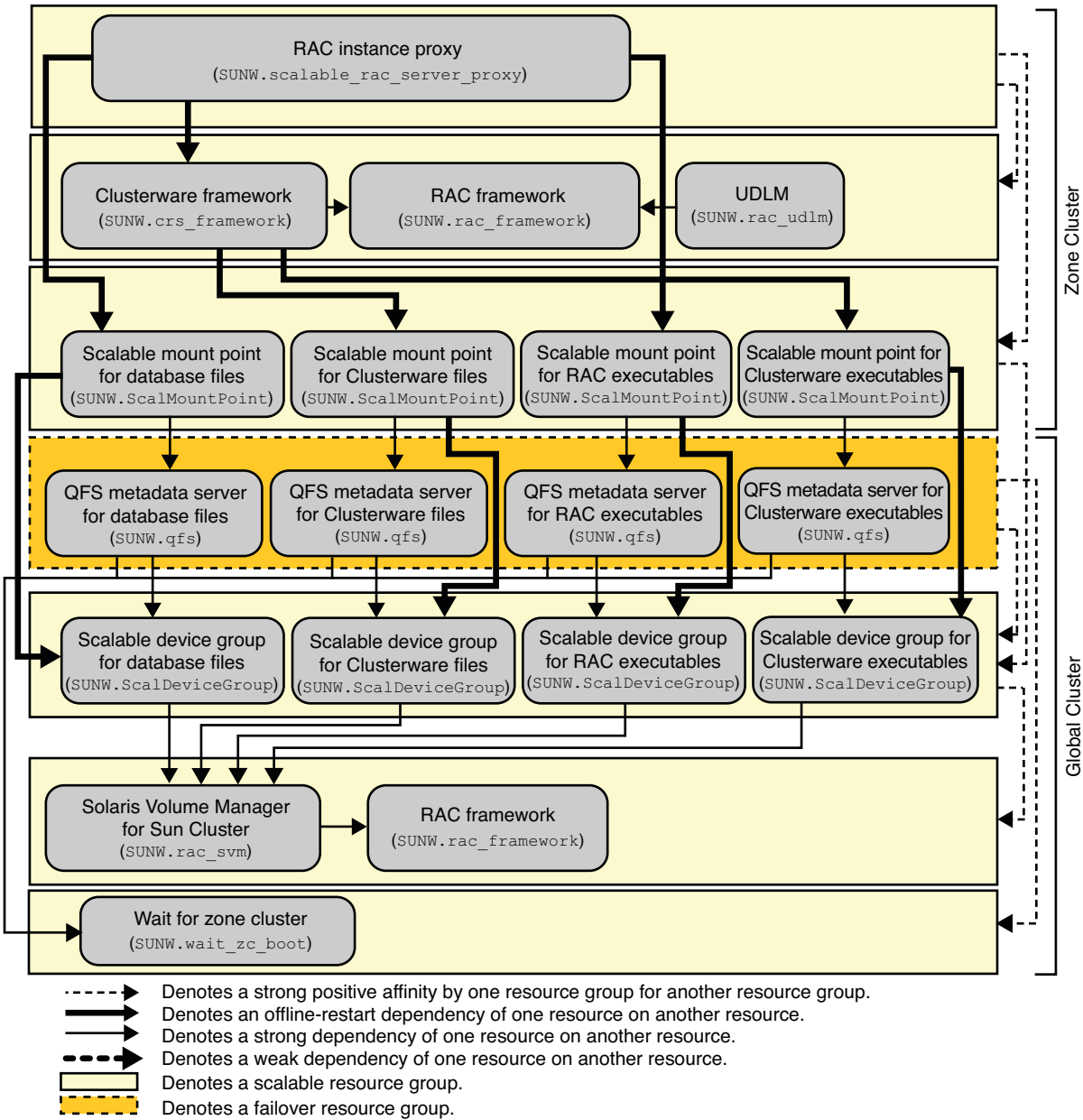


FIGURE A-25 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster in a Zone Cluster (Legacy)

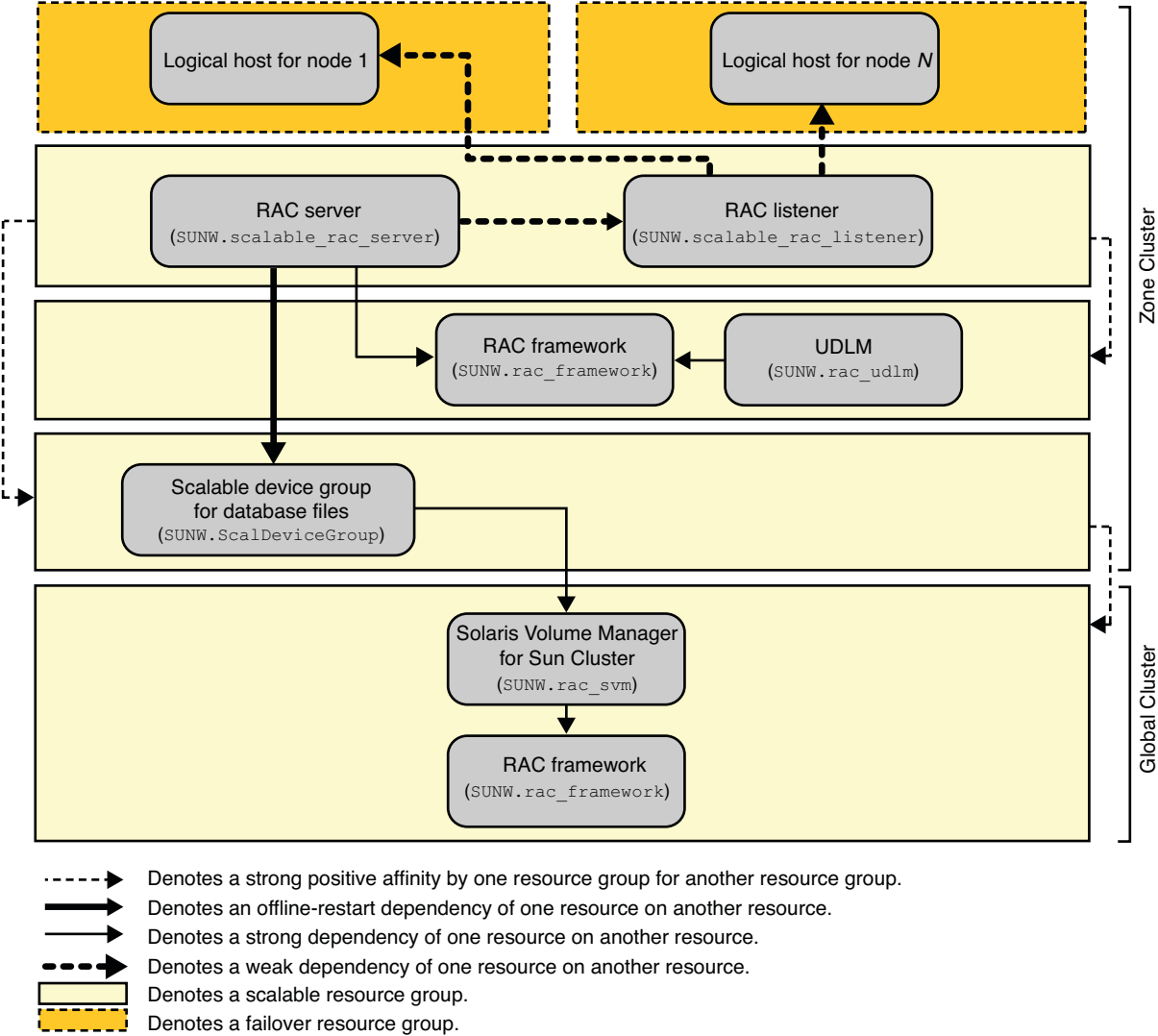
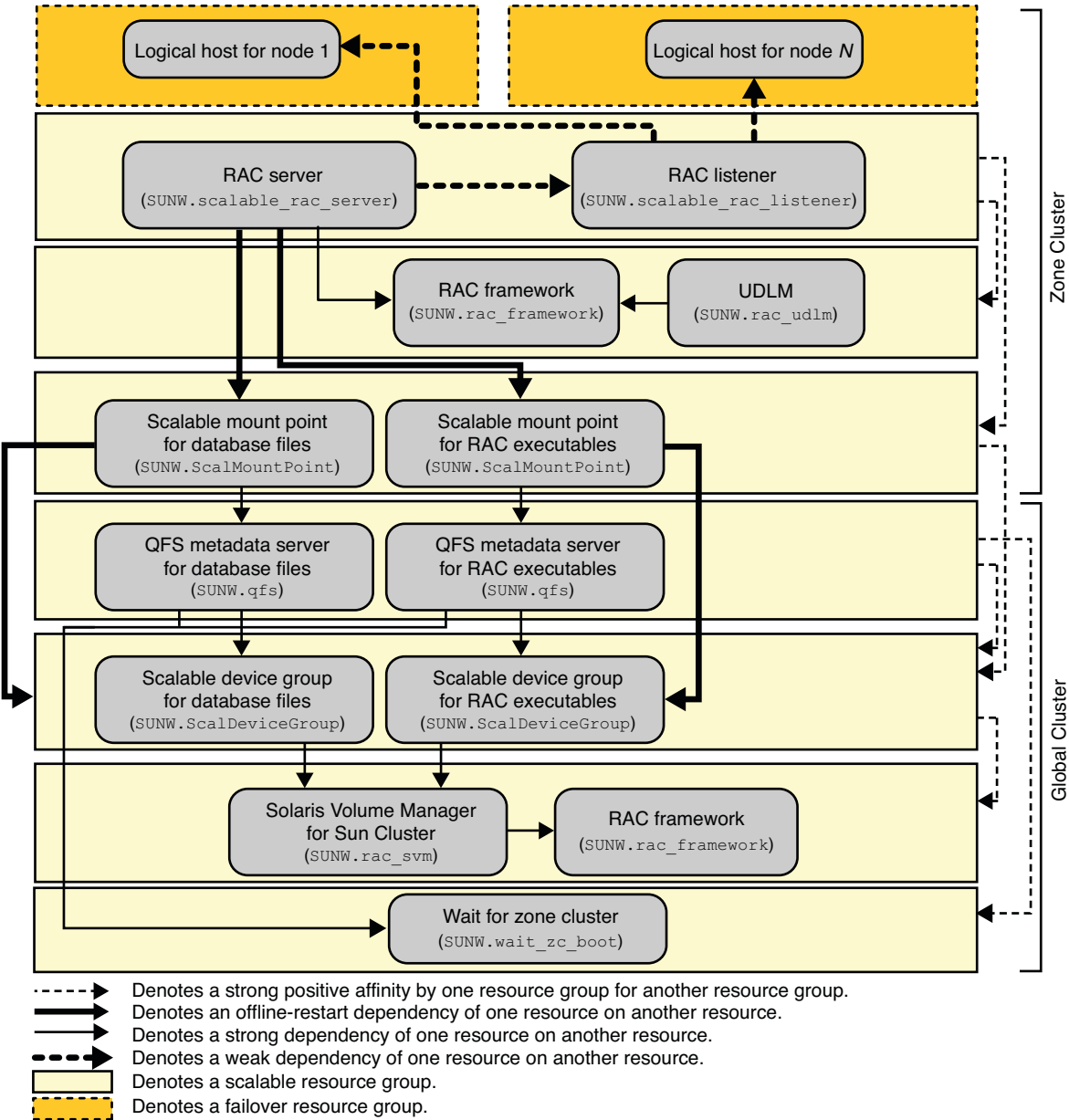


FIGURE A-26 Configuration of Oracle 9i With Solaris Volume Manager for Sun Cluster and Sun QFS Shared File System in a Zone Cluster (Legacy)



Preset Actions for DBMS Errors and Logged Alerts

Preset actions for database management system (DBMS) errors and logged alerts are listed as follows:

- DBMS errors for which an action is preset are listed in [Table B-1](#).
- Logged alerts for which an action is preset are listed in [Table B-2](#).

TABLE B-1 Preset Actions for DBMS Errors

Error Number	Action	Connection State	New State	Message
18	NONE	co	di	Max. number of DBMS sessions exceeded
20	NONE	co	di	Max. number of DBMS processes exceeded
28	NONE	on	di	Session killed by DBA, will reconnect
50	RESTART	*	di	O/S error occurred while obtaining an enqueue. See o/s error.
51	NONE	*	di	timeout occurred while waiting for resource
55	NONE	*	*	maximum number of DML locks in DBMS exceeded
62	STOP	*	di	Need to set DML_LOCKS in init.ora file to value other than 0
107	RESTART	*	di	failed to connect to ORACLE listener process
257	NONE	*	di	archiver error. Connect internal only, until freed.
290	RESTART	*	di	Operating system archival error occurred. Check alert log.
447	RESTART	*	di	fatal error in background process
448	RESTART	*	di	normal completion of background process
449	RESTART	*	di	background process '%s' unexpectedly terminated with error %s
470	RESTART	*	di	Oracle background process died

TABLE B-1 Preset Actions for DBMS Errors (Continued)

Error Number	Action	Connection State	New State	Message
471	RESTART	*	di	Oracle background process died
472	RESTART	*	di	Oracle background process died
473	RESTART	*	di	Oracle background process died
474	RESTART	*	di	SMON died, warm start required
475	RESTART	*	di	Oracle background process died
476	RESTART	*	di	Oracle background process died
477	RESTART	*	di	Oracle background process died
480	RESTART	*	di	LCK* process terminated with error
481	RESTART	*	di	LMON process terminated with error
482	RESTART	*	di	LMD* process terminated with error
602	RESTART	*	di	internal programming exception
604	NONE	on	di	Recursive error
705	RESTART	*	di	inconsistent state during start up
942	NONE	on	*	Warning - V\$SYSSTAT not accessible - check grant on V_\$SYSSTAT
1001	NONE	on	di	Lost connection to database
1002	NONE	on	*	Internal error in HA-DBMS Oracle
1003	NONE	on	di	Resetting database connection
1012	NONE	on	di	Not logged on
1012	RESTART	di	co	Not logged on
1014	NONE	*	*	ORACLE shutdown in progress
1017	STOP	*	*	Please correct login information in HA-DBMS Oracle database configuration
1031	NONE	on	*	Insufficient privileges to perform DBMS operations - check Oracle user privileges
1033	NONE	co	co	Oracle is in the shutdown or initialization process
1033	NONE	*	di	Oracle is in the shutdown or initialization process
1034	RESTART	co	co	Oracle is not available
1034	RESTART	di	co	Oracle is not available

TABLE B-1 Preset Actions for DBMS Errors (Continued)

Error Number	Action	Connection State	New State	Message
1034	NONE	on	di	Oracle is not available
1035	RESTART	co	co	Access restricted - restarting database to reset
1041	NONE	on	di	
1041	NONE	di	co	
1045	NONE	co	*	Fault monitor user lacks CREATE SESSION privilege logon denied.
1046	RESTART	*	di	cannot acquire space to extend context area
1050	RESTART	*	di	cannot acquire space to open context area
1053	RESTART	*	*	user storage address cannot be read or written
1054	RESTART	*	*	user storage address cannot be read or written
1075	NONE	co	on	Already logged on
1089	NONE	on	di	immediate shutdown in progresss
1089	NONE	*	*	Investigate! Could be hanging!
1090	NONE	*	di	shutdown in progress - connection is not permitted
1092	NONE	*	di	ORACLE instance terminated. Disconnection forced
1513	RESTART	*	*	invalid current time returned by operating system
1542	NONE	on	*	table space is off-line - please correct!
1552	NONE	on	*	rollback segment is off-line - please correct!
1950	NONE	on	*	Insufficient privileges to perform DBMS operations - check Oracle user privileges
2701	STOP	*	*	HA-DBMS Oracle error - ORACLE_HOME did not get set!
2703	RESTART	*	di	
2704	RESTART	*	di	
2709	RESTART	*	di	
2710	RESTART	*	di	
2719	RESTART	*	di	
2721	RESTART	*	*	
2726	STOP	*	*	Could not locate ORACLE executables - check ORACLE_HOME setting
2735	RESTART	*	*	osnfpmp: cannot create shared memory segment

TABLE B-1 Preset Actions for DBMS Errors (Continued)

Error Number	Action	Connection State	New State	Message
2811	RESTART	*	*	Unable to attach shared memory segment
2839	RESTART	*	*	Sync of blocks to disk failed.
2840	RESTART	*	*	
2846	RESTART	*	*	
2847	RESTART	*	*	
2849	RESTART	*	*	
2842	RESTART	*	*	Client unable to fork a server - Out of memory
3113	RESTART	co	di	lost connection
3113	NONE	on	di	lost connection
3113	NONE	di	di	lost connection
3114	NONE	*	co	Not connected?
4030	RESTART	*	*	
4032	RESTART	*	*	
4100	RESTART	*	*	communication area cannot be allocated insufficient memory
6108	STOP	co	*	Can't connect to remote database - make sure SQL*Net server is up
6114	STOP	co	*	Can't connect to remote database - check SQL*Net configuration
7205	RESTART	*	di	
7206	RESTART	*	di	
7208	RESTART	*	di	
7210	RESTART	*	di	
7211	RESTART	*	di	
7212	RESTART	*	di	
7213	RESTART	*	di	
7214	RESTART	*	di	
7215	RESTART	*	di	
7216	RESTART	*	di	
7218	RESTART	*	di	

TABLE B-1 Preset Actions for DBMS Errors (Continued)

Error Number	Action	Connection State	New State	Message
7219	RESTART	*	*	slspool: unable to allocate spooler argument buffer.
7223	RESTART	*	*	slspool: fork error, unable to spawn spool process. - Resource limit reached
7224	RESTART	*	*	
7229	RESTART	*	*	
7232	RESTART	*	*	
7234	RESTART	*	*	
7238	RESTART	*	*	slemcl: close error.
7250	RESTART	*	*	
7251	RESTART	*	*	
7252	RESTART	*	*	
7253	RESTART	*	*	
7258	RESTART	*	*	
7259	RESTART	*	*	
7263	RESTART	*	*	
7269	RESTART	*	*	
7279	RESTART	*	*	
7280	RESTART	*	*	
7296	RESTART	*	*	
7297	RESTART	*	*	
7306	RESTART	*	*	
7310	RESTART	*	*	
7315	RESTART	*	*	
7321	RESTART	*	*	
7322	RESTART	*	*	
7324	RESTART	*	*	
7325	RESTART	*	*	
7351	RESTART	*	*	

TABLE B-1 Preset Actions for DBMS Errors (Continued)

Error Number	Action	Connection State	New State	Message
7361	RESTART	*	*	
7404	RESTART	*	*	
7414	RESTART	*	*	
7415	RESTART	*	*	
7417	RESTART	*	*	
7418	RESTART	*	*	
7419	RESTART	*	*	
7430	RESTART	*	*	
7455	RESTART	*	*	
7456	RESTART	*	*	
7466	RESTART	*	*	
7470	RESTART	*	*	
7475	RESTART	*	*	
7476	RESTART	*	*	
7477	RESTART	*	*	
7478	RESTART	*	*	
7479	RESTART	*	*	
7481	RESTART	*	*	
9706	RESTART	*	*	
9716	RESTART	*	*	
9718	RESTART	*	*	
9740	RESTART	*	*	
9748	RESTART	*	*	
9747	RESTART	*	*	
9749	RESTART	*	*	
9751	RESTART	*	*	
9755	RESTART	*	*	

TABLE B-1 Preset Actions for DBMS Errors *(Continued)*

Error Number	Action	Connection State	New State	Message
9757	RESTART	*	*	
9756	RESTART	*	*	
9758	RESTART	*	*	
9761	RESTART	*	*	
9765	RESTART	*	*	
9779	RESTART	*	*	
9829	RESTART	*	*	
9831	RESTART	*	*	
9834	RESTART	*	*	
9836	RESTART	*	*	
9838	RESTART	*	*	
9837	RESTART	*	*	
9844	RESTART	*	*	
9845	RESTART	*	*	
9846	RESTART	*	*	
9847	RESTART	*	*	
9853	RESTART	*	*	
9854	RESTART	*	*	
9856	RESTART	*	*	
9874	RESTART	*	*	
9876	RESTART	*	*	
9877	RESTART	*	*	
9878	RESTART	*	*	
9879	RESTART	*	*	
9885	RESTART	*	*	
9888	RESTART	*	*	
9894	RESTART	*	*	

TABLE B-1 Preset Actions for DBMS Errors *(Continued)*

Error Number	Action	Connection State	New State	Message
9909	RESTART	*	*	
9912	RESTART	*	*	
9913	RESTART	*	*	
9919	RESTART	*	*	
9943	RESTART	*	*	
9947	RESTART	*	*	
9948	RESTART	*	*	
9949	RESTART	*	*	
9950	RESTART	*	*	
12505	STOP	*	*	TNS:listener could not resolve SID given in connect descriptor.Check listener configuration file.
12541	STOP	*	*	TNS:no listener. Please verify connect_string property, listener and TNSconfiguration.
12545	SWITCH	*	*	Please check HA-Oracle parameters. Connect failed because target host or object does not exist
27100	STOP	*	*	Shared memory realm already exists
99999	RESTART	*	di	Monitor detected death of Oracle background processes.

TABLE B-2 Preset Actions for Logged Alerts

Alert String	Action	Connection State	New State	Message
ORA-07265	RESTART	*	di	Semaphore access problem
found dead multi-threaded server	NONE	*	*	Warning: Multi-threaded Oracle server process died (restarted automatically)
found dead dispatcher	NONE	*	*	Warning: Oracle dispatcher process died (restarted automatically)

Support for Oracle RAC Extension Properties

The extension properties that you can set for each Support for Oracle RAC resource type are listed in the following sections:

- “SUNW.asm_diskgroup Extension Properties” on page 266
- “SUNW.crs_framework Extension Properties” on page 269
- “SPARC: SUNW.rac_cvm Extension Properties” on page 269
- “SUNW.rac_framework Extension Properties” on page 272
- “SUNW.rac_svm Extension Properties” on page 272
- “SPARC: SUNW.rac_udlm Extension Properties” on page 274
- “SUNW.scalable_acfs_proxy Extension Properties” on page 277
- “SUNW.scalable_asm_diskgroup_proxy Extension Properties” on page 279
- “SUNW.scalable_asm_instance Extension Properties” on page 280
- “SUNW.scalable_asm_instance_proxy Extension Properties” on page 283
- “SUNW.scalable_rac_listener Extension Properties” on page 286
- “SUNW.scalable_rac_server Extension Properties” on page 287
- “SUNW.scalable_rac_server_proxy Extension Properties” on page 292
- “SUNW.ScalDeviceGroup Extension Properties” on page 295
- “SUNW.ScalMountPoint Extension Properties” on page 297
- “SPARC: SUNW.vucmm_cvm Extension Properties” on page 300
- “SUNW.vucmm_framework Extension Properties” on page 303
- “SUNW.vucmm_svm Extension Properties” on page 303
- “SUNW.wait_zc_boot Extension Properties” on page 305

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 145. The Tunable entries indicate when you can update each property.

For information about all system-defined properties, see the [r_properties\(5\)](#) man page and the [rg_properties\(5\)](#) man page.

For information about SUNW.qfs extension properties, see the [SUNW.qfs\(5\)](http://wikis.sun.com/download/attachments/175440964/SUNW.qfs.5.txt?version=1) (<http://wikis.sun.com/download/attachments/175440964/SUNW.qfs.5.txt?version=1>) man page.

SUNW.asm_diskgroup Extension Properties

- asm_diskgroups

This property specifies the Oracle ASM disk group. If required, more than one Oracle ASM disk group can be specified as a comma separated list.

Data Type: String array

Default: Not applicable

Range: Not applicable

Tunable: When disabled
- Child_mon_level(integer)

Provides control over the processes that are monitored through the Process Monitor Facility (PMF). This property denotes the level to which the forked child processes are monitored. Omitting this property or setting this property to the default value is the same as omitting the -Cooption for [pmfadm\(1M\)](#). All child processes and their descendents are monitored.

Category: Optional

Default: -1

Tunable When disabled
- debug_level

Note – All SQL*Plus and srvmgr messages that the Oracle ASM disk group resource issues are written to the log file `/var/opt/SUNWscor/oracle_asm/message_log.${RESOURCE}`.

This property indicates the level to which debug messages for the Oracle ASM disk group resources are logged. When the debug level is increased, more debug messages are written to the system log `/var/adm/messages` as follows:

- | | |
|---|----------------------------------------------------|
| 0 | No debug messages |
| 1 | Function Begin and End messages |
| 2 | All debug messages and function Begin/End messages |

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–2

Default: 0

Tunable: Any time

`Failover_Enabled`(boolean)

Allows the resources to fail over. If this property is set to `False`, failover of the resource is disabled. You can use this property to prevent the application resource from initiating a failover of the resource group.

Note – Use the `Failover_mode` property instead of the `Failover_enabled` extension property because `Failover_mode` better controls failover behavior. For more information, see the descriptions of the `LOG_ONLY` and `RESTART_ONLY` values for `Failover_mode` in [r_properties\(5\)](#).

Category: Optional

Default: True

Tunable: When disabled

`Log_level`

Specifies the level, or type, of diagnostic messages that are logged by GDS. You can specify `None`, `Info`, or `Err` for this property. When you specify `None`, diagnostic messages are not logged by GDS. When you specify `Info`, both information and error messages are logged. When you specify `Err`, only error messages are logged.

Category: Optional

Default: Info

Tunable: Any time

`Network_aware`(boolean)

This property specifies whether an application uses the network.

Category: Optional

Default: False

Tunable: At creation

Monitor_retry_count

This property specifies the number of PMF restart allowed for the fault monitor.

Default: 4

Tunable: Any time

Monitor_retry_interval

This property specifies the number of PMF restart allowed for the fault monitor.

Default: 2

Tunable: Any time

probe_command(string)

Specifies the command that periodically checks the health of the single instance Oracle ASM.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control probe -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable: None

Probe_timeout(integer)

This property specifies the timeout value, in seconds, for the probe command.

Category: Optional

Default: 30 seconds

Tunable: Any time

Start_command(string)

Specifies the command that mounts the Oracle ASM disk group.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control start -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable: None

Stop_command(string)

Specifies the command that dismounts the Oracle ASM disk group.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control stop -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable: None

Stop_signal(integer)

Specifies the command that send stop signal to the Oracle ASM disk group.

Category: Optional

Default: 15

Tunable: When disabled

Validate_command(string)

Specifies the absolute path to the command that validates the application, although currently not used.

Category: Optional

Default: NULL

Tunable: When disabled

SUNW.crs_framework Extension Properties

The SUNW.crs_framework resource type has no extension properties.

SPARC: SUNW.rac_cvm Extension Properties

cvm_abort_step_timeout

This property specifies the timeout (in seconds) for the abort step of a reconfiguration of the Veritas Volume Manager (VxVM) component of Support for Oracle RAC.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

cvm_return_step_timeout

This property specifies the timeout (in seconds) for the return step of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_start_step_timeout`

This property specifies the timeout (in seconds) for the start step of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step1_timeout`

This property specifies the timeout (in seconds) for step 1 of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step2_timeout`

This property specifies the timeout (in seconds) for step 2 of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step3_timeout`

This property specifies the timeout (in seconds) for step 3 of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 240

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step4_timeout`

This property specifies the timeout (in seconds) for step 4 of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 320

Range: 100 – 99999 seconds

Tunable: Any time

`cvm_stop_step_timeout`

This property specifies the timeout (in seconds) for the stop step of a reconfiguration of the VxVM component of Support for Oracle RAC.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`vxclust_num_ports`

This property specifies the number of communications ports that the `vxclust` program uses.

Data Type: Integer

Default: 32

Range: 16 – 64

Tunable: When disabled

`vxclust_port`

This property specifies the communications port number that the `vxclust` program uses.

Data Type: Integer

Default: 5568

Range: 1024 – 65535

Tunable: When disabled

`vxconfigd_port`

This property specifies the communications port number that the VxVM component configuration daemon `vxconfigd` uses.

Data Type: Integer

Default: 5560

Range: 1024 – 65535

Tunable: When disabled

`vxkmsgd_port`

This property specifies the communications port number that the VxVM component messaging daemon `vxkmsgd` uses.

Data Type: Integer

Default: 5559

Range: 1024 – 65535

Tunable: When disabled

SUNW.rac_framework Extension Properties

`reservation_timeout`

This property specifies the timeout (in seconds) for the reservation step of a reconfiguration of Support for Oracle RAC.

Data Type: Integer

Default: 325

Range: 100 – 99999 seconds

Tunable: Any time

SUNW.rac_svm Extension Properties

`debug_level`

This property specifies 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.

Data Type: Integer

Default: 1, which logs `syslog` messages

Range: 0 – 10

Tunable: Any time

`svm_abort_step_timeout`

This property specifies the timeout (in seconds) for the abort step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_return_step_timeout`

This property specifies the timeout (in seconds) for the return step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_start_step_timeout`

This property specifies the timeout (in seconds) for the start step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step1_timeout`

This property specifies the timeout (in seconds) for step 1 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step2_timeout`

This property specifies the timeout (in seconds) for step 2 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step3_timeout`

This property specifies the timeout (in seconds) for step 3 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step4_timeout`

This property specifies the timeout (in seconds) for step 4 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 120

Range: 100 – 99999 seconds

Tunable: Any time

`svm_stop_step_timeout`

This property specifies the timeout (in seconds) for the stop step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of Support for Oracle RAC.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

SPARC: SUNW.rac_udlm Extension Properties

`failfastmode`

This property specifies the failfast mode of the node on which the UNIX Distributed Lock Manager (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.

Data Type: Enum

Default: panic

Tunable: Any time

num_ports

This property specifies the number of communications ports that the UDLM uses.

Data Type: Integer

Default: 32

Range: 16 – 64

Tunable: When disabled

oracle_config_file

This property specifies 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.

Data Type: String

Default: /etc/opt/SUNWcluster/conf/udlm.conf

Tunable: When disabled

port

This property specifies the communications port number that the UDLM uses.

Data Type: Integer

Default: 6000

Range: 1 – 65500

Tunable: When disabled

schedclassSchedclass

This property specifies the scheduling class of the UDLM that is passed to the `prctl(1)` command. The possible values of this property are as follows:

- RT – Real-time
- TS – Time-sharing
- IA – Interactive

Data Type: Enum

Default: RT

Tunable: When disabled

`schedpriority`

This property specifies the scheduling priority of the UDLM that is passed to the `priocntl` command.

Data Type: Integer

Default: 11

Range: 0 – 59

Tunable: When disabled

`udlm_abort_step_timeout`

This property specifies the timeout (in seconds) for the abort step of an UDLM reconfiguration.

Data Type: Integer

Default: 325

Range: 30 – 99999 seconds

Tunable: Any time

`udlm_start_step_timeout`

This property specifies the timeout (in seconds) for the start step of an UDLM reconfiguration.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`udlm_step1_timeout`

This property specifies the timeout (in seconds) for step 1 of an UDLM reconfiguration.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`udlm_step2_timeout`

This property specifies the timeout (in seconds) for step 2 of an UDLM reconfiguration.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`uUdlm_step3_timeout`

This property specifies the timeout (in seconds) for step 3 of an UDLM reconfiguration.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`udlm_step4_timeout`

This property specifies the timeout (in seconds) for step 4 of an UDLM reconfiguration.

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`udlm_step5_timeout`

This property specifies the timeout (in seconds) for step 5 of an UDLM reconfiguration.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

SUNW.scalable_acfs_proxy Extension Properties

`acfs_mountpoint`

This property specifies the mount point of an Oracle ACFS file system.

Data Type String

Default No default defined

Minimum length 1

Tunable When disabled

debug_level

Note – All SQL*Plus messages that the Oracle ACFS proxy resource issues are written to the log file `/var/opt/SUNWscor/oracle_asm/message_log.${RESOURCE}`.

This property indicates the level to which debug messages from the monitor for the Oracle ACFS proxy are logged. When the debug level is increased, more debug messages are written to the system log `/var/adm/messages` as follows:

- 0 No debug messages
- 1 Function Begin and End messages
- 2 All debug messages and function Begin/End messages

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type	Integer
Range	0–2
Default	0
Tunable	Any time

proxy_probe_interval

This property specifies the interval , in seconds, between probes of the Oracle ACFS resource for which this resource is acting as a proxy.

Data Type	Integer
Range	5–300
Default	30
Tunable	Any time

proxy_probe_timeout

This property specifies the timeout value, in seconds, that the proxy monitor uses when checking the status of the Oracle ACFS resource for which this resource is acting as a proxy.

Data Type	Integer
Range	5–120
Default	60
Tunable	Any time

SUNW.scalable_asm_diskgroup_proxy Extension Properties

asm_diskgroups

This property specifies the single-instance Oracle ASM disk group. If required, more than one single-instance Oracle ASM disk group can be specified as a comma separated list.

Data Type: String array

Default: Not applicable

Range: Not applicable

Tunable: When disabled

debug_level (integer)

Note – All SQL*Plus and srvmgr messages that the Oracle ASM disk group resource issues are written to the log file /var/opt/SUNWscor/oracle_asm/message_log.\${RESOURCE}.

This property indicates the level to which debug messages for the Oracle ASM disk group resources are logged. When the debug level is increased, more debug messages are written to the system log /var/adm/messages as follows:

0	No debug messages
1	Function Begin and End messages
2	All debug messages and function Begin/End messages

You can specify a different value of the debug_level extension property for each node that can master the resource.

Range: 0–2

Default: 0

Tunable: Any time

Proxy_probe_interval(integer)

Specifies the timeout value, in seconds, that the proxy monitor uses when checking the status of the clustered Oracle ASM disk group resource for which this resource is acting as a proxy.

Range: 5–120

Default: 30

Tunable: Any time

`proxy_probe_timeout(integer)`

This property specifies the timeout value, in seconds, for the probe command.

Range: 5–120

Default: 60

Tunable: Any time

SUNW.scalable_asm_instance Extension Properties

`child_mon_level(integer)`

Provides control over the processes that are monitored through the Process Monitor Facility (PMF). This property denotes the level to which the forked child processes are monitored. Omitting this property or setting this property to the default value is the same as omitting the `-Coption` for `pmfadm(1M)`. All child processes and their descendents are monitored.

Category: Optional

Default: -1

Tunable: When disabled

`debug_level`

Note – All SQL*Plus and `srvmgr` messages that the clustered Oracle ASM instance proxy resource issues are written to the log file `/var/opt/SUNWscor/oracle_asm/message_log.${RESOURCE}`.

This property indicates the level to which debug messages from the monitor for the clustered Oracle ASM instance proxy are logged. When the debug level is increased, more debug messages are written to the system log `/var/adm/messages` as follows:

- 0 No debug messages
- 1 Function Begin and End messages
- 2 All debug messages and function Begin/End messages

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–2

Default: 0

Tunable: Any time

Failover_Enabled(boolean)

Allows the resources to fail over. If this property is set to `False`, failover of the resource is disabled. You can use this property to prevent the application resource from initiating a failover of the resource group.

Note – Use the `Failover_mode` property instead of the `Failover_enabled` extension property because `Failover_mode` better controls failover behavior. For more information, see the descriptions of the `LOG_ONLY` and `RESTART_ONLY` values for `Failover_mode` in [r_properties\(5\)](#).

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Category: Optional

Default: `True`

Tunable: When disabled

Log_level

Specifies the level, or type, of diagnostic messages that are logged by GDS. You can specify `None`, `Info`, or `Err` for this property. When you specify `None`, diagnostic messages are not logged by GDS. When you specify `Info`, both information and error messages are logged. When you specify `Err`, only error messages are logged.

Category: Optional

Default: `Info`

Tunable: Any time

Network_aware(boolean)

This property specifies whether an application uses the network.

Category: Optional

Default: `False`

Tunable: At creation

Monitor_retry_count

This property specifies the number of PMF restart allowed for the fault monitor.

Default: `4`

Tunable: Any time

Monitor_retry_interval

This property specifies the number of PMF restart allowed for the fault monitor.

Default: 2

Tunable: Any time

oracle_home

This property specifies the full path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

oracle_sid

This property specifies the Oracle System Identifier (SID). The Oracle SID uniquely identifies the single instance Oracle ASM on the node where the instance is running.

Data Type: String

Range: Not applicable

Default: +ASM

Tunable: When disabled

probe_command(string)

Specifies the command that periodically checks the health of the single instance Oracle ASM.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control probe -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable:None

Probe_timeout(integer)

This property specifies the timeout value, in seconds, for the probe command.

Category: Optional

Default: 30 seconds

Tunable: Any time

Start_command(string)

Specifies the command that starts the single instance Oracle ASM.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control start -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable: None

Stop_command(string)

Specifies the command that stops the single instance Oracle ASM.

Category: Required

Default: /opt/SUNWscor/oracle_asm/bin/asm_control stop -R %RS_NAME -G %RG_NAME -T %RT_NAME

Tunable: None

Stop_signal(integer)

Specifies the command that stops the single instance Oracle ASM.

Category: Optional

Default: 15

Tunable: When disabled

Validate_command(string)

Specifies the absolute path to the command that validates the application, although currently not used.

Category: Optional

Default: Null

Tunable: When disabled

SUNW.scalable_asm_instance_proxy Extension Properties

asm_diskgroups

This property specifies the Oracle ASM disk group. If required, more than one Oracle ASM disk group can be specified as a comma separated list.

Data Type: String array

Default: Not applicable

Range: Not applicable

Tunable: When disabled

`crs_home`

This property specifies the full path to the Oracle Clusterware home directory. The Oracle Clusterware home directory contains the binary files, log files and parameter files for the Oracle Clusterware software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

`debug_level`

Note – All SQL*Plus and srvmgr messages that the clustered ASM instance proxy resource issues are written to the log file
`/var/opt/SUNWscor/oracle_asm/message_log.${RESOURCE}`.

This property indicates the level to which debug messages from the monitor for the Oracle clustered ASM instance proxy are logged. When the debug level is increased, more debug messages are written to the system log `/var/adm/messages` as follows:

- 0 No debug messages
- 1 Function Begin and End messages
- 2 All debug messages and function Begin/End messages

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–2

Default: 0

Tunable: Any time

`oracle_home`

This property specifies the full path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

`oracle_sid`

This property specifies the Oracle System Identifier (SID). The Oracle SID uniquely identifies the clustered Oracle ASM database instance on the node where the instance is running.

You *must* specify a different value of the `oracle_sid` extension property for each node that can master the resource. The value for each node must correctly identify the instance that is running on the node.

Data Type: String

Range: Not applicable

Default: NULL

Tunable: When disabled

`proxy_probe_timeout`

This property specifies the timeout value, in seconds, that the proxy monitor uses when checking the status of the Oracle Clusterware resource for which this resource is acting as a proxy.

Data Type: Integer

Range: 5–120

Default: 60

Tunable: Any time

`proxy_probe_interval`

This property specifies the interval, in seconds, between probes of the Oracle Clusterware resource for which this resource is acting as a proxy.

Data Type: Integer

Range: 5–120

Default: 60

Tunable: Any time

SUNW.scalable_rac_listener Extension Properties

debug_level

This property indicates the level to which debug messages from the Oracle RAC listener component are logged. When the debug level is increased, more debug messages are written to the log files. These messages are logged to the file `/var/opt/SUNWscor/scalable_rac_listener/message_log.rs`, where *rs* is the name of the resource that represents the Oracle RAC listener component.

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–100

Default: 1, which logs `syslog` messages

Tunable: Any time

listener_name

This property specifies the name of the Oracle listener instance that is to be started on the node where the instance is running. This name must match the corresponding entry in the `listener.ora` configuration file.

You can specify a different value of the `listener_name` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: LISTENER

Tunable: When disabled

oracle_home

This property specifies the full path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

probe_timeout

This property specifies the timeout value, in seconds, that the fault monitor uses when checking the status of an Oracle RAC listener.

Data Type: Integer

Range: 1–99999

Default: 300

Tunable: Any time

`user_env`

This property specifies the name of the file that contains the environment variables that are to be set before the listener starts up or shuts down. You must define all environment variables whose values differ from Oracle defaults in this file.

For example, a user's `listener.ora` file might not be located under the `/var/opt/oracle` directory or the `oracle-home/network/admin` directory. In this situation, the `TNS_ADMIN` environment variable must 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.

You can specify a different value of the `user_env` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: Any time

SUNW.scalable_rac_server Extension Properties

`alert_log_file`

This property specifies the absolute path of the Oracle alert log file. The Oracle software logs alerts in this file. The Oracle RAC server fault monitor scans the alert log file for new alerts at the following times:

- When the Oracle RAC server fault monitor is started
- Each time that the Oracle RAC server fault monitor queries the health of the server

If an action is defined for a logged alert that the Oracle RAC server fault monitor detects, the Oracle RAC server fault monitor performs the action in response to the alert.

Preset actions for logged alerts are listed in [Appendix B, “Preset Actions for DBMS Errors and Logged Alerts.”](#) To change the action that the Oracle RAC server fault monitor performs, customize the server fault monitor as explained in [“Customizing the Oracle 9i RAC Server Fault Monitor” on page 151.](#)

You can specify a different value of the `alert_log_file` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: NULL

Tunable: Any time

`connect_cycle`

This property specifies the number of fault monitor probe cycles that are performed before the fault monitor disconnects from the database.

You can specify a different value of the `connect_cycle` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–99999

Default: 5

Tunable: Any time

`connect_string`

This property specifies the Oracle database user ID and password that the fault monitor uses to connect to the Oracle database. This property is specified as follows:

userid/password

userid

Specifies the Oracle database user ID that the fault monitor uses to connect to the Oracle database.

password

Specifies the password that is set for the Oracle database user *userid*.

The system administrator must define the database user ID and password for the fault monitor during the setup of Oracle RAC. To use Solaris authentication, type a slash (/) instead of a user ID and password.

You can specify a different value of the `connect_string` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: NULL

Tunable: Any time

`custom_action_file`

This property specifies the absolute path of the file that defines the custom behavior of the Oracle RAC server fault monitor.

You can specify a different value of the `custom_action_file` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: Empty string

Tunable: Any time

`debug_level`

This property indicates the level to which debug messages from the monitor for the Oracle RAC proxy server are logged. When the debug level is increased, more debug messages are written to the log files.

The messages are logged to files in the directory

`/var/opt/SUNWscor/oracle_server/proxyrs`. Messages for server-side components and client-side components of the proxy server resource are written to separate files:

- Messages for server-side components are written to the file `message_log.rs`.
- Messages for client-side components are written to the file `message_log.client.rs`.

In these file names and directory names, *rs* is the name of the resource that represents the Oracle RAC server component.

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–100

Default: 1, which logs `syslog` messages

Tunable: Any time

`oracle_home`

This property specifies the full path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

`oracle_sid`

This property specifies the Oracle System Identifier (SID). The Oracle SID uniquely identifies the Oracle Real Application Cluster database instance on the node where the instance is running.

You *must* specify a different value of the `oracle_sid` extension property for each node that can master the resource. The value for each node must correctly identify the instance that is running on the node.

Data Type: String

Range: Not applicable

Default: NULL

Tunable: When disabled

`parameter_file`

This property specifies the full path to the Oracle parameter file. This file contains parameters that are to be set when the Oracle database is started. This property is optional. If you do not set this property, the default parameter file that is specified by Oracle is used, namely: *oracle-home/dbs/initoracle-sid.ora*.

oracle-home

Specifies the Oracle home directory.

oracle-sid

Specifies the Oracle system identifier of the database instance for which the file is to be used.

You can specify a different value of the `parameter_file` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: Any time

`probe_timeout`

This property specifies the timeout value, in seconds, that the fault monitor uses when checking the status of an Oracle RAC server.

Data Type: Integer

Range: 1–99999

Default: 300

Tunable: Any time

`user_env`

This property specifies the name of the file that contains the environment variables that are to be set before the database starts up or shuts down. You must define all environment variables whose values differ from Oracle defaults in this file.

For example, a user's `listener.ora` file might not be located under the `/var/opt/oracle` directory or the `oracle-home/network/admin` directory. In this situation, the `TNS_ADMIN` environment variable must 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.

You can specify a different value of the `user_env` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: Any time

`wait_for_online`

This property 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. |
| 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. |

Data Type: Boolean

Range: Not applicable

Default: True

Tunable: Any time

SUNW.scalable_rac_server_proxy Extension Properties

`client_retries`

This property specifies the maximum number of attempts by the resource's remote procedure call (RPC) client to connect to the proxy daemon.

Data Type: Integer

Range: 1–25

Default: 3

Tunable: When disabled

`client_retry_interval`

This property specifies the interval, in seconds, between attempts by the resource's RPC client to connect to the proxy daemon.

Data Type: Integer

Range: 1–3600

Default: 5

Tunable: When disabled

`crs_home`

This property specifies the directory in which the Oracle Clusterware software is located.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

`db_name`

This property specifies the name that uniquely identifies the specific Oracle RAC database that is associated with this resource. This identifier distinguishes the database from other databases that might run simultaneously on your system. The name of the Oracle RAC database is specified during the installation of Oracle RAC.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

debug_level

This property indicates the level to which debug messages from the component for the Oracle RAC proxy server are logged. When the debug level is increased, more debug messages are written to the log files. These messages are logged to the file `/var/opt/SUNWscor/scalable_rac_server_proxy/message_log.rs`, where *rs* is the name of the resource that represents the Oracle RAC proxy server component.

You can specify a different value of the `debug_level` extension property for each node that can master the resource.

Data Type: Integer

Range: 0–100

Default: 1, which logs `syslog` messages

Tunable: Any time

monitor_probe_interval

This property specifies the interval, in seconds, between probes of the Oracle Clusterware resource for which this resource is acting as a proxy.

Data Type: Integer

Range: 10–3600

Default: 300

Tunable: Any time

oracle_home

This property specifies the full path to the Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: When disabled

oracle_sid

This property specifies the Oracle System Identifier (SID). The Oracle SID uniquely identifies the Oracle RAC database instance on the node where the instance is running.

You *must* specify a different value of the `oracle_sid` extension property for each node that can master the resource. The value for each node must correctly identify the instance that is running on the node.

Data Type: String

Range: Not applicable

Default: NULL

Tunable: When disabled

`proxy_probe_timeout`

This property specifies the timeout value, in seconds, that the proxy monitor uses when checking the status of the Oracle Clusterware resource for which this resource is acting as a proxy.

Data Type: Integer

Range: 5–3600

Default: 120

Tunable: Any time

`startup_wait_count`

This property specifies the maximum number of attempts by this resource to confirm that the Oracle Clusterware software is started completely. The interval between attempts is twice the value of the `proxy_probe_timeout` extension property.

The resource requires confirmation that Oracle Clusterware software is started before attempting to start an Oracle RAC database instance. If the maximum number of attempts is exceeded, the resource does not attempt to start the database instance.

Data Type: Integer

Range: 10–600

Default: 20

Tunable: When disabled

`user_env`

This property specifies the name of the file that contains the environment variables that are to be set before the database starts up or shuts down. You must define all environment variables whose values differ from Oracle defaults in this file.

For example, a user's `listener.ora` file might not be located under the `/var/opt/oracle` directory or the `oracle-home/network/admin` directory. In this situation, the `TNS_ADMIN` environment variable must 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.

You can specify a different value of the `user_env` extension property for each node that can master the resource.

Data Type: String

Range: Not applicable

Default: No default defined

Tunable: Any time

SUNW.ScalDeviceGroup Extension Properties

`debug_level`

This property specifies the level to which debug messages from the resource of this type are logged. When the debug level is increased, more debug messages are written to the log files.

Data type: Integer

Default: 0

Range: 0–10

Tunable: Any time

`diskgroupname`

This property specifies the name of the device group that the resource represents. You must set this property to one of the following items:

- The name of an existing Solaris Volume Manager for Sun Cluster multi-owner disk set. This name was specified in the `metaset(1M)` command with which the disk set was created.
- The name of an existing VxVM shared-disk group. This name was specified in the Veritas command with which the disk group was created.

The requirements for the device group that you specify are as follows:

- The device group must be a valid, existing multi-owner disk set or shared-disk group.
- The device group must be hosted on all nodes that can master the resource.
- The device group must be accessible from all nodes that can master the scalable device group resource.
- The device group must contain at minimum one volume.

Data type: String

Default: No default defined

Range: Not applicable

Tunable: When disabled

`logicaldevicelist`

This property specifies a comma-separated list of logical volumes that the fault monitor of the resource is to monitor. This property is optional. If you do not specify a value for this property, all logical volumes in the device group are to be monitored.

The status of the device group is derived from the statuses of the individual logical volumes that are monitored. If all monitored logical volumes are healthy, the device group is healthy. If any monitored logical volume is faulty, the device group is faulty.

The status of an individual logical volume is obtained by querying the volume's volume manager. If the status of a Solaris Volume Manager for Sun Cluster volume cannot be determined from a query, the fault monitor performs file input/output (I/O) operations to determine the status.

If a device group is discovered to be faulty, monitoring of the resource that represents the group is stopped and the resource is put into the disabled state.

Note – For mirrored disks, if one submirror is faulty, the device group is still considered to be healthy.

The requirements for each logical volume that you specify are as follows:

- The logical volume must exist.
- The logical volume must be contained in the device group that the `diskgroupname` property specifies.
- The logical volume must be accessible from all nodes that can master the scalable device group resource.

Data type: String array

Default: ""

Range: Not applicable

Tunable: Any time

`monitor_retry_count`

This property specifies the maximum number of restarts by the process monitor facility (PMF) that are allowed for the fault monitor.

Data type: Integer

Default: 4

Range: No range defined

Tunable: Any time

`monitor_retry_interval`

This property specifies the period of time in minutes during which the PMF counts restarts of the fault monitor.

Data type: Integer

Default: 2

Range: No range defined

Tunable: Any time

SUNW.ScalMountPoint Extension Properties

`debug_level`

This property specifies the level to which debug messages from the resource for a file-system mount point are logged. When the debug level is increased, more debug messages are written to the log files.

Data type: Integer

Default: 0

Range: 0–10

Tunable: Any time

`filesystemtype`

This property specifies the type of file system whose mount point the resource represents. You must specify this property. Set this property to one of the following values:

`nas` Specifies that the file system is a file system on a qualified NAS device.

`s-qfs` Specifies that the file system is a Sun QFS shared file system.

Data type: String

Default: No default defined

Range: Not applicable

Tunable: When disabled

iotimeout

This property specifies the timeout value in seconds that the fault monitor uses for file input/output (I/O) probes. To determine if the mounted file system is available, the fault monitor performs I/O operations such as opening, reading, and writing to a test file on the file system. If an I/O operation is not completed within the timeout period, the fault monitor reports an error.

Data type: Integer

Default: 300

Range: 5–300

Tunable: Any time

monitor_retry_count

This property specifies the maximum number of restarts by the process monitor facility (PMF) that are allowed for the fault monitor.

Data type: Integer

Default: 4

Range: No range defined

Tunable: Any time

monitor_retry_interval

This property specifies the period of time in minutes during which the PMF counts restarts of the fault monitor.

Data type: Integer

Default: 2

Range: No range defined

Tunable: Any time

mountoptions

This property specifies a comma-separated list of mount options that are to be used when the file system that the resource represents is mounted. This property is optional. If you do not specify a value for this property, mount options are obtained from the file system's table of defaults.

- For a Sun QFS shared file system, these options are obtained from the `/etc/opt/SUNWsamfs/samfs.cmd` file.
- For a file system on a qualified NAS device, these options are obtained from the `/etc/vfstab` file.

Mount options that you specify through this property override the mount options in the file system's table of defaults.

Data type: String

Default: ""

Range: Not applicable

Tunable: When disabled

mountpointdir

This property specifies the mount point of the file system that the resource represents. The mount point is the full path to the directory where the file system is attached to the file system hierarchy when the file system is mounted. You must specify this property.

The directory that you specify must already exist.

Data type: String

Default: No default defined

Range: Not applicable

Tunable: When disabled

targetfilesystem

This property specifies the file system that is to be mounted at the mount point that the mountpointdir extension property specifies. You must specify this property. The type of the file system must match the type that the filesystemtype property specifies. The format of this property depends on the type of the file system as follows:

- For a Sun QFS shared file system, set this property to the name that was assigned to the file system when the file system was created. The file system must be correctly configured. For more information, see your Sun QFS shared file system documentation.
- For a file system on a qualified NAS device, set this property to *nas-device:path*. The replaceable items in this format are as follows:

nas-device

Specifies the name of the qualified NAS device that is exporting the file system. You can optionally qualify this name with a domain.

path

Specifies the full path to the file system that the qualified NAS device is exporting.

The qualified NAS device and the file system must already be configured for use with Sun Cluster. For more information, see [Oracle Solaris Cluster 3.3 With Network-Attached Storage Device Manual](#).

Data type: String

Default: No default defined

Range: Not applicable

Tunable: When disabled

SPARC: SUNW.vucmm_cvm Extension Properties

`cvm_abort_step_timeout`

This property specifies the timeout (in seconds) for the abort step of a reconfiguration of the Veritas Volume Manager (VxVM) component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_return_step_timeout`

This property specifies the timeout (in seconds) for the return step of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_start_step_timeout`

This property specifies the timeout (in seconds) for the start step of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step1_timeout`

This property specifies the timeout (in seconds) for step 1 of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step2_timeout`

This property specifies the timeout (in seconds) for step 2 of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 100

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step3_timeout`

This property specifies the timeout (in seconds) for step 3 of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 240

Range: 30 – 99999 seconds

Tunable: Any time

`cvm_step4_timeout`

This property specifies the timeout (in seconds) for step 4 of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 320

Range: 100 – 99999 seconds

Tunable: Any time

`cvm_stop_step_timeout`

This property specifies the timeout (in seconds) for the stop step of a reconfiguration of the VxVM component of the volume manager reconfiguration framework.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

`vxclust_num_ports`

This property specifies the number of communications ports that the `vxclust` program uses.

Data Type: Integer

Default: 32

Range: 16 – 64

Tunable: When disabled

`vxclust_port`

This property specifies the communications port number that the `vxclust` program uses.

Data Type: Integer

Default: 5568

Range: 1024 – 65535

Tunable: When disabled

`vxconfigd_port`

This property specifies the communications port number that the VxVM component configuration daemon `vxconfigd` uses.

Data Type: Integer

Default: 5560

Range: 1024 – 65535

Tunable: When disabled

`vxkmsgd_port`

This property specifies the communications port number that the VxVM component messaging daemon `vxkmsgd` uses.

Data Type: Integer

Default: 5559

Range: 1024 – 65535

Tunable: When disabled

SUNW.vucmm_framework Extension Properties

reservation_timeout

This property specifies the timeout (in seconds) for the reservation step of a reconfiguration of the framework.

Data Type: Integer

Default: 325

Range: 100 – 99999 seconds

Tunable: Any time

SUNW.vucmm_svm Extension Properties

debug_level

This property specifies 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.

Data Type: Integer

Default: 1, which logs `syslog` messages

Range: 0 – 10

Tunable: Any time

svm_abort_step_timeout

This property specifies the timeout (in seconds) for the abort step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

svm_return_step_timeout

This property specifies the timeout (in seconds) for the return step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_start_step_timeout`

This property specifies the timeout (in seconds) for the start step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step1_timeout`

This property specifies the timeout (in seconds) for step 1 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step2_timeout`

This property specifies the timeout (in seconds) for step 2 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

`svm_step3_timeout`

This property specifies the timeout (in seconds) for step 3 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 30 – 99999 seconds

Tunable: Any time

svm_step4_timeout

This property specifies the timeout (in seconds) for step 4 of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 120

Range: 100 – 99999 seconds

Tunable: Any time

svm_stop_step_timeout

This property specifies the timeout (in seconds) for the stop step of a reconfiguration of the Solaris Volume Manager for Sun Cluster module of the volume manager reconfiguration framework.

Data Type: Integer

Default: 40

Range: 30 – 99999 seconds

Tunable: Any time

SUNW.wait_zc_boot Extension Properties

zcname This property specifies the name of the zone cluster that needs to be booted before the dependent resource.

Data type: String

Default: No default defined

Range: Not applicable

Tunable: When disabled

Command-Line Alternatives

Oracle Solaris Cluster maintenance commands enable you to automate the creation, modification, and removal of the framework resource groups by using scripts. Automating this process reduces the time for propagating the same configuration information to many nodes in a cluster.

This appendix contains the following sections:

- [“Setting Support for Oracle RAC Extension Properties” on page 307](#)
- [“Registering and Configuring the Framework Resource Groups by Using Oracle Solaris Cluster Maintenance Commands” on page 308](#)
- [“Registering and Configuring Oracle ASM Resource Groups \(CLI\)” on page 316](#)
- [“Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands” on page 324](#)
- [“Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands” on page 334](#)
- [“Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i by Using Oracle Solaris Cluster Maintenance Commands” on page 348](#)

Setting Support for Oracle RAC Extension Properties

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

- [“Tuning Support for Oracle RAC” on page 142](#)
- [Appendix C, “Support for Oracle RAC Extension Properties”](#)

Registering and Configuring the Framework Resource Groups by Using Oracle Solaris Cluster Maintenance Commands

The tasks in this section are an alternative for the resource-configuration steps in “[How to Register and Configure the Oracle RAC Framework Resource Group by Using `clsetup`](#)” on page 66. Instructions include configuring the multiple-owner volume-manager framework, which currently you cannot configure by using `clsetup`. The following information is in this section:

- “[Overview of the Framework Resource Groups](#)” on page 308
- “[How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands](#)” on page 309
- “[How to Register and Configure the Oracle RAC Framework Resource Group in a Zone Cluster by Using Oracle Solaris Cluster Maintenance Commands](#)” on page 314

Overview of the Framework Resource Groups

This section describes the following framework resource groups:

- “[Oracle RAC Framework Resource Group](#)” on page 308
- “[Multiple-Owner Volume-Manager Framework Resource Group](#)” on page 309

Oracle RAC Framework Resource Group

The Oracle RAC framework resource group enables Oracle RAC to run with Oracle Solaris Cluster. This resource group contains an instance of the following single-instance resource types:

- `SUNW.rac_framework`, which represents the framework that enables Oracle RAC to be managed by using Oracle Solaris Cluster commands
- SPARC: `SUNW.rac_udlm`, which represents the UNIX Distributed Lock Manager (UDLM) component of Support for Oracle RAC

In addition, the Oracle RAC framework resource group can contain an instance of a single-instance resource type that represents the volume manager that you are using for Oracle files, if any. This is the legacy configuration that is used in releases before the Sun Cluster 3.2 11/09 release, before the introduction of the `SUNW.vucmm_framework` resource group to contain multiple-owner volume-manager resources.

Note – This legacy use of the `SUNW.rac_framework` resource group to contain volume-manager resources is still supported in this release, but might be deprecated in a future Oracle Solaris Cluster release.

- Solaris Volume Manager for Sun Cluster is represented by the `SUNW.rac_svm` resource type.

- SPARC: VxVM with the cluster feature is represented by the `SUNW.rac_cvm` resource type.

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

Multiple-Owner Volume-Manager Framework Resource Group

The multiple-owner volume-manager framework resource group enables a multiple-owner shared-storage feature to be used by Oracle RAC.

The multiple-owner volume-manager framework resource group is based on the `SUNW.vucmm_f` framework resource type. This resource group contains the volume manager resources for the multiple-owner volume-manager framework, `SUNW.vucmm_svm` or `SUNW.vucmm_cvm`.

When a multiple-owner volume-manager framework resource group is configured, you do not also put a `SUNW.rac_svm` or `SUNW.rac_cvm` resource in the `SUNW.rac_framework` resource group.

▼ How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands

Perform this procedure on only one node of the global cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create a scalable Oracle RAC resource group.**

Note – If you are performing the steps in this procedure to register and configure the Oracle RAC resource framework in a zone cluster and Oracle RAC support is not also required in the global cluster, you do not need to also create an Oracle RAC framework resource group in the global cluster. In that case, skip this step and proceed to [Step 7](#).

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -n nodelist \  
-p maximum_primaries=num-in-list \  
-p desired_primaries=num-in-list \  
[-p rg_description="description"] \  
-p rg_mode=Scalable rac-fwk-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes on which Support for Oracle RAC is to be enabled. The Support for Oracle RAC software packages must be installed on each node in this list.

-p *maximum_primaries=num-in-list*

Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *nodelist*.

-p *desired_primaries=num-in-list*

Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *nodelist*.

-p *rg_description="description"*

Specifies an optional brief description of the resource group. This description is displayed when you use Oracle Solaris Cluster maintenance commands to obtain information about the resource group.

-p *rg_mode=Scalable*

Specifies that the resource group is scalable.

rac-fwk-rg

Specifies the name that you are assigning to the Oracle RAC resource group.

3 Register the `SUNW.rac_framework` resource type.

```
# clresourcetype register SUNW.rac_framework
```

4 Add an instance of the `SUNW.rac_framework` resource type to the resource group that you created in [Step 2](#).

```
# clresource create -g rac-fwk-rg -t SUNW.rac_framework rac-fwk-rs
```

-g *rac-fwk-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 2](#).

rac-fwk-rs Specifies the name that you are assigning to the `SUNW.rac_framework` resource.

5 SPARC: Register the `SUNW.rac_udlm` resource type.

```
# clresourcetype register SUNW.rac_udlm
```

6 SPARC: 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_f framework resource that you created in [Step 4](#).

```
# clresource create -g resource-group \  
-t SUNW.rac_udlm \  
-p resource_dependencies=rac-fmwk-rs rac-udlm-rs
```

-g *rac-fmwk-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 2](#).

-p *resource_dependencies=rac-fmwk-rs*

Specifies that this instance depends on the SUNW.rac_f framework resource that you created in [Step 4](#).

rac-udlm-rs

Specifies the name that you are assigning to the SUNW.rac_udlm resource.

7 Create a scalable multiple-owner volume-manager framework resource group, if one does not already exist.

If you do not intend to create a multiple-owner volume-manager framework resource group, skip to [Step 10](#).

```
# clresourcegroup create -n nodelist -S vucmm-fmwk-rg
```

-n *nodelist*

Specifies the same node list that you configured for the scalable Oracle RAC resource group.

vucmm-fmwk-rg

Specifies the name that you are assigning to the multiple-owner volume-manager framework resource group.

8 Register the SUNW.vucmm_framework resource type.

If you did not create a multiple-owner volume-manager framework resource group, skip to [Step 10](#).

```
# clresourcetype register SUNW.vucmm_framework
```

9 Add an instance of the SUNW.vucmm_f framework resource type to the resource group that you created in [Step 7](#).

If you did not create a multiple-owner volume-manager framework resource group, skip to [Step 10](#).

```
# clresource create -g vucmm-fmwk-rg -t SUNW.vucmm_framework vucmm-fmwk-rs
```

-g *vucmm-fmwk-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 7](#).

vucmm-fmwk-rs Specifies the name that you are assigning to the SUNW.vucmm_f framework resource.

10 Register and add an instance of the resource type that represents the volume manager that you are using for Oracle files, if any.

If you are not using a volume manager, omit this step.

- **If you are using Solaris Volume Manager for Sun Cluster, register and add the instance as follows:**

a. Register the resource type.

```
# clresourcetype register svm-rt
```

svm-rt

Specifies the resource type you register.

- If you are using a SUNW.vucmm_f framework based resource group, register the SUNW.vucmm_svm resource type.
- If you are using only a SUNW.rac_f framework based resource group, register the SUNW.rac_svm resource type.

b. Add an instance of the resource type to the resource group to contain the volume manager resource.

Ensure that this instance depends on the framework resource that you created.

```
# clresource create -g fmwk-rg \  
-t svm-rt \  
-p resource_dependencies=fmwk-rs svm-rs
```

-g fmwk-rg

Specifies the resource group to which you are adding the resource.

- If you are using a SUNW.vucmm_f framework based resource group, specify the resource group that you created in [Step 7](#).
- If you are using only a SUNW.rac_f framework based resource group, specify the resource group that you created in [Step 2](#).

```
-p resource_dependencies=fmwk-rs
```

Specifies that this instance depends on the framework resource that you created.

- If you are using a SUNW.vucmm_f framework based resource group, specify the resource group that you created in [Step 9](#).
- If you are using only a SUNW.rac_f framework based resource group, specify the resource group that you created in [Step 4](#).

svm-rs

Specifies the name that you are assigning to the SUNW.vucmm_svm or SUNW.rac_svm resource.

- **SPARC: If you are using VxVM with the cluster feature, register and add the instance as follows.**

a. Register the resource type.

```
# clresourcetype register cvm-rt
```

cvm-rt

Specifies the resource type you register.

- If you are using a `SUNW.vucmm_f` framework based resource group, register the `SUNW.vucmm_cvm` resource type.
- If you are using only a `SUNW.rac_f` framework based resource group, register the `SUNW.rac_cvm` resource type.

b. Add an instance of the resource type to the resource group that you created.

Ensure that this instance depends on the framework resource that you created.

```
# clresource create -g fmwk-rg \
-t cvm-rt \
-p resource_dependencies=fmwk-rs cvm-rs
```

-g fmwk-rg

Specifies the resource group to which you are adding the resource. This resource group must be the resource group that you created.

- If you are using a `SUNW.vucmm_f` framework based resource group, specify the resource group that you created in [Step 7](#).
- If you are using only a `SUNW.rac_f` framework based resource group, specify the resource group that you created in [Step 2](#).

-p resource_dependencies=fmwk-rs

Specifies that this instance depends on the framework resource that you created.

- If you are using a `SUNW.vucmm_f` framework based resource group, specify the resource group that you created in [Step 9](#).
- If you are using only a `SUNW.rac_f` framework based resource group, specify the resource group that you created in [Step 4](#).

cvm-rs

Specifies the name that you are assigning to the `SUNW.vucmm_cvm` or `SUNW.rac_cvm` resource.

11 Bring online and in a managed state the Oracle RAC framework resource group, the multiple-owner volume-manager framework resource group if used, and their resources.

```
# clresourcegroup online -emM rac-fmwk-rg [vucmm-fmwk-rg]
```

rac-fmwk-rg

Specifies that the Oracle RAC resource group that you created in [Step 2](#) is to be moved to the MANAGED state and brought online.

vucmm-fmwk-rg Specifies that the multiple-owner volume-manager framework resource group that you created in [Step 7](#) is to be moved to the MANAGED state and brought online.

▼ How to Register and Configure the Oracle RAC Framework Resource Group in a Zone Cluster by Using Oracle Solaris Cluster Maintenance Commands

Perform the steps in this procedure to register and configure the Oracle RAC framework resource group in a zone cluster for the Sun QFS shared file system with Solaris Volume Manager. For this configuration, you need to create the Oracle RAC framework resource group in both the global cluster and zone cluster.

Note – When a step in the procedure requires running the Oracle Solaris Cluster commands in a zone cluster, you should run the command from the global cluster and use the `-Z` option to specify the zone cluster.

Before You Begin Perform the steps to register and configure the Oracle RAC framework resource group *rac-fmwk-rg*, with resources *rac-fmwk-rs* and *rac-svm-rs* in the global cluster.

Note – For information on registering and configuring the Oracle RAC framework resource group in the global cluster, see [“How to Register and Configure the Framework Resource Groups in the Global Cluster by Using Oracle Solaris Cluster Maintenance Commands”](#) on page 309.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create a scalable Oracle RAC resource group.**

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -Z zcname -n nodelist \
  -p maximum_primaries=num-in-list \
  -p desired_primaries=num-in-list \
  [-p rg_description="description"] \
  -p rg_mode=Scalable rac-fmwk-rg
```

3 Register the `SUNW.rac_framework` resource type.

```
# clresourcetype register -Z zcname SUNW.rac_framework
```

4 Add an instance of the `SUNW.rac_framework` resource type to the resource group that you created in [Step 2](#).

```
# clresource create -Z zcname -g rac-fmwk-rg \  
-t SUNW.rac_framework rac-fmwk-rs
```

`-g rac-fmwk-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 2](#).

`rac-fmwk-rs` Specifies the name that you are assigning to the `SUNW.rac_framework` resource.

5 SPARC: Register the `SUNW.rac_udlm` resource type.

```
# clresourcetype register -Z zcname SUNW.rac_udlm
```

6 SPARC: 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](#).

```
# clresource create -Z zcname -g resource-group \  
-t SUNW.rac_udlm \  
-p resource_dependencies=rac-fmwk-rs rac-udlm-rs
```

`-g rac-fmwk-rg` Specifies the Oracle RAC resource group to which you are adding the resource. This resource group must be the resource group that you created in [Step 2](#).

`-p resource_dependencies=rac-fmwk-rs` Specifies that this instance depends on the `SUNW.rac_framework` resource that you created in [Step 4](#).

`rac-udlm-rs`

Specifies the name that you are assigning to the `SUNW.rac_udlm` resource.

7 Bring online and in a managed state the Oracle RAC framework resource group and its resources.

```
# clresourcegroup online -Z zcname -emM rac-fmwk-rg
```

Registering and Configuring Oracle ASM Resource Groups (CLI)

The following information is in this section:

- “How to Register and Configure Oracle ASM Resource Groups in the Global Cluster (CLI)” on page 316
- “How to Register and Configure Oracle ASM Resource Groups in a Zone Cluster (CLI)” on page 320

▼ How to Register and Configure Oracle ASM Resource Groups in the Global Cluster (CLI)

Before You Begin

- Ensure that the Oracle Clusterware framework resource is created and that dependencies are configured between the Oracle RAC framework resource and the Oracle Clusterware framework resource.
- Ensure that the Oracle RAC framework resource group, the multiple-owner volume-manager framework resource group if used, and their resources are online.

Note – For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.

1 Register the Oracle ASM resource types for the data service.

a. Register the scalable Oracle ASM instance proxy resource type.

```
# clresourcetype register SUNW.scalable_asm_instance_proxy
```

b. Register the Oracle ASM disk-group resource type.

- For Oracle 10g and 11g release 1 only, use the `SUNW.asm_diskgroup` resource type.

```
# clresourcetype register SUNW.asm_diskgroup
```

- For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type.

```
# clresourcetype register SUNW.scalable_asm_diskgroup_proxy
```

2 Create resource groups *asm-inst-rg* and *asm-dg-rg*.

```
# clresourcegroup create -S asm-inst-rg asm-dg-rg
```

asm-inst-rg

Specifies the name of the ASM instance resource group.

asm-dg-rg

Specifies the name of the ASM disk-group resource group.

- 3 Set a strong positive affinity on *rac-fmwk-rg* by *asm-inst-rg*.

```
# clresourcegroup set -p rg_affinities=++rac-fmwk-rg asm-inst-rg
```

- 4 Set a strong positive affinity on *asm-inst-rg* by *asm-dg-rg*.

```
# clresourcegroup set -p rg_affinities=++asm-inst-rg asm-dg-rg
```

- 5 If the Oracle ASM home is located on a PxFS-based cluster file system or a Sun QFS shared file system, create a storage resource and bring it online.

- For a cluster file system, create a `SUNW.HASStoragePlus` resource.

```
# clresourcetype register SUNW.HASStoragePlus
```

```
# clresource create -g asm-inst-rg \
-t SUNW.HASStoragePlus \
-p FileSystemMountpoints=clusterfilesystem \
asm-stor-rs
```

```
# clresourcegroup online -eM asm-inst-rg
-p FileSystemMountpoints=clusterfilesystem
Sets the cluster file system.
```

asm-stor-rs

Specifies the name of the Oracle ASM storage resource that you are creating.

- For a Sun QFS shared file system, create a `SUNW.qfs` resource.

```
# clresourcetype register SUNW.qfs
# clresourcegroup create qfs-rg
```

```
# clresource create -g qfs-rg \
-t SUNW.qfs \
-p QFSFileSystem=qfs-mp \
qfs-rs
```

```
# clresourcegroup online -eM qfs-rg
```

qfs-rg

Specifies the name of the QFS resource group.

```
-p QFSFileSystem=qfs-mp
```

Sets the mount point of the QFS shared file system that is used for the Oracle ASM home.

qfs-rs

Specifies the name of the QFS resource.

- 6 If you use a Sun QFS shared file system for the Oracle ASM home, create a scalable mount-point resource, set the resource dependency, and bring the resource group online.

```
# clresourcetype register SUNW.ScalMountPoint
# clresourcegroup create -S scal-mp-rg
```

```
# clresource create -g scal-mp-rg \
-t SUNW.ScalMountPoint \
-p mountpointdir=qfs-mp \
-p filesystemtype=s-qfs \
-p targetfilesystem=qfs-fs \
-p resource_dependencies_restart=qfs-rs \
qfs-mp-rs
```

```
# clresourcegroup online -eM scal-mp-rg
```

```
-p mountpointdir=qfs-mp
    Sets the QFS mount point.
```

```
-p targetfilesystem=qfs-fs
    Sets the QFS shared file system.
```

```
scal-mp-rg
    Specifies the name of the scalable mount-point resource group.
```

7 Create a SUNW.scalable_asm_instance_proxy resource and set the resource dependencies.

- For a PxFS-based cluster file system or Oracle ACFS file system, perform the following commands:

```
# clresource create -g asm-inst-rg \
-t SUNW.scalable_asm_instance_proxy \
-p ORACLE_HOME=oracle-asm-home \
-p CRS_HOME=Grid_home \
-p "ORACLE_SID{node1}"=asm-instance1 \
-p "ORACLE_SID{node2}"=asm-instance2 \
-p resource_dependencies_restart=asm-stor-rs \
-p resource_dependencies_offline_restart=crs-fmwk-rs \
-d asm-inst-rs
```

```
-t SUNW.scalable_asm_instance_proxy
    Specifies the type of the resource to add.
```

```
-p ORACLE_HOME=oracle-asm-home
    Sets the path to the Oracle ASM home directory.
```

```
-p CRS_HOME=Grid_home
    Sets the path to the Oracle Clusterware home directory.
```

```
-p ORACLE_SID=asm-instance
    Sets the Oracle ASM system identifier.
```

```
-d asm-inst-rs
    Specifies the name of the Oracle ASM instance resource that you create.
```

- For a QFS shared file system, perform the following commands:

```
# clresource create -g asm-inst-rg \
-t SUNW.scalable_asm_instance_proxy \
-p ORACLE_HOME=oracle-asm-home \
```

```
-p CRS_HOME=Grid_home \
-p "ORACLE_SID{node1}"=asm-instance1 \
-p "ORACLE_SID{node2}"=asm-instance2 \
-p resource_dependencies_offline_restart=crs-fmwrk-rs,qfs-mp-rs \
-d asm-inst-rs
```

qfs-mp-rs

Specifies the name of the scalable mount-point resource.

- For a local file system, perform the following commands:

```
# clresource create -g asm-inst-rg \
-t SUNW.scalable_asm_instance_proxy \
-p ORACLE_HOME=oracle-asm-home \
-p CRS_HOME=Grid_home \
-p "ORACLE_SID{node1}"=asm-instance1 \
-p "ORACLE_SID{node2}"=asm-instance2 \
-p resource_dependencies_offline_restart=crs-fmwrk-rs \
-d asm-inst-rs
```

8 Add an Oracle ASM disk-group resource type to the *asm-dg-rg* resource group.

- For Oracle 10g and 11g release 1 only, use the *SUNW.asm_diskgroup* resource type.

```
# clresource create -g asm-dg-rg \
-t SUNW.asm_diskgroup \
-p asm_diskgroups=dg[,dg...] \
-p resource_dependencies_offline_restart=asm-inst-rs,asm-stor-rs \
-d asm-dg-rs
```

```
-t SUNW.asm_diskgroup
```

Specifies the type of the resource to add.

```
-p asm_diskgroups=dg
```

Specifies the ASM disk group.

```
-d asm-dg-rs
```

Specifies the name of the resource that you are creating.

- For Oracle 11g release 2 or 12c only, use the *SUNW.scalable_asm_diskgroup_proxy* resource type.

```
# clresource create -g asm-dg-rg -t SUNW.scalable_asm_diskgroup_proxy \
-p asm_diskgroups=dg[,dg...] \
-p resource_dependencies_offline_restart=asm-inst-rs,asm-stor-rs \
-d asm-dg-rs
```

9 Bring online the *asm-inst-rg* resource group in a managed state on a cluster node.

```
# clresourcegroup online -eM asm-inst-rg
```

10 Bring online the *asm-dg-rg* resource group in a managed state on a cluster node.

```
# clresourcegroup online -eM asm-dg-rg
```

11 For an Oracle ACFS file system, create the Oracle ACFS proxy resource.**a. Register the Oracle ACFS proxy resource type.**

```
# clresourcetype register SUNW.scalable_acfs_proxy
```

b. Create the Oracle ACFS proxy resource group.

Set a strong positive affinity on *asm-dg-rg* by *acfs-rg*.

```
# clresourcegroup create -S -p rg_affinities=++asm-dg-rg acfs-rg
acfs-rg    Specifies the Oracle ACFS proxy resource group.
```

c. Create a *SUNW.scalable_acfs_proxy* resource and set the resource dependencies.

```
# clresource create -g asm-inst-rg \
-t SUNW.scalable_acfs_proxy \
-p ACFS_MOUNTPOINT=acfs-mount-path \
-p resource_dependencies_offline_restart=asm-dg-rs \
-d acfs-rs

-t SUNW.scalable_acfs_proxy
    Specifies the type of the resource to add.

-p ACFS_MOUNTPOINT=acfs-mount-path
    Sets the path to the Oracle ACFS mount point.

-d acfs-rs
    Specifies the name of the resource that you are creating.
```

d. Bring online the *acfs-rg* resource in a managed state on a cluster node.

```
# clresourcegroup online -eM acfs-rg
```

12 Verify the Oracle ASM configuration.

```
# clresource status +
```

▼ How to Register and Configure Oracle ASM Resource Groups in a Zone Cluster (CLI)

Before You Begin

- Ensure that the Oracle Clusterware framework resource is created and that dependencies are configured between the Oracle RAC framework resource and the Oracle Clusterware framework resource.
- Ensure that the Oracle RAC framework resource group, the multiple-owner volume-manager framework resource group if used, and their resources are online.

Note – Observe the following restrictions for Oracle 11g Release 2 or 12c:

- For 11g release 2 and 12c, Oracle ASM is only supported with hardware RAID. The use of Oracle ASM disk groups on devices that are managed by volume managers is not supported with version 11g release 2 or 12c.
 - Oracle ACFS is not currently supported in a zone cluster.
-

Perform all steps from the global zone.

1 Register the ASM resource types for the data service.

a. Register the scalable ASM instance proxy resource type.

```
# clresourcetype register -Z zcname SUNW.scalable_asm_instance_proxy
```

b. Register the ASM disk-group resource type.

- For Oracle 10g and 11g release 1 only, use the `SUNW.asm_diskgroup` resource type.

```
# clresourcetype register -Z zcname SUNW.asm_diskgroup
```

- For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type.

```
# clresourcetype register -Z zcname SUNW.scalable_asm_diskgroup_proxy
```

2 Create resource groups *asm-inst-rg* and *asm-dg-rg*.

```
# clresourcegroup create -Z zcname -S asm-inst-rg asm-dg-rg
```

asm-inst-rg

Specifies the name of the Oracle ASM instance resource group.

asm-dg-rg

Specifies the name of the Oracle ASM disk-group resource group.

3 Set a strong positive affinity on *rac-fmwk-rg* by *asm-inst-rg*.

```
# clresourcegroup set -Z zcname -p rg_affinities=++rac-fmwk-rg asm-inst-rg
```

4 Set a strong positive affinity on *asm-inst-rg* by *asm-dg-rg*.

```
# clresourcegroup set -Z zcname -p rg_affinities=++asm-inst-rg asm-dg-rg
```

5 If the Oracle ASM home is located on a Sun QFS shared file system, create a storage resource.

a. Ensure that the file system is available for use from within the zone cluster.

```
# clzonecluster configure zcname
clzc:zcname> add fs
clzc:zcname:fs> set dir=mountpoint
```

```

clzc:zcname:fs> set special=QFSfilesystemname
clzc:zcname:fs> set type=samfs
clzc:zcname:fs> end
clzc:zcname> verify
clzc:zcname> commit
clzc:zcname> exit

```

b. Create a storage resource and bring it online.

Create a SUNW.qfs resource with a dependency on a SUNW.wait_zc_boot resource.

```

# clresourcetype register SUNW.wait_zc_boot
# clresourcetype register SUNW.qfs

```

```

# clresourcegroup create -S scal-wait-zc-rg
# clresourcegroup create qfs-rg

```

```

# clresource create -g scal-wait-zc-rg \
-t SUNW.wait_zc_boot \
-p zcname=zcname \
wait-zc-rs

```

```

# clresource create -g qfs-rg \
-t SUNW.qfs \
-p QFSFileSystem=qfs-mp \
-p resource_dependencies=wait-zc-rs
qfs-rs

```

```

# clresourcegroup online -eM scal-wait-zc-rg
# clresourcegroup online -eM qfs-rg

```

scal-wait-zc-rg

Specifies the name of the SUNW.wait_zc_boot resource group.

qfs-rg

Specifies the name of the QFS resource group.

wait-zc-rs

Specifies the name of the SUNW.wait_zc_boot resource.

-p QFSFileSystem=qfs-mp

Sets the mount point of the QFS shared file system that is used for the Oracle ASM home.

c. Create a scalable mount-point resource, set the resource dependency, and bring the resource group online.

```

# clresourcetype register -Z zcname SUNW.ScalMountPoint
# clresourcegroup create -Z zcname -S scal-mp-rg

```

```

# clresource create -Z zcname -g scal-mp-rg \
-t SUNW.ScalMountPoint \
-p mountpointdir=qfs-mp \
-p filesystemtype=s-qfs \
-p targetfilesystem=qfs-fs \
-p resource_dependencies_restart=global:qfs-rs \
qfs-mp-rs

```

```

# clresourcegroup online -Z zcname -eM scal-mp-rg

```

scal-mp-rg

Specifies the name of the scalable mount-point resource group.

-p *targetfilesystem=qfs-fs*

Specifies the name of the QFS shared file system.

qfs-rs

Specifies the name of the QFS resource.

qfs-mp-rs

Specifies the name of the scalable mount-point resource.

6 Create a `SUNW.scalable_asm_instance_proxy` resource and set the resource dependencies.

- For a QFS shared file system, perform the following command:

```
# clresource create -Z zcname -g asm-inst-rg \
-t SUNW.scalable_asm_instance_proxy \
-p ORACLE_HOME=oracle-asm-home \
-p CRS_HOME=Grid_home \
-p "ORACLE_SID{node1}"=asm-instance1 \
-p "ORACLE_SID{node2}"=asm-instance2 \
-p resource_dependencies_offline_restart=crs-fmwk-rs,qfs-mp-rs \
-d asm-inst-rs
```

- For a local file system, perform the following command:

```
# clresource create -Z zcname -g asm-inst-rg \
-t SUNW.scalable_asm_instance_proxy \
-p ORACLE_HOME=oracle-asm-home \
-p CRS_HOME=Grid_home \
-p "ORACLE_SID{node1}"=asm-instance1 \
-p "ORACLE_SID{node2}"=asm-instance2 \
-p resource_dependencies_offline_restart=crs-fmwk-rs \
-d asm-inst-rs
```

-g *asm-inst-rg*

Specifies the name of the resource group into which the resources are to be placed.

-t *SUNW.scalable_asm_instance_proxy*

Specifies the type of the resource to add.

-p *ORACLE_HOME=Oracle-asm-home*

Sets the path to the Oracle ASM home directory.

-p *ORACLE_SID=asm-instance*

Sets the Oracle ASM system identifier.

-d *asm-inst-rs*

Specifies the name of the resource that you are creating.

7 Add an ASM disk-group resource type to the *asm-dg-rg* resource group.

- For Oracle 10g and 11g release 1 only, use the `SUNW.asm_diskgroup` resource type.

```
# clresource create -Z zcname -g asm-dg-rg -t SUNW.asm_diskgroup \
-p asm_diskgroups=dg[,dg...] \
-p resource_dependencies_offline_restart=asm-inst-rs,asm-stor-rs \
-d asm-dg-rs
```

```
-t SUNW.asm_diskgroup
```

Specifies the type of the resource to add.

```
-p asm_diskgroups=dg
```

Specifies the ASM disk group.

```
-d asm-dg-rs
```

Specifies the name of the resource that you are creating.

- For Oracle 11g release 2 or 12c only, use the `SUNW.scalable_asm_diskgroup_proxy` resource type.

```
# clresource create -Z zcname -g asm-dg-rg -t SUNW.scalable_asm_diskgroup_proxy \
-p asm_diskgroups=dg[,dg...] \
-p resource_dependencies_offline_restart=asm-inst-rs,asm-stor-rs \
-d asm-dg-rs
```

8 Bring online the *asm-inst-rg* resource group in a managed state on a cluster node.

```
# clresourcegroup online -Z zcname -eM asm-inst-rg
```

9 Bring online the *asm-dg-rg* resource group in a managed state on a cluster node.

```
# clresourcegroup online -Z zcname -eM asm-dg-rg
```

10 Verify the Oracle ASM configuration.

```
# clresource status -Z zcname +
```

Creating Storage Management Resources by Using Oracle Solaris Cluster Maintenance Commands

The tasks in this section are alternatives for the resource-configuration steps in “[How to Register and Configure Storage Resources for Oracle Files by Using `clsetup`](#)” on page 84. The following information is in this section:

- “Resources for Scalable Device Groups and Scalable File-System Mount Points” on page 325
- “Resources for the Sun QFS Metadata Server” on page 325
- “How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326
- “How to Create a Resource for a Scalable Device Group in a Zone Cluster” on page 327
- “How to Register and Configure Resources for the Sun QFS Metadata Server in the Global Cluster” on page 328

- [“How to Register and Configure Resources for the Sun QFS Metadata Server for a Zone Cluster” on page 329](#)
- [“How to Create a Resource for a File-System Mount Point in the Global Cluster” on page 331](#)
- [“How to Create a Resource for a File-System Mount Point in Zone Cluster” on page 332](#)

The following resources to represent storage for Oracle files are required:

- Resources for scalable device groups and scalable file-system mount points
- Resources for the Sun QFS metadata server

Resources for Scalable Device Groups and Scalable File-System Mount Points

If you are using Solaris Volume Manager for Sun Cluster or VxVM, configure storage resources as follows:

- Create one scalable resource group to contain all resources for scalable device groups.
- Create one resource for each Solaris Volume Manager for Sun Cluster multi-owner disk set or VxVM shared-disk group that you are using for Oracle files.

If you are using Sun QFS or qualified NAS devices, configure storage resources as follows:

- Create one scalable resource group to contain all resources for scalable file-system mount points.
- Create one resource for each Sun QFS shared file system or NFS file system on a qualified NAS device that you are using for Oracle files.

The resource that represents a Sun QFS shared file system can start only if the file system's Sun QFS metadata server is running. Similarly, the resource that represents a Sun QFS shared file system can stop only if the file system's Sun QFS metadata server is stopped. To meet this requirement, configure a resource for each Sun QFS metadata server. For more information, see [“Resources for the Sun QFS Metadata Server” on page 325](#).

Resources for the Sun QFS Metadata Server

If you are using the Sun QFS shared file system, create one resource for each Sun QFS metadata server. The configuration of resource groups for these resources depends on the version of Oracle that you are using:

- [“Configuration of Sun QFS Resource Groups With Oracle Version 9i, 10g Release 2, 11g, or 12c” on page 326](#)
- [“Configuration of Sun QFS Resource Groups With Oracle 10g Release 1” on page 326](#)

Configuration of Sun QFS Resource Groups With Oracle Version 9i, 10g Release 2, 11g, or 12c

If you are using Oracle 9i, Oracle 10g release 2, Oracle 11g, or Oracle 12c, the configuration of resource groups depends on the number of file systems in your configuration.

- If your configuration contains a small number of file systems, create one resource group for all resources for the Sun QFS metadata server.
- If your configuration contains a large number of file systems, configure resources for the Sun QFS metadata server in several resource groups as follows:
 - Distribute resources among the resource groups to ensure optimum load balancing.
 - Select a different primary node for each resource group to prevent all the resource groups from being online on the same node simultaneously.

Configuration of Sun QFS Resource Groups With Oracle 10g Release 1

If you are using Oracle 10g, Oracle Clusterware manages Oracle RAC database instances. These database instances must be started *only* after all shared file systems are mounted.

You might use multiple file systems for database files and related files. For more information, see [“Sun QFS File Systems for Database Files and Related Files” on page 54](#). In this situation, ensure that the file system that contains the Oracle Clusterware voting disk is mounted *only* after the file systems for other database files have been mounted. This behavior ensures that, when a node is booted, Oracle Clusterware resources are started only after all Sun QFS file systems are mounted.

If you are using Oracle 10g release 1, the configuration of resource groups must ensure that Oracle Solaris Cluster mounts the file systems in the required order. To meet this requirement, configure resource groups for the metadata servers of the file systems as follows:

- Create the resources for the metadata servers in separate resource groups.
- Set the resource group for the file system that contains the Oracle Clusterware voting disk to depend on the other metadata resource groups.

▼ How to Create a Resource for a Scalable Device Group in the Global Cluster

Perform this procedure on only one node of the cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**

2 Create a scalable resource group to contain the scalable device group resource.

Set a strong positive affinity by the resource group for the Oracle RAC framework resource group.

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -p nodelist=nodelist \
-p desired_primaries=num-in-list \
-p maximum_primaries=num-in-list \
-p rg_affinities=++rac-fwk-rg \
[-p rg_description="description"] \
-p rg_mode=Scalable \
scal-dg-rg
```

3 Register the SUNW.ScalDeviceGroup resource type.

```
# clresourcetype register SUNW.ScalDeviceGroup
```

4 For each scalable device group that you are using for Oracle files, add an instance of the SUNW.ScalDeviceGroup resource type to the resource group that you created in [Step 2](#).

Set a strong dependency for the instance of SUNW.ScalDeviceGroup on the resource in the Oracle RAC framework resource group that represents the volume manager for the device group. Limit the scope of this dependency to only the node where the SUNW.ScalDeviceGroup resource is running.

```
# clresource create -t SUNW.ScalDeviceGroup -g scal-dg-rg \
-p resource_dependencies=fm-vol-mgr-rs{local_node} \
-p diskgroupname=disk-group scal-dg-rs
```

5 Bring online and in a managed state the resource group that you created in [Step 2](#).

```
# clresourcegroup online -emM scal-dg-rg
```

▼ How to Create a Resource for a Scalable Device Group in a Zone Cluster

Perform this procedure from the global cluster.

1 Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**2 Create a scalable resource group to contain the scalable device group resource.**

Set a strong positive affinity by the resource group for the Oracle RAC framework resource group.

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -Z zcname -p nodelist=nodelist \
-p desired_primaries=num-in-list \
-p maximum_primaries=num-in-list \
-p rg_affinities=++rac-fwk-rg \
[-p rg_description="description"] \
-p rg_mode=Scalable \
scal-dg-rg
```

3 Register the `SUNW.ScalDeviceGroup` resource type.

```
# clresourcetype register -Z zcname SUNW.ScalDeviceGroup
```

4 For each scalable device group that you are using for Oracle files, add an instance of the `SUNW.ScalDeviceGroup` resource type to the resource group that you created in [Step 2](#).

Set a strong dependency for the instance of `SUNW.ScalDeviceGroup` on the resource in the Oracle RAC framework resource group that represents the volume manager for the device group. Limit the scope of this dependency to only the node where the `SUNW.ScalDeviceGroup` resource is running.

```
# clresource create -Z zcname -t SUNW.ScalDeviceGroup -g scal-dg-rg \
-p resource_dependencies=fm-vol-mgr-rs{local_node} \
-p diskgroupname=disk-group scal-dg-rs
```

5 Bring online and in a managed state the resource group that you created in [Step 2](#).

```
# clresourcegroup online -Z zcname-emM scal-dg-rg
```

▼ How to Register and Configure Resources for the Sun QFS Metadata Server in the Global Cluster

Perform this task *only* if you are using the Sun QFS shared file system.

Perform this procedure on only one node of the cluster.

1 Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.

2 Create a failover resource group to contain the resources for the Sun QFS metadata server.

If you are also using a volume manager, set a strong positive affinity by the resource group for the resource group that contains the volume manager's scalable device-group resource. This resource group is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326.](#)

```
# clresourcegroup create -n nodelist \
[-p rg_affinities==scal-dg-rg] \
[-p rg_description="description"] \
qfs-mds-rg
```

3 Register the SUNW.qfs resource type.

```
# clresourcetype register SUNW.qfs
```

4 For each Sun QFS shared file system that you are using, add an instance of the SUNW.qfs resource type to the resource group that you created in [Step 2.](#)

Each instance of SUNW.qfs represents the metadata server of the file system.

If you are also using a volume manager, set a strong dependency by the instance of SUNW.qfs on the resource for the scalable device group that is to store the file system. This resource is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326.](#)

```
# clresource create -t SUNW.qfs -g qfs-mds-rg \
-p qfsfilesystem=path \
[-p resource_dependencies=scal-dg-rs] \
qfs-mds-rs
```

5 Bring online and in a managed state the resource group that you created in [Step 2.](#)

```
# clresourcegroup online -emM qfs-mds-rg
```

▼ How to Register and Configure Resources for the Sun QFS Metadata Server for a Zone Cluster

Perform the steps in this procedure to register and configure resources for the Sun QFS metadata server for a zone cluster.

Perform these steps in the global cluster.

1 Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**2 Create a scalable resource group to contain the SUNW.wait_zc_boot resource in the global cluster.**

```
# clresourcegroup create -n nodelist \
-p rg_mode=Scalable \
-p maximum primaries=num-in-list \
-p desired primaries=num-in-list \
```

```
[-p rg_mode=Scalable \
zc-wait-rg
```

3 Register the SUNW.wait_zc_boot resource type.

```
# clresourcetype register SUNW.wait_zc_boot
```

4 Add an instance of the SUNW.wait_zc_boot resource type to the resource group that you created in [Step 2](#).

```
# clresource create -g zc-wait-rg -t SUNW.wait_zc_boot \
-p ZCName=zcname zc-wait-rs
```

5 Bring online and in a managed state the resource group that you created in [Step 2](#).

```
# clresourcegroup online -emM zc-wait-rg
```

6 Create a failover resource group to contain the resources for the Sun QFS metadata server.

Set a strong positive affinity by the resource group for the resource group that contains the SUNW.wait_zc_boot resource that is configured for the zone cluster.

If you also use a volume manager, set a strong positive affinity by the resource group for the resource group that contains the volume manager's scalable device-group resource. This resource group is created in “[How to Create a Resource for a Scalable Device Group in the Global Cluster](#)” on page 326.

```
# clresourcegroup create -n nodelist \
-p rg_affinities=++wait-zc-rg[,++scal-dg-rg] \
[-p rg_description="description"] \
qfs-mds-rg
```

7 Register the SUNW.qfs resource type.

```
# clresourcetype register SUNW.qfs
```

8 Add an instance of the SUNW.qfs resource type to the resource group that you created in [Step 6](#) for each Sun QFS shared file system that you are using.

Each instance of SUNW.qfs represents the metadata server of the file system.

Set a strong dependency by the instance of SUNW.qfs on the SUNW.wait_zc_boot resource that is configured for the zone cluster.

If you are also using a volume manager, set a strong dependency by the instance of SUNW.qfs on the resource for the scalable device group that is to store the file system. This resource is created in “[How to Create a Resource for a Scalable Device Group in the Global Cluster](#)” on page 326.

```
# clresource create -t SUNW.qfs -g qfs-mds-rg \
-p qfsfilesystem=path
\ -p resource_dependencies=zc-wait-rs[,scal-dg-rs] \
qfs-mds-rs
```

9 Bring online and in a managed state the resource group that you created in [Step 6](#).

```
# clresourcegroup online -emM qfs-mds-rg
```

▼ How to Create a Resource for a File-System Mount Point in the Global Cluster

Perform this procedure on only one node of the cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create a scalable resource group to contain the resource for a scalable file-system mount point.**

If you are also using a volume manager, set a strong positive affinity by the resource group for the resource group that contains the volume manager's scalable device-group resource. This resource group is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -n nodelist \
-p desired_primaries=num-in-list \
-p maximum_primaries=num-in-list \
[-p rg_affinities==scal-dg-rg] \
[-p rg_description="description"] \
-p rg_mode=Scalable scal-mp-rg
```

- 3 **Register the `SUNW.ScalMountPoint` resource type.**

```
# clresourcetype register SUNW.ScalMountPoint
```
- 4 **For each shared file system that requires a scalable file-system mount point resource, add an instance of the `SUNW.ScalMountPoint` resource type to the resource group that you created in [Step 2](#).**

- **For each Sun QFS shared file system, type the following command:**

Set a strong dependency by the instance of `SUNW.ScalMountPoint` on the resource for the Sun QFS metadata server for the file system. The resource for the Sun QFS metadata server set is created in [“How to Register and Configure Resources for the Sun QFS Metadata Server in the Global Cluster” on page 328](#).

If you are also using a volume manager, set an offline-restart dependency by the instance of `SUNW.ScalMountPoint` on the resource for the scalable device group that is to store the file system. This resource is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).

```
# clresource create -t SUNW.ScalMountPoint -g scal-mp-rg \
-p resource_dependencies=qfs-mds-rs \
[-p resource_dependencies_offline_restart=scal-dg-rs] \
```

```
-p mountpointdir=mp-path \  
-p filesystemtype=s-qfs \  
-p targetfilesystem=fs-name qfs-mp-rs
```

- **For each file system on a qualified NAS device, type the following command:**

If you are also using a volume manager, set an offline-restart dependency by the instance of SUNW.ScalMountPoint on the resource for the scalable device group that is to store the file system. This resource is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).

```
# clresource create -t SUNW.ScalMountPoint -g scal-mp-rg \  
[-p resource_dependencies_offline_restart=scal-dg-rs] \  
-p mountpointdir=mp-path \  
-p filesystemtype=nas \  
-p targetfilesystem=nas-device:fs-name nas-mp-rs
```

- 5 **Bring online and in a managed state the resource group that you created in [Step 2](#).**

```
# clresourcegroup online -emM scal-mp-rg
```

▼ How to Create a Resource for a File-System Mount Point in Zone Cluster

Perform the steps in this procedure to create a resource for a file-system mount point in a zone cluster. For RAC configurations with the Sun QFS shared file system on Solaris Volume Manager for Sun Cluster and the Sun QFS shared file system on hardware RAID, you create a scalable resource group to contain all the scalable mount point resources in a zone cluster.

Note – The node list is the list of zone-cluster nodes.

Perform this procedure from the global cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create a scalable resource group to contain the resource for a scalable file-system mount point in zone cluster.**

If you are also using a volume manager, set a strong positive affinity by the resource group for the resource group that contains the volume manager's scalable device-group resource. This resource group is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -Z zcname zcnodelist \
-p desired_primaries=num-in-list \
-p maximum_primaries=num-in-list \
[-p rg_affinities==+global:scal-dg-rg] \
[-p rg_description="description"] \
-p rg_mode=Scalable scal-mp-rg
```

3 Register the SUNW.ScalMountPoint resource type.

```
# clresourcetype register -Z zcname SUNW.ScalMountPoint
```

4 For each Sun QFS shared file system that requires a scalable file-system mount point resource, add an instance of the SUNW.ScalMountPoint resource type to the resource group that you created in [Step 2](#).

```
# clresource create -Z zcname -t SUNW.ScalMountPoint -d -g scal-mp-rg \
-p resource_dependencies=global:qfs-mds-rs \
[-y resource_dependencies_offline_restart=global:scal-dg-rs \]
-x mountpointdir=mp-path \
-x filesystemtype=s-qfs \
-x targetfilesystem=fs-name qfs-mp-rs
```

- Set a strong dependency by the instance of SUNW.ScalMountPoint on the resource for the Sun QFS metadata server for the file system.

The resource for the Sun QFS metadata server set is created in [“How to Register and Configure Resources for the Sun QFS Metadata Server in the Global Cluster”](#) on page 328.

- If you are also using a volume manager, set an offline-restart dependency by the instance of SUNW.ScalMountPoint on the resource for the scalable device group that is to store the file system.

This resource is created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster”](#) on page 326.

5 Bring online and in a managed state the resource group that you created in [Step 2](#).

```
# clresourcegroup online -Z zcname -emM scal-mp-rg
```

Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands

The tasks in this section are an alternative for the resource-configuration steps in “[How to Enable Oracle Solaris Cluster and Oracle Clusterware 10g Release 2, 11g, or 12c to Interoperate](#)” on page 114. The following information is in this section:

- “[How to Create an Oracle Clusterware Resource for Interoperation With Oracle Solaris Cluster](#)” on page 337
- “[How to Create an Oracle Grid Infrastructure Resource for Interoperation With Oracle Solaris Cluster](#)” on page 339
- “[How to Create an Oracle ASM Resource for Oracle Clusterware Interoperation With Oracle Solaris Cluster Software](#)” on page 340
- “[How to Create Oracle Solaris Cluster Resources in the Global Cluster for Interoperation With Oracle 10g, 11g, or 12c](#)” on page 343
- “[How to Create Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 10g, 11g, or 12c](#)” on page 345

Resources for interoperation with Oracle 10g release 2, 11g, or 12c enable you to administer Oracle RAC database instances by using Oracle Solaris Cluster interfaces. These resources also ensure that dependencies by Oracle Clusterware resources on Oracle Solaris Cluster resources are met. These resources enable the high-availability frameworks that are provided by Oracle Solaris Cluster software and Oracle Clusterware to interoperate.

The following resources for interoperation with Oracle 10g, 11g, or 12c are required:

- An Oracle Solaris Cluster resource to act as a proxy for the Oracle RAC database
- An Oracle Solaris Cluster resource to represent the Oracle Clusterware framework
- Oracle Clusterware resources to represent scalable device groups
- Oracle Clusterware resources to represent scalable file-system mount points

You must assign to an Oracle Clusterware resource that represents an Oracle Solaris Cluster resource a name in the following form:

`sun.node.sc-rs`

`node` Specifies the name of the node where the Oracle Clusterware resource is to run.

`sc-rs` Specifies the name of the Oracle Solaris Cluster resource that the Oracle Clusterware resource represents.

For example, the name of the Oracle Clusterware resource for node `pc1us1` that represents the Oracle Solaris Cluster resource `scal-dg-rs` must be as follows:

`sun.pc1us1.scal-dg-rs`

FIGURE D-1 Proxy Resources for Configurations With a Volume Manager

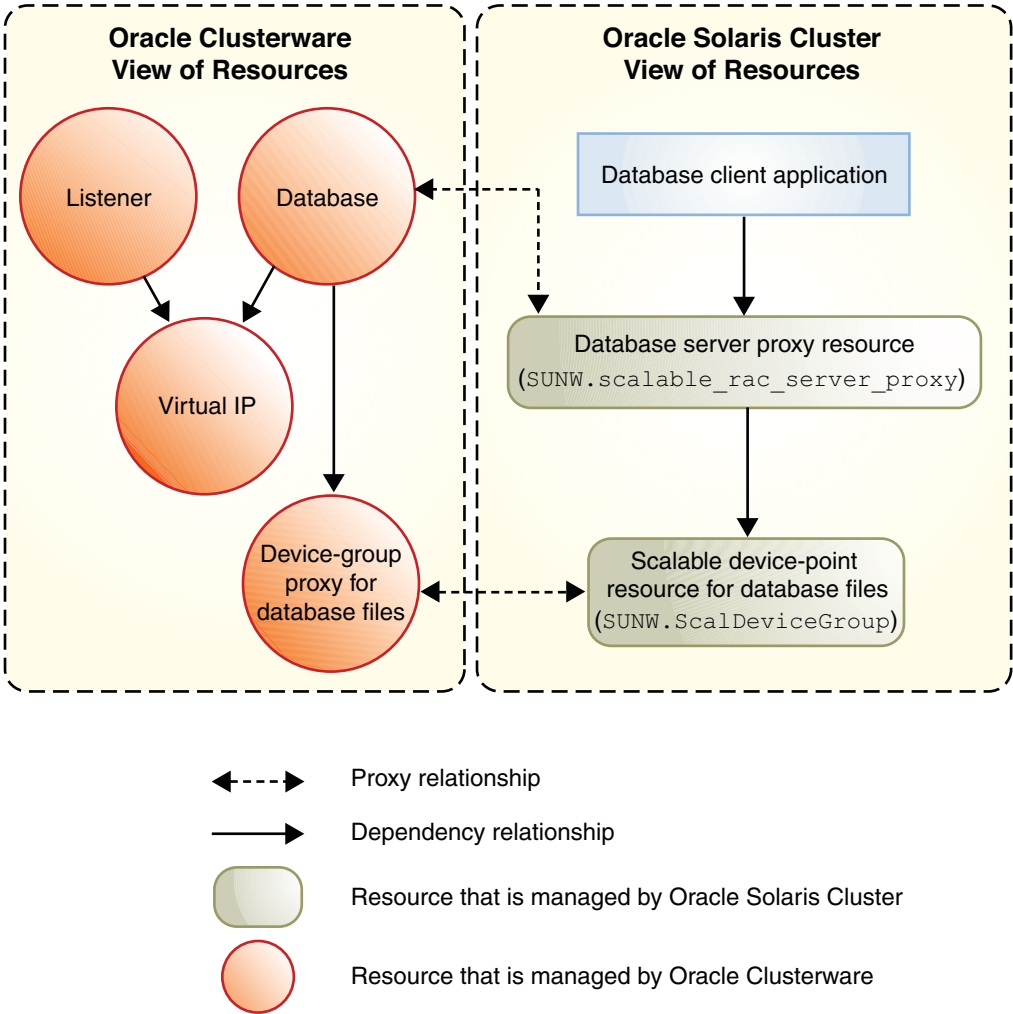
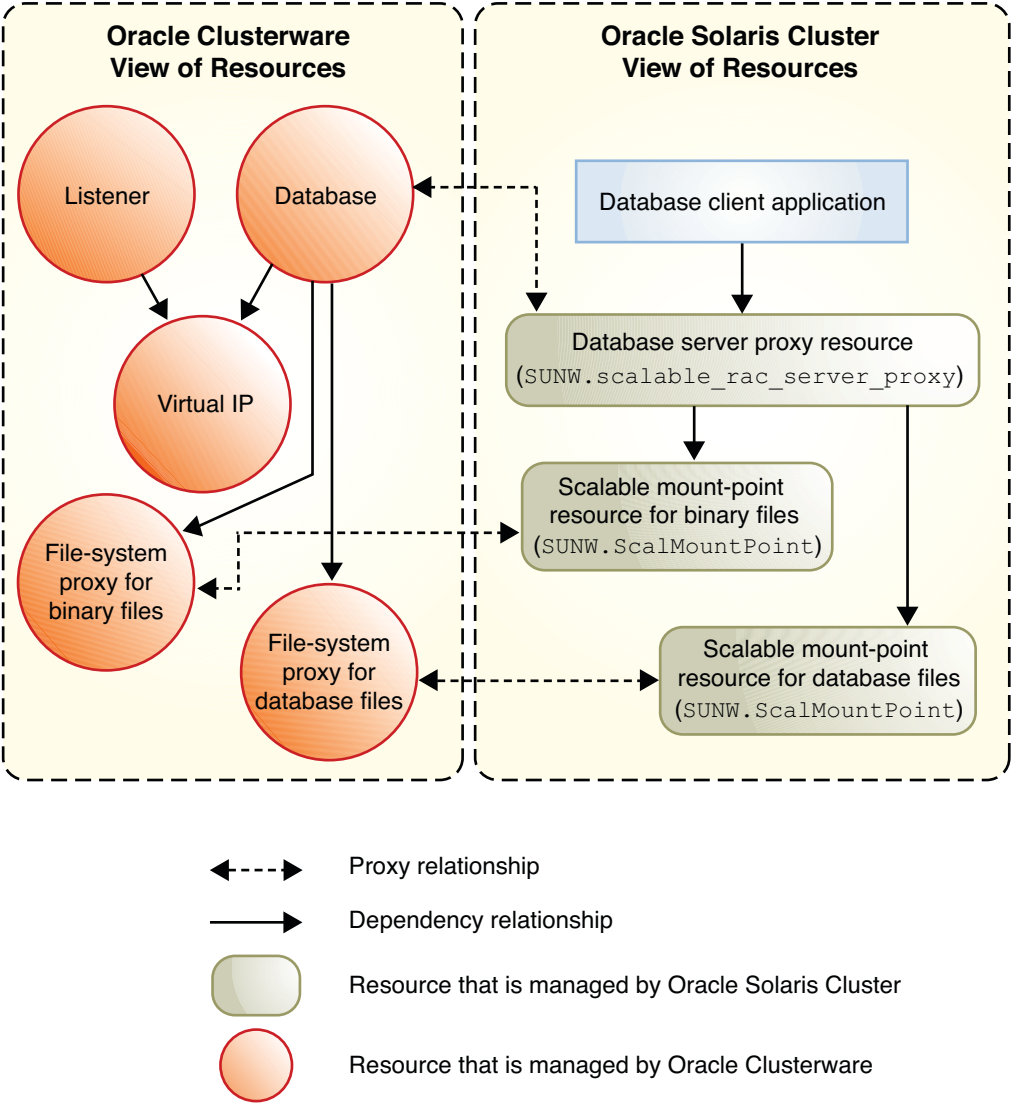


FIGURE D-2 Proxy Resources for Configurations With a Shared File System



▼ How to Create an Oracle Clusterware Resource for Interoperation With Oracle Solaris Cluster

Note – This procedure is for Oracle release 10g release 2, or for 11g release 1 without Oracle ASM.

- For Oracle release 11g release 2 or 12c, instead use [“How to Create an Oracle Grid Infrastructure Resource for Interoperation With Oracle Solaris Cluster”](#) on page 339.
 - For Oracle release 10g release 2 or for 11g release 1 using Oracle ASM, instead use [“How to Create an Oracle ASM Resource for Oracle Clusterware Interoperation With Oracle Solaris Cluster Software”](#) on page 340.
-

Oracle Clusterware resources are similar to Oracle Solaris Cluster resources. Oracle Clusterware resources represent items that the Oracle Clusterware manage in a similar way to how Oracle Solaris Cluster resources represent items that the Oracle Solaris Cluster RGM manages.

Depending on your configuration, some Oracle components that are represented as Oracle Clusterware resources might depend on file systems and global devices that Oracle Solaris Cluster manages. For example, if you are using file systems and global devices for Oracle files, the Oracle RAC database and the Oracle listener might depend on these file systems and global devices.

Create an Oracle Clusterware resource for each Oracle Solaris Cluster resource for scalable device groups and scalable file-system mount points on which Oracle components depend. The Oracle Clusterware resources that you create track the status of their associated Oracle Solaris Cluster resources. The Oracle Clusterware resources also ensure the orderly startup of Oracle Clusterware resources.

Perform this task on each cluster node where Support for Oracle RAC is to run.

Note – To create an Oracle Clusterware resource in a zone cluster, you should perform the steps in this procedure in that zone cluster.

- 1 On the node where you are performing this task, global-cluster node for a global cluster or zone-cluster node for a zone cluster, become superuser.**
- 2 If the `/var/ccluster/ucmm/profile` directory does not exist, create it.**

Profiles for Oracle Clusterware resources are created in this directory.

```
# mkdir -p /var/ccluster/ucmm/profile
```

3 Create a profile for the Oracle Clusterware resource.

```
# Grid_home/bin/crs_profile \  
-create sun.node.sc-rs \  
-t application -d "description" \  
-dir /var/cluster/ucmm/profile \  
-a /opt/SUNWscor/dsconfig/bin/scproxy_crs_action \  
-p restricted -h node -f -o st=1800
```

4 Register the Oracle Clusterware resource for which you created a profile in [Step 3](#).

```
# Grid_home/bin/crs_register sun.node.sc-rs \  
-dir /var/cluster/ucmm/profile
```

5 Ensure that the Oracle Solaris Cluster resource for which the Oracle Clusterware resource is a proxy is online.**a. Obtain the state of the Oracle Solaris Cluster resource.**

```
# clresource status sc-rs
```

b. If the state of the Oracle Solaris Cluster resource is *not* online, bring online the resource group that contains the Oracle Solaris Cluster resource.

If the state of the Oracle Solaris Cluster resource is online, omit this step.

```
# clresourcegroup online -emM sc-rg
```

6 Start the Oracle Clusterware resource that you registered in [Step 4](#).

```
# Grid_home/bin/crs_start sun.node.sc-rs
```

7 Add the Oracle Clusterware resource that you registered in [Step 4](#) to the list of resources that the dependent Oracle Clusterware resource requires.**a. If the dependent Oracle Clusterware resource is the Oracle RAC database instance, obtain the name of the instance.**

```
# Grid_home/bin/srvctl config database -d db-name | grep node
```

b. Obtain the list of resources that the dependent Oracle Clusterware resource requires.

```
# Grid_home/bin/crs_stat -p depend-crs-rs | grep REQUIRED_RESOURCES
```

c. Append the name of the Oracle Clusterware resource to the list that you obtained in [Step b](#).

```
# Grid_home/bin/crs_register depend-crs-rs \  
-update -r "existing-list sun.node.sc-rs"
```

▼ How to Create an Oracle Grid Infrastructure Resource for Interoperation With Oracle Solaris Cluster

For Oracle RAC 11g release 2 or 12c without Oracle ASM, perform this procedure to manually create an Oracle Grid Infrastructure resource that proxies the Oracle Solaris ClusterSUNW.ScalDeviceGroup, SUNW.ScalMountPoint, or SUNW.scalable_acfs_proxy resource.

Note – For Oracle RAC 10g or 11g release 1 without Oracle ASM, instead use [“How to Create an Oracle Clusterware Resource for Interoperation With Oracle Solaris Cluster”](#) on page 337.

For Oracle RAC 10g release 2 or 11g release 1 using Oracle ASM, instead use [“How to Create an Oracle ASM Resource for Oracle Clusterware Interoperation With Oracle Solaris Cluster Software”](#) on page 340.

This Oracle Grid Infrastructure resource ensures that the corresponding Oracle database is not started until the Oracle Grid Infrastructure resource is online. The resource comes online only if the corresponding SUNW.ScalDeviceGroup, SUNW.ScalMountPoint, or SUNW.scalable_acfs_proxy resource is online. And the SUNW.ScalDeviceGroup, SUNW.ScalMountPoint, or SUNW.scalable_acfs_proxy resource only comes online if the actual volume-manager disk set or disk group or the mount point is online.

- 1 **Become superuser on one node of the cluster.**
- 2 **Create the Oracle Grid Infrastructure `sun.storage_proxy.type` resource type.**

```
# Grid_home/bin/crsctl \
add type sun.storage_proxy.type \
-basetype cluster_resource \
-attr \
"ATTRIBUTE=ACTION_SCRIPT,TYPE=string", \
"ATTRIBUTE=HOSTING_MEMBERS,TYPE=string", \
"ATTRIBUTE=CARDINALITY,TYPE=string", \
"ATTRIBUTE=PLACEMENT,TYPE=string", \
"ATTRIBUTE=SCRIPT_TIMEOUT,TYPE=int", \
"ATTRIBUTE=RESTART_ATTEMPTS,TYPE=int", \
"ATTRIBUTE=ACL,TYPE=string", \
"ATTRIBUTE=VERSION,TYPE=string"
```

- 3 **Create the Oracle Solaris Cluster `sun.sc-resource` resource of type `sun.storage_proxy.type`.**

The Oracle Grid Infrastructure resource name uses the form `sun.sc-resource`, where `sc-resource` is the name of the SUNW.ScalDeviceGroup, SUNW.ScalMountPoint, or SUNW.scalable_acfs_proxy resource.

```
# Grid_home/bin/crsctl add resource sun.sc-resource \
-type sun.storage_proxy.type \
-attr "ACTION_SCRIPT='/opt/SUNWscor/dsconfig/bin/scproxy_crs_action' \
```

```
CARDINALITY='number-nodes' \
SCRIPT_TIMEOUT='20' \
PLACEMENT='restricted' \
RESTART_ATTEMPTS='60' \
HOSTING_MEMBERS='nodelist' \
VERSION='1' "
```

CARDINALITY The number of nodes in the cluster membership

HOSTING_MEMBERS The list of nodes in the cluster membership

4 Determine the DBA group of the Oracle Grid Infrastructure installation.

```
# echo 'Grid_home/bin/osdbagrp' griddba-group
```

5 Set the primary group of the Oracle Grid Infrastructure storage_proxy resource to the group determined in [Step 4](#).

```
# Grid_home/bin/crsctl setperm resource sun.scal-dg1-rs -g "griddba"
```

6 Determine the DBA group of the Oracle Database Software installation.

```
# echo 'oracle_home/bin/osdbagrp' dba-group
```

7 Set the group permissions of the Oracle Grid Infrastructure storage_proxy resource to the group determined in [Step 6](#).

Omit this step if the Oracle Grid Infrastructure installation DBA group griddba-group, determined in [Step 4](#), and the Oracle Database Software installation DBA group dba-group, determined in [Step 6](#), are the same DBA group.

```
# Grid_home/bin/crsctl setperm resource sun.scal-dg1-rs -u "group:dba-group:r-x"
```

8 Bring online the Oracle Grid Infrastructure storage_proxy resource.

```
# Grid_home/bin/crsctl start resource sun.scal-dg1-rs
```

See Also If you need to remove an Oracle Grid Infrastructure resource, perform procedures in [“Removing an Oracle Grid Infrastructure Resource” on page 202](#).

▼ How to Create an Oracle ASM Resource for Oracle Clusterware Interoperation With Oracle Solaris Cluster Software

Oracle Clusterware and Oracle Solaris Cluster need to interoperate between each other to ensure that dependencies between various file systems, global devices, or Oracle ASM disk groups are met. To achieve this, you create sun-prefixed Oracle Clusterware resources. Once created, the sun-prefixed Oracle Clusterware resources ensure an orderly startup of an Oracle ASM disk group and the Oracle RAC 10g release 2 or 11g release 1 database.

Note – Some steps in this procedure require you to use Oracle Clusterware commands. In these steps, the syntax of the command for Oracle 10g release 2 or 11g release 1 is provided.

If you are using Oracle 11g release 2 or 12c, use instead [“How to Create an Oracle Grid Infrastructure Resource for Interoperation With Oracle Solaris Cluster” on page 339](#). If you are using a version of Oracle other than these releases, see your Oracle documentation for the correct command syntax.

Note – To create an Oracle ASM resource for Oracle Clusterware in a zone cluster, perform the steps in this procedure from that zone cluster.

1 Become superuser.

2 On each node where Support for Oracle RAC is to run, create the `/var/cluster/ucmm/profile` directory, if it does not already exist.

```
# mkdir -p /var/cluster/ucmm/profile
```

Profiles for Oracle Clusterware resources are created in this directory.

3 Create a profile for the Oracle ASM disk-group resource for Oracle Clusterware.

```
# Grid_home/bin/crs_profile \  
-create sun.node.asm-dg-rs \  
-t application -d "description" \  
-dir /var/cluster/ucmm/profile \  
-a /opt/SUNWscor/dsconfig/bin/scproxy_crs_action \  
-p restricted -h node -f -o ra=60,st=20
```

asm-dg-rs

Specifies the name of the Oracle ASM disk-group resource for Oracle Clusterware.

4 Register the Oracle ASM disk-group resource for Oracle Clusterware for which you created a profile in [Step 3](#).

```
# Grid_home/bin/crs_register sun.node.asm-dg-rs \  
-dir /var/cluster/ucmm/profile
```

5 Ensure that the Oracle Solaris Cluster resource, for which the Oracle ASM disk-group resource for Oracle Clusterware is a proxy, is online.

a. Obtain the state of the Oracle Solaris Cluster resource.

```
# clresource status asm-dg-rs
```

- b. If the state of the Oracle Solaris Cluster resource is *not* online, bring online the resource group that contains the Oracle Solaris Cluster resource.**

If the state of the Oracle Solaris Cluster resource is online, omit this step.

```
# clresourcegroup online -emM asm-dg-rg
```

- 6 Start the Oracle ASM disk-group resource for Oracle Clusterware that you registered in [Step 4](#).**

```
# Grid_home/bin/crs_start sun.node.asm-dg-rs
```

- 7 On each node where Support for Oracle RAC is to run, add a dependency for the Oracle ASM disk-group resource for Oracle Clusterware.**

Add the Oracle Clusterware with Oracle ASM disk-group resource that you registered in [Step 4](#) to the list of resources that the dependent Oracle Clusterware with Oracle ASM disk-group resource requires.

- a. Obtain the name of the Oracle Clusterware RAC instance resource.**

```
# Grid_home/bin/srvctl config database -d db-name | grep node
```

- b. List the dependencies for the Oracle Clusterware RAC instance resource.**

```
# Grid_home/bin/crs_stat -p ora.db-name.instance.inst | grep REQUIRED_RESOURCES
```

- c. Add the name of the Oracle ASM disk-group resource for Oracle Clusterware to the list that you obtained in [Step b](#).**

```
# Grid_home/bin/crs_register ora.db-name.instance.inst \  
-update -r "existing-list sun.node.asm-dg-rs"
```

- 8 On each node where Support for Oracle RAC is to run, add a dependency for the Oracle ASM instance resource for Oracle Clusterware.**

Add the Oracle ASM instance resource as a depended-on resource that the Oracle ASM disk group requires.

- a. Obtain the name for the Oracle ASM instance resource for Oracle Clusterware.**

```
# Grid_home/bin/crs_stat -p | grep -i asm | grep node
```

- b. Add the Oracle ASM instance resource for Oracle Clusterware as a depended-on resource to the Oracle ASM disk-group resource for Oracle Clusterware.**

```
# Grid_home/bin/crs_register -p sun.node.asm-dg-rs  
-update -r crs-asm-instance
```

▼ How to Create Oracle Solaris Cluster Resources in the Global Cluster for Interoperation With Oracle 10g, 11g, or 12c

Note – If you are configuring Oracle RAC to run in a zone cluster, instead perform [“How to Create Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 10g, 11g, or 12c”](#) on page 345.

Perform this procedure on only one node of the cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Register the `SUNW.crs_framework` resource type.**

```
# clresourcetype register SUNW.crs_framework
```
- 3 **Add an instance of the `SUNW.crs_framework` resource type to the Oracle RAC framework resource group.**

For information about this resource group, see [“Registering and Configuring the Oracle RAC Framework Resource Group”](#) on page 65.

Set a strong dependency by the instance of `SUNW.crs_framework` on the instance of `SUNW.rac_framework` in the Oracle RAC framework resource group.

You might have configured a storage resource for the storage that you are using for Oracle Clusterware files. In this situation, set an offline-restart dependency by the instance of `SUNW.crs_framework` on the storage resource. Limit the scope of this dependency to only the node where the storage resource is running.

- If you are using a volume manager for database files, set the dependency on the resource that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster”](#) on page 326.
- If you are using a file system for database files, set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in the Global Cluster”](#) on page 331.

You might have configured a storage resource for the file system that you are using for Oracle Clusterware executables. In this situation, set an offline-restart dependency by the instance of `SUNW.crs_framework` on the storage resource. Limit the scope of this dependency to only the

node where the storage resource is running. Set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in the Global Cluster” on page 331](#).

```
# clresource create -t SUNW.crs_framework \  
-g rac-fmwk-rg \  
-p resource_dependencies=rac-fmwk-rs \  
[-p resource_dependencies_offline_restart=db-storage-rs{local_node} \  
[, bin-storage-rs{local_node}]] \  
crs-fmwk-rs
```

4 Create a scalable resource group to contain the proxy resource for the Oracle RAC database server.

Set a strong positive affinity by the scalable resource group for the Oracle RAC framework resource group.

You might have configured a storage resource for the storage that you are using for database files. In this situation, set a strong positive affinity by the scalable resource group for the resource group that contains the storage resource for database files.

- If you are using a volume manager for database files, set a strong positive for the resource group that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).
- If you are using a file system for database files, set a strong positive affinity for the resource group that you created in [“How to Create a Resource for a File-System Mount Point in the Global Cluster” on page 331](#).

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -n nodelist \  
-p maximum_primaries=num-in-list \  
-p desired_primaries=num-in-list \  
-p rg_affinities=++rac-fmwk-rg[,db-storage-rg] \  
[-p rg_description="description"] \  
-p rg_mode=Scalable \  
rac-db-rg
```

5 Register the `SUNW.scalable_rac_server_proxy` resource type.

```
# clresourcetype register SUNW.scalable_rac_server_proxy
```

6 Add an instance of the `SUNW.scalable_rac_server_proxy` resource type to the resource group that you created in [Step 4](#).

Set a strong dependency by the instance of `SUNW.scalable_rac_server_proxy` on the instance of `SUNW.crs_framework` in the Oracle RAC framework resource group.

Set an offline-restart dependency by the instance of `SUNW.scalable_rac_server_proxy` on the instance of `SUNW.crs_framework` that you created in [Step 3](#).

You might have configured a storage resource for the storage that you are using for database files. In this situation, set an offline-restart dependency by the instance of `SUNW.scalable_rac_server_proxy` on the storage resource. Limit the scope of this dependency to only the node where the storage resource is running.

- If you are using a volume manager for database files, set the dependency on the resource that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).
- If you are using a file system for database files, set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in the Global Cluster” on page 331](#).

Set a different value of the `oracle_sid` extension property for each node that can master the resource.

```
# clresource create -g rac-db-rg \  
-t SUNW.scalable_rac_server_proxy \  
-p resource_dependencies=rac-fmwk-rs \  
-p resource_dependencies_offline_restart=crs-fmk-rs[, db-storage-rs] \  
-p oracle_home=ora-home \  
-p crs_home=Grid_home \  
-p db_name=db-name \  
-p oracle_sid{node1-id}=sid-node1 \  
[ -p oracle_sid{node2-id}=sid-node2... ] \  
rac-srvr-proxy-rs
```

7 Bring online the resource group that you created in [Step 4](#).

```
# clresourcegroup online -emM rac-db-rg
```

▼ How to Create Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 10g, 11g, or 12c

Note – If you are configuring Oracle RAC to run in the global cluster, instead perform [“How to Create Oracle Solaris Cluster Resources in the Global Cluster for Interoperation With Oracle 10g, 11g, or 12c” on page 343](#).

Perform this procedure on only one node of the cluster.

Note – When a step in the procedure requires running the Oracle Solaris Cluster commands in a zone cluster, you should run the command from the global cluster and use the `-Z` option to specify the zone cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**

- 2 **Register the `SUNW.crs_framework` resource type.**

```
# clresourcetype register -Z zcname SUNW.crs_framework
```

- 3 **Add an instance of the `SUNW.crs_framework` resource type to the Oracle RAC framework resource group.**

For information about this resource group, see [“Registering and Configuring the Oracle RAC Framework Resource Group” on page 65](#).

Set a strong dependency by the instance of `SUNW.crs_framework` on the instance of `SUNW.rac_framework` in the Oracle RAC framework resource group.

You might have configured a storage resource for the storage that you are using for Oracle Clusterware files. In this situation, set an offline-restart dependency by the instance of `SUNW.crs_framework` on the storage resource. Limit the scope of this dependency to only the node where the storage resource is running.

- If you are using a volume manager for database files, set the dependency on the resource that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).
- If you are using a file system for database files, set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in Zone Cluster” on page 332](#).

You might have configured a storage resource for the file system that you are using for Oracle Clusterware executables. In this situation, set an offline-restart dependency by the instance of `SUNW.crs_framework` on the storage resource. Limit the scope of this dependency to only the node where the storage resource is running. Set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in Zone Cluster” on page 332](#).

```
# clresource create -Z zcname -t SUNW.crs_framework \
-g rac-fmwk-rg \
-p resource_dependencies=rac-fmwk-rs \
[-p resource_dependencies_offline_restart=db-storage-rs{local_node} \
[,bin-storage-rs{local_node}]] \
crs-fmwk-rs
```

4 Create a scalable resource group to contain the proxy resource for the Oracle RAC database server.

Set a strong positive affinity by the scalable resource group for the Oracle RAC framework resource group.

You might have configured a storage resource for the storage that you are using for database files. In this situation, set a strong positive affinity by the scalable resource group for the resource group that contains the storage resource for database files.

- If you are using a volume manager for database files, set a strong positive affinity for the resource group that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster”](#) on page 326.
- If you are using a file system for database files, set a strong positive affinity for the resource group that you created in [“How to Create a Resource for a File-System Mount Point in Zone Cluster”](#) on page 332.

Tip – If you require Support for Oracle RAC to run on all cluster nodes, specify the `-S` option in the command that follows and omit the options `-n`, `-p maximum primaries`, `-p desired primaries`, and `-p rg_mode`.

```
# clresourcegroup create -Z zcname -n nodelist \
-p maximum_primaries=num-in-list \
-p desired_primaries=num-in-list \
-p rg_affinities=++rac-fwk-rg[,db-storage-rg] \
[-p rg_description="description"] \
-p rg_mode=Scalable \
rac-db-rg
```

5 Register the `SUNW.scalable_rac_server_proxy` resource type.

```
# clresourcetype register -Z zcname SUNW.scalable_rac_server_proxy
```

6 Add an instance of the `SUNW.scalable_rac_server_proxy` resource type to the resource group that you created in [Step 4](#).

Set a strong dependency by the instance of `SUNW.scalable_rac_server_proxy` on the instance of `SUNW.rac_framework` in the Oracle RAC framework resource group.

Set an offline-restart dependency by the instance of `SUNW.scalable_rac_server_proxy` on the instance of `SUNW.crs_framework` that you created in [Step 3](#).

You might have configured a storage resource for the storage that you are using for database files. In this situation, set an offline-restart dependency by the instance of `SUNW.scalable_rac_server_proxy` on the storage resource. Limit the scope of this dependency to only the node where the storage resource is running.

- If you are using a volume manager for database files, set the dependency on the resource that you created in [“How to Create a Resource for a Scalable Device Group in the Global Cluster” on page 326](#).
- If you are using a file system for database files, set the dependency on the resource that you created in [“How to Create a Resource for a File-System Mount Point in Zone Cluster” on page 332](#).
- If you are using an Oracle ACFS file system for database files, set a strong positive affinity for the resource group that you created in [“How to Register and Configure the Oracle ACFS Proxy Resource Group” in *Oracle Solaris Cluster Software Installation Guide*](#).

Set a different value of the `oracle_sid` extension property for each node that can master the resource.

```
# clresource create -Z zcname -g rac-db-rg \
-t SUNW.scalable_rac_server_proxy \
-p resource_dependencies=rac-fmwk-rs \
-p resource_dependencies_offline_restart=crs-fmk-rs \
[ , db-storage-rs,acfs-rs,bin-storage-rs] \
-p oracle_home=ora-home \
-p crs_home=Grid_home \
-p db_name=db-name \
-p oracle_sid{node1-id}=sid-node1 \
[ -p oracle_sid{node2-id}=sid-node2... ] \
rac-srvr-proxy-rs
```

7 Bring online the resource group that you created in [Step 4](#).

```
# clresourcegroup online -Z zcname -emM rac-db-rg
```

Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i by Using Oracle Solaris Cluster Maintenance Commands

The task in this section is an alternative for the resource-configuration steps in [“How to Automate the Startup and Shutdown of Oracle 9i RAC Database Instances” on page 120](#). The following information is in this section:

- [“Oracle 9i RAC Server Resources” on page 349](#)
- [“Oracle 9i Listener Resources” on page 349](#)
- [“Logical Hostname Resources for Oracle 9i Listener Resources” on page 350](#)
- [“How to Register and Configure Oracle Solaris Cluster Resources in a Global Cluster for Interoperation With Oracle 9i” on page 351](#)

- [“How to Register and Configure Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 9i” on page 358](#)

Resources for interoperation with Oracle 9i enable you to administer Oracle RAC database instances by using Oracle Solaris Cluster interfaces. These resources also provide fault monitoring and automatic fault recovery for Oracle RAC. The automatic fault recovery that this data service provides supplements the automatic fault recovery that the Oracle RAC software provides.

The following resources for interoperation with Oracle 9i are required:

- Oracle RAC server resources
- Oracle listener resources
- Logical hostname resources

Oracle 9i RAC Server Resources

Note – If you are using Oracle 10g, 11g, or 12c, no Oracle RAC server resources are required. For more information, see [“Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands” on page 334](#).

You require one scalable resource group for each Oracle RAC database. Each resource group contains the Oracle RAC server resource that represents all instances of the database in the cluster. Ensure that this scalable resource group is mastered on all nodes where Oracle RAC is to run.

Oracle 9i Listener Resources

Note – If you are using Oracle 10g, 11g, or 12c, no Oracle listener resources are required. For more information, see [“Creating Resources for Interoperation With Oracle 10g, 11g, or 12c by Using Oracle Solaris Cluster Maintenance Commands” on page 334](#).

If your configuration of Oracle RAC requires Oracle listeners, configure each listener to serve only one Oracle RAC database instance. This configuration provides the highest availability and scalability, and the easiest management.

Note – Not all configurations of Oracle RAC require Oracle listeners. For example, if the Oracle RAC database server and the database client are running on the same machine, no Oracle listeners are required.

If your configuration includes Oracle listeners, configure one scalable resource to represent all listeners that serve a specific Oracle RAC database. Configure the listener resource as follows:

- Configure the listener resource and the Oracle RAC server resource in the same resource group.
- Set the listener resource's listener name to a unique value for each node.
- Set the Oracle RAC server resource to depend on the listener resource.

Logical Hostname Resources for Oracle 9i Listener Resources

Note – If you are using Oracle 10g, 11g, or 12c, no LogicalHostname resources are required.

To ensure that Oracle listeners can continue to access the database after failure of an instance on a node, each node requires a logical hostname resource. On each node, the scalable Oracle listener listens on an IP address that is represented by the logical hostname resource.

If a cluster node that is running an instance of Oracle RAC 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 Oracle Solaris Cluster logical hostname resource. If a node fails, the resource group that contains the logical hostname resource fails over to another surviving node on which Oracle RAC is running. The failover of the logical hostname resource enables new connections to be directed to the other instance of Oracle RAC.

Configure LogicalHostname resources for each listener resource as follows:

- Create one logical hostname resource for each listener that the listener resource represents.
- Configure each logical hostname resource in a separate resource group.
- Set the listener resource to depend on the logical hostname resources for all listeners that the listener resource represents.

- Ensure that each node is the primary node of one resource group.
- Ensure that the logical hostname resource is failed back to the primary node when the database instance on the primary node recovers after a failure.

▼ How to Register and Configure Oracle Solaris Cluster Resources in a Global Cluster for Interoperation With Oracle 9i

The `SUNW.scalable_rac_server` resource type represents the Oracle RAC server in an Oracle Solaris Cluster configuration.

Oracle RAC server instances should be started only after the Oracle 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 group and the Oracle RAC framework resource group
- A dependency between the Oracle RAC server resource and the Oracle RAC framework resource

Perform this procedure on only one node of the cluster.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create the logical hostname resources to represent the IP addresses on which the Oracle listeners are to listen.**

Each node where Support for Oracle RAC can run requires a logical hostname resource. Create each logical hostname resource as follows:

a. Create a failover resource group to contain the logical hostname resource.

Set the properties of the resource group as follows:

- Specify the node for which you are creating the logical hostname resource as the primary node.
- Specify the remaining nodes where Support for Oracle RAC can run as potential primary nodes.
- Choose an order for the potential primary nodes that ensures that the logical hostname resources are distributed equally throughout the cluster.

- Ensure that the resource group is failed back to the primary node when the database instance on the primary node recovers after a failure.

```
# clresourcegroup create -n nodelist -p failback=true \
[-p rg_description="description"] \
lh-name-rg
```

-n *nodelist*

Specifies a comma-separated list of names of the nodes that can master this resource group. Ensure that the node for which you are creating the logical hostname resource appears first in the list. Choose an order for the remaining nodes that ensures that the logical hostname resources are distributed equally throughout the cluster.

-p *rg_description*="*description*"

Specifies an optional brief description of the resource group. This description is displayed when you use Oracle Solaris Cluster maintenance commands to obtain information about the resource group.

lh-name-rg

Specifies your choice of name to assign to the resource group.

b. Add a logical hostname resource to the resource group that you created in [Step a](#).

```
# clreslogicalhostname create -h lh-name -g lh-name-rg lh-name-rs
```

-h *lh-name*

Specifies the logical hostname that this resource is to make available. An entry for this logical hostname must exist in the name service database.

-g *lh-name-rg*

Specifies that you are adding the resource to the resource group that you created in [Step 2](#).

lh-name-rs

Specifies your choice of name to assign to the logical hostname resource.

3 Create a scalable resource group to contain the Oracle RAC server resource and Oracle listener resource.

```
# clresourcegroup create -n nodelist \
-p maximum primaries=num-in-list \
-p desired primaries=num-in-list \
-p rg_affinities=++rac-fmwk-rg \
[-p rg_description="description"] \
-p rg_mode=Scalable rac-db-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes on which Support for Oracle RAC is to be enabled. The Support for Oracle RAC software packages must be installed on each node in this list.

- p `maximum primaries=num-in-list`
Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *odelist*.
 - p `desired primaries=num-in-list`
Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *odelist*.
 - p `rg_affinities=++rac-fwk-rg`
Creates a strong positive affinity to the Oracle RAC framework resource group. If the Oracle RAC framework resource group was created by using the `clsetup` utility, the Oracle RAC framework resource group is named `rac-framework-rg`.
 - p `rg_description="description"`
Specifies an optional brief description of the resource group. This description is displayed when you use Oracle Solaris Cluster maintenance commands to obtain information about the resource group.
 - p `rg_mode=Scalable`
Specifies that the resource group is scalable.
- rac-db-rg*
Specifies the name that you are assigning to the resource group.

4 Register the `SUNW.scalable_rac_listener` resource type.

```
# clresourcetype register SUNW.scalable_rac_listener
```

5 Add an instance of the `SUNW.scalable_rac_listener` resource type to the resource group that you created in [Step 3](#).

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

- The name of the Oracle listener on each node where Oracle RAC is to run. This name must match the corresponding entry in the `listener.ora` file for the node.
- The Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

```
# clresource create -g rac-db-rg \
-t SUNW.scalable_rac_listener \
-p resource_dependencies_weak=lh-rs-list \
[-p resource_dependencies=db-bin-rs] \
-p listener_name{node}=listener[...] \
-p oracle_home=ora-home \
rac-lsnr-rs
```

- g *rac-db-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 3](#).

`[-p resource_dependencies=db-bin-rs]`

Specifies that this Oracle listener resource has a strong dependency on the storage resource for binary files. Specify this dependency only if you are using the Sun QFS shared file system or a qualified NAS device for Oracle binary files. The storage resource for Oracle binary files is created when you perform the tasks in “[Registering and Configuring Storage Resources for Oracle Files](#)” on page 83.

`-p listener_name{node}=ora-sid`

Specifies the name of the Oracle listener instance on node *node*. This name must match the corresponding entry in the `listener.ora` file.

`-p resource_dependencies_weak=lh-rs-list`

Specifies a comma-separated list of resources on which this resource is to have a weak dependency. The list must contain all the logical hostname resources that you created in [Step 2](#).

`-p 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.

rac-lsnr-rs

Specifies the name that you are assigning to the `SUNW.scalable_rac_listener` resource.

6 Register the `SUNW.scalable_rac_server` resource type.

```
# clresource type register SUNW.scalable_rac_server
```

7 Add an instance of the `SUNW.scalable_rac_server` resource type to the resource group that you created in [Step 3](#).

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 on each node where Oracle RAC is to run. This identifier is the name of the Oracle database instance on the node.
- The full path to the alert log file on each node where Oracle RAC is to run.

```
# clresource create -g rac-db-rg \
-t SUNW.scalable_rac_server \
-p resource_dependencies=rac-fmwk-rs \
-p resource_dependencies_offline_restart=[db-storage-rs][,db-bin-rs] \
-p resource_dependencies_weak=rac-lsnr-rs \
-p oracle_home=ora-home \
-p connect_string=string \
-p oracle_sid{node}=ora-sid[...] \
-p alert_log_file{node}=al-file[...] \
rac-srvr-rs
```

-g *rac-db-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 3](#).

-p *resource_dependencies=rac-fwk-rs*

Specifies the resources on which this Oracle RAC server resource has a strong dependency.

You must specify the Oracle RAC framework resource. If the Oracle RAC framework resource group is created by using the `clsetup` utility or Oracle Solaris Cluster Manager, this resource is named `rac-framework-rs`.

If you are using a volume manager or the Sun QFS shared file system for database files, you must also specify the storage resource for database files.

If you are using the Sun QFS shared file system for Oracle binary files, you must also specify the storage resource for binary files.

The storage resources for Oracle files are created when you perform the tasks in “[Registering and Configuring Storage Resources for Oracle Files](#)” on page 83.

-p *resource_dependencies_weak=rac-lsnr-rs*

Specifies a weak dependency by this Oracle RAC server resource on the Oracle listener resource that you created in [Step 5](#).

-p *oracle_sid{node}=ora-sid*

Specifies the Oracle system identifier on node *node*. This identifier is the name of the Oracle database instance on the node. You must set a different value for this property on each node where Oracle RAC is to run.

-p *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.

-p *connect_string=string*

Specifies the Oracle database user ID and password that the fault monitor uses to connect to the Oracle database. *string* is specified as follows:

userid/password

userid

Specifies the Oracle database user ID that the fault monitor uses to connect to the Oracle database.

password

Specifies the password that is set for the Oracle database user *userid*.

The database user ID and password are defined during the setup of Oracle RAC. To use Solaris authentication, type a slash (/) instead of a user ID and password.

rac-srvr-rs

Specifies the name that you are assigning to the `SUNW.scalable_rac_server` resource.

8 Bring online the resource group that you created in Step 3.

```
# clresourcegroup online -eM rac-db-rg
```

rac-db-rg Specifies that a resource group that you created in [Step 3](#) is to be moved to the MANAGED state and brought online.

Example D-1 Registering and Configuring Oracle Solaris Cluster Resources for Interoperation With Oracle 9i

This example shows the sequence of operations that is required to register and configure Oracle Solaris Cluster resources for interoperation with Oracle 9i on a two-node cluster.

The example makes the following assumptions:

- Support for Oracle RAC is to run on all cluster nodes.
- The C shell is used.
- An Oracle RAC framework resource group that is named `rac-framework-rg` exists and contains a resource of type `SUNW.rac_framework` that is named `rac-framework-rs`.
- A resource of type `SUNW.ScalDeviceGroup` that is named `db-storage-rs` represents the Solaris Volume Manager for Sun Cluster multi-owner disk set where the Oracle database files are stored.
- The Oracle binary files are installed on the cluster file system, for which no storage resource is required.

1. To create the logical hostname resource for node `phys-schost-1`, the following commands are run:

```
# clresourcegroup create -n phys-schost-1,phys-schost-2 -p failback=true \
-p rg_description="Logical hostname schost-1 RG" \
schost-1-rg
# clreslogicalhostname create -h schost-1 -g schost-1-rg schost-1
```

2. To create the logical hostname resource for node `phys-schost-2`, the following commands are run:

```
# clresourcegroup create -n phys-schost-2,phys-schost-1 -p failback=true \
-p rg_description="Logical hostname schost-2 RG" \
schost-2-rg
# clreslogicalhostname create -h schost-2 -g schost-2-rg schost-2
```

3. To create a scalable resource group to contain the Oracle RAC server resource and Oracle listener resource, the following command is run:

```
# clresourcegroup create -S \
-p rg_affinities=++rac-framework-rg \
-p rg_description="RAC 9i server and listener RG" \
rac-db-rg
```

4. To register the `SUNW.scalable_rac_listener` resource type, the following command is run:

```
# clresourcetype register SUNW.scalable_rac_listener
```

5. To add an instance of the SUNW.scalable_rac_listener resource type to the rac-db-rg resource group, the following command is run:

```
# clresource create -g rac-db-rg \
-t SUNW.scalable_rac_listener \
-p resource_dependencies_weak=schost-1,schost-2 \
-p listener_name\{phys-schost-1\}=LISTENER1 \
-p listener_name\{phys-schost-2\}=LISTENER2 \
-p oracle_home=/home/oracle/product/9.2.0 \
scalable_rac_listener-rs
```

A different value of the listener_name extension property is set for each node that can master the resource.

6. To register the SUNW.scalable_rac_server resource type, the following command is run:

```
# clresourcetype register SUNW.scalable_rac_server
```

7. To add an instance of the SUNW.scalable_rac_listener resource type to the rac-db-rg resource group, the following command is run:

```
# clresource create -g rac-db-rg \
-t SUNW.scalable_rac_server \
-p resource_dependencies=rac_framework-rs, db-storage-rs \
-p resource_dependencies_weak=scalable_rac_listener-rs \
-p oracle_home=/home/oracle/product/9.2.0 \
-p connect_string=scooter/t!g3r \
-p oracle_sid\{phys-schost-1\}=V920RAC1 \
-p oracle_sid\{phys-schost-2\}=V920RAC2 \
-p alert_log_file\{phys-schost-1\}=/home/oracle/9.2.0/rdbms/log/alert_V920RAC1.log \
-p alert_log_file\{phys-schost-2\}=/home/oracle/9.2.0/rdbms/log/alert_V920RAC2.log \
scalable_rac_server-rs
```

A different value of the following extension properties is set for each node that can master the resource:

- alert_log_file
- oracle_sid

8. To bring online the resource group that contains the Oracle RAC server resource and Oracle listener resource, the following command is run:

```
# clresourcegroup online -emM rac-db-rg
```

Next Steps Go to [“Verifying the Installation and Configuration of Support for Oracle RAC”](#) on page 126.

▼ How to Register and Configure Oracle Solaris Cluster Resources in a Zone Cluster for Interoperation With Oracle 9i

Perform the steps in this procedure to register and configure Oracle Solaris Cluster resources in a zone cluster for interoperation with Oracle 9i.

- 1 **Become superuser or assume a role that provides `solaris.cluster.admin` and `solaris.cluster.modify` RBAC authorizations.**
- 2 **Create the logical hostname resources to represent the IP addresses on which the Oracle listeners are to listen.**

Each node where Support for Oracle RAC can run requires a logical hostname resource. Create each logical hostname resource as follows:

a. Create a failover resource group to contain the logical hostname resource.

Set the properties of the resource group as follows:

- Specify the node for which you are creating the logical hostname resource as the primary node.
- Specify the remaining nodes where Support for Oracle RAC can run as potential primary nodes.
- Choose an order for the potential primary nodes that ensures that the logical hostname resources are distributed equally throughout the cluster.
- Ensure that the resource group is failed back to the primary node when the database instance on the primary node recovers after a failure.

```
# clresourcegroup create -Z zcname -n nodelist -p failback=true \
  [-p rg_description="description"] \
  lh-name-rg
```

`-n nodelist`

Specifies a comma-separated list of names of the nodes that can master this resource group. Ensure that the node for which you are creating the logical hostname resource appears first in the list. Choose an order for the remaining nodes that ensures that the logical hostname resources are distributed equally throughout the cluster.

`-p rg_description="description"`

Specifies an optional brief description of the resource group. This description is displayed when you use Oracle Solaris Cluster maintenance commands to obtain information about the resource group.

lh-name-rg Specifies your choice of name to assign to the resource group.

b. Add a logical hostname resource to the resource group that you created in [Step a](#).

```
# clreslogicalhostname create -Z zcname -h lh-name -g lh-name-rg lh-name-rs
```

-h *lh-name* Specifies the logical hostname that this resource is to make available. An entry for this logical hostname must exist in the name service database.

-g *lh-name-rg* Specifies that you are adding the resource to the resource group that you created in [Step 2](#).

lh-name-rs Specifies your choice of name to assign to the logical hostname resource.

3 Create a scalable resource group to contain the Oracle RAC server resource and Oracle listener resource.

```
# clresourcegroup create -Z zcname -n nodelist \
-p maximum_primaries=num-in-list \
-p desired_primaries=num-in-list \
-p rg_affinities=++rac-fwk-rg \
[-p rg_description="description"] \
-p rg_mode=Scalable rac-db-rg
```

-n *nodelist*

Specifies a comma-separated list of cluster nodes on which Support for Oracle RAC is to be enabled. The Support for Oracle RAC software packages must be installed on each node in this list.

-p *maximum_primaries=num-in-list*

Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *nodelist*.

-p *desired_primaries=num-in-list*

Specifies the number of nodes on which Support for Oracle RAC is to be enabled. This number must equal the number of nodes in *nodelist*.

-p *rg_affinities=++rac-fwk-rg*

Creates a strong positive affinity to the Oracle RAC framework resource group. If the Oracle RAC framework resource group was created by using the `clsetup` utility, the Oracle RAC framework resource group is named `rac-framework-rg`.

-p *rg_description="description"*

Specifies an optional brief description of the resource group. This description is displayed when you use Oracle Solaris Cluster maintenance commands to obtain information about the resource group.

-p *rg_mode=Scalable*

Specifies that the resource group is scalable.

rac-db-rg

Specifies the name that you are assigning to the resource group.

4 Register the `SUNW.scalable_rac_listener` resource type.

```
# clresourcetype register -Z zcname SUNW.scalable_rac_listener
```

5 Add an instance of the `SUNW.scalable_rac_listener` resource type to the resource group that you created in [Step 3](#).

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

- The name of the Oracle listener on each node where Oracle RAC is to run. This name must match the corresponding entry in the `listener.ora` file for the node.
- The Oracle home directory. The Oracle home directory contains the binary files, log files, and parameter files for the Oracle software.

```
# clresource create -Z zcname -g rac-db-rg \
-t SUNW.scalable_rac_listener \
-p resource_dependencies_weak=lh-rs-list \
[-p resource_dependencies=db-bin-rs] \
-p listener_name{node}=listener[...] \
-p oracle_home=ora-home \
rac-lsnr-rs
```

-g rac-db-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 3](#).

[-p resource_dependencies=db-bin-rs]

Specifies that this Oracle listener resource has a strong dependency on the storage resource for binary files. Specify this dependency only if you are using the Sun QFS shared file system for Oracle binary files. The storage resource for Oracle binary files is created when you perform the tasks in “[Registering and Configuring Storage Resources for Oracle Files](#)” on [page 83](#).

-p listener_name{node}=ora-sid

Specifies the name of the Oracle listener instance on node *node*. This name must match the corresponding entry in the `listener.ora` file.

-p resource_dependencies_weak=lh-rs-list

Specifies a comma-separated list of resources on which this resource is to have a weak dependency. The list must contain all the logical hostname resources that you created in [Step 2](#).

-p 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.

rac-lsnr-rs

Specifies the name that you are assigning to the `SUNW.scalable_rac_listener` resource.

6 Register the `SUNW.scalable_rac_server` resource type.

```
# clresourcetype register -Z zcname SUNW.scalable_rac_server
```

7 Add an instance of the `SUNW.scalable_rac_server` resource type to the resource group that you created in [Step 3](#).

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 on each node where Oracle RAC is to run. This identifier is the name of the Oracle database instance on the node.
- The full path to the alert log file on each node where Oracle RAC is to run.

```
# clresource create -Z zcname -g rac-db-rg \
-t SUNW.scalable_rac_server \
-p resource_dependencies=rac-fmwk-rs \
-p resource_dependencies_offline_restart=[db-storage-rs] [,db-bin-rs] \
-p resource_dependencies_weak=rac-lsnr-rs \
-p oracle_home=ora-home \
-p connect_string=string \
-p oracle_sid{node}=ora-sid[...] \
-p alert_log_file{node}=al-file[...] \
rac-srvr-rs
```

```
-g rac-db-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 3](#).

```
-p resource_dependencies=rac-fmwk-rs
```

Specifies the resources on which this Oracle RAC server resource has a strong dependency.

You must specify the Oracle RAC framework resource. If the Oracle RAC framework resource group is created by using the `clsetup` utility or Oracle Solaris Cluster Manager, this resource is named `rac-framework-rs`.

If you are using a volume manager or the Sun QFS shared file system for database files, you must also specify the storage resource for database files.

If you are using the Sun QFS shared file system for Oracle binary files, you must also specify the storage resource for binary files.

The storage resources for Oracle files are created when you perform the tasks in “[Registering and Configuring Storage Resources for Oracle Files](#)” on page 83.

```
-p resource_dependencies_weak=rac-lsnr-rs
```

Specifies a weak dependency by this Oracle RAC server resource on the Oracle listener resource that you created in [Step 5](#).

-p `oracle_sid{node}=ora-sid`

Specifies the Oracle system identifier on node *node*. This identifier is the name of the Oracle database instance on the node. You must set a different value for this property on each node where Oracle RAC is to run.

-p `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.

-p `connect_string=string`

Specifies the Oracle database user ID and password that the fault monitor uses to connect to the Oracle database. *string* is specified as follows:

userid/password

userid

Specifies the Oracle database user ID that the fault monitor uses to connect to the Oracle database.

password

Specifies the password that is set for the Oracle database user *userid*.

The database user ID and password are defined during the setup of Oracle RAC. To use Solaris authentication, type a slash (/) instead of a user ID and password.

rac-srvr-rs

Specifies the name that you are assigning to the `SUNW.scalable_rac_server` resource.

8 Bring online the resource group that you created in [Step 3](#)

```
# clresourcegroup online -Z zcname -emM rac-db-rg
```

rac-db-rg Specifies that a resource group that you created in [Step 3](#) is to be moved to the MANAGED state and brought online.

Index

Numbers and Symbols

32-bit mode, 29

64-bit mode, 29

A

abort step timeout

 Solaris Volume Manager for Sun Cluster, 272, 303

 UDLM, 276

 VxVM, 269, 300

acfs_mountpoint extension property, 277

action file, *See* custom action file

ACTION keyword, 153

actions

 file-system mount-point fault monitor, 147–148

 listener fault monitor, 150

 preset for fault monitor, 257–264

 scalable device-group fault monitor, 147

 server fault monitor

 definition, 149

 modifying, 153

adding

 messages to log files, 154

 resources to multiple-owner volume-manager

 framework resource group, 192–194

 resources to Oracle RAC framework resource group, 192–194

 Support for Oracle RAC to nodes, 185–192

 volume manager resources, 192–194

 volumes to be monitored, 184

administering, Support for Oracle RAC, 137–160

affinities

 examples

 Oracle 10g, 230–236

 Oracle 11g, 230–236

 Oracle 12c, 230–236

 Oracle 9i, 236–237

 file-system mount-point resource groups, 331

 Oracle RAC server resource groups

 Oracle 10g, 344, 347

 Oracle 11g, 344, 347

 Oracle 12c, 344, 347

 Oracle 9i, 351

 scalable device-group resource groups, 327

 Sun QFS resource groups, 329

alert files

 in cluster file system, 61

 in Oracle ACFS file system, 62

 file-system options

 Sun QFS shared file system, 56

 UNIX file system, 63

 storage management schemes, 25

 in Sun QFS shared file system, 54

alert_log_file extension property, 287

alert logs

 modifying response to errors, 156–157

 use of by fault monitor, 150

apache directory, 102

architecture requirements, processors, 29

archived redo log files

 in cluster file system, 61

 in Oracle ACFS file system, 62

archived redo log files (*Continued*)

- file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
- optimum I/O performance, 62
- storage management schemes, 25
- in Sun QFS shared file system, 54–55

arrays

- disk, 51–53
 - See also* redundant array of independent disks (RAID)

ASM, *See* Oracle Automatic Storage Management (Oracle ASM)

asm_diskgroup resource type, extension properties, 266–269

asm_diskgroups extension property description, 266, 279, 283

ASM_DISKSTRING parameter, 60

automating

- database startup and shutdown for Oracle 10g
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 343–345, 345–348
- database startup and shutdown for Oracle 11g
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 343–345, 345–348
- database startup and shutdown for Oracle 12c
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 343–345, 345–348
- database startup and shutdown for Oracle 9i
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 348–362

avm_stop_step_timeout extension property, 274

B

binary files

- in cluster file system, 61
- in Oracle ACFS file system, 62
- file-system options
 - Sun QFS shared file system, 56

binary files, file-system options (*Continued*)

- UNIX file system, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54
- boot, verifying, 134–135

C

caution notice

- adding volume manager resources to framework resource group, 192
- rebooting nodes, 35
- server fault monitor customizations, 151
- Support for Oracle RAC verification, 134
- UDLM, 40
- VxVM, 51

changing, *See* modifyingchecking, *See* verifying

Child_mon_level extension property, 280 description, 266

client_retries extension property, 292

client_retry_interval extension property, 292

clsetup utility

- comparison with Oracle Solaris Cluster maintenance commands, 66, 71, 84, 113–114

database resources

- Oracle 10g, 114–120
- Oracle 11g, 114–120
- Oracle 12c, 114–120
- Oracle 9i, 120–126

multiple-owner volume-manager framework resources, 71–74

names of resources created by, 138

Oracle ASM resources, 90–97

Oracle Clusterware resources, 109–111

Oracle RAC framework resources, 66–70

proxy resources, 114–120

storage resources, 84–89

cluster file system

- creating, 61–64
- installation of Oracle files, 28
- mounting, 61–64
- node-specific directories, 102–104
- node-specific files, 105–106

cluster file system (*Continued*)

- Oracle file types supported, 25
- requirements, 61
- restriction for zone clusters, 49
- task summary, 48–49

Cluster Ready Services, *See* Oracle Clusterware

commands, license verification, 24

communications ports

UDLM

- extension properties, 275
- guidelines for setting, 144

VxVM, 271, 302

components

- validation failures, 173, 176

concatenating, slices, 76

configuration daemon

VxVM, 271, 302

configuration files

- in cluster file system, 61
- in Oracle ACFS file system, 62
- file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
- Oracle DLM, 275
- storage management schemes, 25
- in Sun QFS shared file system, 54

configuration information

- multiple-owner volume-manager framework
 - resource group, 171
- UCMM, 171

configuring

- DID, 51–53, 58–60
- file-system mount-point resources
 - with `clsetup` utility, 84–89
 - with Oracle Solaris Cluster maintenance
 - commands, 331–332
- hardware RAID, 51–53
- interoperation with Oracle Grid
 - Infrastructure, 339–340
- listener
 - planning, 349–350
 - with `clsetup` utility, 120–126
 - with Oracle Solaris Cluster maintenance
 - commands, 351–357, 358–362

configuring (*Continued*)

- multiple-owner volume-manager framework
 - resource group, 70
 - for clusters, 71–74, 309–314

Oracle 10g RAC server

- with `clsetup` utility, 114–120
- with Oracle Solaris Cluster maintenance
 - commands, 343–345, 345–348

Oracle 11g RAC server

- with `clsetup` utility, 114–120
- with Oracle Solaris Cluster maintenance
 - commands, 343–345, 345–348

Oracle 12c RAC server

- with `clsetup` utility, 114–120
- with Oracle Solaris Cluster maintenance
 - commands, 343–345, 345–348

Oracle 9i RAC listener

- with `clsetup` utility, 120–126

Oracle 9i RAC server

- planning, 349
- with `clsetup` utility, 120–126
- with Oracle Solaris Cluster maintenance
 - commands, 348–362, 358–362

Oracle ASM, 58–60

- resource group, 90

Oracle RAC framework resource group

- overview, 65
- for clusters, 66–70, 309–314
- for zone clusters, 314–315
- planning, 308–309

qualified NAS devices, 49

scalable device-group resources

- with `clsetup` utility, 84–89
- with Oracle Solaris Cluster maintenance
 - commands, 326–327, 327–328

Solaris Volume Manager for Sun Cluster, 50–51

Sun QFS resources

- with `clsetup` utility, 84–89
- with Oracle Solaris Cluster maintenance
 - commands, 328–329
 - with Oracle Solaris Cluster maintenance
 - commands for a zone cluster, 329–330

Support for Oracle RAC

- examples, 229–254

- configuring, Support for Oracle RAC (*Continued*)
 - for selected nodes, 185–192
 - UFS, 63
 - VxVM, 51
- connect_cycle extension property, 288
- connect_string extension property, 288
- CONNECTION_STATE keyword, 153
- control files
 - in cluster file system, 62
 - in Oracle ACFS file system, 62
 - file-system options, 56
 - storage management schemes, 25
 - in Sun QFS shared file system, 54–55
- core files
 - fault monitors, 150–151
 - UDLM, 171
- creating
 - cluster file system, 61–64
 - device groups, 75–82
 - file-system mount-point resources
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 331–332
 - global device groups, 75–82
 - listener resource
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 353, 360
 - listener resource group
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 352, 359
 - logical hostname resource groups
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 351, 358
 - LUN, 51–53
 - multi-owner disk sets, 75–81
 - multiple-owner volume-manager framework
 - resource group
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 309–314

- creating (*Continued*)
 - Oracle 10g RAC server resource group
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 10g RAC server resources
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 11g RAC server resource group
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 11g RAC server resources
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 12c RAC server resource group
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 12c RAC server resources
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - Oracle 9i RAC server resource group
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 352, 359
 - Oracle 9i RAC server resources
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 354, 361
 - Oracle ASM instance, 108
 - Oracle ASM resources
 - with clsetup utility, 90–97
 - with Oracle Solaris Cluster maintenance commands, 340–342
 - Oracle Clusterware resources
 - with clsetup utility, 109–111
 - with Oracle Solaris Cluster maintenance commands, 337–338
 - Oracle RAC framework resource group
 - with clsetup utility, 66–70

creating, Oracle RAC framework resource group
(*Continued*)

- with Oracle Solaris Cluster maintenance commands, 309–314

- with Oracle Solaris Cluster maintenance commands in a zone cluster, 314–315

proxy resources

- with `clsetup` utility, 114–120

- with Oracle Solaris Cluster maintenance commands, 337–338, 340–342

scalable device-group resources

- with `clsetup` utility, 84–89

- with Oracle Solaris Cluster maintenance commands, 326–327, 327–328

shared-disk groups, 81–82

slices, 52

Sun QFS resources

- with `clsetup` utility, 84–89

- with Oracle Solaris Cluster maintenance commands, 328–329

- with Oracle Solaris Cluster maintenance commands for a zone cluster, 329–330

Sun QFS shared file system, 55–58

CRS, *See* Oracle Clusterware

`crs_framework` resource type

- dependencies, 119, 343, 346

- extension properties, 269

- instantiating

- with `clsetup` utility, 109–111

- with Oracle Solaris Cluster maintenance commands, 343, 346

- names of instances created by `clsetup`, 138

- registering

- with `clsetup` utility, 109–111

- with Oracle Solaris Cluster maintenance commands, 343, 346

`crs_home` extension property, 292

- description, 284

custom action file

- format, 152–154

- maximum number of entries in, 152

- order of entries in, 156

- propagating to cluster nodes, 159

- specifying, 160

custom action file (*Continued*)

- validating, 160

`custom_action_file` extension property, 289

customizing, server fault monitor, 151–160

`cvm_abort_step_timeout` extension property, 269, 300

`cvm_return_step_timeout` extension property, 269, 300

`cvm_start_step_timeout` extension property, 270, 300

`cvm_step1_timeout` extension property, 270, 300

`cvm_step2_timeout` extension property, 270, 301

`cvm_step3_timeout` extension property, 270, 301

`cvm_step4_timeout` extension property

- definition, 270, 301

- guidelines for setting, 143

`cvm_stop_step_timeout` extension property, 271, 301

cylinders, restrictions, 52

D

daemons

- `ucmmd`

- failure to start, 173

- unexpected termination, 172–173

- `vucmmd`

- failure to start, 176

- unexpected termination, 175–176

- `vxconfigd`, 271, 302

- `vxkmsgd`, 272, 302

data files

- file-system options, 56

- location on shared file system, 111–112

- storage management schemes, 25

Data Guard, *See* Oracle Data Guard

database administrator (DBA)

- creating, 31–34

- granting access to file systems, 57

- granting access to volumes, 78

database management system (DBMS)

- See also* relational database management system (RDBMS)

- errors

- modifying response to, 154–156

database management system (DBMS), errors
(*Continued*)

 preset actions, 257–264

 timeouts, 150–151

databases

 automating startup and shutdown for Oracle 10g
 with `clsetup` utility, 114–120

 with Oracle Solaris Cluster maintenance
 commands, 343–345, 345–348

 automating startup and shutdown for Oracle 11g
 with `clsetup` utility, 114–120

 with Oracle Solaris Cluster maintenance
 commands, 343–345, 345–348

 automating startup and shutdown for Oracle 12c
 with `clsetup` utility, 114–120

 with Oracle Solaris Cluster maintenance
 commands, 343–345, 345–348

 automating startup and shutdown for Oracle 9i
 with `clsetup` utility, 120–126

 with Oracle Solaris Cluster maintenance
 commands, 348–362

 creating, 111–112

 file systems for, 54–55

 instance name, 285, 290, 293

resources

 creating with `clsetup` utility, 113–126

 creating with Oracle Solaris Cluster maintenance
 commands, 334–348

verifying

 Oracle 10g resources, 130–133

 Oracle 11g resources, 130–133

 Oracle 12c resources, 130–133

 Oracle 9i resources, 133–134

DAU (disk allocation unit), 56

db_name extension property, 292

DBA (database administrator)

 creating, 31–34

 granting access to file systems, 57

 granting access to volumes, 78

dbca command, 111

DBMS (database management system)

See also RDBMS (relational database management
 system)

DBMS (database management system) (*Continued*)
errors

 modifying response to, 154–156

 preset actions, 257–264

 timeouts, 150–151

debug_level extension property

 description, 266, 279

 scalable_asm_instance_proxy resource type, 278,
 280, 284

 scalable_rac_listener resource type, 286

 scalable_rac_server_proxy resource type, 292

 scalable_rac_server resource type, 289

 ScalDeviceGroup resource type, 295

 ScalMountPoint resource type, 297

 SUNW.rac_svm resource type, 272

 SUNW.scalable_asm_instance_proxy resource
 type, 278, 280, 284

 SUNW.scalable_rac_listener resource type, 286

 SUNW.scalable_rac_server_proxy resource
 type, 292

 SUNW.scalable_rac_server resource type, 289

 SUNW.ScalDeviceGroup resource type, 295

 SUNW.ScalMountPoint resource type, 297

 SUNW.vucmm_svm resource type, 303

Degraded - reconfiguration in progress
 message, 179, 180

deleting

See modifying

See removing

See uninstalling

dependencies

 crs_framework resource type, 119, 343, 346

 LogicalHostname resource type, 125, 350

 offline-restart, 126

 oracle_asm_diskgroup resource type, 96

 qfs resource type, 89, 96, 329

 rac_cvm resource type, 313

 rac_framework resource type, 70

 rac_svm resource type, 312

 rac_udlm resource type, 70, 311, 315

 scalable_oracle_asm_instance_proxy resource
 type, 96

 scalable_rac_listener resource type, 125, 350

 scalable_rac_server_proxy resource type, 119,
 344, 347

dependencies (*Continued*)

- scalable_rac_server resource type, 126, 351
- ScalDeviceGroup resource type, 89, 97, 327, 328
- ScalMountPoint resource type, 89, 96, 331
- Sscalable_rac_server_proxy resource type, 95
- SUNW.crs_framework resource type, 119, 343, 346
- SUNW.LogicalHostname resource type, 125, 350
- SUNW.oracle_asm_diskgroup resource type, 96
- SUNW.qfs resource type, 89, 96, 329
- SUNW.rac_cvm resource type, 313
- SUNW.rac_framework resource type, 70
- SUNW.rac_svm resource type, 312
- SUNW.rac_udlm resource type, 70, 311, 315
- SUNW.scalable_oracle_asm_instance_proxy resource type, 96
- SUNW.scalable_rac_listener resource type, 125, 350
- SUNW.scalable_rac_server_proxy resource type, 95, 119, 344, 347
- SUNW.scalable_rac_server resource type, 126, 351
- SUNW.ScalDeviceGroup resource type, 89, 97, 327, 328
- SUNW.ScalMountPoint resource type, 89, 96, 331
- SUNW.vucmm_cvm resource type, 74, 313
- SUNW.vucmm_framework resource type, 74
- SUNW.vucmm_svm resource type, 74, 312
- vucmm_cvm resource type, 74, 313
- vucmm_framework resource type, 74
- vucmm_svm resource type, 74, 312

device groups

- See also* multi-owner disk sets
- See also* shared-disk groups
- creating, 75–82
- extension properties, 295–297
- monitoring additional volumes, 184
- optimum I/O performance, 62
- resource group affinities, 327
- restrictions, 82
- storage resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325

device identity (DID)

- configuring, 51–53, 58–60

devices

- adding to multi-owner disk sets, 76
- raw, 51–53
 - See also* redundant array of independent disks (RAID)
- removing from multi-owner disk sets, 206

diagnostic information, 171–172

DID (device identity)

- configuring, 51–53, 58–60

directories

- node-specific, 102–104
- Oracle home, 282, 284, 286, 289, 293
- /var/opt, 33

disabling, RAC server resources, 139–142

disk allocation unit (DAU), 56

disk groups

- Oracle ASM, 266, 279, 283

disk sets, multi-owner, 75–81

diskgroupname extension property, 295

disks

- arrays, 51–53
 - See also* redundant array of independent disks (RAID)
- effect of number on reservation timeout, 143
- installation of Oracle files, 27
- Oracle file types supported, 25
- slices, 52
- soft partitions, 76
- stripe width, 56

distributed lock manager (DLM), 275

DLM (distributed lock manager), 275

E

- editing, *See* modifying

enabling

- See also* starting
- listener, 356, 362
- Oracle RAC server resource group
 - Oracle 10g, 345, 348
 - Oracle 11g, 345, 348
 - Oracle 12c, 345, 348

enabling, Oracle RAC server resource group
(*Continued*)

Oracle 9i, 356, 362

environment variables, 287, 291, 294

ERROR keyword, 152

ERROR_TYPE keyword, 152

errors

in custom action file, 160

DBMS

modifying response to, 154–156

preset actions for, 257–264

ignoring, 155–156

responding to, 154–155

SGA, 154

timeouts

core-file creation, 150–151

modifying maximum allowed, 157–159

types detected by fault monitor, 151

/etc/group file, 31

/etc/opt/SUNWsamfs/samfs.cmd file, 56

/etc/passwd file, 32

/etc/project file, 35

/etc/shadow file, 32

/etc/system file, 35

/etc/vfstab file

Sun QFS, 56

UNIX file system, 63

/etc/nsswitch.conf file, 31

event logs, 171

examples, configuration, 229–254

executing, *See* starting

extension properties

asm_diskgroup resource type, 266–269

crs_framework resource type, 269

hardware RAID, 272

Oracle ASM, 266–269, 272, 277–278, 279–280

qualified network-attached storage (NAS)

devices, 272

rac_cvm resource type, 269–272

rac_framework resource type, 272

rac_svm resource type, 272–274

rac_udlm resource type, 274–277

RAID, 272

restrictions, 145

extension properties (*Continued*)

scalable_asm_diskgroup_proxy resource
type, 277–278, 279–280

scalable_asm_instance_proxy resource
type, 283–285

scalable_asm_instance resource type, 280–283

scalable_rac_listener resource type, 286–287

scalable_rac_server_proxy resource
type, 292–295

ScalDeviceGroup resource type, 295–297

ScalMountPoint resource type, 297–300

setting, 307

Solaris Volume Manager for Sun Cluster, 272–274,
303–305

Sun QFS shared file system, 272

SUNW.asm_diskgroup resource type, 266–269

SUNW.crs_framework resource type, 269

SUNW.rac_cvm resource type, 269–272

SUNW.rac_framework resource type, 272

SUNW.rac_svm resource type, 272–274

SUNW.rac_udlm resource type, 274–277

SUNW.scalable_asm_diskgroup_proxy resource
type, 277–278, 279–280

SUNW.scalable_asm_instance_proxy resource
type, 283–285

SUNW.scalable_asm_instance resource
type, 280–283

SUNW.scalable_rac_listener resource
type, 286–287

SUNW.scalable_rac_server_proxy resource
type, 292–295

SUNW.scalable_rac_server resource
type, 287–291

SUNW.ScalDeviceGroup resource type, 295–297

SUNW.ScalMountPoint resource type, 297–300

SUNW.vucmm_cvm resource type, 300–302

SUNW.vucmm_framework resource type, 303

SUNW.vucmm_svm resource type, 303–305

SUNW.wait_zc_boot resource type, 305

UDLM, 274–277

vucmm_cvm resource type, 300–302

vucmm_framework resource type, 303

vucmm_svm resource type, 303–305

VxVM, 269–272, 300–302

extension properties (*Continued*)

- wait_zc_boot resource type, 305

F

Failfast: Aborting because "ucmmd" died message, 172–173

Failfast: Aborting because "vucmmd" died message, 175–176

failfastmode extension property, 274

failover, LogicalHostname resource, 350

Failover_Enabled extension property, 281 description, 267

failures

- component validations, 173, 176

nodes

- network timeouts, 350

panics

- during initialization, 172–173, 175–176

- during installation, 35

- timeouts, 178–179

public networks, 30–31

rac_framework resource

- startup, 179

reconfiguration of resources, 179, 180

START method timeout, 180

startup of resources, 179

stopping of resources, 181

SUNW.rac_framework resource, 179

SUNW.vucmm_framework resource, 179

ucmmd daemon

- startup, 173

- unexpected termination, 172–173

vucmm_framework resource

- startup, 179

vucmmd daemon

- startup, 176

- unexpected termination, 175–176

fault monitoring, 22

fault monitors

actions

- file-system mount-point fault monitor, 147–148

- listener fault monitor, 150

- modifying, 153

fault monitors, actions (*Continued*)

- scalable device-group fault monitor, 147

- server fault monitor, 149

alert logs, 150

caution notice, 151

core-file creation, 150–151

customizing, 151–160

device groups

- resource type for, 146

error types detected by, 151

file systems

- resource type for, 146

mount points

- resource type for, 146

Oracle RAC listener

- resource type for, 146

Oracle RAC server

- resource type for, 146

preset actions, 257–264

tuning, 146–151

Faulted - ucmmd is not running message, 179

file-system mount-point fault monitor, 147–148

file-system mount points

- resource groups for

- affinities, 331

- creating with clsetup utility, 84–89

- creating with Oracle Solaris Cluster maintenance commands, 331–332

- planning, 325

resources

- state information, 171

- syslog() function, 171

resources for

- creating with clsetup utility, 84–89

- creating with Oracle Solaris Cluster maintenance commands, 331–332

- planning, 325

file systems

See also cluster file system

See also Sun QFS shared file system

extension properties, 297–300

installation of Oracle files, 28

restrictions, 75, 82

file systems (*Continued*)

- storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- UFS options, 63

files

- alert log
 - modifying response to errors in, 156–157
 - use of by fault monitor, 150
- core
 - fault monitors, 150–151
 - UDLM, 171
- custom action
 - format, 152–154
 - order of entries in, 156
 - propagating to cluster nodes, 159
 - specifying, 160
 - validating, 160
- determining location, 24–26
- diagnostic information, 171
- `/etc/group`, 31
- `/etc/opt/SUNWsamfs/samfs.cmd`, 56
- `/etc/passwd`, 32
- `/etc/project`, 35
- `/etc/shadow`, 32
- `/etc/system`, 35
- `/etc/vfstab`
 - Sun QFS, 56
 - UNIX file system, 63
- `/etc/nsswitch.conf`, 31
- group, 31
- node-specific, 105–106
- `nsswitch.conf`, 31
- Oracle RAC, 54, 61, 62
- `passwd`, 32
- `project`, 35
- `samfs.cmd`, 56
- `shadow`, 32
- storage management schemes for, 24–26
- Support for Oracle RAC logs
 - additional messages in, 154
- system, 35

files (*Continued*)

- `vfstab`
 - Sun QFS, 56
 - UNIX file system, 63
- `filesystemtype` extension property, 297
- flashback log files
 - in cluster file system, 61
 - in Oracle ACFS file system, 62
 - file-system options, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54–55
- fragmentation, of memory, 154
- framework, *See* Oracle Real Application Clusters (Oracle RAC) framework resource group

G

- gen use type, volumes, 82
- global device groups
 - See also* multi-owner disk sets
 - See also* shared-disk groups
 - creating, 75–82
 - monitoring additional volumes, 184
 - storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- global devices
 - adding to multi-owner disk sets, 76
 - removing from multi-owner disk sets, 206
- global zone, 38
- group database, `nsswitch.conf` file, 31
- group file, 31
- groups, creating, 31–34

H

- hardware redundant array of independent disks (RAID)
 - configuring, 51–53
 - extension properties, 272
 - installing, 51–53
 - Oracle file types supported, 25

hardware redundant array of independent disks (RAID)
(*Continued*)

reservation step timeout, 143–144

task summary, 46–47

hardware requirements, 23–24

heap memory, 155

help, 20

home directory

Oracle, 282, 284, 286, 289, 293

I

I/O (input/output) performance, 62

identifiers

system, 285, 290, 293

user, 30

ignoring, minor errors, 155–156

input/output (I/O) performance, 62

installing

hardware RAID, 51–53

Oracle ASM, 58–60

Oracle RAC

overview, 100–101

verifying installation, 107

qualified NAS devices, 49

Solaris Volume Manager for Sun Cluster, 50–51

storage management software, 49–64

Support for Oracle RAC, 38–40

verifying installation, 126–135

UDLM, 40

VxVM, 51

insufficient memory errors, 154, 155

interfaces, network, 101

io timeout extension property, 297

K

keywords, custom action file, 152

L

license requirements, 24

listener

extension properties, 286–287

resource groups

creating with `clsetup` utility, 120–126

creating with Oracle Solaris Cluster maintenance
commands, 351–357, 358–362

planning, 349–350

resource groups for

enabling, 356, 362

resources

creating with `clsetup` utility, 120–126

creating with Oracle Solaris Cluster maintenance
commands, 353, 360

listener fault monitor, 150

listener_name extension property

scalable_rac_listener resource type, 286

SUNW.scalable_rac_listener resource type, 286

load, effect on reservation timeout, 143

local disks

installation of Oracle files, 27

Oracle file types supported, 25

local zones, *See* non-global zone

location

diagnostic information files, 171

log files, 171–172

Oracle files, 24–26

redo log files, 62

log files

locations, 171–172

Oracle RAC server, 289

Oracle RAC server proxy, 293

RAC listener, 286

Support for Oracle RAC

additional messages in, 154

use in troubleshooting, 171

Log_level extension property, 281

description, 267

logged alerts

modifying response to, 156–157

use of by fault monitor, 150

logical-hostname resources, zone clusters, 37–38

logical unit number (LUN), creating, 51–53

logicaldevicelist extension property, 296

LogicalHostname resource type
 dependencies, 125, 350
 instantiating
 with clsetup utility, 120–126
 with Oracle Solaris Cluster maintenance
 commands, 352, 359
 names of instances created by clsetup, 138
 planning, 350–351
LUN (logical unit number), creating, 51–53

M

maximum values
 entries in custom action file, 152
 number of allowed timeouts, 157–159
memory
 shared, 34–35, 35–37
 shortage of, 154, 155
MESSAGE keyword, 154
messages
 debug, 278, 280, 284, 286, 289, 293
 panics, 172–173, 175–176
 startup failure, 179
messaging daemon
 VxVM, 272, 302
metadata server
 resource groups for
 creating with clsetup utility, 84–89
 creating with Oracle Solaris Cluster maintenance
 commands, 328–329
 planning, 325
 resources for
 creating with clsetup utility, 84–89
 creating with Oracle Solaris Cluster maintenance
 commands, 328–329
 planning, 325
migrating
 volume-manager resources
 to a multiple-owner volume-manager
 framework, 195–198
mirrored devices, adding to multi-owner disk sets, 77
modifying
 extension properties
 command for, 142

 modifying, extension properties (*Continued*)
 tunable when disabled, 145
 number of allowed timeouts, 157–159
 response to DBMS errors, 154–156
 response to logged alerts, 156–157
 server fault monitor actions, 153
 Support for Oracle RAC
 by removing nodes from, 210–221
monitor_probe_interval extension property, 293
Monitor_retry_count extension property, 281
 description, 267
monitor_retry_count extension property
 ScalDeviceGroup resource type, 296
 ScalMountPoint resource type, 298
 SUNW.ScalDeviceGroup resource type, 296
 SUNW.ScalMountPoint resource type, 298
Monitor_retry_interval extension property, 281
 description, 268
monitor_retry_interval extension property
 ScalDeviceGroup resource type, 297
 ScalMountPoint resource type, 298
 SUNW.ScalDeviceGroup resource type, 297
 SUNW.ScalMountPoint resource type, 298
monitoring, Support for Oracle RAC, 161
mount options, UFS, 63
mount points, extension properties, 297–300
mounting
 cluster file system, 61–64
 Sun QFS shared file system, 55–58
mountoptions extension property, 298
mountpointdir extension property, 299
multi-owner disk sets
 creating, 75–81
 Oracle Automatic Storage Management (Oracle
 ASM) (Oracle ASM), 79, 82
 storage resources for
 creating with clsetup utility, 84–89
 creating with Oracle Solaris Cluster maintenance
 commands, 326–327, 327–328
 planning, 325
multiple-owner volume-manager framework resource
 group
 adding resources to, 192–194
 configuration information, 171

multiple-owner volume-manager framework resource group (*Continued*)

- configuring, 70
- configuring for clusters, 71–74
- creating
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 309–314
- failure to start, 176
- migrating volume-manager resources, 195–198
- overview, 309
- unexpected termination, 175–176
- verifying, 128

N

name service

- bypassing, 30–31
- database user entries in, 31

names

- Oracle database instance, 285, 290, 293

NAS devices, *See* qualified network-attached storage (NAS) devices

necessary privileges, zone clusters, 37

network/agent directory, 102

Network_aware extension property, 281

- description, 267

Network Information Service (NIS)

- bypassing, 30–31
- database user entries in, 31

network interfaces, 101

network/log directory, 102

network timeouts, effect on node failure detection, 350

network/trace directory, 102

networks

- private, 101
- public
 - failures, 30–31
 - installation options for Oracle 10g, 101
 - installation options for Oracle 11g, 101
 - installation options for Oracle 12c, 101

NEW_STATE keyword, 153

NIS (Network Information Service)

- bypassing, 30–31

NIS (Network Information Service) (*Continued*)

- database user entries in, 31

nodes

- adding Support for Oracle RAC to, 185–192
- caution notice, 35
- directories specific to, 102–104
- failure
 - public networks, 30–31
- failures
 - network timeouts, 350
- files specific to, 105–106
- installing Oracle Clusterware on subset, 101
- network timeouts, 350
- panics
 - during initialization, 172–173, 175–176
 - during installation, 35
 - timeouts, 178–179
- preparing for Oracle RAC, 29–38
- rebooting, 35
- removing Support for Oracle RAC from, 210–221
- uninstalling
 - Support for Oracle RAC software packages from, 217

non-global zone, 38

nsswitch.conf file, 31

num_ports extension property, definition, 275

Num_ports extension property, guidelines for setting, 144

O

OCR (Oracle cluster registry) files

- in cluster file system, 61
- in Oracle ACFS file system, 62
- file-system options, 63
- storage management schemes, 25
- in Sun QFS shared file system, 54–55

offline-restart dependencies, 126

- removing from Oracle Grid Infrastructure resource, 202–203

oinstall group, 31

Online message, 180

online redo log files

- in cluster file system, 62

- online redo log files (*Continued*)
 - in Oracle ACFS file system, 62
 - file-system options, 56
 - storage management schemes, 25
 - in Sun QFS shared file system, 54–55
- oper group, 31
- Oracle, error numbers, 257–264
- Oracle 10g
 - configuring after Oracle Solaris Cluster
 - upgrade, 226–227
 - database resources
 - creating with `clsetup` utility, 114–120
 - extension properties, 292–295
 - databases
 - administering with Oracle Solaris Cluster, 140–142
 - creating, 111–112
 - location of data files, 112
 - log files, 171
 - overriding networking defaults, 101
 - resource group affinities, 344, 347
 - sample configurations in a zone cluster, 239–244
 - sample configurations in the global cluster, 230–236
 - sample legacy configurations, 247
 - verifying
 - database resources, 130–133
 - installation, 107
- Oracle 11g
 - configuring after Oracle Solaris Cluster
 - upgrade, 226–227
 - database resources
 - creating with `clsetup` utility, 114–120
 - extension properties, 292–295
 - databases
 - administering with Oracle Solaris Cluster, 140–142
 - creating, 111–112
 - location of data files, 112
 - log files, 171
 - overriding networking defaults, 101
 - resource group affinities, 344, 347
 - sample configurations in a zone cluster, 239–244
 - sample configurations in the global cluster, 230–236
 - sample legacy configurations, 247
 - verifying
 - database resources, 130–133
 - installation, 107
- Oracle 11g (*Continued*)
 - verifying
 - database resources, 130–133
 - installation, 107
- Oracle 12c
 - configuring after Oracle Solaris Cluster
 - upgrade, 226–227
 - database resources
 - creating with `clsetup` utility, 114–120
 - extension properties, 292–295
 - databases
 - administering with Oracle Solaris Cluster, 140–142
 - creating, 111–112
 - location of data files, 112
 - log files, 171
 - overriding networking defaults, 101
 - resource group affinities, 344, 347
 - sample configurations in a zone cluster, 239–244
 - sample configurations in the global cluster, 230–236
 - sample legacy configurations, 247
 - verifying
 - database resources, 130–133
 - installation, 107
- Oracle 9i
 - database resources
 - creating with `clsetup` utility, 120–126
 - extension properties, 287–291
 - databases
 - administering with Oracle Solaris Cluster, 142
 - creating, 111–112
 - location of data files, 112
 - log files, 172
 - resource group affinities, 351
 - sample configurations, 236–237
 - sample configurations in a zone cluster, 245–246
 - sample legacy configurations, 247
 - use of older resource types, 223
 - verifying
 - database resources, 133–134
 - installation, 107
- Oracle ACFS file system
 - creating, 64
 - requirements, 62

- Oracle ACFS file system (*Continued*)
 - restriction for zone clusters, 49
 - task summary, 49
- `oracle_asm_diskgroup` resource type
 - dependencies, 96
 - names of instances created by `clsetup`, 138
- Oracle Automatic Storage Management (Oracle ASM)
 - configuring, 58–60
 - creating an instance, 108
 - device groups, 79, 82
 - disk groups, 266, 279, 283
 - extension properties, 266–269, 272, 277–278, 279–280
 - installing, 58–60
 - Oracle file types supported, 25
 - reservation step timeout, 143–144
 - resource group
 - configuring, 90
 - creating with `clsetup` utility, 90–97
 - resources
 - creating with Oracle Solaris Cluster maintenance commands, 340–342
 - task summary, 47
 - zone clusters, 58
- Oracle cluster registry (OCR) files
 - in cluster file system, 61
 - in Oracle ACFS file system, 62
 - file-system options, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54–55
- Oracle Clusterware
 - extension properties, 269
 - file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - installing on subset of nodes, 101
 - overriding networking defaults, 101
 - resources
 - creating with `clsetup` utility, 109–111
 - creating with Oracle Solaris Cluster maintenance commands, 337–338
 - state changes, 140–142
 - storage management schemes, 25
- `oracle_config_file` extension property, 275
- Oracle Data Guard, 29
- Oracle distributed lock manager (DLM), 275
- Oracle files
 - disks, 27
 - local disks, 27
 - storage management schemes for, 24–26
 - storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
 - Sun QFS shared file system, 28
- Oracle Grid Infrastructure
 - configuring interoperation, 339–340
 - removing a resource, 202–203
 - removing offline-restart dependency, 202–203
 - removing `sun.resource`, 203
- `oracle_home` extension property
 - `scalable_asm_instance_proxy` resource type, 282, 284
 - `scalable_rac_listener` resource type, 286
 - `scalable_rac_server_proxy` resource type, 293
 - `scalable_rac_server` resource type, 289
 - `SUNW.scalable_asm_instance_proxy` resource type, 282, 284
 - `SUNW.scalable_rac_listener` resource type, 286
 - `SUNW.scalable_rac_server_proxy` resource type, 293
 - `SUNW.scalable_rac_server` resource type, 289
- Oracle RAC
 - 32-bit mode, 29
 - 64-bit mode, 29
 - log file locations, 171–172
 - multi-owner disk sets for, 75–81
 - Oracle Data Guard, 29
 - shared-disk groups for, 81–82
- `oracle_rac_listener` resource type, 223
- `oracle_rac_server` resource type, 223
- Oracle RDBMS (relational database management system)
 - file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - processor architecture requirements, 29

Oracle RDBMS (relational database management system) (*Continued*)

- storage management schemes, 25

Oracle Real Application Clusters (Oracle RAC)

- overview, 22

- files related to, 54

- installing

 - overview, 100–101

 - verifying installation, 107

- preparing nodes for, 29–38

- verifying installation and configuration, 107

Oracle Real Application Clusters (Oracle RAC)

- framework resource group

- overview, 308

- adding resources to, 192–194

- configuring

 - overview, 65

 - for clusters, 66–70, 308–309

- creating

 - with `clsetup` utility, 66–70

 - with Oracle Solaris Cluster maintenance

 - commands, 309–314

 - with Oracle Solaris Cluster maintenance

 - commands in a zone cluster, 314–315

- migrating volume-manager resources

 - to a multiple-owner volume-manager framework

 - resource group, 195–198

- planning, 308–309

- upgrading resources in, 224–226

- verifying, 127

Oracle Real Application Clusters (Oracle RAC) server

- configuring for Oracle 10g

 - with `clsetup` utility, 114–120

 - with Oracle Solaris Cluster maintenance

 - commands, 343–345, 345–348

- configuring for Oracle 11g

 - with `clsetup` utility, 114–120

 - with Oracle Solaris Cluster maintenance

 - commands, 343–345, 345–348

- configuring for Oracle 12c

 - with `clsetup` utility, 114–120

 - with Oracle Solaris Cluster maintenance

 - commands, 343–345, 345–348

Oracle Real Application Clusters (Oracle RAC) server
(*Continued*)

- configuring for Oracle 9i

 - planning, 349

 - with `clsetup` utility, 120–126

 - with Oracle Solaris Cluster maintenance

 - commands, 348–362, 358–362

- log files, 172

- resource groups for Oracle 10g

 - creating with `clsetup` utility, 114–120

 - creating with Oracle Solaris Cluster maintenance

 - commands, 344, 347

 - enabling, 345, 348

- resource groups for Oracle 11g

 - creating with `clsetup` utility, 114–120

 - creating with Oracle Solaris Cluster maintenance

 - commands, 344, 347

 - enabling, 345, 348

- resource groups for Oracle 12c

 - creating with `clsetup` utility, 114–120

 - creating with Oracle Solaris Cluster maintenance

 - commands, 344, 347

 - enabling, 345, 348

- resource groups for Oracle 9i

 - creating with `clsetup` utility, 120–126

 - creating with Oracle Solaris Cluster maintenance

 - commands, 352, 359

 - enabling, 356, 362

 - planning, 349

- resources for Oracle 10g

 - creating with `clsetup` utility, 114–120

 - creating with Oracle Solaris Cluster maintenance

 - commands, 344, 347

- resources for Oracle 10g

 - disabling, 140–142

- resources for Oracle 10g

 - enabling, 345, 348

- resources for Oracle 11g

 - creating with `clsetup` utility, 114–120

 - creating with Oracle Solaris Cluster maintenance

 - commands, 344, 347

- resources for Oracle 11g

 - disabling, 140–142

Oracle Real Application Clusters (Oracle RAC) server (Continued)

- resources for Oracle 11g
 - enabling, 345, 348
 - resources for Oracle 12c
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - resources for Oracle 12c
 - disabling, 140–142
 - resources for Oracle 12c
 - enabling, 345, 348
 - resources for Oracle 9i
 - creating with `clsetup` utility, 120–126
 - creating with Oracle Solaris Cluster maintenance commands, 354, 361
 - resources for Oracle 9i
 - disabling, 142
 - resources for Oracle 9i
 - enabling, 356, 362
 - planning, 349
- ## Oracle relational database management system (RDBMS)
- file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - processor architecture requirements, 29
 - storage management schemes, 25
- ## oracle_sid extension property, 282
- scalable_asm_instance_proxy resource type, 285
 - scalable_rac_server_proxy resource type, 293
 - scalable_rac_server resource type, 290
 - SUNW.scalable_asm_instance_proxy resource type, 285
 - SUNW.scalable_rac_server_proxy resource type, 293
 - SUNW.scalable_rac_server resource type, 290
- ## Oracle Solaris Cluster, framework, 23
- ## Oracle Solaris Cluster maintenance commands
- comparison with `clsetup` utility, 66, 71, 84, 113–114
 - multiple-owner volume-manager framework
 - resource group
 - creating, 309–314

Oracle Solaris Cluster maintenance commands (Continued)

- Oracle ASM resources, 340–342
 - Oracle Clusterware resources, 337–338
 - Oracle RAC framework resource group
 - creating, 309–314, 314–315
 - proxy resources, 337–338, 340–342
 - storage resources, 325, 326–327, 327–328
 - tuning extension properties with, 142–145
- ## oracle user, 31
- granting access to file systems, 57
 - granting access to volumes, 78
- ## order, entries in custom action file, 156
- ## overriding, server fault monitor presets, 151–160
- ## overview
- Oracle RAC, 22
 - Oracle RAC framework resource group, 308

P

- packages, 38–40
- panics
 - during initialization, 172–173, 175–176
 - during installation, 35
 - timeouts, 178–179
- parameter_file extension property
 - scalable_rac_server resource type, 290
 - SUNW.scalable_rac_server resource type, 290
- partitions
 - restrictions, 52
 - soft, 76
- passwd file, 32
- patch requirements, 24
- port extension property
 - definition, 275
 - guidelines for setting, 144
- ports
 - See communications ports
- prerequisites, See requirements
- preset actions, fault monitor, 257–264
- preventing
 - unnecessary restarts
 - for DBMS errors, 155–156
 - for timeouts, 157–159

- primary groups, 31
- private network interfaces, 101
- probe_command extension property, 282
 - description, 268
- probe_timeout extension property, 282
 - description, 268
 - scalable_rac_listener resource type, 286
 - scalable_rac_server resource type, 290
 - SUNW.scalable_rac_listener resource type, 286
 - SUNW.scalable_rac_server resource type, 290
- processor architecture requirements, 29
- programs
 - vxclust, 271, 302
- project file, 35
- proxy_probe_interval extension property, 278
 - description, 279
- proxy_probe_timeout extension property, 278, 285, 294
 - description, 279
- proxy resources
 - creating with clsetup utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 337–338, 340–342
 - examples, 335
- public networks
 - failure, 30–31
 - installation options
 - Oracle 10g, 101
 - Oracle 11g, 101
 - Oracle 12c, 101

Q

- QFS file system, *See* Sun QFS shared file system
- qfs resource type
 - dependencies, 89, 96, 329
 - instantiating
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 329
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 84–89

- qfs resource type, registering (*Continued*)
 - with Oracle Solaris Cluster maintenance commands, 329
- qualified network-attached storage (NAS) devices
 - configuring, 49
 - extension properties, 272
 - installing, 49
 - Oracle file types supported, 25
 - storage resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
 - supported with Oracle RAC, 83
 - task summary, 47–48

R

- RAC, *See* Oracle Real Application Clusters (Oracle RAC)
- rac_cvm resource type
 - dependencies, 313
 - extension properties, 269–272
 - instantiating
 - with Oracle Solaris Cluster maintenance commands, 313
 - names of instances created by clsetup, 138
 - purpose, 309
 - registering
 - with Oracle Solaris Cluster maintenance commands, 313
 - restrictions, 145
 - upgrading, 224–226
- rac_framework resource type
 - dependencies, 70
 - extension properties, 272
 - failure of instance to start, 179
 - instantiating
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315
 - monitoring instances of, 161
 - names of instances created by clsetup, 138
 - purpose, 308

- rac_framework resource type (*Continued*)
 - registering
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315
 - START method timeout, 180
 - upgrading, 224–226
- rac_svm resource type
 - dependencies, 312
 - extension properties, 272–274
 - instantiating
 - with Oracle Solaris Cluster maintenance commands, 312
 - names of instances created by clsetup, 138
 - purpose, 308
 - registering
 - with Oracle Solaris Cluster maintenance commands, 312
 - upgrading, 224–226
- rac_udlm resource type
 - dependencies, 70, 311, 315
 - extension properties, 274–277
 - instantiating
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 311, 315
 - names of instances created by clsetup, 138
 - purpose, 308
 - registering
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315
 - restrictions, 145
 - upgrading, 224–226
- RAID (redundant array of independent disks)
 - configuring, 51–53
 - extension properties, 272
 - installing, 51–53
 - Oracle file types supported, 25
 - reservation step timeout, 143–144
 - task summary, 46–47
- raw devices, 51–53
 - See also* redundant array of independent disks (RAID)
- RDBMS (relational database management system)
 - See also* DBMS (database management system)
 - file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - processor architecture requirements, 29
 - storage management schemes, 25
- rdbms/audit directory, 102
- rdbms/log directory, 102
- reconfiguration failures
 - SUNW.rac_framework, 179
 - SUNW.vucmm_framework, 180
- reconfiguration timeouts
 - Oracle ASM, 272
 - reservation step, 272, 303
 - Solaris Volume Manager for Sun Cluster definition, 272, 303
 - UDLM, 276
 - VxVM
 - definition, 269, 300
 - reconfiguration step 4, 143
- recovery files
 - in cluster file system, 62
 - in Oracle ACFS file system, 62
 - storage management schemes, 25
 - in Sun QFS shared file system, 54–55
- redo log files
 - See* archived redo log files
 - See* online redo log files
- redundant array of independent disks (RAID)
 - configuring, 51–53
 - extension properties, 272
 - installing, 51–53
 - Oracle file types supported, 25
 - reservation step timeout, 143–144
 - task summary, 46–47
- registering
 - crs_framework resource type
 - with clsetup utility, 109–111
 - with Oracle Solaris Cluster maintenance commands, 343, 346
- qfs resource type
 - with clsetup utility, 84–89

registering, qfs resource type (*Continued*)

- with Oracle Solaris Cluster maintenance commands, 329

rac_cvm resource type

- with Oracle Solaris Cluster maintenance commands, 313

rac_framework resource type

- with clsetup utility, 66–70
- with Oracle Solaris Cluster maintenance commands, 310, 315

rac_svm resource type

- with Oracle Solaris Cluster maintenance commands, 312

rac_udlm resource type

- with clsetup utility, 66–70
- with Oracle Solaris Cluster maintenance commands, 310, 315

scalable_rac_listener resource type

- with clsetup utility, 120–126
- with Oracle Solaris Cluster maintenance commands, 353, 360

scalable_rac_server_proxy resource type

- with clsetup utility, 114–120
- with Oracle Solaris Cluster maintenance commands, 344, 347

scalable_rac_server resource type

- with clsetup utility, 120–126
- with Oracle Solaris Cluster maintenance commands, 354, 361

ScalDeviceGroup resource type

- with clsetup utility, 84–89
- with Oracle Solaris Cluster maintenance commands, 327, 328

ScalMountPoint resource type

- with clsetup utility, 84–89
- with Oracle Solaris Cluster maintenance commands, 331

SUNW.crs_framework resource type

- with clsetup utility, 109–111
- with Oracle Solaris Cluster maintenance commands, 343, 346

SUNW.qfs resource type

- with clsetup utility, 84–89

registering, SUNW.qfs resource type (*Continued*)

- with Oracle Solaris Cluster maintenance commands, 329

SUNW.rac_cvm resource type

- with Oracle Solaris Cluster maintenance commands, 313

SUNW.rac_framework resource type

- with clsetup utility, 66–70
- with Oracle Solaris Cluster maintenance commands, 310, 315

SUNW.rac_svm resource type

- with Oracle Solaris Cluster maintenance commands, 312

SUNW.rac_udlm resource type

- with clsetup utility, 66–70
- with Oracle Solaris Cluster maintenance commands, 310, 315

SUNW.scalable_rac_listener resource type

- with clsetup utility, 120–126
- with Oracle Solaris Cluster maintenance commands, 353, 360

SUNW.scalable_rac_server_proxy resource type

- with clsetup utility, 114–120
- with Oracle Solaris Cluster maintenance commands, 344, 347

SUNW.scalable_rac_server resource type

- with clsetup utility, 120–126
- with Oracle Solaris Cluster maintenance commands, 354, 361

SUNW.ScalDeviceGroup resource type

- with clsetup utility, 84–89
- with Oracle Solaris Cluster maintenance commands, 327, 328

SUNW.ScalMountPoint resource type

- with clsetup utility, 84–89
- with Oracle Solaris Cluster maintenance commands, 331

SUNW.vucmm_cvm resource type

- with clsetup utility, 71–74
- with Oracle Solaris Cluster maintenance commands, 313

SUNW.vucmm_framework resource type

- with clsetup utility, 71–74

- registering, `SUNW.vucmm_framework` resource type
(*Continued*)
 - with Oracle Solaris Cluster maintenance commands, 311
 - `SUNW.vucmm_svm` resource type
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 312
 - `SUNW.wait_zc_boot` resource type
 - with Oracle Solaris Cluster maintenance commands, 330
 - `vucmm_cvm` resource type
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 313
 - `vucmm_framework` resource type
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 311
 - `vucmm_svm` resource type
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 312
- relational database management system (RDBMS)
 - See also* database management system (DBMS)
 - file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - processor architecture requirements, 29
 - storage management schemes, 25
- removing
 - See also* uninstalling
 - offline-restart dependency, 202–203
 - Oracle Grid Infrastructure resource, 202–203
 - Oracle Grid Infrastructure `sun.resource`, 203
 - Support for Oracle RAC
 - from clusters, 204–210
 - from selected nodes, 210–221
- requirements
 - hardware, 23–24
 - multi-owner disk sets, 75
 - Oracle files, 24–26
 - processor architecture, 29
 - shared-disk groups, 82
 - requirements (*Continued*)
 - software, 23–24
- reservation step timeout
 - description, 272, 303
 - guidelines for setting, 143–144
- `reservation_timeout` extension property
 - description, 272, 303
 - guidelines for setting, 143
- Resource Group Manager (RGM), restrictions, 309
- resource groups
 - file-system mount point
 - affinities, 331
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 331–332
 - planning, 325
- listener
 - creating with `clsetup` utility, 120–126
 - creating with Oracle Solaris Cluster maintenance commands, 351–357, 358–362
 - enabling, 356, 362
 - planning, 349–350
- multiple-owner volume-manager framework
 - creating with `clsetup` utility, 71–74
 - creating with Oracle Solaris Cluster maintenance commands, 309–314
 - overview, 309
- Oracle 10g RAC server
 - affinities, 344, 347
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - enabling, 345, 348
- Oracle 11g RAC server
 - affinities, 344, 347
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - enabling, 345, 348
- Oracle 12c RAC server
 - affinities, 344, 347
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347

- resource groups, Oracle 12c RAC server (*Continued*)
 - enabling, 345, 348
- Oracle 9i RAC server
 - affinities, 351
 - creating with `clsetup` utility, 120–126
 - creating with Oracle Solaris Cluster maintenance commands, 352, 359
 - enabling, 356, 362
 - planning, 349
- Oracle ASM
 - creating with `clsetup` utility, 90–97
- Oracle RAC framework
 - creating with `clsetup` utility, 66–70
 - creating with Oracle Solaris Cluster maintenance commands, 309–314
 - migrating to a multiple-owner volume-manager framework resource group, 195–198
 - planning, 308–309
- sample configurations, 229–254
- scalable device group
 - affinities, 327
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- Sun QFS metadata server
 - affinities, 329
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 328–329
 - creating with Oracle Solaris Cluster maintenance commands for a zone cluster, 329–330
 - planning, 325
- resource types
 - `asm_diskgroup`
 - extension properties, 266–269
 - `crs_framework`
 - dependencies, 119, 343, 346
 - extension properties, 269
 - instantiating with `clsetup` utility, 109–111
 - instantiating with Oracle Solaris Cluster maintenance commands, 343, 346
 - names of instances created by `clsetup`, 138
 - registering with `clsetup` utility, 109–111
 - resource types, `crs_framework` (*Continued*)
 - registering with Oracle Solaris Cluster maintenance commands, 343, 346
 - fault monitors, 146
 - `LogicalHostname`
 - dependencies, 125, 350
 - instantiating with `clsetup` utility, 120–126
 - instantiating with Oracle Solaris Cluster maintenance commands, 352, 359
 - names of instances created by `clsetup`, 138
 - planning, 350–351
 - names of instances created by `clsetup`, 138
 - `oracle_asm_diskgroup`
 - dependencies, 96
 - names of instances created by `clsetup`, 138
 - `oracle_rac_listener`, 223
 - `oracle_rac_server`, 223
 - `qfs`
 - dependencies, 89, 96, 329
 - instantiating with `clsetup` utility, 84–89
 - instantiating with Oracle Solaris Cluster maintenance commands, 329
 - names of instances created by `clsetup`, 138
 - registering with `clsetup` utility, 84–89
 - registering with Oracle Solaris Cluster maintenance commands, 329
 - `rac_cvm`
 - dependencies, 313
 - extension properties, 269–272
 - instantiating with Oracle Solaris Cluster maintenance commands, 313
 - names of instances created by `clsetup`, 138
 - purpose, 309
 - registering with Oracle Solaris Cluster maintenance commands, 313
 - restrictions, 145
 - upgrading, 224–226
 - `rac_framework`
 - dependencies, 70
 - extension properties, 272
 - failure of instance to start, 179
 - instantiating with `clsetup` utility, 66–70
 - instantiating with Oracle Solaris Cluster maintenance commands, 310, 315

resource types, *rac_framework* (Continued)

- monitoring instances of, 161
- names of instances created by *clsetup*, 138
- purpose, 308
- registering with *clsetup* utility, 66–70
- registering with Oracle Solaris Cluster maintenance commands, 310, 315
- START method timeout, 180
- upgrading, 224–226

rac_svm

- dependencies, 312
- extension properties, 272–274
- instantiating with Oracle Solaris Cluster maintenance commands, 312
- names of instances created by *clsetup*, 138
- purpose, 308
- registering with Oracle Solaris Cluster maintenance commands, 312
- upgrading, 224–226

rac_udlm

- dependencies, 70, 311, 315
- extension properties, 274–277
- instantiating with *clsetup* utility, 66–70
- instantiating with Oracle Solaris Cluster maintenance commands, 311, 315
- names of instances created by *clsetup*, 138
- purpose, 308
- registering with *clsetup* utility, 66–70
- registering with Oracle Solaris Cluster maintenance commands, 310, 315
- restrictions, 145
- upgrading, 224–226

restrictions, 309

sample configurations, 229–254

scalable_asm_diskgroup_proxy

- extension properties, 277–278, 279–280

scalable_asm_instance

- extension properties, 280–283

scalable_asm_instance_proxy

- extension properties, 283–285

scalable_oracle_asm_instance_proxy

- dependencies, 96
- names of instances created by *clsetup*, 138

resource types (Continued)

scalable_rac_listener

- dependencies, 125, 350
- extension properties, 286–287
- instantiating with *clsetup* utility, 120–126
- instantiating with Oracle Solaris Cluster maintenance commands, 353, 360
- names of instances created by *clsetup*, 138
- registering with *clsetup* utility, 120–126
- registering with Oracle Solaris Cluster maintenance commands, 353, 360

scalable_rac_server

- overview, 351
- dependencies, 126, 351
- instantiating with *clsetup* utility, 120–126
- instantiating with Oracle Solaris Cluster maintenance commands, 354, 361
- names of instances created by *clsetup*, 138
- registering with *clsetup* utility, 120–126
- registering with Oracle Solaris Cluster maintenance commands, 354, 361

scalable_rac_server_proxy

- dependencies, 119, 344, 347
- extension properties, 292–295
- instantiating with *clsetup* utility, 114–120
- names of instances created by *clsetup*, 138
- registering with *clsetup* utility, 114–120
- registering with Oracle Solaris Cluster maintenance commands, 344, 347

ScalDeviceGroup

- dependencies, 89, 97, 327, 328
- extension properties, 295–297
- instantiating with *clsetup* utility, 84–89
- instantiating with Oracle Solaris Cluster maintenance commands, 327, 328
- modifying instances of, 184
- names of instances created by *clsetup*, 138
- registering with *clsetup* utility, 84–89
- registering with Oracle Solaris Cluster maintenance commands, 327, 328

ScalMountPoint

- dependencies, 89, 96, 331
- extension properties, 297–300
- instantiating with *clsetup* utility, 84–89

- resource types, ScalMountPoint (*Continued*)
 - instantiating with Oracle Solaris Cluster maintenance commands, 331
 - names of instances created by clsetup, 138
 - registering with clsetup utility, 84–89
 - registering with Oracle Solaris Cluster maintenance commands, 331
- Sscalable_rac_server_proxy
 - dependencies, 95
- SUNW.asm_diskgroup
 - extension properties, 266–269
- SUNW.crs_framework
 - dependencies, 119, 343, 346
 - extension properties, 269
 - instantiating with clsetup utility, 109–111
 - instantiating with Oracle Solaris Cluster maintenance commands, 343, 346
 - names of instances created by clsetup, 138
 - registering with clsetup utility, 109–111
 - registering with Oracle Solaris Cluster maintenance commands, 343, 346
- SUNW.LogicalHostname
 - dependencies, 125, 350
 - instantiating with clsetup utility, 120–126
 - instantiating with Oracle Solaris Cluster maintenance commands, 352, 359
 - names of instances created by clsetup, 138
 - planning, 350–351
- SUNW.oracle_asm_diskgroup
 - dependencies, 96
 - names of instances created by clsetup, 138
- SUNW.oracle_rac_listener, 223
- SUNW.oracle_rac_server, 223
- SUNW.qfs
 - dependencies, 89, 96, 329
 - instantiating with clsetup utility, 84–89
 - instantiating with Oracle Solaris Cluster maintenance commands, 329
 - names of instances created by clsetup, 138
 - registering with clsetup utility, 84–89
 - registering with Oracle Solaris Cluster maintenance commands, 329
- SUNW.rac_cvm
 - dependencies, 313
- resource types, SUNW.rac_cvm (*Continued*)
 - extension properties, 269–272
 - instantiating with Oracle Solaris Cluster maintenance commands, 313
 - names of instances created by clsetup, 138
 - purpose, 309
 - registering with Oracle Solaris Cluster maintenance commands, 313
 - restrictions, 145
 - upgrading, 224–226
- SUNW.rac_framework
 - dependencies, 70
 - extension properties, 272
 - failure of instance to start, 179
 - instantiating with clsetup utility, 66–70
 - instantiating with Oracle Solaris Cluster maintenance commands, 310, 315
 - monitoring instances of, 161
 - names of instances created by clsetup, 138
 - purpose, 308
 - registering with clsetup utility, 66–70
 - registering with Oracle Solaris Cluster maintenance commands, 310, 315
 - START method timeout, 180
 - upgrading, 224–226
- SUNW.rac_svm
 - dependencies, 312
 - extension properties, 272–274
 - instantiating with Oracle Solaris Cluster maintenance commands, 312
 - names of instances created by clsetup, 138
 - purpose, 308
 - registering with Oracle Solaris Cluster maintenance commands, 312
 - upgrading, 224–226
- SUNW.rac_udlm
 - dependencies, 70, 311, 315
 - extension properties, 274–277
 - instantiating with clsetup utility, 66–70
 - instantiating with Oracle Solaris Cluster maintenance commands, 311, 315
 - names of instances created by clsetup, 138
 - purpose, 308
 - registering with clsetup utility, 66–70

resource types, `SUNW.rac_udlm` (*Continued*)

- registering with Oracle Solaris Cluster maintenance commands, 310, 315
- restrictions, 145
- upgrading, 224–226

`SUNW.scalable_asm_diskgroup_proxy`

- extension properties, 277–278, 279–280

`SUNW.scalable_asm_instance`

- extension properties, 280–283

`SUNW.scalable_asm_instance_proxy`

- extension properties, 283–285

`SUNW.scalable_oracle_asm_instance_proxy`

- dependencies, 96
- names of instances created by `clsetup`, 138

`SUNW.scalable_rac_listener`

- dependencies, 125, 350
- extension properties, 286–287
- instantiating with `clsetup` utility, 120–126
- instantiating with Oracle Solaris Cluster maintenance commands, 353, 360
- names of instances created by `clsetup`, 138
- registering with `clsetup` utility, 120–126
- registering with Oracle Solaris Cluster maintenance commands, 353, 360

`SUNW.scalable_rac_server`

- overview, 351
- dependencies, 126, 351
- extension properties, 287–291
- instantiating with `clsetup` utility, 120–126
- instantiating with Oracle Solaris Cluster maintenance commands, 354, 361
- names of instances created by `clsetup`, 138
- registering with `clsetup` utility, 120–126
- registering with Oracle Solaris Cluster maintenance commands, 354, 361

`SUNW.scalable_rac_server_proxy`

- dependencies, 95, 119, 344, 347
- extension properties, 292–295
- instantiating with `clsetup` utility, 114–120
- instantiating with Oracle Solaris Cluster maintenance commands, 344, 347
- names of instances created by `clsetup`, 138
- registering with `clsetup` utility, 114–120

resource types, `SUNW.scalable_rac_server_proxy` (*Continued*)

- registering with Oracle Solaris Cluster maintenance commands, 344, 347

`SUNW.ScalDeviceGroup`

- dependencies, 89, 97, 327, 328
- extension properties, 295–297
- instantiating with `clsetup` utility, 84–89
- instantiating with Oracle Solaris Cluster maintenance commands, 327, 328
- modifying instances of, 184
- names of instances created by `clsetup`, 138
- registering with `clsetup` utility, 84–89
- registering with Oracle Solaris Cluster maintenance commands, 327, 328

`SUNW.ScalMountPoint`

- dependencies, 89, 96, 331
- extension properties, 297–300
- instantiating with `clsetup` utility, 84–89
- instantiating with Oracle Solaris Cluster maintenance commands, 331
- names of instances created by `clsetup`, 138
- registering with `clsetup` utility, 84–89
- registering with Oracle Solaris Cluster maintenance commands, 331

`SUNW.vucmm_cvm`

- dependencies, 74, 313
- extension properties, 300–302
- instantiating with `clsetup` utility, 71–74
- instantiating with Oracle Solaris Cluster maintenance commands, 313
- overview, 309
- registering with `clsetup` utility, 71–74
- registering with Oracle Solaris Cluster maintenance commands, 313

`SUNW.vucmm_framework`

- dependencies, 74
- extension properties, 303
- failure of instance to start, 179
- instantiating with `clsetup` utility, 71–74
- instantiating with Oracle Solaris Cluster maintenance commands, 311
- overview, 309
- registering with `clsetup` utility, 71–74

resource types, `SUNW.vucmm_framework` (*Continued*)

- registering with Oracle Solaris Cluster maintenance commands, 311

- START method timeout, 180

`SUNW.vucmm_svm`

- dependencies, 74, 312

- extension properties, 303–305

- instantiating with `clsetup` utility, 71–74

- instantiating with Oracle Solaris Cluster maintenance commands, 312

- overview, 309

- registering with `clsetup` utility, 71–74

- registering with Oracle Solaris Cluster maintenance commands, 312

`SUNW.wait_zc_boot`

- extension properties, 305

- instantiating with Oracle Solaris Cluster maintenance commands, 330

- registering with Oracle Solaris Cluster maintenance commands, 330

`vucmm_cvm`

- dependencies, 74, 313

- extension properties, 300–302

- instantiating with `clsetup` utility, 71–74

- instantiating with Oracle Solaris Cluster maintenance commands, 313

- registering with `clsetup` utility, 71–74

- registering with Oracle Solaris Cluster maintenance commands, 313

`vucmm_framework`

- dependencies, 74

- extension properties, 303

- failure of instance to start, 179

- instantiating with `clsetup` utility, 71–74

- instantiating with Oracle Solaris Cluster maintenance commands, 311

- registering with `clsetup` utility, 71–74

- registering with Oracle Solaris Cluster maintenance commands, 311

- START method timeout, 180

`vucmm_svm`

- dependencies, 74, 312

- extension properties, 303–305

- instantiating with `clsetup` utility, 71–74

resource types, `vucmm_svm` (*Continued*)

- instantiating with Oracle Solaris Cluster maintenance commands, 312

- registering with `clsetup` utility, 71–74

- registering with Oracle Solaris Cluster maintenance commands, 312

`wait_zc_boot`

- dependencies, 89

- extension properties, 305

resources

- adding to multiple-owner volume-manager framework resource group, 192–194

- adding to Oracle RAC framework resource group, 192–194

database

- creating with `clsetup` utility, 113–126

- creating with Oracle Solaris Cluster maintenance commands, 334–348

file-system mount point

- creating with `clsetup` utility, 84–89

- creating with Oracle Solaris Cluster maintenance commands, 331–332

- planning, 325

listener

- creating with `clsetup` utility, 120–126

- creating with Oracle Solaris Cluster maintenance commands, 351–357, 358–362

- planning, 349–350

multiple-owner volume-manager framework

resource group

- creating with `clsetup` utility, 71–74

- creating with Oracle Solaris Cluster maintenance commands, 309–314

Oracle 10g RAC server

- creating with `clsetup` utility, 114–120

- creating with Oracle Solaris Cluster maintenance commands, 344, 347

- disabling, 140–142

- enabling, 345, 348

Oracle 11g RAC server

- creating with `clsetup` utility, 114–120

- creating with Oracle Solaris Cluster maintenance commands, 344, 347

- disabling, 140–142

resources, Oracle 11g RAC server (*Continued*)

- enabling, 345, 348

Oracle 12c RAC server

- creating with `clsetup` utility, 114–120
- creating with Oracle Solaris Cluster maintenance commands, 344, 347
- disabling, 140–142
- enabling, 345, 348

Oracle 9i RAC server

- creating with `clsetup` utility, 120–126
- creating with Oracle Solaris Cluster maintenance commands, 354, 361
- disabling, 142
- enabling, 356, 362
- planning, 349

Oracle ASM resource group

- creating with `clsetup` utility, 90–97
- creating with Oracle Solaris Cluster maintenance commands, 340–342

Oracle Clusterware

- creating with `clsetup` utility, 109–111
- creating with Oracle Solaris Cluster maintenance commands, 337–338
- state changes, 140–142

Oracle Grid Infrastructure

- removing, 202–203

Oracle RAC framework resource group

- creating with `clsetup` utility, 66–70
- creating with Oracle Solaris Cluster maintenance commands, 309–314
- planning, 308–309

Oracle Solaris Cluster, 140–142

proxy

- creating with `clsetup` utility, 114–120
- creating with Oracle Solaris Cluster maintenance commands, 337–338, 340–342
- examples, 335

sample configurations, 229–254

scalable device group

- creating with `clsetup` utility, 84–89
- creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
- planning, 325

resources (*Continued*)

storage

- creating with `clsetup` utility, 84–89
- creating with Oracle Solaris Cluster maintenance commands, 324–333, 327–328
- planning, 325

Sun QFS metadata server

- creating with `clsetup` utility, 84–89
- creating with Oracle Solaris Cluster maintenance commands, 328–329

Sun QFS metadata server

- planning, 325

- responding, to major errors, 154–155

restarts

preventing

- for DBMS errors, 155–156
- for timeouts, 157–159

restrictions

- cylinders, 52
- device groups, 82
- file systems, 75, 82
- multi-owner disk sets, 75
- partitions, 52
- rebooting nodes, 35
- resource types, 309
- RGM, 309
- shared-disk groups, 82
- Solaris Volume Manager for Sun Cluster, 26
- tuning extension properties, 145
- zones, 38

return step timeout

- Solaris Volume Manager for Sun Cluster, 273, 303
- VxVM, 269, 300

- RGM (Resource Group Manager), restrictions, 309

- running, *See* starting

S

- `samfs.cmd` file, 56

- sample configurations, 229–254

- `scalable_asm_diskgroup_proxy` resource type

- extension properties, 277–278, 279–280

- `scalable_asm_instance_proxy` resource type,

- extension properties, 283–285

- scalable_asm_instance resource type, extension properties, 280–283
- scalable device groups
 - fault monitor, 147
 - modifying resources, 184
 - resource group affinities, 327
 - resource groups for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
 - resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
 - state information, 171
 - syslog() function, 171
- scalable_oracle_asm_instance_proxy resource type
 - dependencies, 96
 - names of instances created by clsetup, 138
- scalable_rac_listener resource type
 - dependencies, 125, 350
 - extension properties, 286–287
 - instantiating
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 353, 360
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 353, 360
- scalable_rac_server_proxy resource type
 - dependencies, 95, 119, 344, 347
 - extension properties, 292–295
 - instantiating
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 114–120
- scalable_rac_server_proxy resource type, registering (*Continued*)
 - with Oracle Solaris Cluster maintenance commands, 344, 347
- scalable_rac_server resource type
 - overview, 351
 - dependencies, 126, 351
 - extension properties, 287–291
 - instantiating
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 354, 361
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 354, 361
- ScalDeviceGroup resource type
 - dependencies, 89, 97, 327, 328
 - extension properties, 295–297
 - instantiating
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 327, 328
 - modifying instances of, 184
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 327, 328
- ScalMountPoint resource type
 - dependencies, 89, 96, 331
 - extension properties, 297–300
 - instantiating
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 331
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 331
- schedclass extension property, 275
- schedpriority extension property, 276

- secondary groups, 31
- server
 - extension properties
 - Oracle 10g, 292–295
 - Oracle 11g, 292–295
 - Oracle 12c, 292–295
 - Oracle 9i, 287–291
 - resource groups for Oracle 10g
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - enabling, 345, 348
 - resource groups for Oracle 11g
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - enabling, 345, 348
 - resource groups for Oracle 12c
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - enabling, 345, 348
 - resource groups for Oracle 9i
 - creating with `clsetup` utility, 120–126
 - creating with Oracle Solaris Cluster maintenance commands, 352, 359
 - enabling, 356, 362
 - planning, 349
 - resources for Oracle 10g
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - disabling, 140–142
 - enabling, 345, 348
 - resources for Oracle 11g
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
 - disabling, 140–142
 - enabling, 345, 348
 - resources for Oracle 12c
 - creating with `clsetup` utility, 114–120
 - creating with Oracle Solaris Cluster maintenance commands, 344, 347
- server, resources for Oracle 12c (*Continued*)
 - disabling, 140–142
 - enabling, 345, 348
 - resources for Oracle 9i
 - creating with `clsetup` utility, 120–126
 - creating with Oracle Solaris Cluster maintenance commands, 354, 361
 - disabling, 142
 - enabling, 356, 362
- server fault monitor
 - actions
 - definition, 149
 - modifying, 153
 - alert logs, 150
 - caution notice, 151
 - customizing, 151–160
 - error types detected by, 151
 - overview, 148–150
 - preset actions, 257–264
- sessions
 - effect of errors on, 154, 155
- SGA (shared global area), errors, 154
- shadow file, 32
- shared-disk groups
 - creating, 81–82
 - Oracle Automatic Storage Management (Oracle ASM), 79, 82
 - storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- shared global area (SGA), errors, 154
- shared memory, 34–35
 - zone clusters, 35–37
- shutdown, verifying, 134–135
- shutting down
 - databases
 - Oracle 10g, 140–142
 - Oracle 11g, 140–142
 - Oracle 12c, 140–142
 - Oracle 9i, 142
- slices
 - concatenating, 76

slices (*Continued*)

- disk, 52
- snmp_ro.ora file, 105
- snmp_rw.ora file, 105
- soft partitions, 76
- software packages, 38–40
- software requirements, 23–24
- Solaris Volume Manager, 28
- Solaris Volume Manager for Sun Cluster
 - configuring, 50–51
 - extension properties, 272–274, 303–305
 - installing, 50–51
 - multi-owner disk sets, 75–81
 - Oracle file types supported, 25
 - resource type for, 308
 - restrictions, 26
 - storage resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
 - task summary, 43–45
- SPFILE file
 - in cluster file system, 61
 - in Oracle ACFS file system, 62
 - file-system options, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54
- sqlplus command, 111
- srvm/log directory, 102
- Start_command extension property, 282
 - description, 268
- Start failed state, 179
- START method, 180
- start step timeout
 - Oracle DLM, 276
 - Solaris Volume Manager for Sun Cluster, 273, 304
 - VxVM, 270, 300
- starting
 - databases
 - Oracle 10g, 140–142
 - Oracle 11g, 140–142
 - Oracle 12c, 140–142
 - Oracle 9i, 142

starting (*Continued*)

- failure by resources, 179
- startup_wait_count extension property, 294
- state information
 - database resources, 139–142
 - file-system mount-point resources, 171
 - scalable device-group resources, 171
- status information, Support for Oracle RAC, 161
- Stop_command extension property, 283
 - description, 268
- Stop_signal extension property, 283
 - description, 268
- stopping, failure by resources, 181
- storage management schemes
 - choosing, 24–26
 - installing software for, 49–64
 - resource types for, 308
 - zone clusters, 28–29
- storage resources
 - configuring after Oracle Solaris Cluster upgrade, 226
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 324–333, 327–328
 - planning, 325
 - supported NAS devices, 83
 - verifying, 128–130
- stripes, 56
 - adding to volume, 76
- Sun QFS metadata server
 - resource groups for
 - affinities, 329
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 328–329
 - planning, 325
 - resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 328–329
 - planning, 325
- Sun QFS shared file system
 - creating, 55–58
 - extension properties, 272

Sun QFS shared file system (*Continued*)

- installation of Oracle files, 28
- mounting, 55–58
- node-specific directories, 102–104
- node-specific files, 105–106
- Oracle file types supported, 25
- requirements, 54–55
- storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- task summary, 41–43

`sun.resourceremoving`, 203

Sun StorEdge disk arrays, 51–53

`SUNW.asm_diskgroup` resource type, extension

- properties, 266–269

`SUNW.crs_framework` resource type

- dependencies, 119, 343, 346
- extension properties, 269
- instantiating
 - with `clsetup` utility, 109–111
 - with Oracle Solaris Cluster maintenance commands, 343, 346
- names of instances created by `clsetup`, 138

registering

- with `clsetup` utility, 109–111
- with Oracle Solaris Cluster maintenance commands, 343, 346

`SUNW.LogicalHostname` resource type

- dependencies, 125, 350
- instantiating
 - with `clsetup` utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 352, 359
- names of instances created by `clsetup`, 138
- planning, 350–351

`SUNW.oracle_asm_diskgroup` resource type

- dependencies, 96
- names of instances created by `clsetup`, 138

`SUNW.oracle_rac_listener` resource type, 223

`SUNW.oracle_rac_server` resource type, 223

`SUNW.qfs` resource type

- dependencies, 89, 96, 329

`SUNW.qfs` resource type (*Continued*)

- instantiating
 - with `clsetup` utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 329
- names of instances created by `clsetup`, 138
- registering
 - with `clsetup` utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 329

`SUNW.rac_cvm` resource type

- dependencies, 313
- extension properties, 269–272
- instantiating
 - with Oracle Solaris Cluster maintenance commands, 313
- names of instances created by `clsetup`, 138
- purpose, 309
- registering
 - with Oracle Solaris Cluster maintenance commands, 313
- restrictions, 145
- upgrading, 224–226

`SUNW.rac_framework` resource type

- dependencies, 70
- extension properties, 272
- failure of instance to start, 179
- instantiating
 - with `clsetup` utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315

`SUNW.rac_framework` resource type, monitoring

- instances of, 161

`SUNW.rac_framework` resource type

- names of instances created by `clsetup`, 138
- purpose, 308
- registering
 - with `clsetup` utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315
- START method timeout, 180
- upgrading, 224–226

`SUNW.rac_svm` resource type

- dependencies, 312

SUNW.rac_svm resource type (*Continued*)

- extension properties, 272–274
- instantiating
 - with Oracle Solaris Cluster maintenance commands, 312
- names of instances created by clsetup, 138
- purpose, 308
- registering
 - with Oracle Solaris Cluster maintenance commands, 312
- upgrading, 224–226

SUNW.rac_udlm resource type

- dependencies, 70, 311, 315
- extension properties, 274–277
- instantiating
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 311, 315
- names of instances created by clsetup, 138
- purpose, 308
- registering
 - with clsetup utility, 66–70
 - with Oracle Solaris Cluster maintenance commands, 310, 315
- restrictions, 145
- upgrading, 224–226

SUNW.scalable_asm_diskgroup_proxy resource type

- extension properties, 277–278, 279–280

SUNW.scalable_asm_instance_proxy resource type

- extension properties, 283–285

SUNW.scalable_asm_instance resource type

- extension properties, 280–283

SUNW.scalable_oracle_asm_instance_proxy resource type

- dependencies, 96
- names of instances created by clsetup, 138

SUNW.scalable_rac_listener resource type

- dependencies, 125, 350
- extension properties, 286–287
- instantiating
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 353, 360
- names of instances created by clsetup, 138

SUNW.scalable_rac_listener resource type (*Continued*)

- registering
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 353, 360

SUNW.scalable_rac_server_proxy resource type

- dependencies, 95, 119, 344, 347
- extension properties, 292–295
- instantiating
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347
- names of instances created by clsetup, 138
- registering
 - with clsetup utility, 114–120
 - with Oracle Solaris Cluster maintenance commands, 344, 347

SUNW.scalable_rac_server resource type

- overview, 351
- dependencies, 126, 351
- extension properties, 287–291
- instantiating
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 354, 361
- names of instances created by clsetup, 138
- registering
 - with clsetup utility, 120–126
 - with Oracle Solaris Cluster maintenance commands, 354, 361

SUNW.ScalDeviceGroup resource type

- dependencies, 89, 97, 327, 328
- extension properties, 295–297
- instantiating
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 327, 328
- names of instances created by clsetup, 138
- registering
 - modifying instances of, 184
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 327, 328

- SUNW.ScalMountPoint resource type
 - dependencies, 89, 96, 331
 - extension properties, 297–300
 - instantiating
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 331
 - names of instances created by clsetup, 138
 - registering
 - with clsetup utility, 84–89
 - with Oracle Solaris Cluster maintenance commands, 331
- SUNW.vucmm_cvm resource type
 - dependencies, 74, 313
 - extension properties, 300–302
 - instantiating
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 313
 - overview, 309
 - registering
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 313
- SUNW.vucmm_framework resource type
 - dependencies, 74
 - extension properties, 303
 - failure of instance to start, 179
 - instantiating
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 311
 - overview, 309
 - registering
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 311
 - START method timeout, 180
- SUNW.vucmm_svm resource type
 - dependencies, 74, 312
 - extension properties, 303–305
 - instantiating
 - with clsetup utility, 71–74
- SUNW.vucmm_svm resource type, instantiating (*Continued*)
 - with Oracle Solaris Cluster maintenance commands, 312
 - overview, 309
 - registering
 - with clsetup utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 312
- SUNW.wait_zc_boot resource type
 - extension properties, 305
 - instantiating
 - with Oracle Solaris Cluster maintenance commands, 330
 - registering
 - with Oracle Solaris Cluster maintenance commands, 330
- Support for Oracle RAC
 - overview, 22
 - administering, 137–160
 - configuring
 - for selected nodes, 185–192
 - examples, 229–254
 - fault monitors, 146–151
 - installing, 38–40
 - verifying installation, 126–135
 - log files
 - additional messages in, 154
 - modifying
 - by removing nodes from, 210–221
 - monitoring, 161
 - removing
 - from clusters, 204–210
 - from selected nodes, 210–221
 - sample configurations, 229–254
 - software packages
 - uninstalling from clusters, 207
 - uninstalling from selected nodes, 217
 - software packages, installing, 38–40
 - status information, 161
 - troubleshooting, 161–181
 - tuning, 142–145
 - upgrading, 223–227
- svm_abort_step_timeout extension property, 272, 303

- svm_return_step_timeout extension property, 273, 303
- svm_start_step_timeout extension property, 273, 304
- svm_step1_timeout extension property, 273, 304
- svm_step2_timeout extension property, 273, 304
- svm_step3_timeout extension property, 274, 304
- svm_step4_timeout extension property
 - definition, 274, 305
 - guidelines for setting, 143
- svm_stop_step_timeout extension property, 305
- syntax errors, custom action file, 160
- syslog() function, 171
- syslog messages, 278, 280, 284, 286, 289, 293
- system file, 35
- system identifiers
 - Oracle, 285, 290, 293
- system messages file, 171
- system panics
 - See* panics
- system parameter file
 - in cluster file system, 61
 - in Oracle ACFS file system, 62
 - file-system options, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54
- system properties, effect on fault monitors, 146

T

- target filesystem extension property, 299
- TCP/IP (Transmission Control Protocol/Internet Protocol), timeout, 350
- technical support, 20
- timeouts
 - core-file creation, 150–151
 - log files for, 171
 - modifying maximum allowed, 157–159
 - Oracle ASM, 272
 - panics, and, 178–179
 - reservation step, 143–144, 272, 303
 - Solaris Volume Manager for Sun Cluster
 - definition, 272, 303
 - TCP/IP, 350

timeouts (*Continued*)

- UDLM, 276
- VxVM
 - definition, 269, 300
 - reconfiguration step 4, 143
- topology requirements, 24
- trace files
 - in cluster file system, 61
 - in Oracle ACFS file system, 62
 - file-system options
 - Sun QFS shared file system, 56
 - UNIX file system, 63
 - storage management schemes, 25
 - in Sun QFS shared file system, 54
- Transmission Control Protocol/Internet Protocol (TCP/IP), timeout, 350
- troubleshooting, Support for Oracle RAC, 161–181
- tuning
 - fault monitors, 146–151
 - Support for Oracle RAC, 142–145
- turning off, *See* disabling
- turning on, *See* starting

U

- UCMM (userland cluster membership monitor)
 - configuration information, 171
 - failure to start, 173
 - unexpected termination, 172–173
- ucmm_reconf.log file, 171
- ucmmd daemon
 - failure to start, 173
 - unexpected termination, 172–173
- UDLM, *See* UNIX Distributed Lock Manager (UDLM)
- udlm_abort_step_timeout extension property, 276
- udlm.conf configuration file, 275
- udlm_start_step_timeout extension property, 276
- udlm_step1_timeout extension property, 276
- udlm_step2_timeout extension property, 276
- udlm_step3_timeout extension property, 277
- udlm_step4_timeout extension property, 277
- udlm_step5_timeout extension property, 277
- UFS (UNIX file system), configuring, 63

- uninstalling
 - Support for Oracle RAC software packages
 - from clusters, 207
 - from selected nodes, 217
- UNIX Distributed Lock Manager (UDLM)
 - caution notice, 40
 - communications ports
 - extension properties, 275
 - guidelines for setting, 144
 - core files, 171
 - effect on tunable when disabled extension
 - properties, 145
 - event logs, 171
 - extension properties, 274–277
 - installing, 40
 - log files, 171
 - processor architecture requirements, 29
 - resource type for, 308
 - restrictions, 145
- UNIX file system (UFS), configuring, 63
- upgrading, Support for Oracle RAC, 223–227
- user_env extension property
 - scalable_rac_listener resource type, 287
 - scalable_rac_server_proxy resource type, 294
 - scalable_rac_server resource type, 291
 - SUNW.scalable_rac_listener resource type, 287
 - SUNW.scalable_rac_server_proxy resource type, 294
 - SUNW.scalable_rac_server resource type, 291
- user identifiers, 30
- userland cluster membership monitor (UCMM)
 - configuration information, 171
 - failure to start, 173
 - unexpected termination, 172–173
- users
 - creating, 31–34
 - granting access to file systems, 57
 - granting access to volumes, 78
- V**
 - Validate_command extension property, 283
 - description, 269
 - validating, custom action file, 160
 - validation failures
 - components, 173, 176
 - /var/cluster/ucmm directory, 171
 - /var/opt/SUNWscor/oracle_server directory, 172
 - /var/opt directory, 33
 - verifying
 - cluster boot, 134–135
 - cluster shutdown, 134–135
 - database resources
 - Oracle 10g, 130–133
 - Oracle 11g, 130–133
 - Oracle 12c, 130–133
 - Oracle 9i, 133–134
 - multiple-owner volume-manager framework
 - resource group, 128
 - Oracle RAC, 107
 - Oracle RAC framework resource group, 127
 - storage resources, 128–130
 - Veritas Volume Manager (VxVM)
 - caution notice, 51
 - configuring, 51
 - effect on tunable when disabled extension
 - properties, 145
 - extension properties, 269–272, 300–302
 - installing, 51
 - license requirements, 24
 - Oracle file types supported, 25
 - reconfiguration step 4 timeout, 143
 - reservation step timeout, 143–144
 - resource type for, 309
 - restrictions, 145
 - shared-disk groups, 81–82
 - storage resources for
 - creating with clsetup utility, 84–89
 - creating with Oracle Solaris Cluster maintenance
 - commands, 326–327, 327–328
 - planning, 325
 - task summary, 45–46
 - vxlicrep command, 24
 - vfstab file
 - Sun QFS, 56
 - UNIX file system, 63
 - volume managers, 28
 - See also* Solaris Volume Manager for Sun Cluster

volume managers (*Continued*)

- adding to existing configuration, 192–194
- storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325

volumes, 296

- adding to multi-owner disk sets, 76
- gen use type, 82
- monitoring, 184
- removing from multi-owner disk sets, 206

voting disk

- in cluster file system, 61
- in Oracle ACFS file system, 62
- file-system options, 63
- storage management schemes, 25
- in Sun QFS shared file system, 54–55

VUCMM, *See* multiple-owner volume-manager framework resource group

vucmm_cvm resource type

- dependencies, 74, 313
- extension properties, 300–302
- instantiating
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 313
- registering
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 313

vucmm_framework resource type

- dependencies, 74
- extension properties, 303
- failure of instance to start, 179
- instantiating
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 311
- registering
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 311
- START method timeout, 180

vucmm_reconf.log file, 171

vucmm_svm resource type

- dependencies, 74, 312
- extension properties, 303–305
- instantiating
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 312
- registering
 - with `clsetup` utility, 71–74
 - with Oracle Solaris Cluster maintenance commands, 312

vucmmd daemon

- failure to start, 176
- unexpected termination, 175–176

vxclust_num_ports extension property, 271, 302

vxclust_port extension property, 271, 302

vxclust program, 271, 302

vxconfigd daemon, 271, 302

vxconfigd_port extension property, 271, 302

vxkmsgd daemon, 272, 302

vxkmsgd_port extension property, 272, 302

vxlicrep command, 24

VxVM (Veritas Volume Manager)

- caution notice, 51
- configuring, 51
- effect on tunable when disabled extension properties, 145
- extension properties, 269–272, 300–302
- installing, 51
- license requirements, 24
- Oracle file types supported, 25
- reconfiguration step 4 timeout, 143
- reservation step timeout, 143–144
- resource type for, 309
- restrictions, 145
- shared-disk groups, 81–82
- storage resources for
 - creating with `clsetup` utility, 84–89
 - creating with Oracle Solaris Cluster maintenance commands, 326–327, 327–328
 - planning, 325
- task summary, 45–46
- vxlicrep command, 24

W

- wait_for_online extension property
 - scalable_rac_server resource type, 291
 - SUNW.scalable_rac_server resource type, 291
- wait_zc_boot resource type
 - dependencies, 89
 - extension properties, 305
- width, disk stripes, 56
- wizards
 - multiple-owner volume-manager framework
 - resource group, 71
 - Oracle ASM resource group, 90
 - Oracle RAC database instances, 114
 - Oracle RAC framework resource group, 66
 - storage resources, 84

Z

- zone clusters
 - configuring shared memory, 35–37
 - creating a file-system mount point
 - resource, 332–333
 - creating an Oracle RAC framework resource
 - group, 314–315
 - creating resources for Oracle 10g, 345–348
 - creating resources for Oracle 11g, 345–348
 - creating resources for Oracle 12c, 345–348
 - creating resources for Oracle 9i, 358–362
 - creating storage resources, 327–328
 - creating Sun QFS resources, 329–330
 - logical-hostname resources, 37–38
 - necessary privileges, 37
 - Oracle ASM, 58
 - preparing for Oracle RAC, 30
 - restriction of cluster file systems, 49
 - sample Oracle 10g configurations, 239–244
 - sample Oracle 11g configurations, 239–244
 - sample Oracle 12c configurations, 239–244
 - sample Oracle 9i configurations, 245–246
 - storage management schemes, 28–29
- zones, 38

