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# Legato NetWorker®

Module for Oracle®

Release 4.0  
UNIX® Version

## Administrator's Guide

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# Preface

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This Administrator's Guide provides instructions on how to configure and use the Legato NetWorker<sup>®</sup> Module for Oracle release 4.0 software for Oracle data storage management. You must install the NetWorker Module for Oracle software on a supported HP-UX or Solaris operating system running Oracle Server software before using the information in this guide. For installation instructions, refer to the *Legato NetWorker Module for Oracle, Release 4.0, UNIX Version, Installation Guide*.

## Audience

The information in this guide is intended for system administrators and Oracle database administrators (DBAs) who are responsible for maintaining Oracle Server backup and recovery systems. Operators who monitor the daily Oracle database backups may also find this manual useful.


To use this guide effectively, a working knowledge of Oracle concepts and terminology is required, especially those related to Oracle database backup and recovery.

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This document uses the following typographic conventions and symbols to make information easier to access and understand.

Convention	Indicates	Example
<b>boldface</b>	Names of line commands, daemons, options, programs, or scripts	The <b>nsradmin</b> command starts the command line version of the administration program.
<i>italic in text</i>	Pathnames, filenames, computer names, new terms defined in the Glossary or within the chapter, or emphasized words	Displayed messages are also written to <i>/nsr/logs/daemon.log</i> .
<i>italic in command line</i>	A variable that must be provided in the command line	<b>nwadmin</b> -s <i>server-name</i>
fixed-width	Examples and information displayed on the screen	media waiting: recover waiting for 8mm 5GB tape volume name
<b>fixed-width, boldface</b>	Commands and options that must be typed exactly as shown	<b>nsr_shutdown -a</b>
Menu_Name> Command	A path or an order to follow for making selections in the GUI	Volume>Change Mode>Appendable
<b>Important:</b>	Information that must be read and followed to ensure successful backup and recovery of data	 <hr/> <b>Important:</b> Use the <b>no_verify</b> option with extreme caution.

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# Chapter 1: Introduction

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This chapter describes the main features of the Legato NetWorker server and client, NetWorker Module for Oracle, and Oracle Recovery Manager (RMAN). It also describes Legato PowerSnap™ for EMC Symmetrix, which is required for proxy Oracle backups of EMC Symmetrix devices.

This chapter explains how all these components work together to provide a comprehensive Oracle data storage management system. It also provides basic guidelines for disaster recovery preparation.

**Note:** Throughout this guide, references to *regular* backups and restore indicate non-proxy backups and restores.

This chapter includes the following main sections:

- ["Importance of Backing Up Mission-Critical Data" on page 15](#)
- ["NetWorker Software" on page 16](#)
- ["NetWorker Module for Oracle" on page 17](#)
- ["PowerSnap for EMC Symmetrix" on page 18](#)
- ["Oracle Backup and Recovery System" on page 18](#)
- ["How NetWorker Module for Oracle Backs Up Data" on page 21](#)
- ["How NetWorker Module for Oracle Restores Data" on page 25](#)
- ["Preparing for Disaster" on page 27](#)
- ["About This Guide" on page 28](#)
- ["Other Information Sources" on page 29](#)

## Importance of Backing Up Mission-Critical Data

The reliability of computer equipment has improved greatly in recent years, but system and hardware failures still occur, sometimes with catastrophic results.

In a client-server environment, data can be lost due to hardware failures and user errors. Software bugs, procedural flaws, and simple user errors are common problems that necessitate database restores from backup storage media. A viable backup strategy can help in the recovery from disastrous situations.

Database administrators must recognize the importance of performing regular backups of database files and frequent backups of archived redo logs. If all archived redo logs are lost, a database can be recovered only to the time of its last full backup. Without backups and archived redo logs, the database cannot be recovered at all.

## NetWorker Software

The Legato NetWorker software comprises a high-capacity, easy-to-use data storage management solution that protects and helps manage data across an entire network. The NetWorker software simplifies the storage management process and reduces the administrative burden by automating and centralizing data storage operations.

The NetWorker software enables a user to:

- Perform automated backups during nonpeak hours.
- Administer, configure, monitor, and control NetWorker functions from any computer on a network.
- Centralize and automate data management operations.
- Increase backup performance by simultaneously sending more than one save stream to a single device.
- Optimize performance by using parallel save streams to multiple backup devices or storage nodes.

NetWorker client/server technology uses the network remote procedure call (RPC) protocol to back up data. The NetWorker client software consists of client-side services and user interface programs.

The NetWorker server software consists of several server-side services and programs that:

- Oversee backup and restore processes.
- Maintain client configuration files.
- Maintain an online client file index and online media database, which together comprise the *online indexes* on the NetWorker server.



During a backup, the NetWorker server makes an entry in the online client file index and records the location of the data in the online media database. These entries provide recovery information required for all backed-up data.

After a scheduled backup, the NetWorker server sends a record of the *bootstrap* file to the default printer. This is a printed record of the dates, locations, and save set ID numbers for the server's online indexes, required for restoring data. Keep the bootstrap printout on file as a quick reference in the event of a disaster, such as a disk crash or server failure.

For more information on:

- Installing NetWorker software, refer to the *Legato NetWorker Installation Guide* for the particular platform.
- Configuring and using NetWorker software, refer to the *Legato NetWorker Administrator's Guide*.

## NetWorker Module for Oracle

The NetWorker Module for Oracle software is an add-on module for the NetWorker server that enables you to perform the following tasks:

- Manual Oracle backups
- Scheduled Oracle backups
- Restores of Oracle backup data
- Automated media management

NetWorker Module for Oracle provides the following features:

- Capability to integrate database and filesystem backups, to relieve the burden of backup from the database administrator while allowing the administrator to retain control of the restore process.
- Automatic database storage management through automated scheduling, autochanger support, electronic tape labeling, and tracking.
- Support for backup to a centralized backup server.
- High performance through support for multiple, concurrent high-speed devices such as digital linear tape (DLT) drives.

Together with the NetWorker server, NetWorker Module for Oracle augments the backup and recovery system provided by the Oracle Server and provides a storage management solution that addresses the need for cross-platform support of enterprise applications.

Backups and restores of Oracle database files residing on EMC Symmetrix devices are performed by NetWorker Module for Oracle in conjunction with the NetWorker server and PowerSnap for EMC Symmetrix.

For information on how to install the NetWorker Module for Oracle software, refer to the *Legato NetWorker Module for Oracle Installation Guide*.

## PowerSnap for EMC Symmetrix

The PowerSnap for EMC Symmetrix software works with the NetWorker server and NetWorker Module for Oracle software to perform RMAN proxy backups and restores of Oracle data residing on Symmetrix devices.

A proxy backup performed with the PowerSnap for EMC Symmetrix involves taking a Symmetrix split-mirror snapshot. This snapshot ensures high availability of the database and eliminates downtime latency on the primary (production) host. During the proxy backup, the Oracle data moves from the snapshot to a NetWorker storage device, through a secondary (backup) host that is separate from the Oracle Server host.

For information on how to configure and run proxy Oracle backups and restores by using NetWorker Module for Oracle and PowerSnap for EMC Symmetrix:

- See "[Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix](#)" on page 99.
- Refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

## Oracle Backup and Recovery System

This section describes the system used for *regular* (non-proxy) Oracle backup and recovery.

**Note:** For information on *proxy* Oracle backup and recovery that involves the PowerSnap for EMC Symmetrix software and EMC Symmetrix devices, see "[Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix](#)" on page 99.

The NetWorker Module for Oracle and NetWorker server and client software function with the standard Oracle backup and recovery system to produce an efficient Oracle data storage management system. The implementation of an Oracle backup and recovery strategy requires a knowledge of how the NetWorker software works together with the Oracle components.

The regular Oracle backup and recovery system consists of:

- Oracle8, Oracle8i, or Oracle9i Server
- RMAN
- Recovery Catalog (optional)
- Oracle Enterprise Manager (OEM) Backup Management Tools (optional)

The NetWorker software consists of the following components:

- NetWorker server
- NetWorker client
- NetWorker Module for Oracle

[Figure 1 on page 19](#) illustrates the architecture of the regular Oracle backup and recovery system, and shows the functional relationship between the NetWorker and Oracle software components.

**Figure 1. Regular Oracle Backup and Recovery System**



## Oracle Recovery Manager (RMAN)

During the Oracle backup and restore operations, NetWorker Module for Oracle acts as an intermediary between the NetWorker server and RMAN.

RMAN is the main Oracle utility for backing up, restoring, and recovering Oracle datafiles, control files, and archived redo log files. It stores information about its operations in the control file of the backed-up database (the *target database*) and, optionally, in the Recovery Catalog on the Oracle Server host.

RMAN provides the following features:

- Online and offline Oracle database backups
- High performance through parallel backups and restores
- An intelligent interface to Oracle databases
- Well-defined backup strategies
- Checking for corrupt blocks during backups and restores
- Block-level incremental backups and restores

For more information on RMAN, refer to the Oracle Recovery Manager documentation.

## Oracle Recovery Catalog

The Recovery Catalog is a collection of Oracle database tables containing structural information about Oracle database backups and restores. The collection includes information about the following types of objects:

- Backup sets and backup pieces
- Image copies
- Proxy copies
- Archived redo logs
- Target database schema
- Stored scripts (user-created sequences of RMAN commands)

The Recovery Catalog is maintained by the RMAN utility. This utility uses the catalog information or the database control file to determine how to perform requested backup and restore operations. Store the Recovery Catalog in the dedicated Recovery Catalog database.

For more information on the Recovery Catalog, including the implications of not using it for backups and restores, refer to the Oracle Recovery Manager documentation.

## How NetWorker Module for Oracle Backs Up Data

This section describes the processes involved in *regular* Oracle backups.

**Note:** For information on the processes involved in *proxy* Oracle backups with the PowerSnap for EMC Symmetrix software, see "[Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix](#)" on page 99.

To provide storage management services for Oracle Server data, NetWorker Module for Oracle implements the media management interface, also known as the Oracle System Backup to Tape (SBT). This interface comprises a media management library (MML) that is integrated with the Oracle Server during the NetWorker Module for Oracle installation on the Oracle Server host.

The module installation links the MML with the Oracle kernel software. This enables the Oracle Server processes to call the NetWorker Module for Oracle MML software routines to back up and restore Oracle data to and from the media controlled by the NetWorker server.

A regular Oracle backup can be performed in either of two ways:

- By issuing the appropriate commands through the RMAN command line interface.
- By using the OEM Backup Management Tools, which include an optional graphical user interface to the RMAN utility.

RMAN establishes connections with the target database. Each connection starts an Oracle Server process that performs the backup. During the backup, the following occurs:

1. The Oracle Server processes read the datafile, control file, or archived redo log being backed up; then write it to the NetWorker server through the NetWorker Module for Oracle MML.
2. The NetWorker server, in turn, stores the Oracle data to the appropriate backup storage device.

At the end of the Oracle backup, the NetWorker server updates the online client and media indexes with information about the backup media used and the Oracle data it contains.

For more information about NetWorker server and NetWorker client programs and services, refer to the *Legato NetWorker Administrator's Guide*.

## Regular Manual Oracle Backup

A manual Oracle backup is a backup initiated by an Oracle backup utility, RMAN or OEM. NetWorker Module for Oracle considers a backup scheduled through OEM as a manual backup.

For more information on configuring and running manual Oracle backups, see ["Chapter 3: Manual Oracle Backups" on page 41](#).

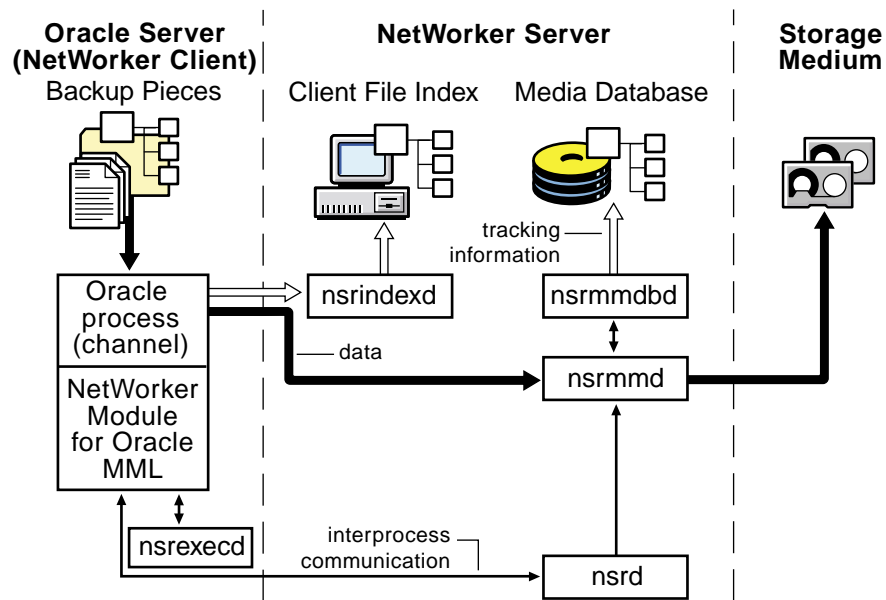
When the RMAN utility is invoked for a backup, Oracle Server processes call the NetWorker Module for Oracle MML software routines to initiate the backup.

A regular manual Oracle backup includes the following process interactions:

1. The Oracle Server processes (one for each allocated channel) contact the **nsrexecd** service to obtain the NetWorker client information.
2. The Oracle Server processes contact the main NetWorker service, **nsrd**, to obtain the required authorization and the identifier of the **nsrmmd** process that manages the requested backup device.
3. The Oracle Server processes send the backup data to the NetWorker media service, **nsrmmd**, to store on the appropriate backup volumes.
4. Tracking information is stored in the NetWorker online indexes:
  - The **nsrmmd** service records tracking information in the NetWorker media database by using the **nsrmmdbd** service.
  - The Oracle processes send tracking information to the NetWorker client file index by using the **nsrindexd** service.

[Figure 2 on page 23](#) shows how the Oracle Server, NetWorker server, and NetWorker Module for Oracle processes interact during a regular manual Oracle backup.

Figure 2. Process Interactions during a Regular Manual Oracle Backup



## Regular Scheduled Oracle Backup

A scheduled Oracle backup is a backup of Oracle data initiated by the NetWorker server. For more information on configuring and running scheduled Oracle backups, see "[Chapter 4: Scheduled Oracle Backups](#)" on page 51.

A regular scheduled Oracle backup includes the following process interactions:

1. At the scheduled backup start time, the main NetWorker service, **nsrd**, starts the configured group's backup by invoking the **savegrp** program.
2. The **savegrp** program requests that the NetWorker client-side service, **nsrexecd**, run the **savefs** program to verify the existence of the RMAN scripts to be used for the backup.
3. The **savefs** program sends back information to the **savegrp** program.
4. The **savegrp** program contacts the **nsrexecd** service to start the backup.

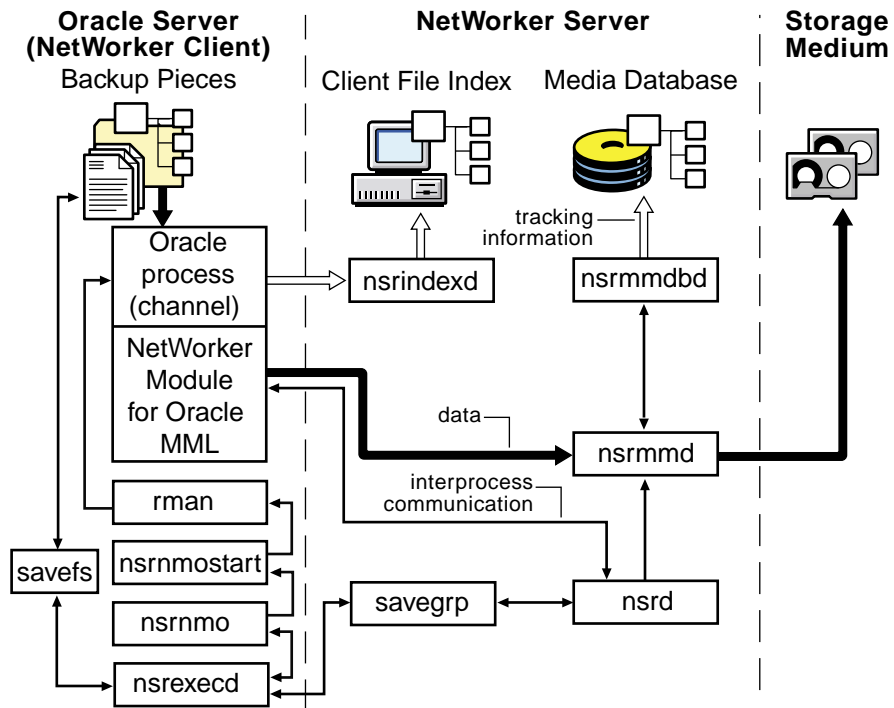
5. For each client in the backup group and each of the client's save sets, the following sequence of events occurs:
  - a. The **nsrexecd** service starts the **nsrnm0** script for the scheduled backup.
  - b. The **nsrnm0** script sets the required environment variables and invokes the NetWorker Module for Oracle program, **nsrnmstart**.
  - c. The **nsrnmstart** program starts the RMAN utility to run the required RMAN backup script.
  - d. From this point on, the scheduled Oracle backup processes follow the same steps as described in ["Regular Manual Oracle Backup" on page 22](#).

**Note:** At the end of a scheduled Oracle backup, the **savegrp** program also automatically backs up the NetWorker server bootstrap and the Oracle client file indexes. The bootstrap and client indexes are *not* automatically backed up at the end of a manual Oracle backup.

[Figure 3 on page 25](#) shows how the Oracle Server, NetWorker server, and NetWorker Module for Oracle processes interact during a regular scheduled Oracle backup.



**Figure 3. Process Interactions during a Regular Scheduled Oracle Backup**



## How NetWorker Module for Oracle Restores Data

This section describes the processes involved in *regular* Oracle restores.

**Note:** For information on the processes involved in *proxy* Oracle restores with the PowerSnap for EMC Symmetrix software, see "[Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix](#)" on page 99.

An Oracle restore can be performed in either of two ways:

- By issuing the appropriate commands through the RMAN command line interface.
- By using the OEM Backup Management Tools, which include an optional graphical user interface to the RMAN utility.

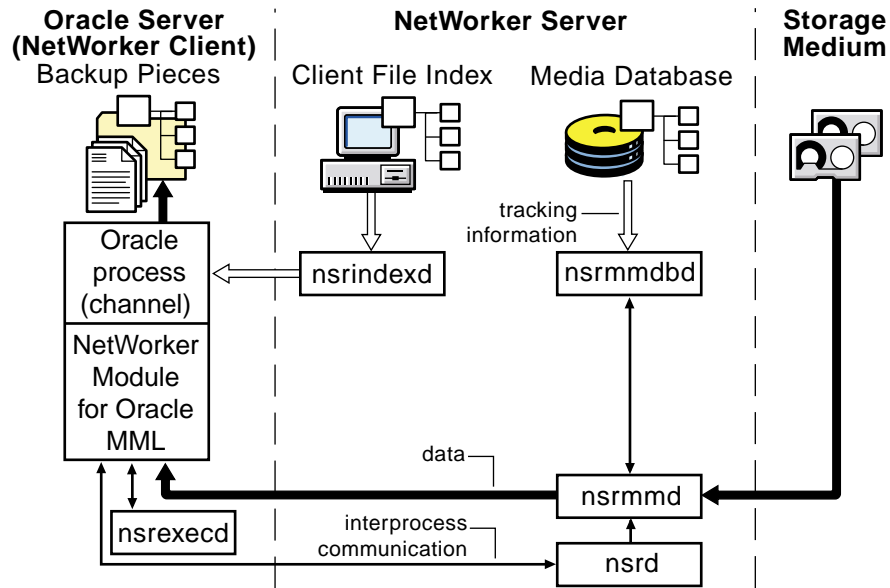
The RMAN utility starts Oracle Server processes on the target database. These Oracle Server processes initiate the restore by calling NetWorker Module for Oracle MML software routines.

A regular Oracle data restore includes the following process interactions:

1. The NetWorker Module for Oracle MML translates the object names requested by RMAN into a format that the NetWorker server understands and forwards the names to the NetWorker service, **nsrindexd**.
2. The **nsrindexd** service verifies that the backup pieces exist in the client file index.
3. When the NetWorker server receives a restore request from the client, the main NetWorker service, **nsrd**, contacts the media service, **nsrmmmd**.
4. The **nsrmmmd** service calls the media database service, **nsrmmdbd**, to determine which media contains the requested save set and issue a mount request.
5. The **nsrmmmd** service reads the appropriate backup volumes and passes the data to the Oracle processes through the NetWorker Module for Oracle MML.
6. The Oracle Server processes write the data to the disk.

[Figure 4 on page 27](#) shows how the Oracle Server, NetWorker server, and NetWorker Module for Oracle processes interact during a regular Oracle data restore.

Figure 4. Process Interactions during a Regular Oracle Data Restore



Once RMAN has restored the required files from the backup volumes, a database administrator can complete the standard Oracle database recovery.

## Preparing for Disaster

Follow these guidelines to make disaster recovery easier:

- Determine the frequency of the backups, considering that the frequency is a trade-off between the time spent backing up data and the time spent later recovering a database after a crash.
- Institute mirrored control files.
- Refer to the Oracle documentation for recommendations on whether to institute mirrored online redo logs.
- Ensure that the Recovery Catalog is backed up regularly.
- Back up the archived redo logs frequently between database backups.
- In conjunction with manual Oracle backups, perform regular backups of the NetWorker server bootstrap and Oracle client file index by using the procedure described in "[NetWorker Server Bootstrap Backup](#)" on page 46.

- In addition to backing up the Oracle database, back up other important Oracle files (for example, *init<oracle\_sid>.ora*) by using regular filesystem backups. For more information, refer to the:
  - Oracle backup and recovery documentation
  - *Legato NetWorker Administrator's Guide*

## About This Guide

Unlike the NetWorker software, which uses the term *recover* for *all* data retrieval activities (as distinguished from the UNIX **restore** command), Oracle distinguishes between restoring and recovering a database:

- Restore means to retrieve individual datafiles from backup media and store the files on disk.
- Recover means to apply the redo logs to make the database consistent.

This guide follows the Oracle terminology.

The other chapters in this guide provide the following information:

- ["Chapter 2: Software Configuration Procedures" on page 31](#) describes the procedures for configuring NetWorker Module for Oracle backups and restores.
- ["Chapter 3: Manual Oracle Backups" on page 41](#) describes the procedures for running manual NetWorker Module for Oracle backups.
- ["Chapter 4: Scheduled Oracle Backups" on page 51](#) describes the procedures for configuring and running scheduled NetWorker Module for Oracle backups.
- ["Chapter 5: Restoring and Recovering Oracle Data" on page 77](#) describes the procedures for restoring and recovering from NetWorker Module for Oracle backups.
- ["Chapter 6: Cluster, OPS, and RAC Systems" on page 85](#) describes the procedures for configuring and running NetWorker Module for Oracle backups and restores on cluster, OPS, and RAC systems.
- ["Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix" on page 99](#) describes the procedures for proxy backups and restores of Oracle data on EMC Symmetrix devices, performed by using NetWorker Module for Oracle and PowerSnap for EMC Symmetrix software.
- ["Appendix A: Environment Variables in the RMAN Session" on page 123](#) describes the environment variables that can be set for NetWorker Module for Oracle backups and restores.

- ["Appendix B: RMAN Commands" on page 131](#) describes RMAN commands that concern the NetWorker Module for Oracle software.
- ["Appendix C: Oracle9i Support in NetWorker Module for Oracle" on page 145](#) describes RMAN features introduced in Oracle9i that concern the NetWorker Module for Oracle software.
- ["Appendix D: Troubleshooting and Error Messages" on page 153](#) describes troubleshooting guidelines, RMAN error messages, and NetWorker Module for Oracle error messages.

## Other Information Sources

The information in this guide is best used in conjunction with information from the following sources:

- Oracle backup and recovery documentation
- *Legato NetWorker Module for Oracle Installation Guide, Release 4.0, UNIX Version*
- *Legato NetWorker Module for Oracle Release Supplement, Release 4.0, UNIX Version*
- *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide, Release 1.0, UNIX Version*
- *Legato NetWorker Administrator's Guide* (for the NetWorker server version)
- *Legato NetWorker Release Supplement* (for the NetWorker server version)
- NetWorker Administrator program Online Help
- *Legato Command Reference Guide* (for NetWorker and NetWorker Module for Oracle commands)
- UNIX man pages (for NetWorker and NetWorker Module for Oracle commands)

The complete set of Legato documentation is provided in PDF form on the Legato Documentation Suite CD-ROM shipped with the Legato software. As explained in ["Product Documentation" on page 11](#), the *most* up-to-date Legato documentation is available on the Legato web site at [www.legato.com](http://www.legato.com).



## Chapter 2: Software Configuration Procedures

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This chapter describes the available NetWorker Module for Oracle configuration options. Procedures to configure the Oracle Server and NetWorker server to perform Oracle backup and restore operations by using the NetWorker Module for Oracle software are also provided.

This chapter includes the following main sections:

- ["Software Configuration Roadmap" on page 31](#)
- ["Task 1: Verify the Oracle Server Configuration" on page 33](#)
- ["Task 2: Configure the NetWorker Server Resource" on page 33](#)
- ["Task 3: Configure the NetWorker Client Resource" on page 35](#)
- ["Task 4: Configure the NetWorker Device Resources" on page 38](#)
- ["Task 5: Configure the NetWorker Volume Pools" on page 38](#)
- ["Task 6: Configure Firewall Support" on page 39](#)

### Software Configuration Roadmap

Before configuring the Oracle Server and NetWorker server, ensure that the NetWorker Module for Oracle software is installed on the Oracle Server host according to the instructions in the *Legato NetWorker Module for Oracle Installation Guide*.

The Oracle Server and NetWorker server must be properly configured before the NetWorker Module for Oracle software can be used for backup and restore operations.

To ensure the proper Oracle Server and NetWorker server configurations:

1. Verify that the appropriate Oracle software is installed and configured on the Oracle Server host. See ["Task 1: Verify the Oracle Server Configuration" on page 33](#).
2. Configure the NetWorker Server resource to:
  - Identify the correct NetWorker server.
  - Specify an appropriate parallelism value.
  - Specify the required user names in the NetWorker Administrator list.Through the Administrator list, ensure that the required users have administrative privileges for the NetWorker server. See ["Task 2: Configure the NetWorker Server Resource" on page 33](#).
3. Configure a NetWorker Client resource for the Oracle Server as a backup client of the NetWorker server. See ["Task 3: Configure the NetWorker Client Resource" on page 35](#).
4. Configure a NetWorker Device resource for each storage device to be used for Oracle backups and restores. Complete any required autochanger or silo configuration procedures. See ["Task 4: Configure the NetWorker Device Resources" on page 38](#).
5. Configure any required NetWorker Pool resources and corresponding Label template resources. See ["Task 5: Configure the NetWorker Volume Pools" on page 38](#).

**Note:** For information on how to label and mount backup volumes in the Oracle storage devices and how to configure any required storage nodes with attached devices, refer to the *Legato NetWorker Administrator's Guide*.
6. Configure firewall support, if required. See ["Task 6: Configure Firewall Support" on page 39](#).
7. Configure any required cluster, Oracle Parallel Server (OPS), or Real Application Cluster (RAC) systems. See ["Chapter 6: Cluster, OPS, and RAC Systems" on page 85](#).

**Note:** Use the NetWorker Administrator program to view and configure the required NetWorker resources and their attributes. For more information on how to use the NetWorker Administrator program, refer to the NetWorker server Online Help and the *Legato NetWorker Administrator's Guide*.



## Task 1: Verify the Oracle Server Configuration

The Oracle Server system must be properly installed and configured before the NetWorker server and NetWorker Module for Oracle software is configured.

To set up the Oracle Server system:

1. Install and configure the Oracle8, Oracle8i, or Oracle9i software components, including RMAN. For more information, refer to the *Oracle Installation Guide* for the particular platform.
2. Set up and configure the target database and Oracle Recovery Catalog. For more information on the Recovery Catalog, refer to the Oracle Recovery Manager documentation.
3. Set up and configure the Oracle networking software:
  - Net8 in Oracle8 and Oracle8i
  - Oracle Net in Oracle9i
4. Register the target database with the Recovery Catalog. For more information, refer to the Oracle backup and recovery documentation.

**Note:** Detailed information on these steps is available from Oracle support services. Oracle support contact information worldwide is available at [www.oracle.com/support](http://www.oracle.com/support).

## Task 2: Configure the NetWorker Server Resource

After the NetWorker server software is installed, the NetWorker configuration includes a preconfigured Server resource with attribute settings that influence the performance and security of backups.

[Table 1 on page 34](#) describes the main NetWorker Server resource attributes. Verify that the attribute settings in your Server resource are valid for the Oracle backup environment, modifying the settings as required.

**Table 1. NetWorker Server Resource Attributes**

Attribute	Description
Name	Specifies the hostname of the NetWorker server.
Parallelism	Specifies the maximum number of backup save streams that the NetWorker software allows to arrive concurrently at the server. The NetWorker server edition determines the maximum parallelism value. When multiple data streams are backed up at the same time, the efficiency of the storage devices is increased.
Administrator	Specifies the users with NetWorker Administrator privileges—the only users able to modify the NetWorker resource configurations and remove entries from the NetWorker online indexes. The initial default setting of the attribute is <i>root@hostname</i> on UNIX and <i>Administrators@hostname</i> on Windows, where <i>hostname</i> is the NetWorker server hostname. For more information, see <a href="#">"Setting the NetWorker Administrator Attribute" on page 34</a> .

For more information on how to configure a NetWorker Server resource and its attributes, refer to the NetWorker server Online Help and the *Legato NetWorker Administrator's Guide*.

## Setting the NetWorker Administrator Attribute

While any user can view NetWorker resource settings, only users specified in the Administrator attribute of the Server resource can modify the NetWorker resource configurations and remove entries from the NetWorker online indexes.

NetWorker Module for Oracle attempts to remove an entry from the NetWorker index in the following cases:

- In Oracle8, if the backup piece name of the current backup is identical to one already in the NetWorker index (see ["Task 1: Create RMAN Scripts for Manual Backups" on page 42](#)).
- In Oracle8, if the RMAN **change...delete** command is used.
- In Oracle8i, if the RMAN **change...delete** or **delete expired backup** command is used.

- In Oracle9i, if the RMAN **delete** command is used.
- If a *running* Oracle backup is canceled according to the instructions in one of these sections:
  - ["Canceling a Manual Oracle Backup" on page 48](#)
  - ["Canceling a Scheduled Oracle Backup" on page 71](#)

**Note:** If the required Oracle user name is *not* in the Administrator list in any of these cases, NetWorker Module for Oracle fails to remove the backup save set entries from the NetWorker index. However, RMAN might remove the corresponding entries from the RMAN catalog, leaving the NetWorker index and RMAN catalog unsynchronized. To resynchronize the index and catalog, issue the appropriate NetWorker media management command to manually remove the inconsistent save set entries from the NetWorker index.

To allow NetWorker Module for Oracle to remove an entry from the NetWorker index, add the required user name to the Administrator list in the NetWorker Server resource:

- If Net service is used, add the name of the operating system user that starts Net service.
- If Net service is *not* used, add the name of the operating system user that runs RMAN.

### Task 3: Configure the NetWorker Client Resource

A NetWorker Client resource is a set of attributes assigned to the Oracle Server host and stored on the NetWorker server. Before the NetWorker Module for Oracle software can be used for Oracle backups and restores, a NetWorker Client resource must be configured for the Oracle Server host by using the NetWorker Administrator program.

To configure the NetWorker Client resource for an Oracle Server, refer to [Table 2 on page 36](#) for a description of the attribute settings and enter the appropriate information for each attribute in the Client resource.

**Table 2. NetWorker Client Resource Attributes (Part 1 of 2)**

Attribute	Description
Name	Specifies the hostname of the Oracle Server host.
Browse Policy	<p>Specifies the length of time that the NetWorker server retains an entry for an Oracle backup in the online client file index. This attribute applies only to <i>scheduled</i> Oracle backups.</p> <p><b>Note:</b> For a scheduled Oracle backup with NetWorker server 6.x, if the NSR_SAVESET_BROWSE environment variable is set as described in "<a href="#">Appendix A: Environment Variables in the RMAN Session</a>" on page 123, its value <i>overrides</i> the Browse Policy attribute setting in the Client resource.</p> <p>To set a specific browse policy for a <i>manual</i> Oracle backup with NetWorker server 6.x, use the NSR_SAVESET_BROWSE environment variable. If the NSR_SAVESET_BROWSE variable is <i>not</i> set, the NetWorker server uses the most appropriate value for the browse policy.</p>
Group	Specifies the NetWorker backup group to be used for a <i>scheduled</i> Oracle backup. For more information, see " <a href="#">Task 5: Configure the Client Resource for a Scheduled Oracle Backup</a> " on page 66.
Remote Access	Specifies the fully qualified IP name of a remote system, to enable restores of the Oracle Server backups to that remote system.

Table 2. NetWorker Client Resource Attributes (Part 2 of 2)

Attribute	Description
Retention Policy	<p>Specifies the minimum length of time that the NetWorker server maintains information about Oracle backup data in the online media database. This attribute applies only to <i>scheduled</i> Oracle backups.</p> <p><b>Note:</b> For a scheduled Oracle backup with NetWorker server 6.x, if the NSR_SAVESET_RETENTION environment variable is set as described in <a href="#">"Appendix A: Environment Variables in the RMAN Session" on page 123</a>, its value <i>overrides</i> the Retention Policy attribute setting in the Client resource.</p> <p>To set a specific retention policy for a <i>manual</i> Oracle backup with NetWorker server 6.x, use the NSR_SAVESET_RETENTION environment variable. If the NSR_SAVESET_RETENTION variable is <i>not</i> set, the NetWorker server uses the most appropriate value for the retention policy.</p>
Save Set	<p>Specifies the complete pathname of each RMAN script to be used for a <i>scheduled</i> Oracle backup. For more information, see <a href="#">"Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 66</a>.</p>
Schedule	<p>Specifies the NetWorker backup schedule to be used for a <i>scheduled</i> Oracle backup. For more information, see <a href="#">"Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 66</a>.</p>

For more information on how the NetWorker server uses the browse and retention policies to manage Oracle backup data and enable the data to be restored, see ["Preparing to Restore Oracle Data" on page 77](#).

**Note:** If the NetWorker server software is installed on the Oracle Server host, a Client resource for the Oracle Server host is created automatically during the NetWorker installation.

For more information on how to configure the NetWorker Client resource and its attributes, refer to the NetWorker server Online Help and the *Legato NetWorker Administrator's Guide*.

## Task 4: Configure the NetWorker Device Resources

The NetWorker server uses an Oracle storage device to write data during an Oracle backup and to read data during an Oracle restore. The NetWorker server configuration must include a Device resource for each Oracle storage device used for backup and restore operations. In addition, each Oracle storage device must contain a labeled and mounted volume.

To create, modify, or remove a Device resource, use the NetWorker Administrator program. For more information on storage devices and how to configure the NetWorker Device resources, refer to the NetWorker server Online Help and the *Legato NetWorker Administrator's Guide*.

For a complete list of the storage devices that the NetWorker server supports, refer to the *Legato Hardware Compatibility Guide* on the Legato web site.

## Task 5: Configure the NetWorker Volume Pools

With the NetWorker server software, backups can be directed to groups of media or backup volumes called *pools*. Volume pools provide a logical and systematic method for tracking, organizing, and sorting backup data. For example, the backups of Oracle data such as tablespaces and archived redo logs can be directed to volumes in specific devices. Label templates also provide a consistent method for labeling the volumes in pools.

### Pools

A *pool* is a specific collection of backup volumes that the NetWorker server uses to sort and store data. Each NetWorker volume pool is defined by its Pool resource in the NetWorker server. The configuration settings specified in the Pool resource act as a filter that the NetWorker server uses to determine which type of data to write to the volumes in that pool. Each volume pool has a Pool Type attribute.

**Note:** For NetWorker Module for Oracle, the only valid pool types are *backup* and *backup clone*.

Each NetWorker volume belongs to a pool, either a preconfigured pool or one that the user creates. Each pool has a specific label template associated with it, providing an automated method of identifying the media assigned to a pool. NetWorker software uses pools of volumes in conjunction with their label templates to track what data is on which volume.

**Note:** If a customized volume pool is not specified for the Oracle backup volumes, the NetWorker server routes Oracle backup data to the appropriate volume pool for the backup.

To create, modify, or remove a Pool resource, use the NetWorker Administrator program. For more information on volume pools and how to configure NetWorker Pool and Label Template resources, refer to the NetWorker server Online Help and the *Legato NetWorker Administrator's Guide*.

## Setting the NSR\_DATA\_VOLUME\_POOL Variable

To send the data from a manual or scheduled Oracle backup to a specific pool, the NSR\_DATA\_VOLUME\_POOL variable can be set in the RMAN backup session. For more information on the two types of Oracle backups, see:

- ["Chapter 3: Manual Oracle Backups" on page 41](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 51](#)

Use the **set duplex** command in the RMAN script to generate up to four copies of an Oracle backup and store those copies on separate media. For more information on the **set duplex** command, see ["Appendix B: RMAN Commands" on page 131](#).

**Note:** The **set duplex** command is deprecated (no longer supported, but still functional) in Oracle9i. For more information on new Oracle9i duplexing commands, see ["Backup Copies" on page 148](#).

Depending on the value used with the duplexing command in the RMAN script, one or more of the NSR\_DATA\_VOLUME\_POOL1, NSR\_DATA\_VOLUME\_POOL2, and NSR\_DATA\_VOLUME\_POOL3 environment variables might need to be set.

For more information on the NSR\_DATA\_VOLUME\_POOL variables, see ["Appendix A: Environment Variables in the RMAN Session" on page 123](#).

## Task 6: Configure Firewall Support

The NetWorker Module for Oracle software provides firewall support. The ports that the NetWorker Module for Oracle software uses for the firewall depend on the corresponding ports configured for the NetWorker server.

To configure the firewall that the NetWorker Module for Oracle software uses, follow the firewall configuration instructions in the *Legato NetWorker Administrator's Guide* for the particular NetWorker server platform.

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## Chapter 3: Manual Oracle Backups

This chapter describes how to set up and run manual Oracle backups. NetWorker Module for Oracle enables manual Oracle backups using either the Oracle RMAN command line interface or the OEM Backup Management Tools.

An important consideration with manual Oracle backups is maintaining regular NetWorker server bootstrap backups to ensure adequate preparation for disaster recovery.

This chapter includes the following main sections:

- ["Roadmap for Manual Oracle Backups" on page 41](#)
- ["Task 1: Create RMAN Scripts for Manual Backups" on page 42](#)
- ["Task 2: Perform the Manual Oracle Backup" on page 45](#)
- ["Using the OEM Backup Management Tools" on page 45](#)
- ["NetWorker Server Bootstrap Backup" on page 46](#)
- ["Archived Redo Log Backups" on page 47](#)
- ["Recovery Catalog Backups" on page 48](#)
- ["Canceling a Manual Oracle Backup" on page 48](#)
- ["Monitoring Manual Oracle Backups" on page 49](#)

### Roadmap for Manual Oracle Backups

Before configuring manual Oracle backups, the Oracle and NetWorker systems must be properly configured, as described in the ["Software Configuration Roadmap" on page 31](#). The NetWorker Server, Client, Device, and Pool resources must be configured, and the required backup volumes must be labeled and mounted in the storage devices.

To perform a manual Oracle backup, use either the RMAN command line interface or the OEM Backup Management Tools.

- To use the RMAN command line interface:
  1. Create the RMAN backup script for the manual Oracle backup, as required. See "[Task 1: Create RMAN Scripts for Manual Backups](#)" on page 42.
  2. Run the manual Oracle backup using the RMAN command line interface. See "[Task 2: Perform the Manual Oracle Backup](#)" on page 45.
- To use the OEM Backup Management Tools, see "[Using the OEM Backup Management Tools](#)" on page 45.



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**Important:** The NetWorker server bootstrap and client indexes are *not* automatically backed up at the end of a manual Oracle backup, as they are for a scheduled Oracle backup. After running a manual Oracle backup, perform a NetWorker server bootstrap backup using the instructions in "[NetWorker Server Bootstrap Backup](#)" on page 46.

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For information on how to keep track of the status of a manual Oracle backup, see "[Monitoring Manual Oracle Backups](#)" on page 49.

For information on how to configure and run scheduled Oracle backups, see "[Chapter 4: Scheduled Oracle Backups](#)" on page 51.

## Task 1: Create RMAN Scripts for Manual Backups

Create an appropriate RMAN script to perform the preferred type of manual Oracle backup on an Oracle Server host.

RMAN backup scripts can be stored as flat ASCII files. Alternatively, if a Recovery Catalog is used, backup scripts can be stored in the Recovery Catalog database. For more information on storing the backup scripts in the Recovery Catalog database, refer to the appropriate Oracle backup and recovery documentation.

For example, the following RMAN script performs an Oracle backup of the entire database to the volume pool *MondayFulls* using the (remote) NetWorker server *mars.legato.com*.

**Note:** As required in Oracle8, the script uses the **parms** option in the **allocate channel** command to set the environment variables. Oracle8 does *not* support the **send** command. However, in Oracle8i and Oracle9i, it is recommended that the variables be set using the **send** command. See ["The send Command" on page 134](#).

```
run {
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_SERVER=mars.legato.com,
    NSR_DATA_VOLUME_POOL=MondayFulls)';

    allocate channel t2 type 'SBT_TAPE'
    parms 'ENV=(NSR_SERVER=mars.legato.com,
    NSR_DATA_VOLUME_POOL=MondayFulls)';

    backup full filesperset 4
    format '/FULL_%d_%u/'
    (database);

    release channel t1;

    release channel t2;

}
```

**Note:** To prevent backup performance problems, use forward slashes in the **format** option in either the RMAN **backup** command or **configure** command, to generate backup piece names that resemble UNIX directory names. For more information on this issue, refer to the *Legato NetWorker Module for Oracle Release Supplement*.

If automatic channel allocation and persistent settings are used in Oracle9i, the **backup** command can be run as a stand-alone command. See ["Automatic Channel Allocation" on page 145](#).

Set the **type** option in the RMAN **allocate channel** command to **SBT\_TAPE**. This value specifies a Media Management (in this case, NetWorker Module for Oracle) device.

If a device is allocated using the **allocate channel t1 type disk** command (with Oracle correctly configured and NetWorker Module for Oracle uninstalled), backups can be directed to disk files through Oracle's backup implementation. Obviously, in this case, the **parms** option has no effect.

To ensure that the required `NSR_*` environment variables are set during an Oracle backup, set them:

- In Oracle8i or Oracle9i, using the RMAN **send** command (*recommended*).
- In Oracle9i *for manual backups only*, using the **send** option in the **configure channel** command.
- In Oracle8, Oracle8i, or Oracle9i, using the **parms** option in *either* the **allocate channel** command *or* the **configure** command (*Oracle9i only*).

**Note:** The `NSR_*` environment variables *cannot* be set using another command, such as **setenv** or **set**, on the operating system command line.

For complete information on setting the `NSR_*` environment variables in the RMAN script or session, see "[Appendix A: Environment Variables in the RMAN Session](#)" on page 123.

In the RMAN backup script on [page 43](#), the **format** string `FULL_%d_%u` specifies the name of each backup piece. This name can be anything, *provided that each backup piece has a unique name on the NetWorker server*. Substitution variables, such as `%d` and `%u`, can be used to guarantee unique names.

- `%d` specifies the name of the database.
- `%u` specifies an eight-character name consisting of compressed representations of the backup set number and time the backup set was created.

A **format** string such as `FULL` or `FULL_%d` will *not* generate unique names. Similarly, the **format** string `FULL_%u` will *not* generate unique names for two databases being backed up to the same NetWorker server.

If a backup piece name is *not* unique:

- In Oracle8, NetWorker Module for Oracle attempts to remove the entry for the previous backup of the same name from the NetWorker index. The removal succeeds only if the required user name is in the Administrator list in the NetWorker Server resource, as described in "[Setting the NetWorker Administrator Attribute](#)" on page 34.
- In Oracle8i and Oracle9i, the Oracle backup fails.

Refer to the following sources for more information:

- For information on how to write RMAN scripts, refer to the appropriate Oracle backup and recovery documentation.
- For information on how to use the OEM Backup Wizard to generate RMAN scripts, refer to the Oracle Enterprise Manager documentation.
- For important Legato-specific information on RMAN commands, see "[Appendix B: RMAN Commands](#)" on page 131.

## Task 2: Perform the Manual Oracle Backup

Before starting a manual Oracle backup, ensure that the required configurations and scripts are in place.

- The Oracle system must be properly configured, as described in "[Chapter 2: Software Configuration Procedures](#)" on page 31.  
The Oracle Server should have the Net service configured. If a Recovery Catalog will be used, the Recovery Catalog should be set up and the target database registered.
- The NetWorker server must have the required Server, Client, Device, and Pool resources configured, as described in "[Chapter 2: Software Configuration Procedures](#)" on page 31.
- A volume must be labeled (and mounted as required) in each configured backup device, or—if auto media management is enabled for a tape device or autochanger—a tape must be loaded in the tape device or autochanger for the NetWorker server to use automatically.
- If using an RMAN backup script, the script must be created, as described in "[Task 1: Create RMAN Scripts for Manual Backups](#)" on page 42.

A manual Oracle backup can be started using the RMAN command line interface on the Oracle Server host.

For example, if the RMAN backup script on [page 43](#) is stored in the file `/disk1/scripts/full_backup.txt` on the Oracle Server and the Net service has been configured to connect to the databases `payroll` and `rcvcatdb`, the manual Oracle backup can be started with the following command:

```
% rman target internal/oracle@payroll rcvcat
rman/rman@rcvcatdb cmdfile
\ '/disk1/scripts/full_backup.txt\ '
```

For more information on the `rman` command line options, refer to the appropriate Oracle backup and recovery documentation.

## Using the OEM Backup Management Tools

The OEM Backup Management Tools can be used instead of the RMAN command line interface to start an Oracle database backup. The OEM Backup Management Tools include a graphical user interface to RMAN for generating the required RMAN commands and performing backup and restore operations.



**Important:** After the completion of a NetWorker Module for Oracle backup or restore, the OEM job queue history displays the status of the job as “failed”, even if the backup or restore completed successfully. This is due to a known problem with OEM. View the job output to confirm that the backup or restore completed successfully.

---

For more information on using the OEM Backup Management Tools, refer to the Oracle Enterprise Manager documentation included with the product kit.

## 3

### NetWorker Server Bootstrap Backup

The bootstrap is a special save set that the NetWorker server software creates in preparation for disaster recovery. The bootstrap save set contains the information needed to restore the online NetWorker indexes and resource configuration files to the state just before the bootstrap was created.

The NetWorker server automatically performs a backup of its bootstrap and the client index of the Oracle Server only at the end of a *scheduled* Oracle backup. This is done by the NetWorker **savegrp** program that performs the scheduled backup.

**Note:** If only manual Oracle backups are run and the client index and bootstrap are not backed up manually, there will be *no* backups of the online client index and NetWorker server bootstrap available for use in the event of a disaster recovery on the NetWorker server.

After finishing a manual Oracle backup, back up the bootstrap and client index. To back up the bootstrap and index, log in as root (on a UNIX NetWorker server) or as administrator (on a Windows NetWorker server) and run the following **savegrp** command:

```
# savegrp -O -l full -P printer_name -c Oracle_Server_name -c  
NetWorker_server_name
```

Specify the correct values in the **savegrp** command:

- *printer\_name* is the name of the printer where the bootstrap information is printed at the end of the bootstrap backup.
- *Oracle\_Server\_name* is the hostname of the Oracle Server.
- *NetWorker\_server\_name* is the hostname of the NetWorker server.

After successfully backing up the bootstrap and the client index using the **savegrp** command:

- Information confirming the completion of **savegrp** is displayed in the NetWorker Administrator program.
- Information is sent to the *printer\_name* printer about the saved bootstrap.

*Store the bootstrap printout in a safe place.* The printed bootstrap information includes dates, locations, and save set ID numbers for the bootstrap save sets backed up during the past month. With this information, determine which volumes are needed to recover the NetWorker indexes and resource configuration files during a disaster recovery.

Refer to the following sources for more information:

- For information on the **savegrp** command and options, refer to the:
  - *Legato NetWorker Administrator's Guide* for the particular NetWorker server platform.
  - **savegrp** man page on UNIX.
  - **savegrp** entry in the *Legato Command Reference Guide*.
- For information on bootstrap backups, refer to the *Legato NetWorker Administrator's Guide* for the particular platform.
- For information on how to use the bootstrap backup during a disaster recovery, refer to the *Legato NetWorker Disaster Recovery Guide*.

## Archived Redo Log Backups

Archived redo log backups enable recovery of the database to its predisaster state. Without archived redo log backups, the database can be recovered only to the time of the last consistent Oracle backup. In this case, transactions that occurred between the time of the last consistent backup and the time of the database corruption will be lost.

Archived redo logs can be backed up using the appropriate option of the RMAN **backup** command. Archived redo log files are *not* backed up automatically during Oracle backups.

For a sample script to back up the archived redo log files in an OPS or RAC system, see "[Backing Up All Archived Logs from Each Node](#)" on page 96.

For more information on setting up and running archived redo log backups, refer to the appropriate Oracle backup and recovery documentation.

## Recovery Catalog Backups

Backing up the Recovery Catalog should be part of the backup and recovery strategy. Back up the Recovery Catalog after every target database backup.

For more information on setting up and running Recovery Catalog backups, refer to the appropriate Oracle backup and recovery documentation.

## Canceling a Manual Oracle Backup

To keep the NetWorker index and RMAN catalog synchronized, include the Oracle user name in the Administrator list in the NetWorker Server resource before canceling a manual Oracle backup. For more information, see ["Setting the NetWorker Administrator Attribute" on page 34](#).

To cancel a manual Oracle backup, see the appropriate section:

- ["How to Cancel a Running Oracle Backup" on page 48](#)
- ["How to Cancel a Nonresponding Oracle Backup" on page 48](#)

## How to Cancel a Running Oracle Backup

Cancel a running manual Oracle backup (*not* including a backup initiated by OEM) during the RMAN script execution on any platform by pressing the [Ctrl]+[c] keys or the equivalent "attention" key combination on the system.

If this method of canceling a manual Oracle backup is not successful, use the **alter system kill** command described in ["Canceling a Scheduled Oracle Backup" on page 71](#).

## How to Cancel a Nonresponding Oracle Backup

The following procedures for canceling a nonresponding Oracle backup *might* work. If these procedures do *not* work, contact Oracle for assistance.

**Note:** Using the following procedures to cancel a nonresponding Oracle backup, the NetWorker index and RMAN catalog might become unsynchronized, since the NetWorker Module for Oracle does *not* attempt to remove the backup save set entries from the NetWorker index.



To cancel a nonresponding Oracle backup:

1. Include the **set command id to 'xxx'** command in the RMAN backup script used for the scheduled Oracle backup. Otherwise, the query in the next step will fail. For a sample script including this command, see "[Task 1: Create RMAN Scripts for Scheduled Backups](#)" on page 53.
2. Run the following query in the Oracle **svrmgr** or **sqlplus** program to determine the Oracle process ID corresponding to each RMAN channel:

```
select spid, client_info from v$process p, v$session s
where p.addr=s.paddr and client_info like '%id=%';
```

3. Run the following **kill** command to cancel the Oracle backup process, where *pid* is the appropriate Oracle process ID:

```
kill -9 pid
```

## Monitoring Manual Oracle Backups

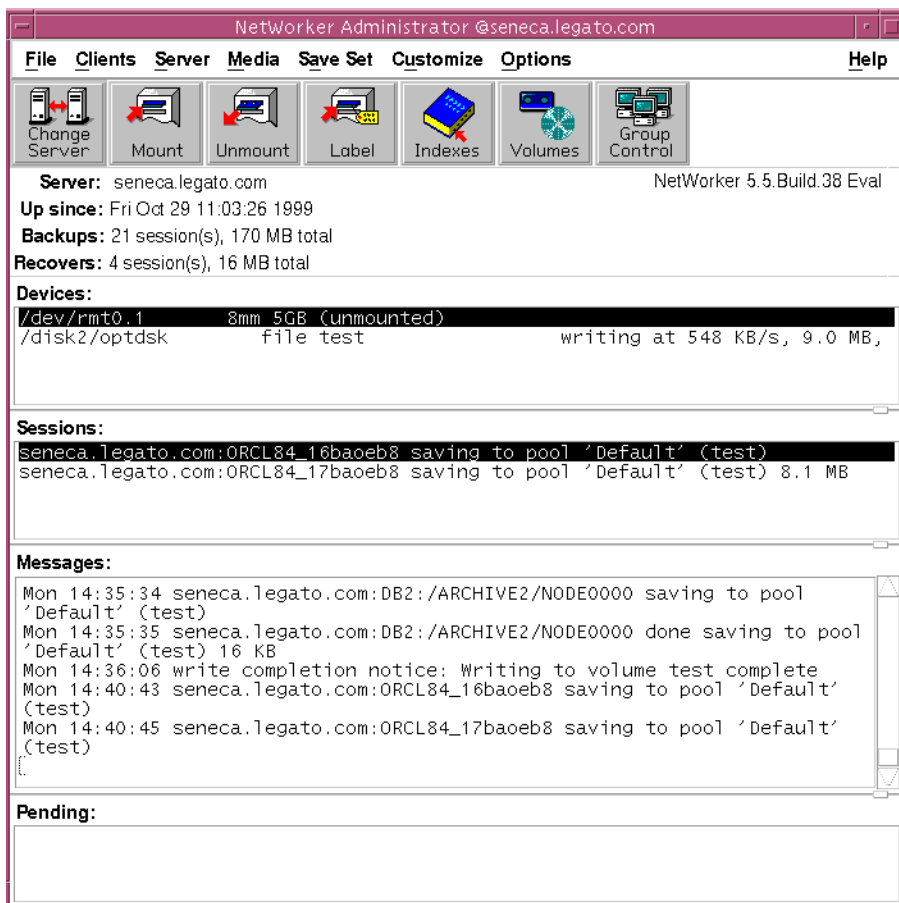
To monitor the status of Oracle backup and restore operations, use the NetWorker Administrator program. The Administrator program displays progress and completion messages that advise when a backup or restore is complete, and information on why a backup or restore cannot proceed.

For more information on viewing these types of messages using the NetWorker Administrator program, refer to the *Legato NetWorker Administrator's Guide* for the particular NetWorker server platform.

For information on how to obtain RMAN-specific and NetWorker Module for Oracle diagnostic and error messages, see "[Appendix D: Troubleshooting and Error Messages](#)" on page 153.

[Figure 5 on page 50](#) shows the types of messages displayed in the Sessions and Messages sections of the main NetWorker Administrator program window during an Oracle backup.

Figure 5. Oracle Backup Messages in the NetWorker Administrator



# Chapter 4: Scheduled Oracle Backups

This chapter describes how to use NetWorker Module for Oracle to set up and run scheduled Oracle backups. It also outlines the procedures for testing, canceling, and monitoring scheduled Oracle backups.

**Note:** Before configuring and running scheduled Oracle backups using the instructions in this chapter, execute a successful manual Oracle backup using the instructions in ["Chapter 3: Manual Oracle Backups" on page 41](#).

This chapter includes the following main sections:

- ["Roadmap for Scheduled Oracle Backups" on page 52](#)
- ["Task 1: Create RMAN Scripts for Scheduled Backups" on page 53](#)
- ["Task 2: Customize the nsrnmo Script" on page 56](#)
- ["Task 3: Configure a NetWorker Backup Schedule" on page 64](#)
- ["Task 4: Configure a NetWorker Backup Group" on page 65](#)
- ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 66](#)
- ["Testing a Scheduled Oracle Backup" on page 69](#)
- ["Archived Redo Log Backups" on page 70](#)
- ["Recovery Catalog Backups" on page 70](#)
- ["Canceling a Scheduled Oracle Backup" on page 71](#)
- ["Monitoring Scheduled Oracle Backups" on page 72](#)
- ["Automation of NSR\\_SERVER and NSR\\_GROUP Variable Settings" on page 72](#)
- ["Scheduled Oracle Backup Information in the NetWorker Indexes" on page 74](#)

## Roadmap for Scheduled Oracle Backups

Before configuring scheduled Oracle backups, the Oracle and NetWorker systems must be properly configured, as described in the ["Software Configuration Roadmap" on page 31](#). The NetWorker Server, Client, Device, and Pool resources must be configured, and the required backup volumes must be labeled and mounted in the storage devices.

The NetWorker server works with NetWorker Module for Oracle to back up the Oracle database according to the selected NetWorker schedule. The Oracle Server must be configured as a NetWorker client, with the Client resource including details on what Oracle data to back up and how.

The NetWorker server can be configured to run RMAN on a regular basis for scheduled Oracle backups. For example, the scheduled backups might include a daily backup of the archived logs and a weekly full backup of the Oracle database.

To configure scheduled Oracle backups:

1. Create the RMAN backup script to use for running the scheduled Oracle backup. See ["Task 1: Create RMAN Scripts for Scheduled Backups" on page 53](#).
2. Customize the `nsrnm` script for the scheduled backup (the file `nsrnm`), setting the required environment variables in the script. See ["Task 2: Customize the nsrnm Script" on page 56](#).
3. Configure the required backup schedules. See ["Task 3: Configure a NetWorker Backup Schedule" on page 64](#).
4. Configure the required backup groups. See ["Task 4: Configure a NetWorker Backup Group" on page 65](#).
5. Configure a NetWorker Client resource for the scheduled backup. See ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 66](#).

After completing these configuration steps:

- Run a test scheduled Oracle backup using the steps in ["Testing a Scheduled Oracle Backup" on page 69](#).
- Review the steps for canceling a scheduled Oracle backup in ["Canceling a Scheduled Oracle Backup" on page 71](#).

For information on how to keep track of the status of scheduled Oracle backups, see ["Monitoring Scheduled Oracle Backups" on page 72](#).

For information on how to access the Oracle backup information in the online NetWorker indexes, see ["Scheduled Oracle Backup Information in the NetWorker Indexes" on page 74](#).

## Task 1: Create RMAN Scripts for Scheduled Backups

Create an appropriate RMAN script to perform the preferred type of scheduled Oracle backup on an Oracle Server host.

For example, the following RMAN script performs an Oracle backup of the entire database to the volume pool *MondayFulls*. The Recovery Catalog is used in this case.

**Note:** As required in Oracle8, the script uses the **parms** option in the **allocate channel** command to set the environment variables. Oracle8 does *not* support the **send** command. However, in Oracle8i and Oracle9i, it is recommended that the variables be set using the **send** command. See ["The send Command" on page 134](#).

```
connect target target_user/target_passwd@target_Netservicename;
connect rcvcat rcvcat_user/rcvcat_passwd@rcvcat_Netservicename;
run {
    set command id to 'xxx';
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=MondayFulls)';
    allocate channel t2 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=MondayFulls)';
    backup full filesperset 4
    format '/FULLL_%d_%u/'
    (database);
    release channel t1;
    release channel t2;
}
```

**Note:** To prevent backup performance problems, use forward slashes in the **format** option in either the RMAN **backup** command or **configure** command, to generate backup piece names that resemble UNIX directory names. For more information on this issue, refer to the *Legato NetWorker Module for Oracle Release Supplement*.

If automatic channel allocation and persistent settings are used in Oracle9i, a scheduled RMAN backup script must still be created, containing the **connect target**, **connect rcvcat** (if using a Recovery Catalog), and **backup** commands.

The command **connect target** *target\_user/target\_passwd@target\_Netservicename* is *mandatory* in each RMAN script for a scheduled Oracle backup. This command establishes the proper connection to the target database.

Specify the correct values in the **connect target** command:

- *target\_user* is the user with SYSDBA privileges for the target database.
- *target\_passwd* is the password of the *target\_user* (for connecting as SYSDBA), specified in the target database's *orapwd* file.
- *target\_Netservicename* is the Net service name of the target database. This name is *mandatory* in the **connect target** command.

A password file must be used for the target database. To do so, the *orapwd* utility might need to be used and the REMOTE\_LOGIN\_PASSWORDFILE parameter set to *exclusive* in the *init<oracle\_sid>.ora* file. For more information, refer to the appropriate Oracle documentation.

#### Notes:

- Since each scheduled backup RMAN script requires a **connect target** command, each Oracle instance requires a *separate* scheduled backup RMAN script.
- In the **connect target** command, do *not* use the value **internal** for *target\_user* or the value **oracle** for *target\_passwd*.

The command **connect rcvcat** *rcvcat\_user/rcvcat\_passwd@rcvcat\_Netservicename* is *mandatory* if the Recovery Catalog is used for the scheduled Oracle backup. This command establishes the proper connection to the Recovery Catalog database.

Specify the correct values in the **connect rcvcat** command:

- *rcvcat\_user* is the owner of the Recovery Catalog database.
- *rcvcat\_passwd* is the password of the *rcvcat\_user*.
- *rcvcat\_Netservicename* is the Net service name of the Recovery Catalog database.

To enable the scheduled backup to be canceled, the scheduled Oracle backup script must include **set command id to 'xxx'** (where *xxx* can be any string of characters *enclosed in single quotes*). For more information on how to cancel a scheduled Oracle backup, see ["Canceling a Scheduled Oracle Backup" on page 71](#).

The remainder of the RMAN script on [page 53](#), starting with the first **allocate channel** command, is similar to the RMAN script on [page 43](#) *except* that the NSR\_SERVER environment variable setting is *not* included. For more information on creating RMAN backup scripts, see "[Task 1: Create RMAN Scripts for Manual Backups](#)" on [page 42](#).



---

**Important:** Do *not* set the NSR\_SERVER or NSR\_GROUP environment variable in a scheduled RMAN backup script. NetWorker Module for Oracle sets these two variables to the values specified in the Client resource for the scheduled Oracle backup—and these values *cannot* be overridden.

---

To have the scheduled backup automatically use a volume pool, the backup group can be specified in the Pool resource. The scheduled backup uses that pool unless the NSR\_DATA\_VOLUME\_POOL variable is set in the RMAN script. The NSR\_DATA\_VOLUME\_POOL setting takes precedence over any pool associated with the scheduled backup group. If NSR\_DATA\_VOLUME\_POOL is set in the RMAN script to a pool different from the pool associated with the backup group, the scheduled backup uses the NSR\_DATA\_VOLUME\_POOL pool. It is the user's responsibility to set NSR\_DATA\_VOLUME\_POOL correctly in the RMAN script for a scheduled backup.

Each scheduled backup RMAN script must be stored as a flat ASCII file. The database administrator should give *minimal* permissions to the scheduled backup RMAN script file, to ensure that unauthorized users *cannot* see the sensitive user IDs and passwords of the target and Recovery Catalog databases.

If a single Oracle instance has multiple RMAN scripts associated with it (for example, to perform tablespace-level or file-level, full or incremental backups, and so on), the database administrator might choose to place the two common **connect** commands in a single file and invoke those two **connects** in all RMAN scripts using the @ command.

## Testing RMAN Backup Scripts

When a scheduled RMAN backup script is created, test the script before using it for scheduled backups.

To test the RMAN script, use one of the following methods:

- In Oracle8, set the NSR\_SERVER and NSR\_GROUP environment variables using the **parms** option in the **allocate channel** command in the RMAN script. Then run one of these commands:

```
% rman cmdfile 'script_name'
% rman nocatalog cmdfile 'script_name'
```

where *script\_name* is the RMAN script file pathname.

After this test, the NSR\_SERVER and NSR\_GROUP variable settings can be deleted from the RMAN script. If the variable settings are left in the script, they will have *no effect* during scheduled Oracle backups.

- In Oracle8i or Oracle9i, run one of these commands:

```
% rman cmdfile 'script_name' send
'"NSR_ENV=(NSR_SERVER=NetWorker_server_name,
NSR_GROUP=group_name)"'
% rman nocatalog cmdfile 'script_name' send
'"NSR_ENV=(NSR_SERVER=NetWorker_server_name,
NSR_GROUP=group_name)''
```

where:

- *script\_name* is the RMAN script file pathname.
- *NetWorker\_server\_name* is the name of the server that starts the backup.
- *group\_name* is the name of the scheduled backup group as specified in the Client resource.

## Task 2: Customize the nsrnm0 Script

Customize the **nsrnm0** script on the Oracle Server host by modifying the environment variables in the script.

The NetWorker Module for Oracle installation on the Oracle Server host stores:

- The sample script named *nsrnm0* in the same directory as the NetWorker executables.
- A template of the script in the */etc/nsrnm0.sh* file. *Do not modify this file.*

Multiple versions of the **nsrnm0** script can be created (for example, one for each Oracle instance) on the same Oracle Server host. Each version of the script must have a *unique* name, starting with the letters *nsr* or *save*.



To create a new version of the **nsrnm0** script:

1. Copy the sample script file, *nsrnm0*, to a file with a different name.
2. Customize the environment variables in the new file.

For example, the new script file named *nsrnm0\_prodDB* might be created.

All versions of the **nsrnm0** script must be located in the same directory as the NetWorker executables. Do *not* move the **nsrnm0** scripts to a different directory.

**Note:** A **nsrnm0** script from NetWorker Module for Oracle release 3.x works with this release 4.0 software. However, the **nsrnm0** script installed with the NetWorker Module for Oracle release 4.0 includes new functionality and settings, such as the new environment variables LIBPATH, SHLIB\_PATH, and TNS\_ADMIN, not found in the script with the 3.0 or 3.1 release.

## Environment Variables in the nsrnm0 Script

The sample **nsrnm0** script installed with NetWorker Module for Oracle contains environment variables that must be customized for a particular scheduled Oracle backup. The variables in the sample **nsrnm0** script are all *undefined* by default.

The **nsrnm0** script contains only the variables required on the particular system where the script is installed. The following variables appear in the **nsrnm0** script only on specific operating systems:

- LD\_LIBRARY\_PATH appears in the script on 64-bit HP-UX and Solaris (SPARC).
- SHLIB\_PATH appears in the script on 32-bit HP-UX and 64-bit HP-UX.

Follow the instructions in the *Oracle Installation Guide* to determine which environment variable—LD\_LIBRARY\_PATH or SHLIB\_PATH—to set on a particular operating system and to what value.

The ORACLE\_HOME and PATH environment variables are *mandatory* for each scheduled backup; they *must* be set in the **nsrnm0** script. The other environment variables in the **nsrnm0** script are *optional*; they can be left undefined in the script, if preferred.

**Note:** For other Oracle environment variables to be in effect during a scheduled Oracle backup, lines must be added in the **nsrnm0** script to define and export the variables. Using a **setenv** command on the operating system command line to set the variables has *no effect*.

The following sections describe all the environment variables that can be set in the **nsrnm0** script for scheduled backups. Refer to the comments in the **nsrnm0** script file itself for details on the variables.

The environment variables in the **nsrnm0** script are as follows:

- "ORACLE\_HOME" on page 58
- "PATH" on page 58
- "LD\_LIBRARY\_PATH" on page 59
- "SHLIB\_PATH" on page 59
- "NSR\_RMAN\_ARGUMENTS" on page 60
- "NSR\_SB\_DEBUG\_FILE" on page 60
- "PRECMD" on page 61
- "POSTCMD" on page 62
- "TNS\_ADMIN" on page 64

## ORACLE\_HOME

This environment variable is *mandatory* for each scheduled backup. Set ORACLE\_HOME in the **nsrnm0** script file to the home directory of the Oracle Server installation. The RMAN executable (**rman**) must be located in the subdirectory *bin* of \$ORACLE\_HOME.

For example, if the Oracle Server installation is located in the directory */disk3/oracle/app/oracle/product/8.1.5*, ORACLE\_HOME must be set in the **nsrnm0** script as follows:

```
ORACLE_HOME=/disk3/oracle/app/oracle/product/8.1.5
```

## PATH

This environment variable is *mandatory* for each scheduled backup. Set PATH in the **nsrnm0** script file to include the pathname of the directory containing the NetWorker Module for Oracle **nsrnm0start** program on the Oracle Server host. This directory also contains the NetWorker executables.

For example, if the program **nsrnm0start** is located in the directory */usr/bin* on the Oracle Server host, set PATH in the **nsrnm0** script to the following type of value:

```
PATH=/usr/bin
```

## LD\_LIBRARY\_PATH

This environment variable is *optional* for a scheduled backup.

LD\_LIBRARY\_PATH can be set in the **nsrnm** script file to the pathname of the directory containing the Oracle libraries, typically *\$ORACLE\_HOME/lib* or *\$ORACLE\_HOME/lib64*.

For example, if the Oracle libraries are located in the directory */disk3/oracle/app/oracle/product/8.1.5/lib*, set LD\_LIBRARY\_PATH in the **nsrnm** script as follows:

```
LD_LIBRARY_PATH=/disk3/oracle/app/oracle/product/8.1.5/lib
```

Uncomment the line “export LD\_LIBRARY\_PATH” (by removing the # symbol at the start of the line) under the function heading “export\_environment\_variables()” in the **nsrnm** script:

```
export_environment_variables()
{
    export ORACLE_HOME
    export NSR_RMAN_ARGUMENTS
    :
    :
    export LD_LIBRARY_PATH
}
```

## SHLIB\_PATH

This environment variable is *optional* for a scheduled backup. It is included in the **nsrnm** script on HP-UX systems *only*. As with LD\_LIBRARY\_PATH, SHLIB\_PATH can be set in the **nsrnm** script file to the pathname of the directory containing the Oracle libraries, typically *\$ORACLE\_HOME/lib*.

To set SHLIB\_PATH in the **nsrnm** script, follow the example shown in ["LD\\_LIBRARY\\_PATH" on page 59](#), replacing LD\_LIBRARY\_PATH with SHLIB\_PATH. Uncomment the line “export SHLIB\_PATH” in the script.

## NSR\_RMAN\_ARGUMENTS

This environment variable is *optional* for a scheduled backup.

NSR\_RMAN\_ARGUMENTS can be set to a double-quoted string containing any valid combination of parameters for the RMAN executable, **rman**. For a list of the valid parameters, refer to the appropriate Oracle Recovery Manager documentation.

For example, to append RMAN output to the message log file `/nsr/applogs/msglog.log`, set NSR\_RMAN\_ARGUMENTS in the **nsrnm0** script as follows:

```
NSR_RMAN_ARGUMENTS="msglog '/nsr/applogs/msglog.log'
append"
```

To append RMAN output to the message log file `/nsr/applogs/msglog.log` if a Recovery Catalog is not used, set NSR\_RMAN\_ARGUMENTS in the **nsrnm0** script as follows:

```
NSR_RMAN_ARGUMENTS="nocatalog msglog
'/nsr/applogs/msglog.log' append"
```

**Note:** In Oracle9i, **nocatalog** is the default option in RMAN.

## NSR\_SB\_DEBUG\_FILE

This environment variable is *optional* for a scheduled backup. It is only used for debugging purposes.

Enable debugging by setting NSR\_SB\_DEBUG\_FILE to the complete pathname of a file to receive detailed debugging information for the scheduled backup. This file will exclude MML-specific debugging information, which is directed to NSR\_DEBUG\_FILE (if set in the RMAN script).

**Note:** If NSR\_SB\_DEBUG\_FILE is undefined (by default), no debugging information is generated. If a file with the specified pathname *cannot* be created, debugging information is either directed to the default location or not generated.

For example, to send detailed debugging information for the scheduled backup to the `/usr/logs/schedbkup.log` file, set the NSR\_SB\_DEBUG\_FILE variable in the **nsrnm0** script as follows:

```
NSR_SB_DEBUG_FILE=/usr/logs/schedbkup.log
```

For more information on how the debugging information is written if the NSR\_SB\_DEBUG\_FILE variable is set to an invalid pathname, see "[NetWorker Module for Oracle Error Messages](#)" on page 155.

## PRECMD

This environment variable is *optional*. Set PRECMD to the *complete* pathname of a file containing a preprocessing script to be executed before the RMAN backup script. If the precommand script fails (returns a nonzero value), the scheduled Oracle backup does not proceed (that is, the RMAN script is not executed).



**Important:** The script file must have permissions allowing execution by the root user, as the scheduled Oracle backup is always launched by root. The script should return a zero value when it succeeds and a nonzero value when it fails. The return of a nonzero value will cause the scheduled backup to fail.

A sample preprocessing script is shown as follows. This script is stored in the file whose complete pathname is specified in the PRECMD variable in the **nsrnm** script.

For example, if the script is stored in the `/usr/scripts/orashutdown` file, set the PRECMD variable as follows:

```
PRECMD=/usr/scripts/orashutdown
```

This sample script shuts down the Oracle database, presumably for an offline database backup. The **su** command is required in the script since the **nsrnm** script runs as root user.

```
#!/bin/ksh
# Define Site Specifics Here
TARGET_DATABASE=orcl84
ERRFILE=/tmp/precmd.log
ORACLE_USER=oracle84
#
# Scheduled backup launches as "root" run PRECMD as oracle
user
su - $ORACLE_USER -c "{
# Shutdown target database and start in maintenace mode
export ORACLE_SID=$TARGET_DATABASE
svrmgrl <<EOF1 > $ERRFILE
connect internal
shutdown
startup mount
exit
EOF1
```

```
}"  
# Do checking as root since "su" will always return its  
status  
export status  
# Define status otherwise it is local to if [] statement  
status=0  
# Scan file for errors and only return true or false  
grep -e error -e warning -e fatal $ERRFILE > /dev/null 2>&1  
if [ $? -eq 0 ]; then  
status=1  
else  
status=0  
fi  
exit $status
```

## POSTCMD

This environment variable is *optional*. Set POSTCMD to the *complete* pathname of a file containing a postprocessing script to be executed after the RMAN backup script. If the RMAN backup script fails, the failure is reported, and the postprocessing script is executed nevertheless. If the postprocessing script fails, an error message is reported.



---

**Important:** The script file must have permissions allowing execution by the root user, as the scheduled Oracle backup is always launched by root. The script should return a zero value when it succeeds and a nonzero value when it fails.

---

A sample postprocessing script is shown as follows. This script is stored in the file whose complete pathname is specified in the POSTCMD variable in the **nsrnm0** script.

For example, if the script is stored in the `/usr/scripts/orastartup` file, set the POSTCMD variable as follows:

```
POSTCMD=/usr/scripts/orastartup
```

This sample script starts up the Oracle database, presumably after an offline backup. The **su** command is required in the script since the **nsrnm** script runs as root user.

```
#!/bin/ksh
# Define Site Specifics Here
TARGET_DATABASE=orcl84
ERRFILE=/tmp/postcmd.log
ORACLE_USER=oracle84

#
# Scheduled backup launches as "root" run POSTCMD as user
oracle84
su - $ORACLE_USER -c "{
# Mount target database as ready for use
export ORACLE_SID=$TARGET_DATABASE
svrmgrl <<EOF > $ERRFILE
connect internal
alter database open;
exit
EOF
}"
# Do checking as root since "su" will always return its
status
export status
# Define status otherwise it is local to if [] statement
status=0

# Scan file for errors and only return true or false
grep -e ORA- -e error -e warning -e fatal $ERRFILE >
/dev/null 2>&1
if [ $? -eq 0 ]; then
status=1
else
status=0
fi
exit $status
```

## TNS\_ADMIN

If the Oracle Net8 (in Oracle8 or Oracle8i) or Oracle Net (in Oracle9i) configuration files are located in a directory other than the default `$ORACLE_HOME/network/admin` directory, add the definition of the environment variable `TNS_ADMIN` to the `nsrnm0` script.

In this case, set the value of `TNS_ADMIN` to the pathname of the directory containing the Oracle Net8 or Oracle Net configuration files. To set `TNS_ADMIN` in the `nsrnm0` script, follow the example shown in "[LD\\_LIBRARY\\_PATH](#)" on page 59, replacing `LD_LIBRARY_PATH` with `TNS_ADMIN`. Uncomment the line "export `TNS_ADMIN`" in the script.

## Task 3: Configure a NetWorker Backup Schedule

The NetWorker server uses backup schedules to automate its scheduled backups. The Schedule resource in the NetWorker Administrator program provides a graphical calendar for configuring the backup schedule, to specify the days of the week when a scheduled Oracle backup runs.

The NetWorker server provides several preconfigured schedules. Both the preconfigured schedules and customized schedules can be created and modified.

For more information on how to configure a Schedule resource using the NetWorkerAdministrator program, refer to the *Legato NetWorker Administrator's Guide* for the particular NetWorker server platform.



---

**Important:** For scheduled Oracle backups, the NetWorker backup levels that appear in the NetWorker Schedule resource do *not* determine the Oracle backup levels.

The level of the Oracle backup must be specified as *either full or incremental* in the RMAN backup script. The backup level is determined by the level in the RMAN script.

---



Customize a NetWorker Schedule resource for an Oracle backup. In the Schedule resource, select a level for each day of the week.

- Level full, incremental, or level 1 to 9 specifies that the NetWorker server runs the backup script on that day.
- Level skip specifies that the NetWorker server does *not* run the backup script on that day.

Enter the name of the NetWorker schedule in the Schedule attribute of the Client resource, as described in "[Task 5: Configure the Client Resource for a Scheduled Oracle Backup](#)" on page 66.

## Task 4: Configure a NetWorker Backup Group

A NetWorker backup group is a set of NetWorker Client resources, all of which start backing up data at a specified time *once the Autostart feature is enabled and the backup start time is specified in the Group resource*. One or more Client resources configured for the Oracle Server host can be assigned to a NetWorker backup group.

All NetWorker backup groups can be created and modified. All backup groups *except* the Default group can be deleted. To use the Default group for testing scheduled Oracle backups, change its Autostart attribute to *Enabled*.

Eventually, customized backup groups will probably need to be created for the scheduled Oracle backups. For more information on how to configure a Group resource using the NetWorker Administrator program, refer to the *Legato NetWorker Administrator's Guide*.

By configuring one or more NetWorker backup groups for scheduled Oracle backups, the backups can be distributed to alleviate network traffic and schedule the backups for a time of day when performance demands on the database and NetWorker server are lower.

**Note:** To have a scheduled Oracle backup automatically use a volume pool associated with the backup group, specify the group name in the Pool resource for the volume pool.

## Task 5: Configure the Client Resource for a Scheduled Oracle Backup

At this point, it is assumed that a Client resource has been configured for the Oracle Server using the instructions in ["Task 3: Configure the NetWorker Client Resource" on page 35](#). This Client resource is required to run manual Oracle backups. For more information on manual Oracle backups, see ["Chapter 3: Manual Oracle Backups" on page 41](#).

For scheduled Oracle backups, additional attributes must be specified in the Client resource for the Oracle Server.

To complete the Client resource configuration for scheduled backups, modify the Client resource by using the NetWorker Administrator program:

1. For the Save Set attribute, specify the complete pathname of each RMAN script to be used for a scheduled backup.

For example, if two separate RMAN backup scripts were created in the `/disk/rman_scripts/archlogbkup` and `/disk/rman_scripts/fullbkup` files (to be run by the `nsrnm0` script from [step 4](#)), specify the complete file pathnames for the Save Set attribute:

```
/disk/rman_scripts/archlogbkup  
/disk/rman_scripts/fullbkup
```

2. Specify a NetWorker backup schedule.

For more information on NetWorker backup schedules, see ["Task 3: Configure a NetWorker Backup Schedule" on page 64](#).

3. Specify a NetWorker backup group.

For more information on NetWorker backup groups, see ["Task 4: Configure a NetWorker Backup Group" on page 65](#).

4. For the Backup Command attribute, specify the name of a single customized `nsrnm0` script (see [step 1](#)).

For example, the script name might be `nsrnm0` or `nsrnm02`.

5. Specify all known aliases for the Oracle Server host.
6. Leave the Directive, Archive Users, Remote User, and Password attributes blank. Leave the Remote Access attribute unmodified if backups from a cluster or recovery to a host other than the one being backed up are not required.
7. Save the Client resource.

**Note:** Each Oracle installation (having a different ORACLE\_HOME) requires a separate NetWorker Client resource because the Backup Command attribute of the Client resource can contain only one **nsrnm0** script name and ORACLE\_HOME is a *mandatory* variable for each **nsrnm0** script.

If multiple RMAN scripts are specified for the Save Set attribute of the Client resource:

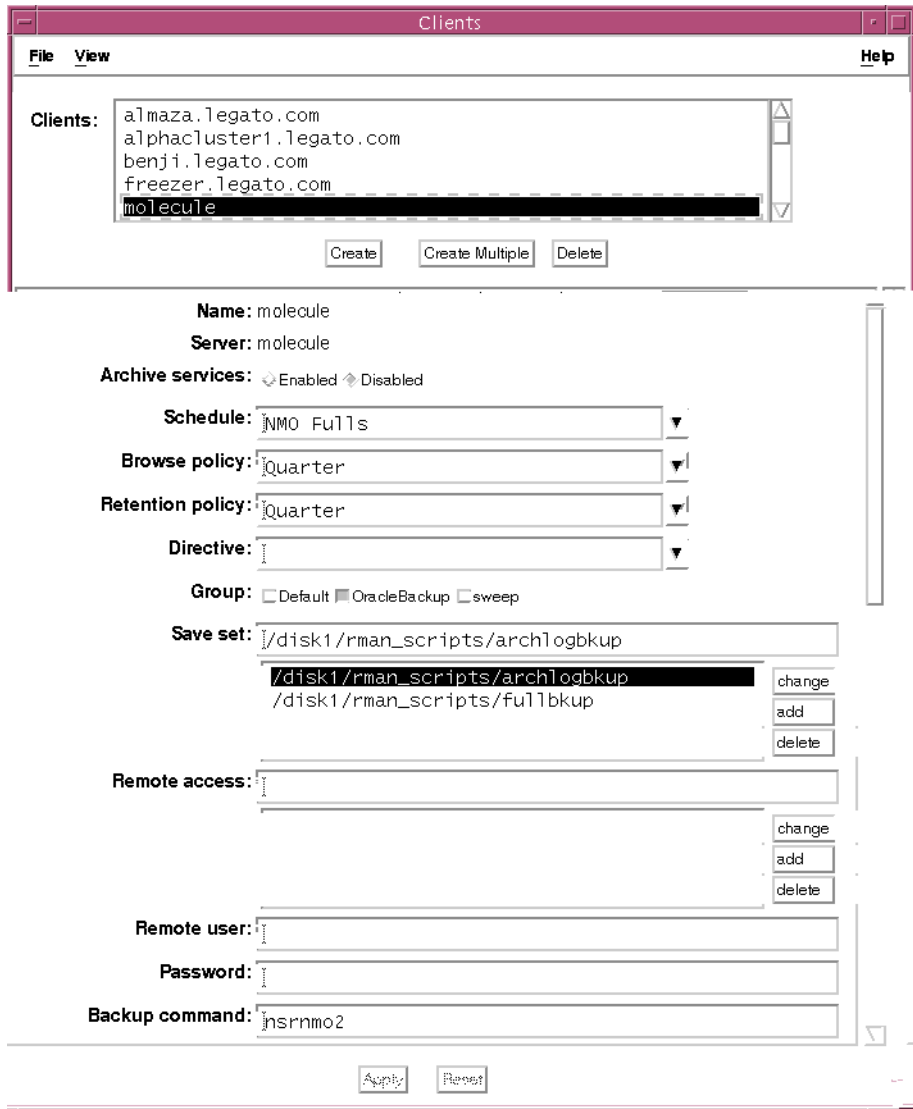
- The RMAN scripts are executed in arbitrary order, possibly in parallel.
- If the **nsrnm0** script also contains a well-defined PRECMD and/or POSTCMD variable, the precommand and postcommand files will be:
  - Common for all the RMAN scripts
  - Executed once for each RMAN script

The sequence of execution of “precommand–RMAN script–postcommand” triplets is arbitrary. Therefore, to include pre- and postprocessing with the backups of the various Oracle database instances of an Oracle installation, defining a separate NetWorker Client resource for each Oracle instance might be preferable.

**Note:** If a scheduled Oracle backup is retried, the specified pre- and postcommands will be executed again for that backup.

[Figure 6 on page 68](#) shows a Client resource configured for scheduled Oracle backups.

Figure 6. Oracle Client Resource in NetWorker Server



## How to Configure an E-Mail Notification

To send an e-mail notification of the scheduled backup results to the owner of a save set, edit the Owner Notification attribute in the Client resource for the Oracle Server (or Oracle instance).

In the NetWorker Administrator program, specify the display of hidden attributes for the Client resource window:

- On UNIX, select View>Details in the Client resource window.
- On Windows:
  1. In the main NetWorker Administrator window, select Customize from the Options menu.
  2. In the Customize window, select the Window Configurations tab.
  3. In the Window Configurations tab, select Display Hidden Attributes.

In the Client resource window, edit the Owner Notification attribute (in the Preferences tab on Windows) and enter a notification command directed to the login ID of the owner, for example, `/usr/bin/mail -s "jupiter-mars-venus backup" jdoe`.

## Testing a Scheduled Oracle Backup

As mentioned in ["Testing RMAN Backup Scripts" on page 55](#), the RMAN script created for a scheduled Oracle backup should be tested.

After the NetWorker Module for Oracle environment for scheduled backups on the Oracle Server is set up, test a scheduled backup manually using the NetWorker Administrator program.

All the required environment variables must be set in the `nsrnm0` and RMAN scripts, the (optional) pre- and postprocessing scripts must be in place, and the NetWorker server and Oracle Server must be correctly configured as described in the preceding sections of this chapter.

To test a scheduled Oracle backup using the NetWorker Administrator program:

1. In the Group Control window, highlight the correct Group name for the scheduled Oracle backup.
2. Click Start in the Group Control window to start the scheduled backup.

**Note:** For information on how to cancel the scheduled Oracle backup, see ["Canceling a Scheduled Oracle Backup" on page 71](#).

The scheduled backup is complete when the Status of the selected group changes to Finished. An e-mail “savegroup completion” message provides a report of the scheduled backup.

## Scheduled Backup Error Messages

If the scheduled backup fails, an error message is produced. For information on how to obtain more details about the scheduled backup using the NetWorker Administrator program, refer to the *Legato NetWorker Administrator's Guide*.

For additional debugging information, set the environment variable `NSR_SB_DEBUG_FILE` in the `nsrnm0` script. See "[NSR\\_SB\\_DEBUG\\_FILE](#)" on [page 60](#).

If the scheduling portion of a scheduled Oracle backup succeeds but the actual backup fails, error messages and debugging information might be generated in the locations described in "[RMAN Error Messages](#)" on [page 155](#).

## 4

## Archived Redo Log Backups

Archived redo log backups enable recovery of the database to its predisaster state. Without archived redo log backups, the database can be recovered only to the time of the last consistent Oracle backup. In this case, transactions that occurred between the time of the last consistent backup and the time of the database corruption will be lost.

Archived redo logs can be backed up using the appropriate option of the RMAN **backup** command. Archived redo log files are *not* backed up automatically during Oracle backups.

For a sample script to back up the archived redo log files in an OPS or RAC system, see "[Backing Up All Archived Logs from Each Node](#)" on [page 96](#).

For more information on setting up and running archived redo log backups, refer to the appropriate Oracle backup and recovery documentation.

## Recovery Catalog Backups

Backing up the Recovery Catalog should be part of the backup and recovery strategy. Back up the Recovery Catalog after every target database backup.

For more information on setting up and running Recovery Catalog backups, refer to the appropriate Oracle backup and recovery documentation.

## Canceling a Scheduled Oracle Backup

To keep the NetWorker index and RMAN catalog synchronized, include the Oracle user name in the Administrator list in the NetWorker Server resource before canceling a scheduled Oracle backup. For more information, see ["Setting the NetWorker Administrator Attribute" on page 34](#).

To cancel a *running* scheduled Oracle backup, NetWorker Module for Oracle currently supports use of the Stop button in the NetWorker Administrator program *only if the NetWorker server and Oracle Server are both running on UNIX platforms*.

The level of Stop button support depends on the NetWorker server operating system (where the Oracle Server operating system is already assumed to be UNIX).

- If the NetWorker server system is UNIX, then the Stop button is supported.
- If the NetWorker server system is Windows, then the Stop button is *not* supported.

**Note:** Although the progress message might indicate that the backup has exited prematurely (before finishing), the NetWorker Module for Oracle processes might still be running on the Oracle Server host.

To cancel a running scheduled Oracle backup when the Stop button does *not* work, the running **rman** process must be interrupted on the Oracle Server host:

1. In the NetWorker Administrator program, press the Stop button to prevent NetWorker Module for Oracle from retrying the backup.
2. For each allocated channel, perform the following:
  - a. View the RMAN message log file (with its filename set in the `NSR_RMAN_ARGUMENTS` environment variable in the `nsrnm` script) to determine the Oracle session ID for the channel.  
For example, the following sample line from an RMAN message log shows that channel `ch1` has the Oracle session ID `15`:  

```
channel ch1: sid=15 devtype=SBT_TAPE
```
  - b. Run the following **select** command in the Oracle **svrmgr** or **sqlplus** program to determine the serial number, where `session_id` is the Oracle session ID from the RMAN message log in [step a](#):  

```
select serial# from v$session where sid=session_id;
```

- c. Run the following **alter system** command in the Oracle **svrmgr** or **sqlplus** program to terminate the channel, where *session\_id* is the Oracle session ID from [step a](#) and *serial#* is the serial number from [step b](#):

```
alter system kill session 'session_id, serial#';
```

To cancel a *nonresponding* scheduled Oracle backup, see ["How to Cancel a Nonresponding Oracle Backup"](#) on page 48.

## Monitoring Scheduled Oracle Backups

Scheduled Oracle backups can be monitored the same way as manual Oracle backups. For more information, see ["Monitoring Manual Oracle Backups"](#) on page 49.

In addition, messages appear in the appropriate Group window in the NetWorker Administrator program and a report is generated upon completion of a scheduled Oracle backup. For more information, refer to the *Legato NetWorker Administrator's Guide*.

# 4

## Automation of NSR\_SERVER and NSR\_GROUP Variable Settings

The NSR\_SERVER and NSR\_GROUP environment variables must *not* be set in a scheduled backup RMAN script. NetWorker Module for Oracle automatically passes server and group information (received from the NetWorker server that started the backup) to Oracle Server processes, created for each allocated channel.

NetWorker Module for Oracle also passes an *internal* environment variable, NSR\_SAVESET\_NAME, to set the save set name. Do *not* set the NSR\_SAVESET\_NAME environment variable.

NetWorker Module for Oracle uses two different methods to pass the information to the Oracle Server processes:

- Invoking the RMAN executable with **send** as a command line option. For more information, see ["The send Command"](#) on page 134.
- Creating a temporary script based on the original backup script. The temporary script includes the three variables—NSR\_SERVER, NSR\_GROUP, and NSR\_SAVESET\_NAME—in the **parms** option of the



**allocate channel** command. NetWorker Module for Oracle either expands **parms** in the original backup script or adds the whole **parms** statement if one does not exist in the original script.

The first method (invoking RMAN with the **send** command) is preferable and NetWorker Module for Oracle uses it most of the time. However, NetWorker Module for Oracle might use the second method when one or more of the following occurs:

- The user backs up Oracle8 database data.
- The user sets the **NSR\_SERVER** and/or **NSR\_GROUP** variables in the scheduled backup script to values different from those that NetWorker Module for Oracle received from the NetWorker server.
- The **send** command does not work for the particular backup.

To determine which method is used for a given backup, check the scheduled backup debug file. The name of the debug file is set in the **NSR\_SB\_DEBUG\_FILE** variable in the **nsrnmo** script file. For more information, see ["Task 2: Customize the nsrnmo Script" on page 56](#).

The debug file contains the following information:

*exepath* — The location of the RMAN binary.

*cmd\_args* — The command line arguments for the RMAN invocation.

*rman\_script* — The RMAN script used during the backup.

*saveset\_name* — The RMAN script specified in the Save Set attribute of the NetWorker Client resource.

The following examples of debug file (**NSR\_SB\_DEBUG\_FILE**) content are from the two different methods that NetWorker Module for Oracle uses to pass information to the Oracle processes.

- From invoking RMAN with the **send** command:

```
(...)  
(25275) exepath =  
/db/ora815/app/oracle/product/8.1.5/bin/rman  
(25275) cmd_args = msglog '/nsr/applogs/msglog.log'  
append cmdfile '/home/ora815/backup0' send  
'NSR_ENV=(NSR_SERVER=molecule, NSR_GROUP=OracleBackup,  
NSR_SAVESET_NAME=/home/ora815/backup0)'  
(25275) rman_script = /home/ora815/backup0  
(25275) saveset_name = /home/ora815/backup0  
(...)
```

- From modifying the RMAN backup script:

```
(...)
(26057) exepath =
/db/ora806/app/oracle/product/8.0.6/bin/rman
(26057) cmd_args = msglog '/nsr/applogs/msglog.log'
append cmdfile '/home/ora806/nmosbBAa09'
(26057) rman_script = /home/ora806/nmosbBAa09
(26057) saveset_name = /home/ora806/backup5
(...)
(26057) nwora_delete_file: File /home/ora806/nmosbBAa09
deleted
(...)
```

NetWorker Module for Oracle deletes the temporary RMAN script at the end of the backup. To see the contents of that script, set the `NSR_RMAN_ARGUMENTS` variable to allow redirection of the RMAN session output to a log file. For more information, see ["NSR\\_RMAN\\_ARGUMENTS" on page 60](#).

## 4

## Scheduled Oracle Backup Information in the NetWorker Indexes

The NetWorker server maintains information about each backup in its online indexes. For more information, see ["Chapter 1: Introduction" on page 15](#).

The NetWorker client file index and media database each contain a different value for the name of the same save set for a scheduled Oracle backup.

Query the online NetWorker indexes by using the NetWorker server programs, `nsrinfo` and `mminfo`.

- Use the `nsrinfo` program to query the NetWorker client file index. For example:
 

```
# nsrinfo -n oracle Oracle_Server_hostname
```
- Use the `mminfo` program to query the NetWorker media database. For example:
 

```
# mminfo -v -c Oracle_Server_hostname
```

For more information on these NetWorker server programs, refer to the *Legato Command Reference Guide* and the UNIX man pages.

The backup piece name is different from the backup script name, as shown in the following examples.

- The client file index contains the backup piece name assigned by RMAN, for example, *full\_ORCL815\_731*:

```
# nsrinfo -n oracle molecule
full_ORCL815_731, date=997818351 Tue Aug 14 15:45:51 2001
```

- The media database contains the name of the RMAN backup script used for the scheduled backup, for example, */db/home/ora815/backup0*:

```
# mminfo -v -c molecule
volume      client      date        time        size
NMO.001     molecule   08/14/01    15:45:51    129 KB
ssid        fl          lvl         name
2038427393  cb         full        /db/home/ora815/backup0
```

Cross-check the client file index and media database using the save time. For example:

```
# mminfo -c molecule -t 997818351
# nsrinfo -n oracle -t '08/14/01 15:45:51' molecule
```

**Note:** For a manual Oracle backup, both online NetWorker indexes contain the same name for a backup save set—the backup piece name.



# Chapter 5: Restoring and Recovering Oracle Data

This chapter describes how to set up and run Oracle data restore operations. It also provides information on recovering the Oracle database to a consistent state and preparing for disaster recovery.

This chapter includes the following main sections:

- ["Preparing to Restore Oracle Data" on page 77](#)
- ["Roadmap for Oracle Data Recovery" on page 78](#)
- ["Task 1: Create RMAN Restore Scripts" on page 79](#)
- ["Task 2: Restore the Oracle Data" on page 80](#)
- ["Using the OEM Backup Management Tools" on page 81](#)
- ["Completing the Oracle Data Recovery" on page 82](#)
- ["Disaster Recovery" on page 82](#)

## Preparing to Restore Oracle Data

During an Oracle backup, the NetWorker server adds an entry for each backup piece in the online client file index and records the location of the data in the media database. These entries provide information required to restore every Oracle data object backed up.

The client file index entry is maintained until the browse policy specified for the client's save set expires. The media database entry is maintained until the retention policy specified for the client's save set expires.

When the retention policies for all the save sets on a backup volume expire, the volume becomes recyclable and eligible for automatic relabeling by the NetWorker server. The save set entries, however, remain in the media database until the volume is actually relabeled. When the volume is relabeled, the data on it becomes inaccessible and can no longer be restored.

NetWorker Module for Oracle uses the client file index entries to restore Oracle backup pieces. Set the browse policy to a period long enough to retain the client index entries for restoring the Oracle backup pieces.

**Note:** After a browse policy expires, the NetWorker **scanner** program can be used to rebuild the online indexes. However, index entries regenerated using **scanner** might cause the NetWorker indexes to become unsynchronized with the RMAN catalog and lead to problems. To avoid problems, ensure that the backup pieces have *unique* names, as described in "[Chapter 3: Manual Oracle Backups](#)" on page 41.

For more information on how the NetWorker server uses browse and retention policies to manage Oracle backup data and track the location and status of the data on backup volumes, see the *Legato NetWorker Administrator's Guide*.

## Roadmap for Oracle Data Recovery

Only Oracle data that has been backed up using the instructions in the following chapters can be restored:

- "[Chapter 3: Manual Oracle Backups](#)" on page 41
- "[Chapter 4: Scheduled Oracle Backups](#)" on page 51

The NetWorker server interface *cannot* be used to restore Oracle data that was backed up with NetWorker Module for Oracle.

To recover a target Oracle database when one or more files of the database are damaged:

1. Perform the Oracle data restore operation using either the RMAN command line interface or the OEM Backup Management Tools:
  - To use the RMAN command line interface:
    - a. Create the RMAN restore script for the Oracle restore. See "[Task 1: Create RMAN Restore Scripts](#)" on page 79.
    - b. Run the Oracle restore using the RMAN command line interface. See "[Task 2: Restore the Oracle Data](#)" on page 80.

**Note:** To restore an Oracle database to a different system from the one backed up, see "[Restoring to a Different Host](#)" on page 80.

- To use the OEM Backup Management Tools, see ["Using the OEM Backup Management Tools" on page 81](#).
2. Complete the Oracle data recovery, if required. See ["Completing the Oracle Data Recovery" on page 82](#).

## Task 1: Create RMAN Restore Scripts

Create an appropriate RMAN script to perform the preferred type of Oracle restore operation on an Oracle Server host.

RMAN restore scripts can be stored as flat ASCII files. Alternatively, if a Recovery Catalog is used, restore scripts can be stored in the Recovery Catalog database. For more information on storing the restore scripts in the Recovery Catalog database, refer to the appropriate Oracle backup and recovery documentation.

For example, the following RMAN script performs a restore of an Oracle tablespace, using the (remote) NetWorker server *mars.legato.com*. The Oracle data is restored to the NetWorker client *jupiter.legato.com*.

**Note:** The script uses the **send** command to set the environment variables. (See ["The send Command" on page 134](#).) However, in Oracle8, the **parms** option of the **allocate channel** command must be used to set the variables, since Oracle8 does *not* support the **send** command.

```
run {
    allocate channel t1 type 'SBT_TAPE';
    allocate channel t2 type 'SBT_TAPE';
    send 'NSR_ENV=(NSR_SERVER=mars.legato.com,
NSR_CLIENT=jupiter.legato.com)';
    sql 'alter tablespace users offline immediate';
    restore (tablespace users);
    sql 'alter tablespace users online';
    release channel t1;
    release channel t2;
}
```

The information in ["Task 1: Create RMAN Scripts for Manual Backups" on page 42](#) about setting the NSR\_\* environment variables also applies to RMAN restore scripts.

## Task 2: Restore the Oracle Data

Before starting an Oracle restore, ensure that the required configurations and scripts are in place.

- The Oracle system must be properly configured, as described in "[Chapter 2: Software Configuration Procedures](#)" on page 31.
- The NetWorker server must have the required Server, Client, Device, and Pool resources configured, as described in "[Chapter 2: Software Configuration Procedures](#)" on page 31.
- The volume required for the restore operation must be mounted in a configured backup device, or—if auto media management is enabled for a tape device or autochanger—the tape must be loaded in the tape device or autochanger for the NetWorker server to use automatically.
- If using an RMAN restore script, the script must be created, as described in "[Task 1: Create RMAN Restore Scripts](#)" on page 79.

An Oracle data restore can be started using the RMAN command line interface on the Oracle Server host.

For example, if the RMAN restore script on [page 79](#) is stored in the file `/disk1/scripts/restore.txt` and the Net service has been configured to connect to the databases `payroll` and `rcvcatdb`, the Oracle restore can be started with the following command:

```
% rman target internal/oracle@payroll rcvcat  
rman/rman@rcvcatdb cmdfile \'/disk1/scripts/restore.txt\'
```

For more information on the `rman` command line options, refer to the appropriate Oracle backup and recovery documentation.

### Restoring to a Different Host

In some cases, an Oracle database must be restored to a different system than the one from which it was originally backed up. Some situations where this could occur include, but are not limited to, performing a disaster recovery or duplicating a database on a remote host. For more information, refer to the appropriate Oracle documentation.



To restore an Oracle database to another system:

1. On the NetWorker server that contains the backup to be restored, specify the hostname of the secondary system for the Remote Access attribute in the Client resource of the original system.
2. Install and configure NetWorker Module for Oracle on the secondary system where the Oracle data is to be restored.
3. Install and configure RMAN on the secondary system.
4. Create an appropriate RMAN restore script.
5. In the RMAN script, set the NSR\_SERVER environment variable to the name of the NetWorker server that contains the backup.
6. In the RMAN script, set the NSR\_CLIENT environment variable to either the name of the NetWorker client (Oracle Server host) that was backed up or the value of NSR\_CLIENT used during the backup.
7. Use the appropriate RMAN command to run the script to restore the Oracle database files.

## Restoring the Recovery Catalog Database

If a Recovery Catalog is used for backups, the loss of that Recovery Catalog can be disastrous for the successful restore of the target database.

As part of the Oracle backup strategy, back up the Recovery Catalog frequently. For more information, refer to the appropriate Oracle backup and recovery documentation.

To restore the Recovery Catalog, follow the steps in "[Roadmap for Oracle Data Recovery](#)" on page 78.

## Using the OEM Backup Management Tools

The OEM Backup Management Tools can be used instead of the RMAN command line interface to start an Oracle restore operation. The OEM Backup Management Tools include a graphical user interface to RMAN for generating the required RMAN commands and performing backup and restore operations.



**Important:** After the completion of a NetWorker Module for Oracle backup or restore, the OEM job queue history displays the status of the job as “failed”, even if the backup or restore completed successfully. This is due to a known problem with OEM. View the job output to confirm that the backup or restore completed successfully.

---

For more information on using the OEM Backup Management Tools, refer to the Oracle Enterprise Manager documentation included with the product kit.

## Completing the Oracle Data Recovery

After restoring the NetWorker Module for Oracle backups of the Oracle data using the RMAN utility, complete the data recovery, if required.

To recover the Oracle data, use the appropriate Oracle commands to apply the archived redo logs and online redo logs. There are two ways to run the Oracle recovery commands:

- Include the Oracle commands in the RMAN restore script.
- Run the commands after the RMAN restore script has completed successfully.

For more information on Oracle data recovery procedures, refer to the appropriate Oracle backup and recovery documentation.

## Disaster Recovery

This section provides basic guidelines for the following types of disaster recovery operations:

- ["Oracle Database Recovery" on page 82](#)
- ["NetWorker Server Recovery" on page 83](#)

### Oracle Database Recovery

The Oracle backup and recovery documentation contains information on how to prepare for a disaster recovery of an Oracle database.

It is important to develop a plan for recovering from a disaster on the computer system. Back up important data on a daily basis. To prepare for a disk crash or loss of data, develop and test a plan for recovering data. The amount of effort spent in creating and testing a disaster recovery plan determines the level of preparation for a possible disaster.

With respect to Oracle backups, recall that certain Oracle files such as *init<oracle\_sid>.ora* are *not* backed up by RMAN. Back up such files manually. For example, back up the files using the NetWorker client installed on the Oracle Server host.

In Oracle9i, use the autobackup functionality for the control file. For more information, see ["Control File Autobackup" on page 148](#).

## NetWorker Server Recovery

NetWorker software can be used to recover from different types of disasters on the NetWorker server. The degree of data loss during a disaster can range from one or more files lost when a disk crashes, to an entire computer system. The degree of severity of the disaster determines the procedures that must be performed to recover data on the NetWorker server.

With respect to NetWorker backups, recall that the bootstrap is a critical file, backed up only after *scheduled* Oracle backups. If only manual Oracle backups are performed, back up the bootstrap and client index manually. For more information, see ["NetWorker Server Bootstrap Backup" on page 46](#).

Along with the bootstrap information, keep accurate records of the network and system configurations, and maintain all the original software in a safe location. For a comprehensive disaster recovery, the following items are required:

- Original operating system media and patches
- Original NetWorker media
- Device drivers and media device names
- Filesystem configuration
- IP addresses and hostnames
- Bootstrap information

The *Legato NetWorker Disaster Recovery Guide* explains how to recover the NetWorker server from various types of disasters. The *Disaster Recovery Guide* is available on the Legato web site. For more information on how to access the guide, see ["Product Documentation" on page 11](#).



# Chapter 6: Cluster, OPS, and RAC Systems

This chapter describes the NetWorker Module for Oracle support provided for cluster, OPS, and RAC systems. It includes the configuration procedures required to enable NetWorker Module for Oracle operations on the supported types of cluster, OPS, and RAC systems.

This chapter includes the following main sections:

- ["Considerations for Cluster, OPS, and RAC Systems" on page 85](#)
- ["Cluster Systems" on page 88](#)
- ["OPS and RAC Systems" on page 89](#)

## Considerations for Cluster, OPS, and RAC Systems

To prepare for successful NetWorker Module for Oracle operations on cluster, OPS, and RAC systems, consider the following items.

- **Environment Variables in the RMAN Script or Session**

The NSR\_CLIENT and NSR\_SERVER environment variables must be correctly set in the RMAN script or session:

- Set the NSR\_CLIENT environment variable as described in ["Setting the NSR\\_CLIENT Environment Variable" on page 87](#).
- For a manual Oracle backup or restore, if the NetWorker server is a *remote* system for the node running the RMAN session, set the NSR\_SERVER variable to the server name for *each* channel.

**Note:** The NSR\_SERVER environment variable does *not* need to be set for a scheduled Oracle backup.

For more information on how to set the required environment variables, see ["Appendix A: Environment Variables in the RMAN Session" on page 123](#).

- **NetWorker Software Configuration**

Ensure the correct NetWorker software configuration by performing the following tasks:

a. Verify that the system includes *one* of the following:

- In the NetWorker Client resource of a *physical* host, the Save Set attribute contains only RMAN scripts that reside on the *local* disk; and in the NetWorker Client resource of a *virtual* host, the Save Set attribute contains only RMAN scripts that reside on the *shared* disk.
- There is an empty file named *pathownerignore* in the directory containing the NetWorker **savefs** program. If this empty file does not exist, create the file on *each* NetWorker server host and client host in the cluster, OPS, or RAC system.

For more information on the default directory for the **savefs** program, refer to the *Legato NetWorker Installation Guide* for the particular type of operating system.

b. Configure a Client resource on the NetWorker server for the virtual host and each physical host that will be used to run backups and restores. In each Client resource, use the fully qualified IP name as the client name.

- For information on how to configure a Client resource for manual Oracle backups, see "[Task 3: Configure the NetWorker Client Resource](#)" on page 35.
- For information on how to customize the Client resource for scheduled Oracle backups, see "[Task 5: Configure the Client Resource for a Scheduled Oracle Backup](#)" on page 66.

c. In the Remote Access attribute in the Client resource for a virtual host, specify the name of each physical host that can store and retrieve the backups.

- **Backup Failover**

Neither RMAN nor NetWorker Module for Oracle supports Transparent Application Failover (TAF). As a result, if a failure occurs during a backup, the backup is not automatically restarted from the point of failure on another node. *Only connect-time failover is supported.* For more information, see "[Connect-Time Failover](#)" on page 91.

## Setting the NSR\_CLIENT Environment Variable

During an Oracle backup, the NetWorker server creates entries about the backed-up data in the online client file index. During an Oracle restore, the data is retrieved by first searching this client file index.

The NSR\_CLIENT environment variable set in the RMAN script provides the following information to the NetWorker server:

- During a backup, the name of the NetWorker client whose index file should be used to record the backup information.
- During a restore, the name of the NetWorker client whose index file should be used to search for the save set to be restored.

If NSR\_CLIENT is *not* set, the NetWorker server uses the name of the local physical host.

The NSR\_CLIENT variable should be set to the *same* value for all channels allocated during the backup.

The value of NSR\_CLIENT (either the default value or an explicitly defined value) used for a backup should be the *same* as the value of NSR\_CLIENT used for the restore of that backup. Setting NSR\_CLIENT to the name of the virtual (as opposed to the physical) host might be preferable, so the backup and restore scripts run successfully unmodified, regardless of the physical host that executes the scripts.



**Important:** If NSR\_CLIENT is set to any value other than the default value during a backup or restore, the Remote Access attribute must be modified in that NetWorker Client resource. For more information, refer to the *Legato NetWorker Administrator's Guide*.

For each Oracle backup and restore, set NSR\_CLIENT using the appropriate method:

- In Oracle8, set NSR\_CLIENT using the **parms** option of the **allocate channel** command in the RMAN script.
- In Oracle8i or Oracle9i, set NSR\_CLIENT using *either* the **rman send** command on the operating system command line *or* the **send** command in the RMAN script.

Setting NSR\_CLIENT in the system environment has *no* effect.

## Cluster Systems

A cluster system typically includes multiple nodes connected by a shared SCSI bus to which common storage is attached. In a cluster system, cluster services such as disk services can be defined and those services assigned their own IP addresses and names (virtual hosts). The services and their associated storage can migrate for failover between the physical nodes in the cluster.

Together, the NetWorker Module for Oracle and NetWorker server software can back up and restore an Oracle database configured on cluster disk services. The NetWorker server treats each cluster service as an independent client and stores the associated backup entries in the online indexes under the name of the service.

After properly configuring a cluster service as a NetWorker client, NetWorker Module for Oracle can be used in conjunction with the NetWorker server to back up and restore the database associated with the service, independent of the actual node that provides the service.

To configure a cluster system for Oracle backup and restore operations by using NetWorker Module for Oracle, see "[Roadmap for Oracle Backup/Restore Configuration in a Cluster System](#)" on page 88.

### Roadmap for Oracle Backup/Restore Configuration in a Cluster System

The Oracle Server and NetWorker server systems must be configured before the NetWorker Module for Oracle can be used with the NetWorker server for Oracle backup and restore operations in a cluster system.

Before configuring Oracle backup and restore operations in a cluster system, ensure the following:

- The NetWorker Module for Oracle software is properly installed according to the instructions in the *Legato NetWorker Module for Oracle Installation Guide*.
- The basic Oracle Server and NetWorker server systems configurations are completed according to the instructions in the "[Software Configuration Roadmap](#)" on page 31.



To properly configure Oracle backup and restore operations with NetWorker Module for Oracle in a cluster system:

1. Configure the storage for the database as a cluster disk service.  
For more information, refer to the appropriate cluster administration guide from the particular cluster software vendor.
2. Configure a Client resource on the NetWorker server for the virtual host and each physical host that will run backups and restores.
3. Create an RMAN script that includes the appropriate NSR\_CLIENT environment variable settings. For more information, see ["Setting the NSR\\_CLIENT Environment Variable" on page 87](#).

## Backup Failover

When a node failure occurs during a *manual* Oracle backup, a database administrator (DBA) must restart the backup after instance recovery. Since the Net8 services (in Oracle8 and Oracle8i) and Oracle Net services (in Oracle9i) are configured with a cluster service name, the restarted backup is executed on the physical node that takes control of the cluster service.

When a node failure occurs during a *scheduled* Oracle backup, the NetWorker server restarts the backup (from the beginning, *not* from the point of failure) if the Client Retries attribute in the NetWorker Group resource is set to a value greater than zero. The restarted backup is executed on the node that takes control of the cluster service.

## OPS and RAC Systems

The NetWorker Module for Oracle software supports backups and restores of OPS and RAC systems for parallelism and high availability.

### OPS and RAC Terminology

A node in an OPS or RAC system is a physical machine with a hostname such as *node1.legato.com*. An Oracle instance is a memory structure and a group of Oracle Server processes running on a node.

An Oracle database (for example, named *data1*) comprises a set of datafiles, which are used by the Oracle instances and can be shared between the nodes. All instances share the same datafiles and control file. Each node must have its own set of redo log files and its own archived redo logs.

## OPS and RAC Backups and Restores

After proper configuration of OPS or RAC and the associated cluster system, NetWorker Module for Oracle enables Oracle backups on either a single node or several nodes of the OPS or RAC system.

A parallel Oracle backup uses Oracle instances running in parallel on multiple nodes of the cluster to back up the Oracle data. In the RMAN backup script created for running a parallel Oracle backup, allocate multiple channels for the backup and specify that each channel run on a specific node. The NSR\_CLIENT environment variable must be set to the *same* value for *each* channel. For more information on setting the variable, see "[Setting the NSR\\_CLIENT Environment Variable](#)" on page 87.

NetWorker Module for Oracle also enables restores of the Oracle data to any physical node in the cluster, regardless of which physical node originally performed the backup.

To enable Oracle backup and restore operations, follow the configuration steps in "[Roadmap for Oracle Backup/Restore Configuration in an OPS or RAC System](#)" on page 90.

## Roadmap for Oracle Backup/Restore Configuration in an OPS or RAC System

To properly configure Oracle backup and restore operations with NetWorker Module for Oracle in an OPS or RAC system:

1. Install the proper cluster management software on each cluster node.

For more information, refer to the appropriate cluster installation documentation from the particular cluster software vendor.

2. Configure the cluster for use with OPS or RAC.

For more information, refer to the appropriate OPS or RAC documentation from Oracle Corporation.

3. Install and configure the OPS or RAC software.

The required patches from Oracle might need to be installed, to complete the OPS or RAC installation and linking procedures. Configure the Net8 or Oracle Net services to allow connect-time (SQL Net) failover. For guidelines, see "[Connect-Time Failover](#)" on page 91. For more information, refer to the appropriate Oracle documentation.

4. Install NetWorker Module for Oracle on *each* node of the cluster to be used for backup and recover operations.

For more information, refer to the *Legato NetWorker Module for Oracle Installation Guide*.

5. Configure a Client resource on the NetWorker server for the virtual host and each physical host that will run backups and restores.
6. Create the appropriate RMAN backup and restore scripts for the preferred types of Oracle backups and restores on the OPS or RAC system.

For more information, see ["Creating RMAN Backup Scripts" on page 93](#) and ["Creating RMAN Restore Scripts" on page 94](#).

7. Review the additional issues concerning Oracle recover operations in ["Archived Redo Logs" on page 96](#).

## Connect-Time Failover

If multiple listeners support a single service, a connect-time failover reroutes the connection request to another listener if the first listener is down or cannot make the connection. To enable the connect-time failover in OPS or RAC, there must be a listener on each node, and each instance must use the same Net service name.

When using the local Net service naming method, the client's *tnsnames.ora* file should include the following type of information:

```
o816pA.legato.com =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (FAILOVER = ON)
      (ADDRESS = (PROTOCOL = tcp) (HOST = nodeA) (PORT = 1521))
      (ADDRESS = (PROTOCOL = tcp) (HOST = nodeB) (PORT = 1521))
    )
    (CONNECT DATA =
      (SERVICE_NAME = orcl816)
    )
  )
```

- Set the `FAILOVER` parameter to `ON`. The default value is `ON` for an `ADDRESS_LIST`, and `OFF` when `ADDRESS_LIST` is not specified.

**Note:** `FAILOVER` was introduced in Oracle8i. In Oracle8, set `SOURCE_ROUTE=OFF`.

- Include the ADDRESS\_LIST parameter. If multiple addresses are specified but the ADDRESS\_LIST parameter is omitted, the Net8 or Oracle Net service reads the addresses sequentially and attempts to connect to the last one only. If the ADDRESS\_LIST parameter is specified, the addresses are tried in the order they appear in the list.
- In the CONNECT\_DATA section, use SERVICE\_NAME instead of the system identifier (SID). SERVICE\_NAME should be *different* from SID.

**Note:** SERVICE\_NAME was introduced in Oracle8i. Oracle8 requires SID. Therefore, to enable the connect-time failover in Oracle8, instances on all nodes must have the same SID.

- GLOBAL\_DBNAME should not appear in the SID\_LIST\_LISTENER parameter of the *listener.ora* file since it disables the failover.

When a node or listener to which a client tries to connect is not available, the next listener on the list is contacted. When the instance is down but the listener is running, the failover occurs only if the instance is configured to dynamically register with the listener.

## Dynamic Instance Registration

Dynamic instance registration was introduced in Oracle8i. During dynamic instance registration, the database registers itself with the Oracle listener on startup and unregisters itself on shutdown.

To perform dynamic instance registration:

- Set the INSTANCE\_NAME and SERVICE\_NAME parameters in the initialization file (*init<oracle\_sid>.ora*). There can be several services for a single instance.
- If the listener does not listen on the default port (1521), set the LOCAL\_LISTENER parameter in the initialization file.
- The SID\_LIST\_LISTENER parameter in *listener.ora* must *not* include SID\_DESC for the OPS or RAC instances.
- It is not necessary to have the *listener.ora* file when the listener listens on the default port.

When the instance is down, the listener does not know how to connect to it. As a result, the listener tries the next connect option specified in the ADDRESS\_LIST in the *tnsnames.ora* file.

**Note:** Some applications such as Oracle Enterprise Manager (OEM) still require static database registration with a listener.

## Static Instance Registration

With static registration, the information about the instance is manually configured in the *listener.ora* file through `SID_DES` in the `SID_LIST_LISTENER` parameter. The listener contains continuous information about the instance, even if the instance is down. As a result, when the instance is down, the listener still tries to connect to it rather than try the next connect option specified in the *tnsnames.ora* file.

## Backup Failover

When a *manual* backup is interrupted by an Oracle server-side failure, a DBA must restart the backup after instance recovery. During the restarted backup, the connection request to the failed instance is rerouted to another instance according to the connect-time failover setup in the *tnsnames.ora* file.

For a *scheduled* backup, when the first backup attempt returns an error, the NetWorker server restarts the backup if the Client Retries attribute in the NetWorker Group resource is set to a value greater than zero. The connect-time failover reroutes the connection to an available instance, and the restarted backup starts from the beginning. For example, if the backup fails 5 hours into a 10-hour backup, it takes 15 hours to complete the backup. In this case, the operator might elect to wait until the next scheduled backup.

## Creating RMAN Backup Scripts

A single RMAN backup script can be used to run a parallel Oracle backup with NetWorker Module for Oracle on an OPS or RAC system. In the backup script, allocate multiple channels for the backup and specify that each channel run on a specific node.

For example, suppose an OPS system consists of two nodes named *node1.legato.com* and *node2.legato.com*. The Oracle instances named *instance1* and *instance2* are running on *node1.legato.com* and *node2.legato.com*, respectively. The NetWorker server is located on a separate node, *server1.legato.com*.

The following RMAN script for a manual backup is intended to run on *node1.legato.com*, using the NOCATALOG mode of RMAN. The script sets `NSR_CLIENT` to *node1.legato.com* and `NSR_SERVER` to *server1.legato.com*. As a result, the NetWorker server stores the backup information in the *node1.legato.com* client file index. (For details, see "[Setting the NSR\\_CLIENT Environment Variable](#)" on page 87.) Two channels are allocated to each of the nodes, *node1.legato.com* and *node2.legato.com*.

```

run {
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=node1.legato.com,
NSR_SERVER=server1.legato.com)';

    allocate channel t2 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=node1.legato.com,
NSR_SERVER=server1.legato.com)';

    allocate channel t3 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=node1.legato.com,
NSR_SERVER=server1.legato.com)'
    connect 'user_name/user_passwd@connect_string_of_node2';

    allocate channel t4 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=node1.legato.com,
NSR_SERVER=server1.legato.com)'
    connect 'user_name/user_passwd@connect_string_of_node2';

    backup filesperset 1
    format '/instance1_%s_%p/'
    (database);

    release channel t1;
    release channel t2;
    release channel t3;
    release channel t4;
}

```

For a sample script to back up all the archive log files in an OPS or RAC system, see ["Backing Up All Archived Logs from Each Node" on page 96](#).

## 6

## Creating RMAN Restore Scripts

A single RMAN restore script can be used to run a parallel Oracle restore with NetWorker Module for Oracle on an OPS or RAC system. In the restore script, allocate multiple channels for the restore and specify that each channel run on a specific node.

**Note:** NetWorker Module for Oracle does *not* support multiple RMAN restores running at the same time.

To run an Oracle restore on an OPS or RAC system, none of the nodes can be open. Only the node running the RMAN restore script needs to be mounted.

Using the same example as in ["Creating RMAN Backup Scripts" on page 93](#), suppose an OPS system consists of two nodes named *node1.legato.com* and *node2.legato.com*. The Oracle instances named *instance1* and *instance2* are running on *node1.legato.com* and *node2.legato.com*, respectively. The NetWorker server is located on a separate node, *server1.legato.com*.

The following RMAN restore script is to be run on *node2.legato.com*, to restore from the backup created by using the RMAN backup script in ["Creating RMAN Backup Scripts" on page 93](#).

This restore script sets NSR\_CLIENT to *node1.legato.com* and NSR\_SERVER to the remote NetWorker server name. As a result, the NetWorker server will obtain the backup information from the *node1.legato.com* client file index. Two channels are allocated to each of the nodes, *node1.legato.com* and *node2.legato.com*.

```
run {
    allocate channel t1 type 'SBT_TAPE' ;
    allocate channel t2 type 'SBT_TAPE' ;
    allocate channel t3 type 'SBT_TAPE'
    connect 'user_name/user_passwd@connect_string_of_node1' ;
    allocate channel t4 type 'SBT_TAPE'
    connect 'user_name/user_passwd@connect_string_of_node1' ;
    send 'NSR_ENV=(NSR_CLIENT=node1.legato.com,
    NSR_SERVER=server1.legato.com)' ;
    restore database;
    release channel t1;
    release channel t2;
    release channel t3;
    release channel t4;
}
```

In this example, the parallel Oracle backup was performed with NSR\_CLIENT set to *node1.legato.com* for each channel in the RMAN backup script. In order to restore the backup data to *node2.legato.com*, add *node2.legato.com* to the Remote Access attribute in the NetWorker Client resource for *node1.legato.com*.

For more information on how to modify the Client resource, refer to the *Legato NetWorker Administrator's Guide*.

For a sample script to restore all the archive log files in an OPS system, see ["Restoring All Archived Logs from Each Node" on page 97](#).

## Archived Redo Logs

Each node in an OPS or RAC system maintains a separate set of redo logs. Redo logs that become full are archived on the local node. As a result, the archived redo logs are divided among the nodes of the system.

To enable RMAN to back up and recover an OPS or RAC system, make all the archived redo log files accessible by all nodes participating in the backup or recovery. For information on how to share the archived redo logs, refer to the appropriate Oracle OPS or RAC documentation.

For sample scripts to back up and restore all the archived redo log files in an OPS or RAC system, see the following sections:

- ["Backing Up All Archived Logs from Each Node" on page 96](#)
- ["Restoring All Archived Logs from Each Node" on page 97](#)

### Backing Up All Archived Logs from Each Node

All the archived log files in an OPS or RAC system can be backed up from a single node (for example, a node named *ops1.legato.com*) using the following type of RMAN script.

```
run {
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=ops1.legato.com)'
    connect 'user_name/user_passwd@connect_string_of_ops1';
    allocate channel t2 type 'SBT_TAPE'
    parms 'ENV=(NSR_CLIENT=ops1.legato.com)'
    connect 'user_name/user_passwd@connect_string_of_ops2';
    backup filesperset 10
    (archive log all delete input format '/al_%s_%p/');
    release channel t1;
    release channel t2;
}
```



## Restoring All Archived Logs from Each Node

All the archived log files in an OPS or RAC system can be restored from a single node (for example, a node named *ops1.legato.com*) using the following type of RMAN script.

```
run {  
    allocate channel t1 type 'SBT_TAPE'  
    connect 'user_name/user_passwd@connect_string_of_ops1' ;  
    allocate channel t2 type 'SBT_TAPE'  
    connect 'user_name/user_passwd@connect_string_of_ops2' ;  
    send 'NSR_ENV=(NSR_SERVER=mars.legato.com,  
NSR_CLIENT=ops1.legato.com)';  
    restore  
    (archive log all);  
    release t1;  
    release t2;  
}
```



# Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix

This chapter describes how to configure and run proxy backups and restores of Oracle data on EMC Symmetrix devices using PowerSnap for EMC Symmetrix with the NetWorker Module for Oracle software.

This chapter includes the following main sections:

- ["Proxy Oracle Backup and Recovery System" on page 99](#)
- ["How a Proxy Oracle Backup Works" on page 101](#)
- ["How a Proxy Oracle Restore Works" on page 107](#)
- ["Software Configuration Requirements" on page 108](#)
- ["Environment Variables for Proxy Oracle Operations" on page 110](#)
- ["Proxy Oracle Backup Requirements" on page 112](#)
- ["Proxy Oracle Backup Information in the NetWorker Indexes" on page 116](#)
- ["Proxy Oracle Restore Requirements" on page 117](#)

## Proxy Oracle Backup and Recovery System

For proxy Oracle backup and recovery, the NetWorker server and client, NetWorker Module for Oracle, and PowerSnap for EMC Symmetrix software function with the components of the Oracle backup and recovery system. The implementation of a proxy Oracle backup and recovery strategy requires a knowledge of how the Oracle and Legato software components work together.

The proxy Oracle backup and recovery system consists of:

- Oracle8i or Oracle9i Server
- RMAN
- Recovery Catalog (optional)
- OEM Backup Management Tools (optional)

For more information on RMAN and the Recovery Catalog, see the following sections:

- ["Oracle Recovery Manager \(RMAN\)" on page 20](#)
- ["Oracle Recovery Catalog" on page 20](#)

The Legato software components required for proxy Oracle backups are as follows:

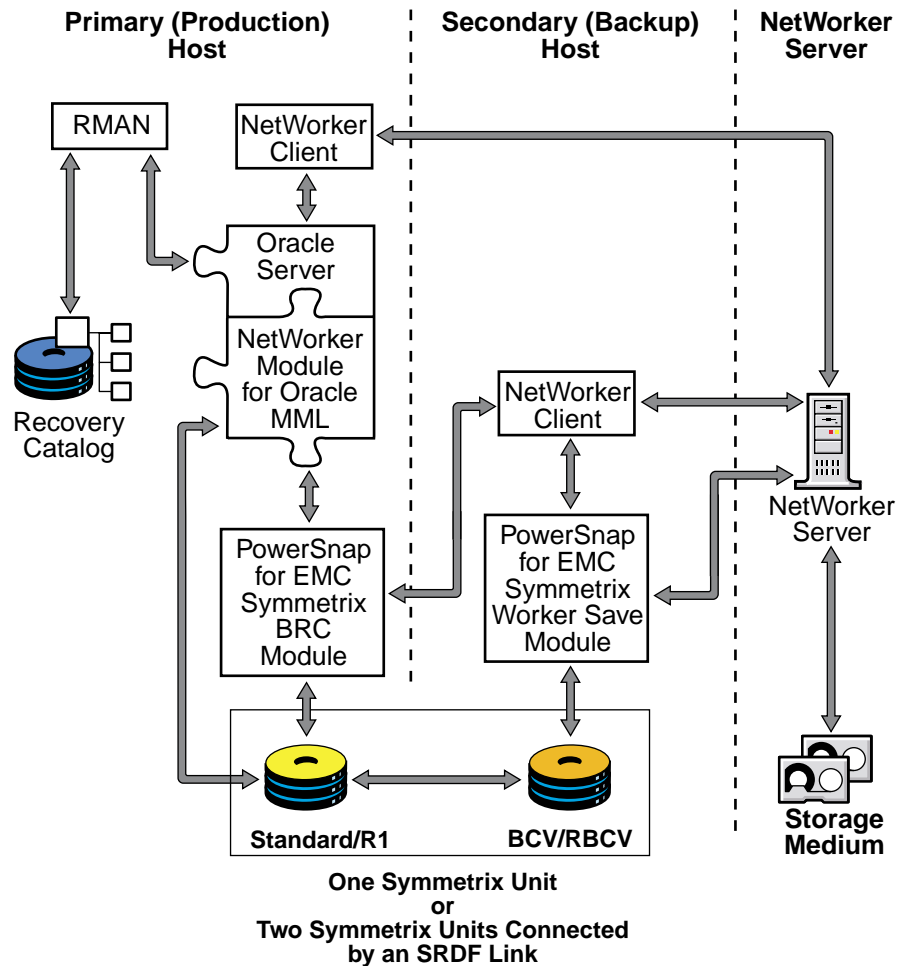
- NetWorker server
- NetWorker client (on primary and secondary hosts)
- NetWorker storage node (optional on secondary host)
- NetWorker Module for Oracle (on primary host)
- PowerSnap for EMC Symmetrix (on primary and secondary hosts)

[Figure 7 on page 101](#) illustrates the architecture of the proxy Oracle backup and recovery system. It provides an overview of the functional relationship between the Legato and Oracle software components. The interactions of the components (including the PowerSnap Backup Restore Control (BRC) module and Worker Save module) are described in the following sections:

- [" How a Proxy Oracle Backup Works" on page 101](#)
- [" How a Proxy Oracle Restore Works" on page 107](#)

**Note:** For performance reasons, the secondary host should be configured as a NetWorker server or storage node and the storage medium attached to the secondary host. For more information, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

**Figure 7. Oracle Backup and Recovery System for Proxy Backups of EMC Symmetrix Devices**



## How a Proxy Oracle Backup Works

During a proxy backup of Oracle data on Symmetrix devices, Oracle Server processes interact with the NetWorker server through the NetWorker Module for Oracle and PowerSnap for EMC Symmetrix software. The NetWorker Module for Oracle media management library (MML) is integrated with the Oracle Server kernel software.

**Note:** Certain RMAN features such as checking for corrupt blocks are *not* applicable to proxy backups since the NetWorker Module for Oracle MML controls the proxy backup process.

When a proxy backup is initiated, the RMAN utility starts the Oracle Server processes that call the NetWorker Module for Oracle MML proxy-specific routines. The MML routines communicate with the PowerSnap service on the primary host.

On the primary host, the PowerSnap for EMC Symmetrix BRC module uses an EMC Symmetrix application programming interface (API) to take a snapshot of the Oracle data on the standard device by synchronizing and splitting the BCV or RBCV device. The BRC module spawns the Worker Save module process on a separate secondary host to perform the actual data movement to NetWorker storage devices.

On the secondary host, the Worker Save process moves the Oracle data from the BCV or RBCV device to the NetWorker server or storage node.

The NetWorker server or storage node stores the Oracle data on the appropriate backup storage device. At the end of the Oracle backup, the NetWorker server updates the online client and media indexes with information about the storage media used and the Oracle data it contains.

For more information about NetWorker server and NetWorker client programs and services, refer to the *Legato NetWorker Administrator's Guide*.

## Manual Backup

A manual Oracle backup can be performed in either of two ways:

- By issuing the appropriate commands through the RMAN command line interface.
- By using the OEM Backup Management Tools, which include an optional graphical user interface to the RMAN utility.

**Note:** NetWorker Module for Oracle considers a backup scheduled through OEM as a manual backup.

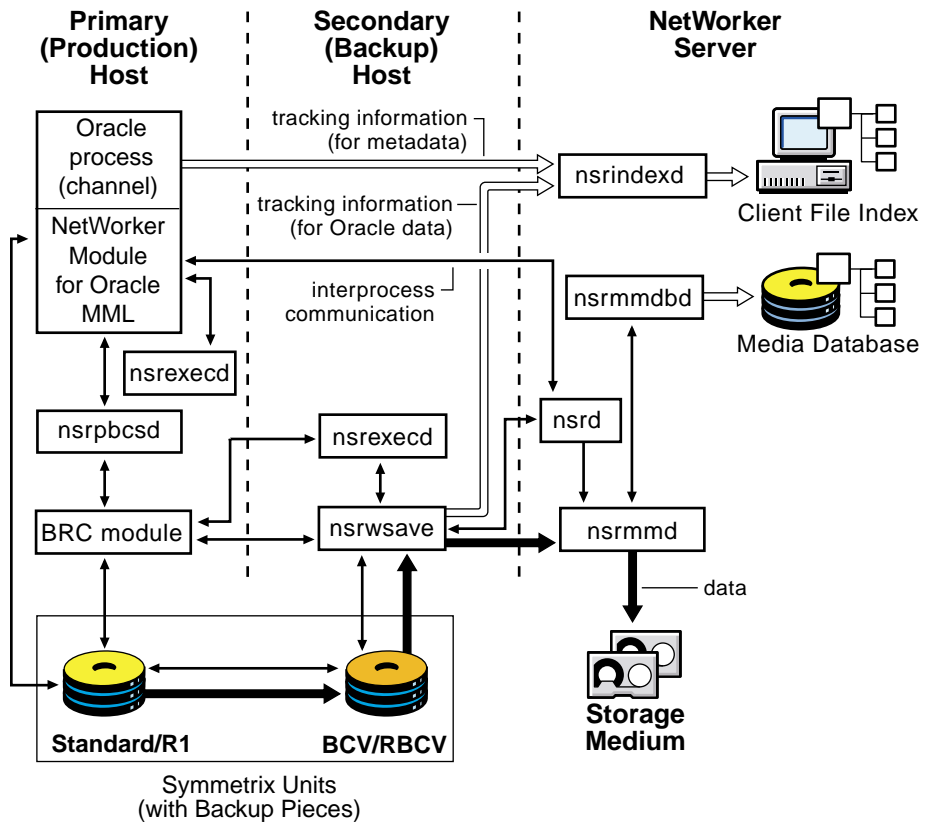
A manual proxy backup involves the following processes:

1. The Oracle Server process uses the NetWorker Module for Oracle MML to start the proxy backup by contacting the PowerSnap master process, **nsrpbcsd**, on the primary host.
2. For each proxy backup request, the master **nsrpbcsd** process spawns an agent process, which enforces the privileges required for proxy backup functions.

3. The BRC module works with the EMC Symmetrix API to create a snapshot of the Oracle data, from the Symmetrix standard device to the BCV or RBCV device.
4. For each Oracle data save set to be backed up, the BRC module spawns a Worker Save process, **nsrwsave**, on the secondary host.
5. The **nsrwsave** process on the secondary host:
  - a. Re-creates the primary host environment (filesystems, mount points, and volume groups) on the secondary host.
  - b. For filesystems, mounts the BCV or RBCV device on the same mount point as the standard or R1 device.
  - c. Sends the backup data from the snapshot to the NetWorker media service, **nsrmmmd**, to store on the appropriate backup volumes.  
The **nsrmmmd** service records tracking information in the NetWorker media database by using the **nsrmmdbd** service.
  - d. Sends tracking information to the NetWorker client file index by using the **nsrindexd** service.
  - e. Cleans up the environment on the secondary host.
6. If requested, the BRC module on the primary host resynchronizes the standard device and BCV or RBCV device.
7. The NetWorker Module for Oracle MML, which runs as part of the Oracle Server process, saves small size metadata about the proxy backup to the NetWorker server.

[Figure 8 on page 104](#) shows how the Oracle Server and Legato processes interact during a manual proxy Oracle backup.

Figure 8. Manual Proxy Oracle Backup of an EMC Symmetrix Device



## Scheduled Backup

A scheduled Oracle backup is a backup of Oracle data initiated by the NetWorker server. For more information on configuring and running scheduled Oracle backups, see ["Chapter 4: Scheduled Oracle Backups" on page 51](#).

A scheduled proxy backup involves the following processes:

1. At the scheduled backup start time, the main NetWorker service, **nsrd**, starts the configured group's backup by invoking the **savegrp** program.
2. The **savegrp** program requests that the NetWorker client-side service, **nsrexecd**, on the primary host run the **savefs** program to verify the existence of the RMAN scripts to be used for the backup.

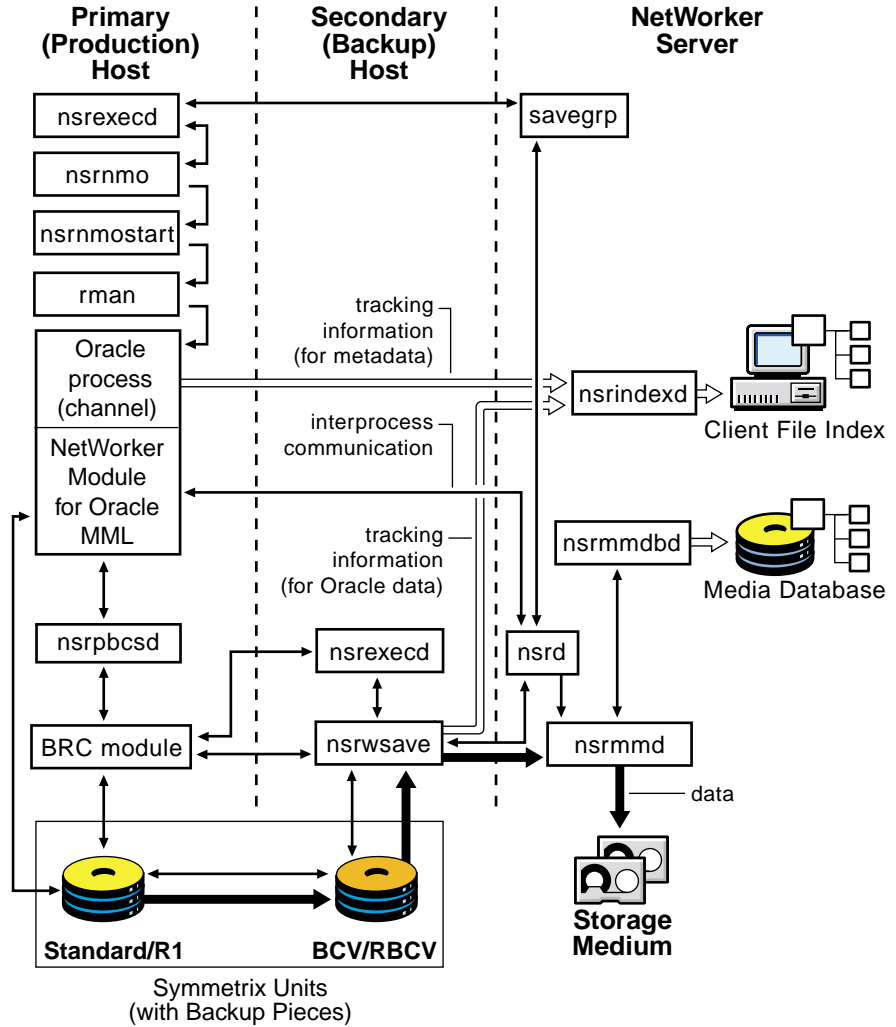


3. The **savefs** program sends back information to the **savegrp** program.
4. The **savegrp** program contacts the **nsrexecd** service on the primary host to start the backup.
5. For each client in the backup group and each of the client's save sets, the following sequence of events occurs:
  - a. The **nsrexecd** service starts the **nsrnm0** script for the scheduled backup.
  - b. The **nsrnm0** script sets the required environment variables and invokes the NetWorker Module for Oracle program, **nsrnmstart**.
  - c. The **nsrnmstart** program starts the RMAN utility to run the required RMAN backup script.
  - d. From this point on, the scheduled Oracle backup processes follow the same steps as described in "[Manual Backup](#)" on page 102.

**Note:** At the end of a scheduled Oracle backup, the **savegrp** program also automatically backs up the NetWorker server bootstrap and the Oracle client file indexes. The bootstrap and client indexes are *not* automatically backed up at the end of a manual Oracle backup.

[Figure 9 on page 106](#) shows how the Oracle Server and Legato processes interact during a scheduled proxy Oracle backup.

**Figure 9. Scheduled Proxy Oracle Backup of an EMC Symmetrix Device**



## How a Proxy Oracle Restore Works

An Oracle restore can be performed in either of two ways:

- By issuing the appropriate commands through the RMAN command line interface.
- By using the OEM Backup Management Tools, which include an optional graphical user interface to the RMAN utility.

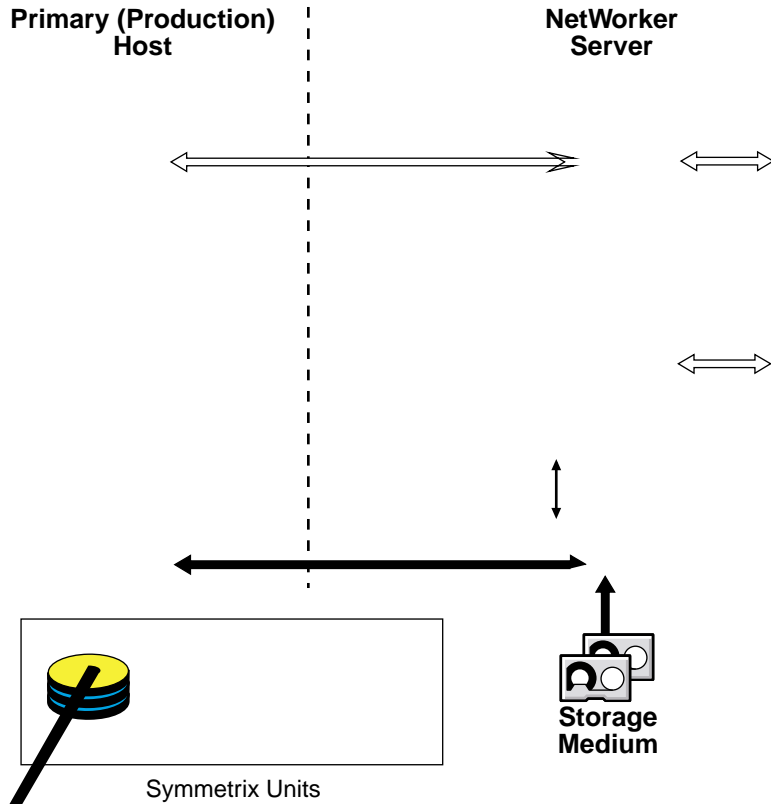
The RMAN utility starts Oracle Server processes on the target database. These Oracle Server processes start the restore by calling NetWorker Module for Oracle MML routines.

A proxy restore involves the following processes:

1. The NetWorker Module for Oracle MML:
  - a. Translates the proxy backup object names requested by RMAN into a format that the NetWorker server understands.
  - b. Verifies the existence of the proxy backup objects through the **nsrindexd** service.
2. The NetWorker Module for Oracle MML contacts the PowerSnap master process, **nsrpbcsd**, on the primary host.
3. For each restore request, the master **nsrpbcsd** process spawns an agent process, to work with the restore process of the BRC module on the primary host.
4. The restore process of the BRC module on the primary host sends a restore request to the NetWorker server.
5. The main NetWorker service, **nsrd**, contacts the media service, **nsrmmmd**.
6. The **nsrmmmd** service calls the media database service, **nsrmmdbd**, to determine which media contains the requested save set and issue a mount request.
7. The **nsrmmmd** service reads the appropriate backup volumes and passes the data to the restore process on the primary host.
8. The restore process on the primary host writes the Oracle data to the original location (standard or R1 device) unless the restored files are being relocated.

[Figure 10 on page 108](#) shows how the Oracle Server and Legato processes interact during a proxy Oracle data restore.

**Figure 10. Proxy Oracle Data Restore to an EMC Symmetrix Device**



Once the required Oracle files are restored from the backup volumes, a database administrator can complete the standard Oracle database recovery.

## Software Configuration Requirements

This section describes the configuration requirements for proxy Oracle backups and restores.

Before performing the required configuration procedures, ensure that *both* the NetWorker Module for Oracle and Legato PowerSnap for EMC Symmetrix software products are properly installed according to the instructions in the following:

- *Legato NetWorker Module for Oracle Installation Guide*
- *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*

## Basic Configurations

Ensure that the basic configurations are performed:

- Follow the ["Software Configuration Roadmap" on page 31](#) to complete the basic Oracle Server and NetWorker configurations. The NetWorker Server, Client, Device, and Pool resources must be configured, and the required backup volumes labeled and mounted.
- Follow the ["Roadmap for Scheduled Oracle Backups" on page 52](#) to complete the required configurations for scheduled Oracle backups.

## Additional Configurations for Proxy Operations

Additional configuration requirements for proxy Oracle backups and restores include the following:

- The required EMC Symmetrix components, including the SYMAPI database files and user-defined device groups, must be properly configured on the primary and secondary hosts.  
For more information, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.
- In the NetWorker Client resource created for the primary host (as described in ["Task 3: Configure the NetWorker Client Resource" on page 35](#)), the Remote Access attribute must be modified to include the name of the secondary host.

**Note:** A NetWorker Client resource must be created for the only the primary host—*not* for the secondary host.

- If the secondary host is to act as a NetWorker storage node:
  - The NetWorker storage node software must be installed and enabled on the secondary host.
  - The required NetWorker Device resource must be configured for each backup device attached to the secondary host.
  - The hostname of the secondary host must appear *first* in the Storage Nodes attribute of the Client resource created for the primary host.
- For a scheduled backup, the Inactivity Timeout attribute in the Group resource must be set properly. This attribute specifies the number of

minutes that the NetWorker server waits to receive status of backup activity before abandoning the scheduled backup of a save set.

- If it is possible to estimate the time in minutes required between the scheduled backup start time and the time that the secondary host starts backing up the Oracle data, *add* this time to the Inactivity Timeout attribute value.
- If it is not possible to estimate the time required for the pre-save Symmetrix operations, specify zero in the Inactivity Timeout attribute. The zero value *disables* the inactivity timeout feature.

**Note:** Since Inactivity Timeout is a hidden attribute, the attribute can be displayed by selecting Details from the View menu in the Group window of the NetWorker Administrator program. For more information on this attribute, refer to the **nsr\_group** entry in the *Legato Command Reference Guide*.

For more information on the configuration requirements of the EMC Symmetrix components and NetWorker resources, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

## Environment Variables for Proxy Oracle Operations

Two types of environment variables can be set for the proxy Oracle backup and restore operations:

- NetWorker Module for Oracle environment variables, described in ["Appendix A: Environment Variables in the RMAN Session" on page 123](#).
- PowerSnap for EMC Symmetrix environment variables, described in the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

The NetWorker Module for Oracle variables must be set using one of the methods in ["Setting the NSR\\_\\* Environment Variables" on page 123](#).

The PowerSnap variables must be set using one of these methods:

- Using the **send** command, either:
  - With the **rman** command on the operating system command line; or
  - In the RMAN run job.

For more information on how to invoke the **send** command, see ["Two Ways to Run the send Command" on page 137](#).

- In a user-defined configuration file. The complete pathname of the file must be specified in the NSR\_PROXY\_PFILE variable, as described on [page 128](#).

The configuration file consists of a separate line such as the following for each variable value setting:

```
var_name=var_value
```

where:

- *var\_name* is the variable name, such as NSR\_SNAP\_REMOTE
- *var\_value* is the variable value, such as TRUE

#### Notes:

- A sample configuration file, */nsr/tmp/nmopss-env-eg*, is installed during the PowerSnap software installation on the primary host only. The file includes all the supported PowerSnap environment variables.  
To use the sample file as a template for creating a user-defined configuration file, copy it to any location (renaming it as required) and modify the variable values in the file according to the requirements of the particular proxy Oracle backup and restore system. The complete pathname of the configuration file must be specified in the NSR\_PROXY\_PFILE variable, as described on [page 128](#).
- Several PowerSnap variables are mandatory. For example, NSR\_PB\_SERVICE must be set to BRC.
- A variable setting in the **send** command takes *precedence* over one in the configuration file.  
If the same PowerSnap variable is set to different values in the **send** command and configuration file, the value in the **send** command is the one used for the proxy backup or restore.
- In a configuration file, the first valid occurrence of a PowerSnap variable takes *precedence* over any other occurrences of the same variable in the same file.
- The use of the **parms** option in the **allocate channel** command to set the PowerSnap variables has *no* effect.
- The use of the **setenv** command on the operating system command line to set the PowerSnap variables has *no* effect.

For example, to set mandatory PowerSnap variables for a proxy Oracle backup, a configuration file named */ora901/rman/proxy.cfg* can be created, consisting of the following lines:

```
NSR_DATA_MOVER=secondary_hostname
NSR_PB_SERVICE=BRC
NSR_SNAP_GROUPS=device_group1:device_group2:device_group3
NSR_SNAP_REMOTE=FALSE
```

In this case, the NetWorker Module for Oracle variable `NSR_PROXY_PFILE` must be set to `/ora901/rman/proxy.cfg` by using the **send** command or the **parms** option in the **configure channel** command. For example, these commands both set the variable correctly:

```
allocate channel t1 device type 'SBT_TAPE' ;
send 'NSR_ENV=(NSR_PROXY_PFILE=/ora901/rman/proxy.cfg) ' ;

configure channel device type 'SBT_TAPE' parms
'ENV=(NSR_PROXY_PFILE=/ora901/rman/proxy.cfg) ' ;
```

## Proxy Oracle Backup Requirements

For basic information on how to configure and run manual and scheduled Oracle backups using NetWorker Module for Oracle, see the following roadmaps:

- ["Roadmap for Manual Oracle Backups" on page 41](#)
- ["Roadmap for Scheduled Oracle Backups" on page 52](#)

Review the following information, specific to proxy Oracle backups:

- ["Creating RMAN Scripts for Proxy Oracle Backups" on page 112](#)
- ["Performing Proxy Oracle Backups" on page 115](#)
- ["Canceling Proxy Oracle Backups" on page 115](#)

## Creating RMAN Scripts for Proxy Oracle Backups

The basic information on RMAN backup scripts in the following chapters also applies to RMAN scripts for proxy Oracle backups:

- ["Chapter 3: Manual Oracle Backups" on page 41](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 51](#)

These additional requirements apply to RMAN scripts for proxy Oracle backups:

- The appropriate environment variables must be set as described in ["Environment Variables for Proxy Oracle Operations" on page 110](#).
- The **proxy** or **proxy only** option must be specified with the **RMAN backup** command.

**Note:** Certain options of the **RMAN backup** command, such as **maxsetsize** and **diskratio**, are *not* supported with the **proxy** option.



For more information on the RMAN options that are not supported, contact Oracle Corporation.

- As required by Oracle for proxy backups, the **%p** variable must be included in the **format** string, either explicitly or implicitly within **%U**. For more information, refer to the appropriate Oracle backup and recovery documentation.
- It is recommended that only one channel be allocated in the RMAN script. Allocating more than one channel in the RMAN script—in an attempt to distribute the proxy backup over more than one channel—is *not* recommended.

**Note:** Proxy backup parallelism is defined by the PowerSnap variable `NSR_PB_SAVE_PARALLELISM`. For more information, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

The following sample RMAN script performs a proxy backup of an entire Oracle database residing on one or more EMC Symmetrix devices.

```
run {
    allocate channel t1 type 'SBT_TAPE';

    send 'NSR_ENV=(
NSR_PROXY_PFILE=/ora901/rman/proxy.cfg,
NSR_SERVER=mars.legato.com)';

    backup full proxy only
    format '/FULL_%d_%U/'
    (database);

    release channel t1;
}
```

In this sample script, `NSR_PROXY_PFILE` is an optional NetWorker Module for Oracle variable, specifying the complete pathname of a user-defined configuration file, */ora901/rman/proxy.cfg*, that contains PowerSnap variable settings for the backup.

## Multiple Channels in RMAN Scripts

Allocating multiple channels in an RMAN script does *not* control the degree of backup or restore parallelism since Oracle uses *only one* of the allocated channels for the proxy backup or restore, unless specific backup options are used.

For example, the proxy backup performed with the following RMAN script is written to either the *OracleVolume1* or *OracleVolume2* volume pool—*not* to both volume pools—because Oracle uses only one of the allocated channels for the proxy backup.

```
run {
    allocate channel c1 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=OracleVolume1)';
    allocate channel c2 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=OracleVolume2)';
    backup proxy only tablespace tbs1, tbs2, tbs3, tbs4;
    release channel c1;
    release channel c2;
}
```

In the following example, the RMAN script uses specific backup options to *enforce* distribution of the proxy backup over two channels.

```
run {
    allocate channel c1 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=OracleVolume1)';
    allocate channel c2 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=OracleVolume2)';
    backup proxy
    (tablespace tbs1, tbs2 channel c1)
    (tablespace tbs3, tbs4 channel c2);
    release channel c1;
    release channel c2;
}
```

The following RMAN script is recommended to *replace* both of the preceding two backup scripts.

```
run {
    allocate channel c1 type 'SBT_TAPE'
    parms 'ENV=(NSR_DATA_VOLUME_POOL=OracleVolume1)';
    backup proxy tablespace tbs1, tbs2, tbs3, tbs4;
    release channel c1;
}
```

## Performing Proxy Oracle Backups

For proxy Oracle backup requirements specific to the PowerSnap for EMC Symmetrix software, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*. The guide also describes the debugging logs produced on both the primary and secondary hosts during a proxy backup.

The following requirements apply to proxy Oracle backups:

- To perform a "dry run" proxy Oracle backup (including all the same operations as a regular backup except for the actual save of the data), the PowerSnap variable NSR\_PB\_DRY\_RUN must be set to TRUE.

### Notes:

- A dry run of an online Oracle backup puts the datafiles in backup mode.
- Although RMAN error messages are displayed normally during a dry run backup, the appearance of a "successful backup" message within an error message indicates that the dry run backup was successful.
- NetWorker Module for Oracle forces RMAN to fail even though the dry run backup is successful in order to avoid recording backup entries in the RMAN repository.
- If the NetWorker Module for Oracle and PowerSnap for EMC Symmetrix software cannot proxy copy a datafile (the datafile does *not* reside on a Symmetrix device), the resulting actions depend on the **backup** command option used:
  - If the **backup proxy** command is used, RMAN performs a regular backup of the datafile instead.
  - If the **backup proxy only** command is used, RMAN terminates the proxy backup.

**Note:** RMAN performs a regular backup of the Oracle control file and archived redo logs.

- A proxy backup of a symbolic link to one level is supported.

## Canceling Proxy Oracle Backups

Proxy Oracle backups can be canceled by using the same methods as for regular Oracle backups. For more information, see:

- ["Canceling a Manual Oracle Backup" on page 48](#)
- ["Canceling a Scheduled Oracle Backup" on page 71](#)

## Proxy Oracle Backup Information in the NetWorker Indexes

The NetWorker server maintains information about each backup in its online indexes. For more information, see "[Chapter 1: Introduction](#)" on page 15.

The index entry for a proxy Oracle backup is stored in the NetWorker client file index for the primary host by default (see "[NSR\\_CLIENT](#)" on page 125 for more information), under the Oracle name space (same as for a regular backup). The NetWorker client file index and media database each contain a different value for the name of the same save set for a proxy Oracle backup.

Query the online NetWorker indexes by using the NetWorker server programs, **nsrinfo** and **mminfo**.

- Use the **nsrinfo** program to query the NetWorker client file index. For example:  

```
# nsrinfo -n oracle Oracle_Server_hostname
```
- Use the **mminfo** program to query the NetWorker media database. For example:  

```
# mminfo -v -c Oracle_Server_hostname
```

For more information on these NetWorker server programs, refer to the *Legato Command Reference Guide* and the UNIX man pages.

- For proxy backups, the client file index contains two sets of backup entries.
  - One set includes the backup piece name assigned by RMAN, such as *PROXY\_EMCTST2\_89\_1* in the following example. These backup entries contain the metadata written at backup time.
  - The other set contains the real Oracle database operating system files that are backed up, such as */emc03C/oradata/orcl901/emctst2\_1.dbf* in the following example.

```
# nsrinfo -n oracle marmaris
scanning client 'marmaris' for all savetimes from the
oracle namespace
PROXY_EMCTST2_89_1, date=1023498572 Fri Jun 7 21:09:32
2002
/emc03C/oradata/orcl901/emctst2_1.dbf, date=1023498566
Fri Jun 7 21:09:26 2002
/emc03C/oradata/orcl901/, date=1023498566 Fri Jun 7
21:09:26 2002
```

```
/emc03C/oradata/, date=1023498566 Fri Jun 7 21:09:26
2002
```

```
/emc03C/, date=1023498566 Fri Jun 7 21:09:26 2002
```

```
/, date=1023498566 Fri Jun 7 21:09:26 2002
```

- The media database contains two entries for the same proxy backup piece.
  - One entry is generated for the metadata save set.
  - The other entry is generated for the Oracle data save set.
  - Both entries include the name of the RMAN backup script used for the proxy backup, such as `/rman_scripts/emctbs2` in the following example.

```
# mminfo -V -c marmaris
```

```
NMOPool.006 marmaris.legato.com 30 MB
/rman_scripts/emctbs2
```

```
22627841 1023498566 06/07/02 21:09:26 07/08/02 06/07/03
0 31473363 22627841 0 15083009 31473364 cb
```

```
NMOPool.006 marmaris.legato.com 256 B full
/rman_scripts/emctbs2
```

```
22629377 1023498572 06/07/02 21:09:32 07/08/02 06/07/03
0 255 22629377 0 15083009 256 cb
```

**Note:** For a manual Oracle backup, both online NetWorker indexes contain the same name for a backup save set—the backup piece name.

## Proxy Oracle Restore Requirements

For basic information on how to configure and run Oracle data restore and recovery using NetWorker Module for Oracle, see the ["Roadmap for Oracle Data Recovery"](#) on page 78.

Review the following information, specific to proxy Oracle restores:

- ["Creating RMAN Scripts for Proxy Oracle Restores"](#) on page 118
- ["Performing Proxy Oracle Restores"](#) on page 118
- ["Relocating Files during Proxy Oracle Restores"](#) on page 119
- ["Restoring from NetWorker Module for EMC Symmetrix for Oracle Backups"](#) on page 122

## Creating RMAN Scripts for Proxy Oracle Restores

The same RMAN script used for a regular Oracle restore can also be used for a proxy Oracle restore.

To create an RMAN script for a proxy Oracle restore, follow the instructions in ["Chapter 5: Restoring and Recovering Oracle Data" on page 77](#).

### Notes:

- The appropriate environment variables must be set as described in ["Environment Variables for Proxy Oracle Operations" on page 110](#).  
For example, to restore Oracle data to a system other than the primary host, the `NSR_CLIENT` environment variable must be set to the required hostname.
- The RMAN **restore** command does *not* include a **proxy** option.

## Performing Proxy Oracle Restores

For proxy Oracle restore requirements specific to the PowerSnap for EMC Symmetrix software, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*. The guide also describes the debugging log produced on the primary host during a proxy restore.

The following requirements apply to proxy Oracle restores:

- The type of Oracle restore performed by RMAN depends on whether the original backup was a regular or proxy backup.
  - If data was backed up during a regular backup, RMAN automatically performs a regular restore of the data.
  - If data was backed up during a proxy backup, RMAN automatically performs a proxy restore of the data.
- A proxy Oracle restore is supported to a standard or R1 device only.
- A proxy restore of a symbolic link restores the file to its original location with the symbolic link intact.
- The relocation of files during a proxy Oracle restore is supported. For more information, see ["Relocating Files during Proxy Oracle Restores" on page 119](#).
- During a proxy restore of regular filesystem data, a temporary `.nworapc` subdirectory (with 0700 permissions) is created for the temporary relocation of the files being restored to a directory. The empty `.nworapc` subdirectory persists after the restore and can be deleted manually if required.

**Note:** If a proxy restore of filesystem data fails, the nonempty *.nworapc* subdirectories persist after the restore, and can be deleted manually, if required. Do *not* use any datafiles from these subdirectories for Oracle recovery; otherwise, database corruption might occur. If you restart the failed restore, NetWorker Module for Oracle automatically cleans up these subdirectories.

- During a proxy Oracle restore, PowerSnap for EMC Symmetrix creates concurrent restore streams to optimize the restore.

The maximum number of concurrent restore streams is defined by the PowerSnap for EMC Symmetrix variable `NSR_MAX_STREAMS`. For more information, refer to the *Legato PowerSnap for EMC Symmetrix Installation and Administrator's Guide*.

To determine the number of concurrent restore streams running:

1. Enter this **ps** command at the operating system command line:
 

```
$ ps -ef | grep nsrpbcsd
```
  2. Count the number of **nsrpbcsd** agent processes (agent processes include the **-a** option).
- After an Oracle restore is complete, a database administrator must recover the database by using the standard Oracle **recover** command, if required.

## Relocating Files during Proxy Oracle Restores

The section describes the details of proxy Oracle restore relocation with NetWorker Module for Oracle.

During a proxy Oracle restore, NetWorker Module for Oracle supports and controls relocation, which is the restore of datafiles (regular files or raw volumes) to a new location. The new location can be specified by using the **set newname** command.

**Note:** During a *regular* Oracle restore, relocation is also supported, but it is controlled by the Oracle Server.

To relocate a regular file or raw volume during a proxy Oracle restore, the **set newname** command must specify the name of the relocated file as *one* of the following:

- The complete pathname of the relocated file
- The complete pathname of a symbolic link that points to the location (a complete file pathname) where the file will be restored

For example, if the symbolic link `/tmp/file1` points to `/dbapps/orcl815/file2` and the symbolic link `/tmp/file1` is specified in the **set newname** command, the backed-up file will be restored to `/dbapps/orcl815/file2`.

**Note:** When a file is relocated during a proxy Oracle restore, any symbolic links backed up with the file are *not* re-created.



---

**Important:** The procedure to relocate a raw volume includes a restriction that is *not* required to relocate a regular file.

To relocate a raw volume (as opposed to a regular file), the base filename of the original raw volume must be identical to *one* of the following:

- The base filename of the path specified in the **set newname** command
  - If the **set newname** command specifies a symbolic link, the base filename of the file pointed to by the symbolic link
- 

For example, if a backed-up raw volume is named `/dev/volume_one/rvol1`, the `/dev/volume_two/rvol1` relocation path can be specified in the **set newname** command, since the original and relocation paths have the same base filename, `rvol1`. However, specifying the `/dev/volume_one/rvol2` path in the **set newname** command would cause the proxy restore to fail, since the original and relocation paths have different base filenames.

The following procedure is one way to relocate `/dev/volume_one/rvol1` to `/dev/volume_one/rvol2`:

1. Create a symbolic link named `/tmp/rvol1` that points to `/dev/volume_one/rvol2`.
2. Specify `/tmp/rvol1` in the **set newname** command in the RMAN restore script.

In this case, the relocation succeeds because both the original path and symbolic link name have the same base filename, `rvol1`.





### Example: File Relocation during a Proxy Oracle Restore

The following sample RMAN script performs a proxy restore of the Oracle datafile `/dbapps/orcl815/users01.dbf` and uses the `set newname` command to relocate the datafile to `/dbapps/orcl815/databs01.dbf`.

```
run {
    set newname for datafile '/dbapps/orcl815/users01.dbf'
    to '/dbapps/orcl815/databs01.dbf' ;

    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(
    NSR_PROXY_PFILE=/ora901/rman/proxy.cfg,
    NSR_SERVER=mars.legato.com) ' ;

    restore datafile 5;

    release channel t1;

}
```

## Restoring to a Different Host

To restore proxy Oracle database backups to a different host, follow the guidelines in ["Restoring to a Different Host" on page 80](#). Step 2 of that section explains that NetWorker Module for Oracle must be installed and configured on the secondary system where the Oracle data is to be restored. For proxy Oracle restores to a different host, PowerSnap for EMC Symmetrix must *also* be installed and configured on the secondary system.

## RMAN Point-in-time Recoveries without a Recovery Catalog

**Note:** If point-in-time recoveries are *not* performed without an RMAN Recovery Catalog, the information in this section does *not* apply.

During a proxy database backup, Oracle backs up the control file after the proxy backup of the datafiles is complete. In a large database production environment, there might be a delay between the start time of the datafile backup and the start time of the control file backup.

During this time delay, if the physical structure of the database is changed (for example, a new datafile is added), the control file must be backed up in a separate RMAN session *before* the changes occur. This is due to the fact that the control file backup from the proxy database backup session will include information on the new database structure.

## Restoring from NetWorker Module for EMC Symmetrix for Oracle Backups

The NetWorker Module for EMC Symmetrix for Oracle software performs filesystem backups of Oracle datafiles. This software can be upgraded to the combination of NetWorker Module for Oracle and PowerSnap for EMC Symmetrix software.

After such an upgrade, datafiles must be restored from existing NetWorker Module for EMC Symmetrix for Oracle backups by using the NetWorker **recover** program. For more information, refer to the restore procedures in one of the following:

- *Legato NetWorker Module for EMC Symmetrix for Oracle Installation and Administrator's Guide, Release 1.3, UNIX Version*
- *Legato NetWorker Module for EMC Symmetrix for Oracle Installation Guide, Release 1.5, UNIX Version*

# Appendix A: Environment Variables in the RMAN Session

This appendix describes the NSR\_\* environment variables that can be set in the RMAN command or script for Oracle backups and restores using NetWorker Module for Oracle.

**Note:** Unless noted otherwise, the variables are supported for *both* non-proxy and proxy Oracle backups and restores. For information specific to proxy Oracle operations, see "[Environment Variables for Proxy Oracle Operations](#)" on page 110.

This appendix includes the following main sections:

- "[Setting the NSR\\_\\* Environment Variables](#)" on page 123
- "[NSR\\_\\* Environment Variable Definitions](#)" on page 124

## Setting the NSR\_\* Environment Variables

The NSR\_\* environment variables described in [Table 3 on page 125](#) are environment variables specific to NetWorker that can be set for an RMAN session of:

- Either a manual or scheduled Oracle backup.
- An Oracle restore.

To ensure that the required NSR\_\* environment variables are set during an Oracle backup or restore, set them in one of these ways:

- In Oracle8i or Oracle9i, using the RMAN **send** command (*recommended*), as either:
  - The **rman send** command on the operating system command line; or
  - The **send** command in the RMAN session or script.

- In Oracle9i *for manual backups only*, using the **send** option in the **configure channel** command.
- In Oracle8, Oracle8i, or Oracle9i, using the **parms** option in *either* the **allocate channel** command *or* the **configure channel** command (*Oracle9i only*). See "[The parms Option in the allocate channel Command](#)" on [page 140](#).

**Note:** Each NSR\_\* environment variable set using the **parms** option in the **allocate channel** command must be included in the **parms** option for *each* allocated channel. Oracle8 does *not* support the RMAN **send** command. For more information, see "[The send Command](#)" on [page 134](#).

Do *not* mix these different ways of setting the NSR\_\* environment variables in the same RMAN session.

*With Oracle8 only*, when an NSR\_\* environment variable is set in an RMAN **run{...}** command, as shown in the sample script on [page 43](#), the value of that NSR\_\* variable in each allocated channel might remain in effect for all subsequent RMAN **run{...}** commands until the RMAN session is closed or finished. To avoid such problems with NSR\_\* variable settings with Oracle8, run each RMAN **run{...}** command in a separate RMAN session.

**Note:** The use of a **setenv** command on the operating system command line to set the NSR\_\* variables has *no effect*. In Oracle release 8.1.5 and earlier, the use of the **backup** command in the RMAN script to set these variables also has *no effect*.

## NSR\_\* Environment Variable Definitions

[Table 3 on page 125](#) lists all the NSR\_\* environment variables to set in the RMAN session. For each variable, the table includes:

- A description of the variable.
- The default value of the variable.
- The valid values that can be assigned to the variable.

Table 3. Environment Variables in the RMAN Command or Script (Part 1 of 5)

Variable	Description	Default and Valid Values
NSR_BROWSE	<i>Not recommended.</i> This NetWorker Module for Oracle release 3.5 variable has been replaced by the NSR_SAVESET_BROWSE variable.	If this variable is used, its value is assigned to the NSR_SAVESET_BROWSE variable.  <b>Note:</b> In the <b>parms</b> option, a value assigned to NSR_SAVESET_BROWSE takes precedence over one assigned to NSR_BROWSE.
NSR_CHECKSUM	<i>Optional.</i> Specifies whether or not the NetWorker software performs checksumming on the backup data.	<ul style="list-style-type: none"> <li>• FALSE (default) = NetWorker software performs <i>no</i> checksumming.</li> <li>• TRUE = NetWorker software performs checksumming.</li> </ul>
NSR_CLIENT	<i>Recommended</i> for a backup of Oracle running on a cluster, OPS, or RAC system.  <i>Recommended</i> for all restores.  NetWorker Client resource to use for a backup or restore session.  Might be needed for disaster recovery.	<ul style="list-style-type: none"> <li>• Physical host on which the session runs (default).</li> <li>• Valid NetWorker client hostname.</li> </ul>
NSR_COMPRESSION	<i>Optional.</i> Specifies whether or not the NetWorker software performs compression on the backup data.	<ul style="list-style-type: none"> <li>• FALSE (default) = NetWorker software performs <i>no</i> compression.</li> <li>• TRUE = NetWorker software performs compression.</li> </ul>

**Table 3. Environment Variables in the RMAN Command or Script (Part 2 of 5)**

Variable	Description	Default and Valid Values
NSR_DATA_VOLUME_POOL	<p><i>Mandatory</i> if using <b>set duplex</b> command (set to 1, 2, 3, or 4).</p> <p>Name of volume pool to use for the Oracle backup, including a <i>duplexed</i> Oracle backup.</p> <p><b>Note:</b> For a scheduled backup, the NSR_DATA_VOLUME_POOL setting takes precedence over any pool associated with the scheduled backup group.</p>	<ul style="list-style-type: none"> <li>• Most appropriate pool, selected by the NetWorker server (default).</li> <li>• Valid NetWorker pool name.</li> <li>• Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable.</li> </ul>
NSR_DATA_VOLUME_POOL1	<p><i>Mandatory</i> if using <b>set duplex</b> command (set to 2, 3, or 4).</p> <p>Name of volume pool to use for <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> <li>• Undefined (default).</li> <li>• Valid NetWorker pool name.</li> <li>• Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable.</li> </ul>
NSR_DATA_VOLUME_POOL2	<p><i>Mandatory</i> if using <b>set duplex</b> command (set to 3 or 4).</p> <p>Name of volume pool to use for <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> <li>• Undefined (default).</li> <li>• Valid NetWorker pool name.</li> <li>• Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable.</li> </ul>
NSR_DATA_VOLUME_POOL3	<p><i>Mandatory</i> if using <b>set duplex</b> command (set to 4).</p> <p>Name of volume pool to use for <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> <li>• Undefined (default).</li> <li>• Valid NetWorker pool name.</li> <li>• Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable.</li> </ul>

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Table 3. Environment Variables in the RMAN Command or Script (Part 3 of 5)

A

Variable	Description	Default and Valid Values
NSR_DEBUG_FILE	<p><i>Optional.</i> Only used for debugging of NetWorker Module for Oracle MML.</p> <p>Enables debugging by specifying the complete pathname of a file to receive debugging information.</p>	<ul style="list-style-type: none"> <li>• Undefined (default).</li> <li>• Valid pathname of the debug file.</li> </ul> <p><b>Note:</b> If undefined, no debugging information is generated. If a file with the specified pathname <i>cannot</i> be created, debugging information is either directed to default location or not generated.</p>
NSR_ENCRYPTION	<p><i>Optional.</i> Specifies whether or not the NetWorker software performs encryption on the backup data.</p>	<ul style="list-style-type: none"> <li>• FALSE (default) = NetWorker software performs <i>no</i> encryption.</li> <li>• TRUE = NetWorker software performs encryption.</li> </ul>
NSR_GROUP	<p><i>Optional. Use for a manual backup only.</i> Specifies the NetWorker group to use for a backup session. Used by the NetWorker server to select the volume pool for the manual backup.</p> <p><b>Note:</b> Do <i>not</i> set this variable for a scheduled backup.</p>	<ul style="list-style-type: none"> <li>• Default group (default).</li> <li>• Valid NetWorker backup group name.</li> </ul> <p><b>Note:</b> A NetWorker Group resource must be configured for the specified backup group.</p>
NSR_NO_BUSY_ERRORS	<p><i>Optional.</i> Specifies whether a scheduled backup fails immediately when the NetWorker server is busy or waits for the NetWorker server to accept the connection.</p> <p><b>Note:</b> For proxy Oracle backups, this variable is always set to FALSE.</p>	<ul style="list-style-type: none"> <li>• FALSE (default) = Scheduled backup waits for NetWorker server to accept the connection.</li> <li>• TRUE = Scheduled backup fails immediately when NetWorker server is busy.</li> </ul>

Table 3. Environment Variables in the RMAN Command or Script (Part 4 of 5)

Variable	Description	Default and Valid Values
NSR_NWPATH	<p><i>Mandatory</i> when removing a backup from the NetWorker server if both:</p> <ul style="list-style-type: none"> <li>• <b>nsrmm</b> binary is in a nondefault location; and</li> <li>• <i>/nsr/res/nwora.res</i> file is not created or does not contain the correct location of NetWorker client binaries.<sup>a</sup></li> </ul> <p>Complete pathname of the directory containing the <b>nsrmm</b> binary.</p>	<ul style="list-style-type: none"> <li>• Platform-specific default location of NetWorker client binaries (default).</li> <li>• Valid pathname of <b>nsrmm</b> binary directory, for example, <i>/usr/local/bin</i>.</li> </ul>
NSR_PROXY_PFILE	<p><i>Supported only for a proxy Oracle backup or restore.</i></p> <p><i>Mandatory if setting PowerSnap variables in a configuration file.</i></p> <p>Specifies the complete pathname of a configuration file that contains PowerSnap variable settings for a proxy Oracle backup or restore.</p>	<ul style="list-style-type: none"> <li>• Undefined (default).</li> <li>• Valid pathname of the configuration file.</li> </ul> <p><b>Note:</b> If undefined or an invalid pathname, variable settings in the preferred configuration file are ignored.</p>
NSR_SAVESET_BROWSE	<p><i>Mandatory</i> if setting a nondefault browse policy for a <i>manual</i> Oracle backup with NetWorker server 6.x or later.</p> <p>Date when the entry for the backup is to be removed from the NetWorker client index.</p> <p><b>Note:</b> This variable has an effect <i>only</i> for an Oracle backup with NetWorker server 6.x or later. For a <i>scheduled</i> Oracle backup with NetWorker server 6.x or later, this variable <i>overrides</i> the Browse Policy attribute setting in the NetWorker Client resource.</p>	<ul style="list-style-type: none"> <li>• Most appropriate policy for the client, as selected by the NetWorker server (default).</li> <li>• Valid date in <b>nsr_getdate(3)</b> format.</li> </ul>



Table 3. Environment Variables in the RMAN Command or Script (Part 5 of 5)

A

Variable	Description	Default and Valid Values
NSR_SAVESET_EXPIRATION	<i>Not recommended.</i> This NetWorker Module for Oracle release 3.5 variable has been replaced by the NSR_SAVESET_RETENTION variable.	If this variable is used, its value is assigned to the NSR_SAVESET_RETENTION variable.  <b>Note:</b> In the <b>parms</b> option, a value assigned to NSR_SAVESET_RETENTION takes precedence over one assigned to NSR_SAVESET_EXPIRATION.
NSR_SAVESET_RETENTION	<i>Mandatory</i> if setting a nondefault retention policy for a <i>manual</i> Oracle backup with NetWorker server 6.x or later.  Date when the save set becomes recyclable.  <b>Note:</b> This variable has an effect <i>only</i> for an Oracle backup with NetWorker server 6.x or later. For a <i>scheduled</i> Oracle backup with NetWorker server 6.x or later, this variable <i>overrides</i> the Retention Policy attribute setting in the NetWorker Client resource.	<ul style="list-style-type: none"> <li>• Most appropriate policy for the client, as selected by the NetWorker server (default).</li> <li>• Valid date in <b>nsr_getdate(3)</b> format.</li> </ul>
NSR_SERVER	<i>Mandatory</i> for a <i>manual</i> backup if the NetWorker server host is different from the Oracle Server host.  <i>Recommended</i> for a local manual backup.  Hostname of the NetWorker server to perform the Oracle backup.	<ul style="list-style-type: none"> <li>• Local physical host (default).</li> <li>• Valid NetWorker server name.</li> </ul>

a. Instead of setting the NSR\_NWPATH variable in the RMAN script, the `/nsr/res/nwora.res` file can be created and a line containing `NSR_NWPATH=nsrmm_dirpath` can be added to the file, where *nsrmm\_dirpath* is the complete pathname of the directory containing the NetWorker **nsrmm** program. For example:

```
NSR_NWPATH=/opt/networker/bin
```

This is the only variable entry allowed in the `nwora.res` file. Other environment variables *cannot* be set in the file.

**A**

## Appendix B: RMAN Commands

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This appendix describes RMAN commands, such as the **change...delete** command, that are dependent on the media management (in this case, Legato) implementation. This appendix also addresses the behaviors—undocumented in Oracle guides—of certain other RMAN commands, such as the **change backupset...validate** command, that concern the NetWorker Module for Oracle software.

This appendix includes the following main sections:

- ["The change backupset...validate and change backuppiece...validate Commands" on page 132](#)
- ["The change...delete and delete expired backup Commands" on page 132](#)
- ["The change...crosscheck and crosscheck Commands" on page 133](#)
- ["The pool Option of the backup Command" on page 133](#)
- ["Proxy Copy" on page 133](#)
- ["The send Command" on page 134](#)
- ["The set duplex Command" on page 141](#)
- ["The trace Option of the backup Command" on page 143](#)

For more information on each of these commands, refer to the appropriate Oracle Server documentation.

For more information on how to use the main new Oracle9i RMAN features with NetWorker Module for Oracle, see ["Appendix C: Oracle9i Support in NetWorker Module for Oracle" on page 145](#).

## The change backupset...validate and change backuppiece...validate Commands

The **change backupset...validate** and **change backuppiece...validate** commands are *not* supported in Oracle8 due to an Oracle bug. Do not use these commands in Oracle8 to validate the contents of a backup set or backup piece generated with NetWorker Module for Oracle.

As an alternative, use the **validate backupset...** command in Oracle8. For more information on this command, refer to the Oracle8 documentation.

## The change...delete and delete expired backup Commands

For a particular user to be able to use the **change...delete** command or (*in Oracle8i and Oracle9i only*) the **delete expired backup** command with a NetWorker server, the user must be listed as an Administrator in the NetWorker Server resource, as described in "[Setting the NetWorker Administrator Attribute](#)" on page 34.

If the user name is not listed in the NetWorker Server resource, or there is an authorization problem when the **change...delete** or **delete expired backup** runs, NetWorker Module for Oracle *fails* to remove the required entries in the NetWorker client file index and media database.

Despite this failure, the **change...delete** or **delete expired backup** command in Oracle8 or Oracle8i removes the corresponding backup set or backup piece entries in the Oracle Recovery Catalog. In this case, the appropriate NetWorker media management command can be used to manually remove the required save set entries from the NetWorker indexes.

For more information on the NetWorker media management commands, refer to the *Legato Command Reference Guide* or UNIX man pages.

**Note:** If the NetWorker client binaries are located in a nondefault directory on the Oracle Server host and the `/nsr/res/nwora.res` file was *not* created during NetWorker Module for Oracle installation, the `NSR_NWPATH` environment variable might need to be set in the `/nsr/res/nwora.res` file or in the RMAN script. For more information, see "[Appendix A: Environment Variables in the RMAN Session](#)" on page 123.

In Oracle9i, the **change...delete** command is deprecated and has been replaced by the **delete...** command (including the **delete expired backup** option).

## The change...crosscheck and crosscheck Commands

For all NetWorker client file index entries that are *not* browsable, running the **change...crosscheck** or **crosscheck** command in Oracle8i or Oracle9i causes the status of the corresponding backup pieces to change to *expired* in the RMAN catalog.

**Note:** In the RMAN catalog, an expired status for a backup piece indicates that the NetWorker browse policy specified for that backup piece is expired.

## The pool Option of the backup Command



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**Important:** NetWorker Module for Oracle does *not* support the **pool** option of the RMAN **backup** command, with the exception of **pool=0**.

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If any nonzero value is specified for the **pool** option of the RMAN **backup** command, the RMAN session will terminate and NetWorker Module for Oracle will return the following error message:

```
sbtbackup: Oracle pool is not supported
```

For more information on this error message, see ["NetWorker Module for Oracle Error Messages" on page 155](#).

To specify the NetWorker volume pool to be used by NetWorker Module for Oracle, set the `NSR_DATA_VOLUME_POOL` environment variable in the RMAN script.

For more information on the `NSR_DATA_VOLUME_POOL` variable, see ["Appendix A: Environment Variables in the RMAN Session" on page 123](#).

## Proxy Copy



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**Important:** If the Legato PowerSnap for EMC Symmetrix software is *not* installed and properly configured, NetWorker Module for Oracle does *not* support proxy copy.

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Without the PowerSnap for EMC Symmetrix software, a proxy Oracle backup will fail.

For more information on how to perform proxy backups with NetWorker Module for Oracle and PowerSnap for EMC Symmetrix, see "[Chapter 7: Proxy Oracle Backup and Restore with PowerSnap for EMC Symmetrix](#)" on page 99.

## B

### The send Command

The NetWorker Module for Oracle implementation of the **send** command enables the NSR\_\* environment variables to be set as described in "[Appendix A: Environment Variables in the RMAN Session](#)" on page 123.

The **send** command is supported in Oracle8i and Oracle9i. In Oracle8, the **parms** option in the **allocate channel** command must be used to set the environment variable values. See "[The parms Option in the allocate channel Command](#)" on page 140.

**Note:** Oracle9i supports the **send** option in the **configure channel** command. NetWorker Module for Oracle supports this **send** option *for manual backups only—not for scheduled backups*. To use the **send** option in the **configure channel** command for a manual backup, see the syntax rules in "[Syntax Rules](#)" on page 135.

The following methods are recommended for setting the environment variable values:

- In Oracle8i and Oracle9i, use the **send** command *instead of* the **parms** option in the **allocate channel** command.
- In Oracle9i *for manual backups only*, use the **send** option *instead of* the **parms** option in the **configure channel** command.

**Note:** The *Oracle8i Recovery Manager User's Guide and Reference* states that the **parms** option in the **send** command with type 'SBT\_TAPE' can be used to set environment variables. *This is incorrect.* The **parms** option has *no effect* in the **send** command. The only commands in which the **parms** option can set environment variables are the **allocate channel** and (*Oracle9i only*) the **configure channel** commands.

The following sections describe the **send** command syntax and precedence rules and how to use the **send** command to set the environment variables.

- ["Syntax Rules" on page 135](#)
- ["Two Ways to Run the send Command" on page 137](#)
- ["The parms Option in the allocate channel Command" on page 140](#)
- ["Precedence Rules" on page 140](#)

## Syntax Rules

The **send** command must have the following format:

```
send [ device_type 'device_specifier' | channel channel_id ]
      'NSR_ENV=(var_name1=value1 [, var_name2=value2, ...])'
```

These sections describe the syntax rules for the two main parts of the **send** command:

- ["The send Command String" on page 135](#)
- ["The send Command Options" on page 136](#)

### The send Command String

The command string in the **send** command is the string inside the quotes, `'NSR_ENV=(var_name1=value1...)'`.

Follow these syntax rules for the **send** command string:

- The maximum length of the command string is restricted by Oracle to 512 bytes, including the terminating NULL.
- The NSR\_ENV keyword and the variable names must be *all uppercase*.
- Between the NSR\_ENV keyword and left parenthesis, an equal sign and spaces are *optional*. For example, these commands are all correct:

```
send 'NSR_ENV = (NSR_SERVER=server1)'
```

```
send 'NSR_ENV=(NSR_SERVER=server1)'
```

```
send 'NSR_ENV (NSR_SERVER=server1)'
```

```
send 'NSR_ENV(NSR_SERVER=server1)'
```

- The parentheses in the command string are *mandatory*.
- Inside the parentheses, there must be one or more NetWorker Module for Oracle environment variable names and the corresponding variable values.

- Inside the parentheses, spaces are *not* allowed around the equal signs. A space *before* an equal sign becomes part of the variable name. A space *after* an equal sign becomes part of the variable's value.
- Commas separating the *var\_name=value* entries are *mandatory*.
- Comments are *not* allowed inside the quotes. In the following example, “# NSR\_SERVER” is considered the first variable's name:

```
run {
    allocate channel t1 type 'SBT_TAPE';
    send 'NSR_ENV=(
# NSR_SERVER=server1,
NSR_CLIENT=oracle)';
    :
```

- A **send** command in an RMAN script can span multiple lines. For example:

```
send 'NSR_ENV=(
NSR_SERVER=server1,
NSR_CLIENT=oracle)';
```

## The send Command Options

Run the **send** command with *only one* of the following options:

- **send** with no option—only the quoted command string—sets the environment variables for *all* allocated channels.
- **send device\_type 'SBT\_TAPE'** sets the environment variables for all channels of the backup tape device.

**Note:** The **send** command has *no effect* with **device type disk**.

- **send channel** sets the environment variables for the specified channels only.

In the following sample script, the environment variables are set for channel *t1* *only*, *not* for channel *t2*:

```
run {
    allocate channel t1 type 'SBT_TAPE';
    allocate channel t2 type 'SBT_TAPE';
    send channel t1 'NSR_ENV=(NSR_SERVER=server1,
NSR_DATA_VOLUME_POOL=MondayFulls)';
    :
}
```





**Important:** The **device\_type** or **channel** option can be used in the **send** command in an RMAN script only. *Neither* option can be used in the **send** command on the operating system command line. For more information, see ["The send Command on the Operating System Command Line" on page 137](#).

Specify the correct option values in the **send** command:

- *device\_specifier* is the device type as specified in an **allocate channel** command in the RMAN script. For a backup tape device, use SBT\_TAPE.
- *channel\_id* is the channel identifier as specified in an **allocate channel** command in the RMAN script. In the previous RMAN script example, the identifier is *t1*.
- *var\_name1* is the first NetWorker Module for Oracle environment variable name. In the previous RMAN script example, the first variable name is NSR\_SERVER.
- *value1* is the value assigned to the first environment variable. In the previous RMAN script example, the first value is *server1*.
- *var\_name2* is the second NetWorker Module for Oracle environment variable name. In the previous RMAN script example, the second variable name is NSR\_DATA\_VOLUME\_POOL.
- *value2* is the value assigned to the second environment variable. In the previous RMAN script example, the second value is *MondayFulls*.

B

## Two Ways to Run the send Command

There are two different ways to run the **send** command:

- As an option of the **rman** invocation on the operating system command line, as described in ["The send Command on the Operating System Command Line" on page 137](#).
- In the **run** job of the RMAN script, as described in ["The send Command in the RMAN Script" on page 138](#).

### The send Command on the Operating System Command Line

To run the **send** command as an option of the **rman** invocation on the operating system command line, enter the command in the following format:

```
% rman send "'NSR_ENV=(var_name1=value1[, var_name2=value2, ...])'"
```

## B

- If more than one **send** option appears in the **rman** command, *only the last send* command is executed.
- Follow all the **send** command syntax rules listed in "The send Command String" on page 135—*except* for the last rule, which applies *only* to a **send** command in an RMAN script.
- Do *not* use either the **device\_type** or **channel** option (see "The send Command Options" on page 136).
- Use two sets of quotes around the command string, each set consisting of a single and double quote. The single quote can be either before or after the double quote, but the second set of quotes must be opposite to the first set. For example, this command is also correct:

```
% rman send "'NSR_ENV=(var_name1=value1[, var_name2=value2, ...])'"'
```

Two sets of quotes are required to prevent some operating system shells (for example, **ksh**) from treating spaces inside the quotes as meta (special) characters and attempting to tokenize the string.

- The variable values in the quoted string are applied to *all* channels allocated during the RMAN session. These values are applied *before* any variable values specified in **send** commands within the RMAN script itself. For more information, see "Precedence Rules" on page 140.

In the following example, the NSR\_SERVER environment variable value (*mars.legato.com*) is applied to all three channels (*t1*, *t2*, *t3*) allocated in the RMAN script:

```
% rman send "'NSR_ENV=(NSR_SERVER=mars.legato.com)'"'
```

(RMAN script):

```
run {
    allocate channel t1 type 'SBT_TAPE';
    allocate channel t2 type 'SBT_TAPE';
    allocate channel t3 type 'SBT_TAPE';
    :
}
```

## The send Command in the RMAN Script

To run the **send** command in the **run** job of the RMAN script, enter the command in the following format, at the required point within the **run** command brackets:

```
send [ device_type 'device_specifier' | channel channel_id ]
'NSR_ENV=(var_name1=value1 [, var_name2=value2, ...])'
```

- Follow all the **send** command syntax rules listed in "[The send Command String](#)" on page 135.
- Use either the **device\_type** or **channel** option (if required) with the **send** command in an RMAN script, as described in "[The send Command Options](#)" on page 136.
- Specify the correct option values in the **send** command, as described in "[The send Command Options](#)" on page 136.
- RMAN commands are run *in the order that they appear* in the backup or restore script. For an environment variable value to be in effect during a backup or restore, put the **send** command (setting the value) *before* the **backup** or **restore** command in the script, but after the **allocate channel** commands for those channels to which the variable value applies.
- If no channel is allocated when the **send** command runs, an RMAN error is produced.

The following sample RMAN script performs an Oracle backup of the entire database to the volume pool *MondayFulls* of the (remote) NetWorker server *mars.legato.com*.

```
run {
    allocate channel t1 type 'SBT_TAPE';
    allocate channel t2 type 'SBT_TAPE';

    send 'NSR_ENV=(NSR_SERVER=mars.legato.com,
NSR_DATA_VOLUME_POOL=MondayFulls)';

    backup full filesperset 4
    format '/FULL_%d_%u/'
    (database);

    release channel t1;
    release channel t2;
}
```

This script is the same as the sample script on [page 43](#), *except* the environment variables are set using a single **send** command instead of the **parms** option in each **allocate channel** command. The single **send** command sets the environment variables for *both* channels.

**Note:** To prevent backup performance problems, use forward slashes in the **format** option in either the RMAN **backup** command or **configure** command, to generate backup piece names that resemble UNIX directory names. For more information on this issue, refer to the latest *Legato NetWorker Module for Oracle Release Supplement*.

## The parms Option in the allocate channel Command

Since Oracle8 does *not* support the **send** command, use the **parms** option in the **allocate channel** command in the RMAN script to set the environment variables in Oracle8.

In Oracle8i and Oracle9i, if environment variables are set using *both* the **send** command and the **parms** option in the **allocate channel** command (*not recommended*), the variables are set in the order of the "[Precedence Rules](#)" on [page 140](#).

### Precedence Rules

Environment variables are set for channels allocated during the RMAN session in the following order:

1. In the **parms** option of the **allocate channel** command in the RMAN script or in the **configure channel** command (*Oracle9i only*).
2. In the **rman send** command on the operating system command line.
3. In the **send** command in the **run** job of the RMAN script.

**Note:** In Oracle9i, the **send** option does *not* follow these rules. If both the **send** command on the operating system command line and the **send** option in the **configure channel** command are used at the same time, only the **send** option is executed by Oracle.

To prevent confusion and simplify the task of setting environment variables in a specific order, do *not* mix these different ways of setting environment variables in the same RMAN session.

In the following example, the NSR\_SERVER and NSR\_CLIENT variables are set in this order:

- NSR\_SERVER is set to *server2* (by **parms** option), changed to *server1* (by **rman send**), and finally changed to *server3* (by **send channel**).
- NSR\_CLIENT is set to *client2* (by **parms** option), changed to *client1* (by **rman send**), and finally changed to *client3* (by **send channel**).

```
% rman send "'NSR_ENV=(NSR_SERVER=server1,
NSR_CLIENT=client1)'"
```

(RMAN script):

```
run {
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_SERVER=server2, NSR_CLIENT=client2)';

    send channel t1 'NSR_ENV=(NSR_SERVER=server3,
    NSR_CLIENT=client3)';
    :
}
```

B

## The set duplex Command



**Important:** NetWorker Module for Oracle does *not* support the **set duplex** command on Linux with Oracle 8.1.6.1. On Linux with Oracle 8.1.6.1 and the Oracle patch bug995765, do *not* set the BACKUP\_TAPE\_IO\_SLAVES parameter to TRUE in the *init<oracle\_sid>.ora* file and do *not* use the **set duplex** command. Otherwise, the NetWorker Module for Oracle backup will fail.

NetWorker Module for Oracle supports the **set duplex** command with all other operating systems and Oracle releases.

The **set duplex** command can be set in the RMAN backup script to generate up to four copies of an Oracle backup and store those copies on separate media. Set **duplex** to the value 1, 2 (or **on**), 3, or 4 to produce 1, 2, 3, or 4 copies, respectively, of every Oracle backup set generated by subsequent **backup** commands.

[Table 4 on page 142](#) describes the results of setting **duplex** to each of the valid values.

**Table 4. Set Duplex Command Values**

Set Duplex Command	Oracle Backup Results
<b>set duplex=1</b>	The backup set is directed to NSR_DATA_VOLUME_POOL.
<b>set duplex=2</b> or <b>set duplex=on</b>	Two copies of the backup set are directed to the separate pools specified by NSR_DATA_VOLUME_POOL and NSR_DATA_VOLUME_POOL1. These two pools must be different.
<b>set duplex=3</b>	Three copies of the backup set are directed to the separate pools specified by NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL1, and NSR_DATA_VOLUME_POOL2. These three pools must be different.
<b>set duplex=4</b>	Four copies of the backup set are directed to the separate pools specified by NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL1, NSR_DATA_VOLUME_POOL2, and NSR_DATA_VOLUME_POOL3. These four pools must be different.

There are *no* default values for the environment variables NSR\_DATA\_VOLUME\_POOL, NSR\_DATA\_VOLUME\_POOL1, NSR\_DATA\_VOLUME\_POOL2, and NSR\_DATA\_VOLUME\_POOL3. The values of these variables must be defined. For more information on how to set environment variables, see "[Appendix A: Environment Variables in the RMAN Session](#)" on page 123.

Each pool specified by one of these NSR\_DATA\_VOLUME\_POOL\* variables must be properly configured, and each pool must be different from the other pools used. If a pool is not properly defined or configured, the Oracle backup will hang, waiting for the proper configuration of that pool.

To enable use of the **set duplex** command, set the parameter `BACKUP_TAPE_IO_SLAVES` to `TRUE` in the file `init<oracle_sid>.ora`. For details, refer to the Oracle backup and recovery documentation.

In Oracle9i, if the current control file is included in the backup, RMAN duplexes the backup pieces of the control file in the same backup set. If the control file autobackup is enabled, RMAN also duplexes the backup pieces that belong to the control file autobackup.

**Note:** In Oracle9i, the **set duplex** command is deprecated. For information on additional commands to use for backup set duplexing in Oracle9i, see "[Backup Copies](#)" on page 148.

During an Oracle restore, RMAN selects only one of the copies to use, and if it fails for some reason, the restore fails. If the first copy of a backup piece cannot be found in NetWorker Module for Oracle, RMAN issues the following type of error message:

```
RMAN-10035: exception raised in RPC: ORA-19507: failed to
retrieve sequential file, handle="CH2_bkup3_1_1"
```

To force RMAN to use the duplexed copy of this missing backup piece, run the **change...crosscheck**, **crosscheck**, or **change backuppiece...unavailable** command and retry the restore. These commands cause RMAN to mark the missing backup piece as *expired* (see "[Retention Policies](#)" on page 149 for a definition of expired) and to use the duplexed copy for the restore operation.

For more information, refer to the appropriate Oracle backup and recovery documentation.

## The trace Option of the backup Command

Set the **trace** option of the RMAN **backup** command to the value 0, 1, or 2. The default value of **trace** is 0.

The output of **trace** is written to the Oracle `sbtio.log` file. The output is also written to the `/nsr/applogs/nmo.messages` file.

[Table 5 on page 144](#) outlines the conditions traced when the **trace** option is set to each of the three valid values.

**Table 5. Trace Option Values and Conditions Traced**

Trace Value	Conditions Traced
0 (default)	All error conditions
1	<ul style="list-style-type: none"><li>• All error conditions</li><li>• Entry and exit for each SBT function (the Legato implementation of the Oracle SBT interface)</li></ul>
2	<ul style="list-style-type: none"><li>• All error conditions</li><li>• Entry and exit for each SBT function (the Legato implementation of the Oracle SBT interface)</li><li>• Values of all function parameters</li><li>• First 32 bytes of each read/write buffer</li></ul>

**B**



# Appendix C: Oracle9i Support in NetWorker Module for Oracle

This appendix describes how to use the RMAN features introduced in Oracle9i with the NetWorker Module for Oracle software. For complete information on Oracle9i features, refer to the appropriate Oracle9i backup and recovery documentation.

This appendix includes the following main sections:

- ["Automatic Channel Allocation" on page 145](#)
- ["Control File Autobackup" on page 148](#)
- ["Backup Copies" on page 148](#)
- ["Retention Policies" on page 149](#)
- ["Backup and Restore Optimization" on page 150](#)
- ["Backup of Backup Sets" on page 151](#)
- ["Restartable Backups" on page 152](#)

## Automatic Channel Allocation

In Oracle9i, RMAN supports automatic channel allocation. This feature enables the configuration of persistent settings for automatic channels, for use in all RMAN sessions.

To configure persistent settings for NetWorker Module for Oracle backups or restores, specify the device type in the **configure** command using the noncase-sensitive keywords **sbt**, **sbt\_tape**, **'sbt'**, and **'sbt\_tape'**.

If the **allocate channel** command is not used in an RMAN script to manually allocate at least one channel, RMAN allocates automatic channels in the

RMAN session by using the settings specified in the following **configure** commands:

```
configure default device type to sbt
configure device type sbt parallelism...
configure channel device type sbt send...
configure channel n device type sbt send...
configure channel device type sbt parms...
configure channel n device type sbt parms...
```

**Note:** NetWorker Module for Oracle supports the **send** option in the **configure channel** command *for Oracle9i manual backups only*.



**Important:** Manual and automatic channels are mutually exclusive and cannot be mixed in an RMAN session. The format of an automatic channel name of the device type for NetWorker Module for Oracle backups and restores is `ORA_SBT_n` or `ORA_SBT_TAPE_n`, where *n* is the channel number. Do *not* use this name format for manual channel allocation for NetWorker Module for Oracle; otherwise, RMAN reports an error.

Specify persistent settings for automatic channels for NetWorker Module for Oracle backups and restores using the **configure** commands.

- Specify the default device type using the **configure default device type** command. For example, specify the automatic channel default device type for NetWorker Module for Oracle backups using the following command:

```
configure default device type to 'sbt_tape'
```

- Specify the number of automatic channels using the **parallelism** option. For example, specify two automatic channels for NetWorker Module for Oracle backups using the following command:

```
configure device type 'sbt_tape' parallelism 2
```

- Specify generic automatic channel options using the **configure channel device type...parms...** command. For example, set an automatic channel for NetWorker Module for Oracle backups with the NetWorker server `jupiter.legato.com` using the following command:

```
configure channel device type 'sbt_tape' parms
'ENV=(NSR_SERVER=jupiter.legato.com)'
```

**Note:** Use the **send** command to set the `NSR_*` environment variables for automatic channels only through the operating system command line option of the **rman** invocation. Do *not* use the **send** command in an RMAN script to set the variables for automatic channels. Oracle performs automatic channel allocation when an RMAN command runs that requires the channel allocation, for example, the **backup** command. If the **send** command is issued before this type of RMAN command, an RMAN error is generated, stating that no channels were found for the **send** command.

- Specify automatic channel options for a *specific channel number* using the **configure channel *n* device type...parms...** command. For example, specify a NetWorker Module for Oracle debug file only for the second automatic channel (*not* for other automatic channels) using the following command:

```
configure channel 2 device type 'sbt_tape' parms
'ENV=(NSR_DEBUG_FILE=/db/logs/backup.log,
NSR_SERVER=jupiter.legato.com)'
```

- With automatic channel allocation, the RMAN **backup**, **restore**, or **maintenance** commands can be run as stand-alone commands without requiring manual channel allocations.

The following sample RMAN backup script specifies two automatic channels for NetWorker Module for Oracle backups, each channel using a different debug file and NetWorker volume pool:

```
configure default device type to sbt;
configure device type sbt parallelism 2;
configure channel 1 device type sbt
parms 'ENV=(NSR_SERVER=jupiter.legato.com,
NSR_DEBUG_FILE=/db/logs/debug1.log,
NSR_DATA_VOLUME_POOL=pool1)';
configure channel 2 device type sbt
parms 'ENV=(NSR_SERVER=jupiter.legato.com,
NSR_DEBUG_FILE=/db/logs/debug2.log,
NSR_DATA_VOLUME_POOL=pool2)';
```

## Control File Autobackup

In Oracle9i, RMAN performs a control file autobackup after each RMAN **backup** command if the control file autobackup has been enabled using the **configure controlfile autobackup on** command. Use this feature to restore the backup entries contained in the control file when the control file is lost and the Recovery Catalog is not available.

Specify persistent settings for the control file autobackups using the **configure controlfile autobackup** command. For example, enable control file autobackup and specify the persistent setting for the format of the control file autobackup name using the following commands:

```
configure controlfile autobackup on
configure controlfile autobackup format for device type
'sbt_tape' to '/NMO_%f/'
```

If the control file autobackup is set to *on* and the RMAN backup is performed using NetWorker Module for Oracle, the control file autobackup will also be performed using NetWorker Module for Oracle. As a result, one or more channels of device type **sbt\_tape** must be allocated for the restore.

**Note:** Oracle 9.2 supports autobackup of the current server parameter file together with control file autobackup.

## Backup Copies

In Oracle9i, the **set duplex** command is deprecated. Despite the fact that RMAN in Oracle9i provides different commands for duplexing backups, the rules for duplexing through NetWorker Module for Oracle remain the same as with the **set duplex** command. Separate NetWorker pools must still be defined for each copy. For more information on the **set duplex** command and setting up NetWorker pools for each copy, see "[The set duplex Command](#)" on [page 141](#).

Backups can be duplexed (up to four copies) using the following commands in Oracle9i:

- The **configure...backup copies for device type sbt\_tape to...** command specifies persistent settings for duplexing backups through NetWorker Module for Oracle.

For example, specify persistent settings for duplex copies of datafiles and archived redo logs (respectively) in NetWorker Module for Oracle backups using the following types of **configure** commands:

```
configure datafile backup copies for device type
'sbt_tape' to 2
```

```
configure archivelog backup copies for device type
'sbt_tape' to 2
```

- The **backup** command with the **copies** option applies to objects within the **backup** command. The **backup...copies** setting takes precedence over the persistent settings in the **configure...backup copies** command.
- The **set backup copies** command applies to all backup objects in the same **run** job.

## C

## Retention Policies

In Oracle9i, RMAN provides an Oracle retention policy for backups. An Oracle retention policy is based on the recovery window or redundancy; it is *not* based on a defined time period, such as a year. Oracle considers a backup *obsolete* when it is no longer required according to the Oracle retention policy setting. Oracle checks the retention policy of a backup when the **report obsolete...** or **delete obsolete...** command is run.

NetWorker Module for Oracle supports the Oracle retention policy with some restrictions, since the NetWorker server has its own browse and retention policies to specify how long data is available for recovery. NetWorker browse and retention policies are based on a user-defined time period. Since the Oracle retention policy is independent from the NetWorker server policies and there is no mechanism to synchronize these policies, the NetWorker and Oracle policies might conflict with each other.

For example, a NetWorker server might expire a NetWorker Module for Oracle backup that is not yet obsolete in RMAN, depending on the NetWorker browse and retention policies. NetWorker Module for Oracle *cannot* guarantee that the NetWorker server will not expire a backup volume until all the RMAN backups on that volume have been removed from the RMAN catalog.

To avoid conflict problems, disable the Oracle retention policy (and then use only the NetWorker server policy) with the following command:

```
configure retention policy to none
```

If the Recovery Catalog is used, exempt a backup from the retention policy with one of the following commands:

```
change backupset...keep until/forever...
```

```
backup...keep until/forever...
```

To use the Oracle retention policy, set the NetWorker browse and retention policies to be long enough that backups are kept on the backup volumes *until the Oracle retention policy makes them obsolete*. Set the NetWorker policies in the NetWorker Client resource for scheduled backups or through the NSR\_SAVESET\_BROWSE and NSR\_SAVESET\_RETENTION environment variables. For more information on how to set NetWorker policies for NetWorker Module for Oracle backups, see "[Task 3: Configure the NetWorker Client Resource](#)" on page 35.



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**Important:** Run the **crosscheck** command on the NetWorker Module for Oracle backups before running **report obsolete** or **delete obsolete backups** of the **device type sbt\_tape**. This ensures that backups expired by the NetWorker server are flagged as *expired* in the RMAN catalog. As a result, RMAN can correctly identify which backups are not needed according to the Oracle retention policy.

---

## Backup and Restore Optimization

If backup optimization is enabled using the **configure backup optimization on** command in Oracle9i, RMAN decides which files to skip during a backup, based on several criteria. For more information on these criteria, refer to the appropriate Oracle backup and recovery documentation.

### Notes:

- To force a backup that would otherwise be skipped due to backup optimization, use the **force** option in the **backup** command.
- When RMAN skips a backup due to backup optimization, it does not produce an error message. However, RMAN does issue a warning message similar to the following:

```
skipping archive log file...
```



**Important:** When using Oracle backup optimization with NetWorker Module for Oracle backups and restores, run the **crosscheck** command *regularly* to synchronize the Recovery Catalog and NetWorker indexes. This ensures that backups expired by the NetWorker server are also marked as *expired* in the Recovery Catalog and RMAN does not skip a backup when a referenced backup is already expired in NetWorker.

Restore optimization in Oracle9i causes RMAN not to restore a file if the original file is already in the correct location and contains the expected information.

**Note:** To force a restore that would otherwise be skipped due to restore optimization, use the **force** option in the **restore** command.

C

## Backup of Backup Sets

In Oracle9i, RMAN supports the backup of backup sets. If Oracle data has been backed up using **device type disk**, this Oracle9i feature can be used to back up these backup sets from disk to NetWorker volumes using NetWorker Module for Oracle.

For example, to back up all backup sets from disk to NetWorker volumes in a tape device, use the following command:

```
backup device type sbt backupset all
```

The backup set on disk can also be deleted using the **delete input** option in the **backup device type sbt backupset...** command. For example, to back up the backup sets that were created on disk more than a week ago and then remove the backup sets from disk, use the following command:

```
backup device type sbt backupset completed before
sysdate-7 delete input
```

## Restartable Backups

In Oracle9i, RMAN can back up files that have not been backed up since a specified time. For example, to continue the backup of a database that was canceled two days ago, use the following command:

```
backup device type sbt database not backed up since time  
'sysdate-2'
```

RMAN compares the given time in this command with the completion time of the most recent backup of a datafile to determine if the datafile requires backup. For more information, refer to the appropriate Oracle backup and recovery documentation.

For more information on how to cancel NetWorker Module for Oracle backups, see the appropriate section:

- ["Canceling a Manual Oracle Backup" on page 48](#)
- ["Canceling a Scheduled Oracle Backup" on page 71](#)



# Appendix D: Troubleshooting and Error Messages

This appendix describes troubleshooting guidelines to follow if the NetWorker Module for Oracle software does not function properly. It also describes RMAN error messages and common NetWorker Module for Oracle error messages that might be encountered.

This appendix includes the following main sections:

- ["Troubleshooting Tips" on page 153](#)
- ["RMAN Error Messages" on page 155](#)
- ["NetWorker Module for Oracle Error Messages" on page 155](#)

## Troubleshooting Tips

The following list of troubleshooting tips refers to portions of this *Administrator's Guide* and the *Legato NetWorker Module for Oracle Installation Guide, Release 4.0, UNIX Version*, that are frequently overlooked. Use the following list to troubleshoot any problems in running Oracle backup and restore operations using NetWorker Module for Oracle.

To set up an Oracle backup and restore system correctly:

1. Configure the Oracle Server and Net service (if used) according to the instructions in the Oracle documentation.

Without NetWorker Module for Oracle installed on the Oracle Server host, it should be possible to perform a backup and restore using the **allocate channel t1 type disk** command. For more information, see ["Task 1: Verify the Oracle Server Configuration" on page 33](#).

2. Install and configure the NetWorker server and client software.

For more information, see ["Chapter 2: Software Configuration Procedures" on page 31](#). Refer to the *Legato NetWorker Administrator's Guide* for additional details.

3. Verify that the combination of the operating system, Oracle Server, NetWorker server, and NetWorker client is supported.

For more information, refer to the installation requirements in the *Legato NetWorker Module for Oracle Installation Guide, Release 4.0, UNIX Version*.

4. Install and enable the NetWorker Module for Oracle software using the instructions in the *Legato NetWorker Module for Oracle Installation Guide, Release 4.0, UNIX Version*.

To relink the library file, use the commands listed in the *Installation Guide* table, "NetWorker Module for Oracle Library File Installation." Shut down and restart Oracle when required. Use the correct *libnwora.\** library file.

To verify the version of NetWorker Module for Oracle installed, check the version of the *nsrnmstart* program file or *libnwora.\** library file using one of these commands, where *filenm* is either the *nsrnmstart* or *libnwora.\** filename:

```
# what filenm
# strings filenm | grep "@(#)"
# pkginfo -l LGTOmmo (only on Solaris)
```

Compare the library file with the *libnwora.\** file in the NetWorker Module for Oracle software package—the two files should be identical. Ensure that Oracle is not linked to another *libnwora.\**, *libobk.\** (NetWorker BusinessSuite™ Module for Oracle version of *libnwora.\**), or *liblsm.\** (from Legato Storage Manager or Legato Single Server Version) file.

5. Perform a *manual* Oracle backup using NetWorker Module for Oracle and the proper RMAN script.

Set the required NSR\_\* environment variables in the RMAN backup script or in the **rman send** command on the operating system command line (*Oracle8i and Oracle9i only*). For information on how to set the NSR\_\* environment variables, see ["Appendix A: Environment Variables in the RMAN Session" on page 123](#). For a simple startup RMAN script, see ["Task 1: Create RMAN Scripts for Manual Backups" on page 42](#).

If the manual backup *fails*, check the debugging files for NetWorker Module for Oracle and the NetWorker server. For NetWorker Module for Oracle debugging information, set the `NSR_DEBUG_FILE` environment variable. For more information, see ["NetWorker Module for Oracle Error Messages" on page 155](#).

6. Perform a *scheduled* Oracle backup using NetWorker Module for Oracle and the proper RMAN and `nsrnm` scripts.

In the working RMAN manual backup script, add the **connect target** and **connect rcvcat** commands, as described in ["Task 1: Create RMAN Scripts for Scheduled Backups" on page 53](#). Customize the `nsrnm` script, as described in ["Task 2: Customize the nsrnm Script" on page 56](#).

If the manual backup succeeds but the scheduled backup *fails*, set the `NSR_SB_DEBUG_FILE` environment variable to generate debugging information for the scheduled backup. For more information, see ["RMAN Error Messages" on page 155](#).

## RMAN Error Messages

RMAN stores information and RMAN-specific error messages in the log file specified using the **msglog** option. Review the RMAN information in this log file after each backup.

To specify the name of the RMAN log file:

- For a manual Oracle backup, use the **msglog** option in the `rman` command on the command line:
 

```
% rman target ... rcvcat ... msglog filename
```
- For a scheduled Oracle backup, specify the **msglog** option in the `NSR_RMAN_ARGUMENTS` environment variable in the `nsrnm` script. For more information, see ["NSR\\_RMAN\\_ARGUMENTS" on page 60](#).

For more information on specific RMAN error messages and recommended courses of action, refer to the appropriate Oracle Error Messages guide.

## NetWorker Module for Oracle Error Messages

During a backup or restore, the NetWorker Module for Oracle software records the same error messages in *both* the Oracle `sbtio.log` file and the default log file, `/nsr/applogs/nmo.messages`, on the Oracle Server host.

To obtain more debugging information for a backup or restore, set the environment variable `NSR_DEBUG_FILE` to the valid pathname of a file to store the information. If the variable is set to an invalid pathname or the specified file does *not* have write permissions, the debugging information is written in the `/nsr/applogs/nmosbt.log` file. Otherwise, the information is *not* written.

During a scheduled backup, the NetWorker Module for Oracle software records additional information and error messages in the file specified by the `NSR_SB_DEBUG_FILE` environment variable. If the variable is set to an invalid pathname or the specified file does *not* have write permissions, the debugging information is written in the `/nsr/applogs/nsrnmstart.log` file. Otherwise, the information is *not* written.

If the `NSR_SB_DEBUG_FILE` environment variable is *not* set in the `nsrnm` script file, the debugging information is *not* written. For more information on the `NSR_SB_DEBUG_FILE` variable, see "[NSR\\_SB\\_DEBUG\\_FILE](#)" on page 60.

The NetWorker server also writes diagnostic information from the manual or scheduled Oracle backup to specific log files on the NetWorker server system. For more information on these log files, refer to the *Legato NetWorker Administrator's Guide* for the particular NetWorker server system.

NetWorker Module for Oracle error messages appear in the following format:

*function\_name: error\_message*

where:

- *function\_name* is the name of the internal NetWorker Module for Oracle function that generates the error message.
- *error\_message* is the text of the NetWorker Module for Oracle error message.

The following table of error messages includes several references to NetWorker Module for Oracle environment variables. For more information on how to set the environment variables, see "[Appendix A: Environment Variables in the RMAN Session](#)" on page 123.

**Table 6** describes the main NetWorker Module for Oracle error messages and recommended actions to resolve the associated problems.

**Table 6. NetWorker Module for Oracle Error Messages (Part 1 of 4)**

Error Message	Description	Resolution
nwora_getssinfo: could not locate the saveset <i>saveset_id</i>	Displayed during recovery, when NetWorker Module for Oracle could not find an entry for the requested backup in the NetWorker client file index.	Check the NetWorker media index using the backup timestamp (the save set name in the NetWorker media index is different than the backup piece name in the RMAN catalog for scheduled backups) to find out if the backup entry exists. If it exists, run the NetWorker <b>scanner</b> utility to re-create the client file index that should contain the backup entry. To prevent recurrence of the problem, set the browse policy to the same value as the retention policy in the NetWorker Client resource.
doinfo: <i>NetWorker_client</i> could not connect to server <i>NetWorker_server</i> to find backup file <i>backup_piece_name</i>	NetWorker Module for Oracle could not connect to the <b>nsrindexd</b> or <b>nsrmmd</b> daemon.	Check that the NetWorker server and client daemons are running.
doinfo: <i>NetWorker_client</i> could not find backup file <i>backup_piece_name</i> on server <i>NetWorker_server</i> : permission denied	NetWorker Module for Oracle could not obtain authorization to connect to the NetWorker server.	Add the required user name to the Administrators list in the NetWorker Server resource.
doinfo: could not determine backup server	NetWorker Module for Oracle was unable to determine the NetWorker server.	Set the NSR_SERVER environment variable in the RMAN script.

Table 6. NetWorker Module for Oracle Error Messages (Part 2 of 4)

Error Message	Description	Resolution
nwora_index_ssinfo: index connect to <i>NetWorker_server</i> failed for client <i>NetWorker_client</i> : <i>reason</i>	NetWorker Module for Oracle was unable to establish session with <b>nsrindexd</b> daemon due to the <i>reason</i> .	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_mmdb_connect: cannot connect to media index server <i>NetWorker_server</i> : <i>reason</i>	NetWorker Module for Oracle was unable to establish session with <b>nsrmmmd</b> daemon due to the <i>reason</i> .	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_open_backup: backup file <i>backup_piece_name</i> already exists: ssid <i>saveset_id</i>	A backup with this name already exists in the NetWorker client file index. As a result, NetWorker Module for Oracle could not complete the backup.	Remove the existing backup in the NetWorker client file index and restart the backup operation.
nwora_open_backup: browse time <i>date</i> not in future	The value of the NSR_BROWSE environment variable is less than or equal to the current date.	Check the value of the NSR_BROWSE environment variable in the RMAN script.
nwora_open_backup: expiration time <i>date</i> not in future	The value of the NSR_SAVESET_EXPIRATION environment variable is less than or equal to the current date.	Check the value of the NSR_SAVESET_EXPIRATION environment variable in the RMAN script.
nwora_open_backup: invalid browse time: <i>date</i>	The NSR_BROWSE environment variable has an invalid <i>date</i> value.	Check the NSR_BROWSE environment variable in the RMAN script. It should have a value in the NetWorker date format.
nwora_open_backup: invalid expiration time: <i>date</i>	The NSR_SAVESET_EXPIRATION environment variable has an invalid <i>date</i> value.	Check the NSR_SAVESET_EXPIRATION environment variable in the RMAN script. It should have a value in the NetWorker date format.

**Table 6. NetWorker Module for Oracle Error Messages (Part 3 of 4)**

<b>Error Message</b>	<b>Description</b>	<b>Resolution</b>
nwora_open_backup: unable to start save session with server <i>NetWorker_server: reason</i>	NetWorker Module for Oracle could not establish a save session with the NetWorker server.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_open_restore: cannot start recover session with <i>NetWorker_server: reason</i>	NetWorker Module for Oracle could not establish a recover session with the NetWorker server.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_open_restore: restore: permission denied	The host machine is not allowed to restore the specified backup.	Add the user ID and the hostname to the Remote Access attribute in the NetWorker Client resource when performing a restore from a host different from the one that did the backup.
nwora_remove: Could not determine client name	NetWorker Module for Oracle could not determine the NetWorker client name.	Set the NSR_CLIENT environment variable in the RMAN script.
nwora_remove: Could not determine server name	NetWorker Module for Oracle could not determine the NetWorker server name.	Set the NSR_SERVER environment variable in the RMAN script.
nwora_remove: Could not find the nsrmm binary	NetWorker Module for Oracle could not find the <b>nsrmm</b> utility, which is probably in a nondefault location.	Set the NSR_NWPATH environment variable in the <i>/nsr/res/nwora.res</i> file or in the RMAN script. See <a href="#">"NSR_NWPATH" on page 128</a> . For example, create the <i>/nsr/res/nwora.res</i> (text) file, if required, and add this line to the file: <i>NSR_NWPATH=/opt/networker/ bin</i>

Table 6. NetWorker Module for Oracle Error Messages (Part 4 of 4)

Error Message	Description	Resolution
nwora_remove: Error removing ssid <i>saveset_id</i> from the media database: <i>reason</i>	NetWorker Module for Oracle was unable to remove the save set from the NetWorker server.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_restore_mmdconn: #: could not prepare restore session: <i>reason</i>	NetWorker Module for Oracle could not connect to the <b>nsrmmmd</b> daemon. The # can be 1 or 2.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_session_close: could not end session: <i>reason</i>	NetWorker Module for Oracle could not close the session with the NetWorker server.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_session_init: could not determine client name	NetWorker Module for Oracle was unable to determine the name of the NetWorker client.	Set the NSR_CLIENT environment variable in the RMAN script to the Oracle hostname.
nwora_session_init: could not determine server name	NetWorker Module for Oracle was unable to determine the NetWorker server name.	Set the NSR_SERVER environment variable in the RMAN script.
nwora_server_init: unable to contact server <i>NetWorker_server</i> : <i>reason</i>	Unable to establish connection with NetWorker server.	Check the <i>Legato Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
sbtbackup: Oracle pool is not supported.	NetWorker Module for Oracle does not support Oracle pools. Only NetWorker pools are supported.	Remove the <b>pool</b> option of the <b>backup</b> command in the RMAN script or set the <b>pool</b> option to zero. See " <a href="#">The pool Option of the backup Command</a> " on page 133.
sbtcommand: <i>string</i> should be in format: KEY=(xxxxxx)	Invalid syntax of string in the RMAN <b>send</b> command.	For the correct <b>send</b> command syntax, see " <a href="#">The send Command</a> " on page 134.



# Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to Legato NetWorker products.

<b>administrator</b>	The person normally responsible for installing, configuring, and maintaining NetWorker software.
<b>API</b>	An abbreviation for application programming interface, a standard set of computer library routines designed to accomplish a particular set of tasks.
<b>archived redo log</b>	An archived copy of a filled online Oracle redo log. You can optionally configure an Oracle database to archive copies of the online redo logs after they fill. An archived redo log preserves older redo log data for recovery operations while the preallocated online redo log files are reused to store the most current database changes. See <a href="#">redo log</a> .
<b>attribute</b>	A feature of a NetWorker resource. It is a service or information that the <a href="#">resource</a> provides.
<b>autochanger</b>	A mechanism that uses a robotic arm to move media among various components located in a device, including slots, media drives, media access ports, and transports. Autochangers automate media loading and mounting functions during backups and restores. The term autochanger refers to a variety of robotic libraries, including autoloader, carousel, datawheel, jukebox, library, and near-line storage.

<b>auto media management</b>	A feature that enables the storage device controlled by the NetWorker server to automatically label, mount, and overwrite a volume it considers unlabeled. Volumes that are eligible for reuse are also automatically recycled.
<b>backup</b>	The writing of saved data to a volume.
<b>backup group</b>	See <i>group</i> .
<b>backup host</b>	See <i>secondary host</i> .
<b>backup level</b>	See <i>level</i> .
<b>backup volume</b>	See <i>volume</i> .
<b>BCV device</b>	Business Continence Volume device. A standard EMC Symmetrix device with special attributes that enable it to independently support applications and processes. See also <i>Symmetrix device</i> .
<b>BCV pair</b>	A Symmetrix standard device and BCV device attached together.
<b>bootstrap</b>	A save set that is essential for the NetWorker disaster recovery procedures. For example, in the NetWorker server release 6.x, the bootstrap is composed of the <i>media database</i> and <i>resource database</i> on the NetWorker server.
<b>browse policy</b>	A policy that determines how long entries for your backup data remain in the client file index.
<b>Business Continence Volume (BCV)</b>	An EMC cloning technology that creates a copy of a volume to be used as a backup mirror.
<b>client</b>	A computer that accesses the NetWorker server to back up or restore files. Clients may be workstations, computers, or file servers.
<b>client file index</b>	A database of information maintained by the NetWorker server that tracks every database object, file, or <i>filesystem</i> backed up. The NetWorker server maintains a single client file index for each client computer.

<b>cluster</b>	Two or more nodes that are connected and appear to network users as a single high-availability system. A high-availability system allows the application services to continue despite most hardware or software failures. See also <a href="#">high-availability system</a> .
<b>cold Oracle backup</b>	See <a href="#">offline backup</a> .
<b>connection port</b>	The port NetWorker processes use to perform backup and restore sessions through a firewall.
<b>daemon</b>	A program that lies dormant waiting for a specified condition to occur.
<b>DBA</b>	An abbreviation for database administrator, the person normally responsible for installing, configuring, and maintaining Oracle database systems.
<b>device</b>	<ol style="list-style-type: none"><li>1. A storage unit that reads from and writes to storage volumes (see <a href="#">volume</a>) during backups and restores. A storage unit can be a tape device, optical drive, <a href="#">autochanger</a>, or file connected to the <a href="#">server</a> or <a href="#">storage node</a>.</li><li>2. When dynamic drive sharing (DDS) is enabled, refers to the access path to the physical drive.</li></ol>
<b>drive</b>	When dynamic drive sharing (DDS) is enabled, refers to the physical backup object, such as a tape drive, disk, or file. See also <a href="#">device</a> .
<b>enabler code</b>	A special code provided by Legato that activates the software. The enabler code that unlocks the base features for software you purchase is referred to as a base enabler. Enabler codes for additional features or products (for example, autochanger support) are referred to as add-on enablers.
<b>exit code</b>	An indicator that specifies whether a backup or restore session succeeded. An exit code of zero (“0”) indicates the session completed successfully. A nonzero exit code indicates the session did not complete successfully.
<b>expiration date</b>	The date when the volume changes from “read/write” to “read-only.”

<b>expired save set</b>	A save set whose browse time has been reached; therefore, it can no longer be browsed. In addition, the save set has been removed from the client file index.
<b>failover</b>	In a cluster network, the process of relocating a resource to its redundant or backup component, either because of a hardware or software failure or for administrative purposes.
<b>file index</b>	See <a href="#">client file index</a> .
<b>filesystem</b>	<ol style="list-style-type: none"><li>1. A file tree that is on a specific disk partition or other mount point.</li><li>2. The entire set of all files.</li><li>3. A method of storing files.</li></ol>
<b>firewall</b>	A system designed to prevent unauthorized access to or from a private network. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria. There are several types of firewall techniques. The NetWorker software supports client backups from computers that are protected by packet filtering.
<b>full backup</b>	See <a href="#">level</a> .
<b>group</b>	A client or group of clients configured to start backing up files to the NetWorker server at a designated time of day.
<b>high-availability system</b>	A system that allows the application services to continue despite a hardware or software failure. Each cluster node has its own IP address. Each cluster node also has private (local) resources or disks that are available only to that machine.
<b>hot Oracle backup</b>	See <a href="#">online backup</a> .
<b>incremental</b>	See <a href="#">level</a> .
<b>index policy</b>	A policy that specifies how long file and data index entries should remain valid. Clients specify which index policies they wish to use.

<b>instance</b>	The combination of Oracle processes that runs each time a database starts up.
<b>level</b>	<p>A measurement that determines how much data NetWorker software saves during a scheduled or manual backup. The level of a NetWorker Module for Oracle backup must be specified in the RMAN backup script.</p> <ul style="list-style-type: none"><li>• A <i>full</i> backup backs up all files, regardless of when they last changed.</li><li>• An <i>incremental</i> backup backs up only files that have changed since the last backup.</li></ul>
<b>library</b>	See <a href="#">autochanger</a> .
<b>license enabler</b>	The enabler code that enables you to run a feature or product.
<b>manual backup</b>	A backup that a user requests from the client's <b>save</b> program. The user specifies participating files, filesystems, and directories. A manual backup does not generate a <a href="#">bootstrap</a> save set.
<b>media</b>	The physical storage medium to which backup data is written. NetWorker software supports tape, magnetic or optical disk, and filesystems as backup media. See also <a href="#">volume</a> .
<b>media database</b>	A database that contains indexed entries about the storage volume location and the life cycle status of all data and volumes managed by the NetWorker server. See also <a href="#">volume</a> .
<b>media management library</b>	See <a href="#">MML</a> .
<b>mean time to recover</b>	See <a href="#">MTTR</a> .
<b>mirroring</b>	The Symmetrix process of maintaining two identical copies of a designated volume on separate disks. Each volume is automatically updated during a write operation. If one disk device fails, Symmetrix automatically uses the other disk drive.

<b>MML</b>	An abbreviation for media management library, a library of media management routines provided by the NetWorker Module for Oracle software and linked with the Oracle kernel software during the installation of NetWorker Module for Oracle on the Oracle Server host.
<b>MTTR</b>	An abbreviation for mean time to recover, the desired time required to perform an instance or media recovery for an Oracle database. For example, you might set 10 minutes as the goal for media recovery from a disk failure.
<b>multiplexing</b>	A NetWorker feature that permits data from more than one save set to be simultaneously written to the same storage device.
<b>NetWorker client</b>	See <i>client</i> .
<b>NetWorker server</b>	See <i>server</i> .
<b>NetWorker storage node</b>	See <i>storage node</i> .
<b>notification</b>	A message generated and sent to the NetWorker administrator about important NetWorker events.
<b>offline backup</b>	A backup of Oracle database objects performed while the corresponding Oracle instance is shut down and unavailable to users.
<b>online backup</b>	A backup of Oracle database objects performed while the corresponding Oracle instance is running and available to users.
<b>online indexes</b>	The databases located on the NetWorker server that contain all the information pertaining to the client backups ( <i>client file index</i> ) and backup volumes ( <i>media database</i> ).
<b>operator</b>	The person who monitors the server status, loads backup volumes into the server devices, and otherwise executes the day-to-day NetWorker tasks.
<b>Oracle8 Server</b>	A computer running an Oracle8 release 8.0.x RDBMS. See <i>RDBMS</i> .

<b>Oracle8i Server</b>	A computer running an Oracle8i release 8.1.x RDBMS. See <a href="#">RDBMS</a> .
<b>Oracle9i Server</b>	A computer running an Oracle9i release 9.0.x RDBMS. See <a href="#">RDBMS</a> .
<b>override</b>	A NetWorker feature that allows you to configure a different backup level for a specific date listed in a Schedule resource.
<b>parallelism</b>	A NetWorker feature that enables the backup or restore of save sets from several clients or many save sets from one client at the same time.
<b>pathname</b>	A set of instructions to the operating system for accessing a file. An <i>absolute pathname</i> tells how to find a file beginning at the root directory and working down the directory tree. A <i>relative pathname</i> tells how to find the file starting where you are now.
<b>physical host</b>	Any one of the nodes (or machines) that form a cluster.
<b>policy</b>	A set of constraints that specify how long an entry can remain in a NetWorker online index. When a policy expires, the save sets associated with that policy are marked recyclable. Each Client resource uses two policies: a browse policy and a retention policy. For more information, refer to the <b>nsr_policy (5)</b> man page or the <i>Legato Command Reference Guide</i> .
<b>pool</b>	A feature that enables you to sort backup data to selected volumes. A pool contains a collection of backup volumes to which specific data has been backed up.
<b>primary host</b>	The computer connected to a local Symmetrix unit and running the Oracle Server, NetWorker client, NetWorker Module for Oracle, and PowerSnap for EMC Symmetrix software.
<b>production host</b>	See <a href="#">primary host</a> .

<b>proxy backup</b>	The backup of a database snapshot from a Symmetrix unit to a NetWorker storage device by using PowerSnap software on a secondary (backup) host. See also <a href="#">secondary host</a> .
<b>proxy restore</b>	The restore of data backed up during a proxy backup.
<b>purging</b>	The process of deleting all entries for files on a volume from the client file index, but allowing entries for the save sets to remain in the media database.
<b>R1 device</b>	A Symmetrix standard device connected to the primary host. It is a Symmetrix logical volume that participates in SRDF operations. It resides on the "local" Symmetrix unit and is considered the source volume.
<b>R2 device</b>	A Symmetrix device that is a mirror of the R1 device. It is a Symmetrix logical volume that participates in SRDF operations. It resides on the "remote" Symmetrix unit and is considered the target volume.
<b>RDBMS</b>	An abbreviation for Relational Database Management System, which refers to the primary architecture of an Oracle database.
<b>recover</b>	<ol style="list-style-type: none"><li>1. A recovery method that re-creates an image of the client filesystems and database on the NetWorker server.</li><li>2. An Oracle datafile recovery method that uses Oracle commands to apply archived redo logs and online redo logs to make the database consistent.</li></ol>
<b>Recovery Catalog</b>	A collection of Oracle database tables containing information about Oracle database backups and restores. The Recovery Catalog includes information about backup sets and pieces, image and proxy copies, archived redo logs, stored scripts, and the <a href="#">target database</a> schema. RMAN maintains and uses the information in the Recovery Catalog to determine how to perform requested backup and restore operations.
<b>Recovery Manager</b>	See <a href="#">RMAN</a> .



<b>recyclable save set</b>	A save set whose browse and retention policies have been reached; therefore, the save set has been removed from the media database.
<b>recyclable volume</b>	A volume whose data has passed both its browse and retention policies and is now available for relabeling and use by a NetWorker server or storage node.
<b>redo log</b>	The online log of an Oracle database, consisting of at least two redo log files (separate from the datafiles) that record all changes made in the database. See also <a href="#">archived redo log</a> .
<b>remote device</b>	A storage device that is attached to a NetWorker storage node.
<b>RMAN</b>	An abbreviation for Recovery Manager, the Oracle utility (in Oracle8, Oracle8i, or Oracle9i) that acts as an intelligent interface to Oracle databases and works with third-party media management products, such as NetWorker Module for Oracle, to back up and restore Oracle database objects.
<b>RPC</b>	An abbreviation for remote procedure call, which is the protocol the NetWorker server uses to perform client requests over a network.
<b>resource</b>	A component of the NetWorker software that describes the NetWorker server and its clients. Devices, schedules, clients, groups, and policies are examples of NetWorker resources. Each resource contains a list of attributes that define the parameters to use for the specific NetWorker resource.
<b>resource database</b>	A database that contains information about each of the configured backup server's resources.
<b>restore</b>	The process of retrieving individual Oracle datafiles from backup media and storing the files on disk.
<b>retention policy</b>	A policy that determines how long save set entries are retained in the NetWorker server's media database.

<b>root</b>	<ol style="list-style-type: none"><li>1. (UNIX only) The UNIX superuser account (with user name “root” and user ID). By extension, the privileged system-maintenance login on any operating system.</li><li>2. (Windows NT/Windows 2000 and UNIX) The top node of the system directory structure; the home directory of the root user.</li></ol>
<b>save set</b>	A group of files or a filesystem from a single client computer backed up onto storage media.
<b>save set ID</b>	An internal identification number that NetWorker software assigns to a save set.
<b>save set status</b>	The NetWorker attribute that indicates whether a given save set is restorable, recoverable, or recyclable. The save set status also indicates whether the save set has been successfully backed up.
<b>save stream</b>	The data and save set information being written to a storage volume during a backup. A save stream originates from a single save set.
<b>scanner</b>	A NetWorker utility used to read a backup volume when the online indexes are not available.
<b>secondary host</b>	The computer connected to a local or remote Symmetrix unit and running the NetWorker client (or optionally the NetWorker server or storage node) and PowerSnap software. Separate from the primary (Oracle Server) host, the secondary host backs up the database snapshot from the Symmetrix device to the storage device.
<b>server</b>	The computer on a network that runs the NetWorker server software, contains the online indexes, and provides backup and restore services to the clients and storage nodes on the same network.
<b>server index</b>	A file that lists all the server files that were backed up during a scheduled backup.
<b>service port</b>	The port used by a server or storage node to listen for backup and restore requests from clients through a firewall.

<b>shared disk</b>	The storage disk that is connected between multiple nodes in the cluster.
<b>shell prompt</b>	A cue for input in a shell window where you enter a command.
<b>SID</b>	An abbreviation for Oracle system identifier, a unique name for an Oracle database instance. This value is typically set in an ORACLE_SID environment variable.
<b>silo</b>	A repository for holding hundreds or thousands of volumes. Silo volumes are identified by barcodes, not by slot numbers.
<b>skip</b>	A backup level in which designated files are not backed up. See also <i>level</i> .
<b>snapshot</b>	A point-in-time copy of a filesystem or partition.
<b>SRDF</b>	An EMC product that supports data mirroring to a remote Symmetrix unit.
<b>ssid</b>	See <i>save set ID</i> .
<b>stand-alone device</b>	A <i>storage device</i> that contains a single drive for backing up data.
<b>storage device</b>	The hardware that reads and writes data during backup, restore, or other NetWorker operations.
<b>storage node</b>	A storage device physically attached to a computer other than the NetWorker server, whose backup operations are administered from the controlling NetWorker server.
<b>Symmetrix device</b>	An EMC device configured for normal Symmetrix operation under a desired protection method.
<b>Symmetrix Remote Data Facility</b>	See <i>SRDF</i> .
<b>system administrator</b>	The person normally responsible for installing, configuring, and maintaining NetWorker.
<b>tablespace</b>	An Oracle database structure comprising one or more datafiles.

<b>target database</b>	The Oracle database that has been backed up or that the NetWorker server is to back up as a safeguard against data loss.
<b>TNS</b>	An abbreviation for Transparent Network Substrate, an Oracle networking technology that provides a single interface to all standard network protocols.
<b>versions</b>	The date-stamped collection of available backups for any single file.
<b>volume</b>	A unit of storage media, such as a magnetic tape, an optical disk, or a file. A storage device reads from and writes to volumes, which can be physical units (for example, a labeled tape cartridge) or logical units (for example, optical media can store multiple volumes on a single physical platter).
<b>volume ID</b>	The internal identification assigned to a backup volume by NetWorker software.
<b>volume name</b>	The name you assign to a backup volume when it is labeled.
<b>volume pool</b>	See <a href="#">pool</a> .

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