



NetWorker™

Module for Oracle®

Release 4.1

Multiplatform Version

Administrator's Guide

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Legato NetWorker Module for Oracle, Release 4.1, Multiplatform Version, Administrator's Guide

September 2003

01-8560-4.1

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Preface

This Administrator's Guide provides information on how to configure and manage the Legato NetWorker[®] Module for Oracle release 4.1 software for Oracle data storage management.

Note: In this guide, "Windows" refers to the Microsoft Windows 2000, 2003, and Windows NT operating systems, unless specified otherwise.

Before using the information in this guide, install the NetWorker[™] Module for Oracle software on a supported UNIX or Windows operating system that is running Oracle Server software. For installation instructions, refer to the *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*.

Post-release information is contained in the Release Supplement for this product. This document is available online in the Support section of the Legato web site (www.legato.com). Refer to the web site periodically to view the latest Release Supplement.

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.


Product Documentation

For a complete list of documentation related to this product, see "[Related Documentation](#)" on page 33. Most of the documents are in Adobe Acrobat Portable Document Format (PDF), and can be viewed by downloading and installing the Adobe Acrobat Reader. The Reader is available in the `/viewers/acroread` directory on the Legato® Documentation Suite CD-ROM, or directly from Adobe at www.adobe.com. To install and use the Reader on the preferred platform, refer to the instructions in the CD-ROM's `/viewers/acroread/readme.txt` file or at the Adobe web site.

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

Convention	Indicates	Example
boldface	Names of line commands, daemons, options, programs, or scripts	The nsradmin command starts the command line version of the NetWorker Administrator 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> . The specifications are created, one for each swap file, in <i>c:\pagefile.sys</i> .
<i>italic in command line</i>	A variable that must be provided in the command line	nwadmin -s <i>server_name</i>
fixed-width	Examples and information displayed on the screen	media waiting: recover waiting for 8mm 5GB tape volume name
fixed-width, boldface	Commands and options that must be entered exactly as shown	nsr_shutdown -a

Convention	Indicates	Example
Menu_Name> Command	A path or an order to follow for making selections in the user interface	Volume>Change Mode>Appendable
Important:	Information that must be read and followed to ensure successful backup and recovery of data	 <hr/> Important: Use the <code>no_verify</code> option with extreme caution. <hr/>

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www.legato.com	Yes	Yes	Yes	Yes
ftp.legato.com (log in as <i>anonymous</i>)	Yes	Yes		
Legato Sales (650) 210-7000 (option 1) sales@legato.com			Yes	
Legato Education Services (650) 842-9357 training@legato.com				Yes

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Legato welcomes comments and suggestions about software features, the installation procedure, and documentation. Please send any suggestions and comments to feedback@legato.com. Legato confirms receipt of all e-mail correspondence. Although Legato cannot respond personally to every request, all comments and suggestions are considered during product design.

Help improve Legato documentation by completing a brief survey. Visit the Legato web site at www.legato.com, navigate to the documentation page, and click on the link to the survey.

Chapter 1: Introduction

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 the NetWorker PowerSnap™ Module, which is required for proxy Oracle backups on specific types of primary storage.

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 restores indicate non-proxy backups and restores.

This chapter includes the following main sections:

- ["Importance of Backing Up Mission-Critical Data" on page 19](#)
- ["Legato NetWorker Software" on page 20](#)
- ["Legato NetWorker Module for Oracle" on page 21](#)
- ["NetWorker PowerSnap Module" on page 22](#)
- ["Oracle Backup and Recovery System" on page 23](#)
- ["How NetWorker Module for Oracle Backs Up Data" on page 25](#)
- ["How NetWorker Module for Oracle Restores Data" on page 29](#)
- ["Preparing for Disaster Recovery" on page 31](#)
- ["About This Guide" on page 32](#)
- ["Related Documentation" on page 33](#)

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.

Legato 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*.

Legato NetWorker Module for Oracle

The Legato 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.

Proxy backups and restores of Oracle database files residing on specific types of primary storage devices are supported. These proxy Oracle operations are performed by NetWorker Module for Oracle in conjunction with the NetWorker server and the appropriate NetWorker PowerSnap Module software.

For information on how to install the NetWorker Module for Oracle software, refer to the *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*.

NetWorker PowerSnap Module

The NetWorker PowerSnap Module software works with the NetWorker server and NetWorker Module for Oracle software to perform RMAN proxy backups and restores of Oracle data residing on specific types of primary storage.

Each type of primary storage requires a different type of PowerSnap Module. A proxy backup performed with the PowerSnap Module involves taking a snapshot of the Oracle data. The snapshot resides on the primary storage to ensure high availability of the database and eliminate downtime latency on the Oracle Server host.

During a proxy backup, the Oracle data can *optionally* be copied from the snapshot to a NetWorker storage device. The data is copied to the secondary storage by either the Oracle Server host or a proxy client host that is separate from the Oracle Server host.

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

- See "[Chapter 7: Proxy Oracle Backups and Restores](#)" on page 109.
- Refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

For a complete list of supported PowerSnap Modules, refer to the current *Legato Software Compatibility Guide* on the Legato web site.

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 PowerSnap Module software and specific primary storage devices, see "[Chapter 7: Proxy Oracle Backups and Restores](#)" on page 109.

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:

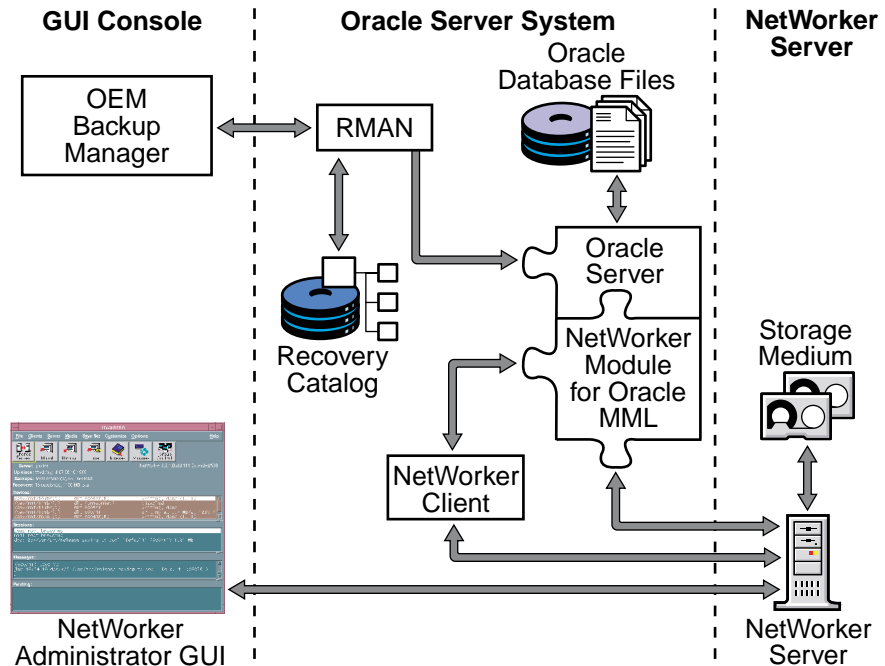
- Oracle Server
- RMAN
- Recovery Catalog (optional)
- Oracle Enterprise Manager (OEM) Backup Management Tools (optional)

The NetWorker software consists of the following components:

- NetWorker server
- NetWorker client
- NetWorker Module for Oracle

[Figure 1 on page 24](#) 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 required PowerSnap Module software, see "[Chapter 7: Proxy Oracle Backups and Restores](#)" on page 109.

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 49](#).

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.

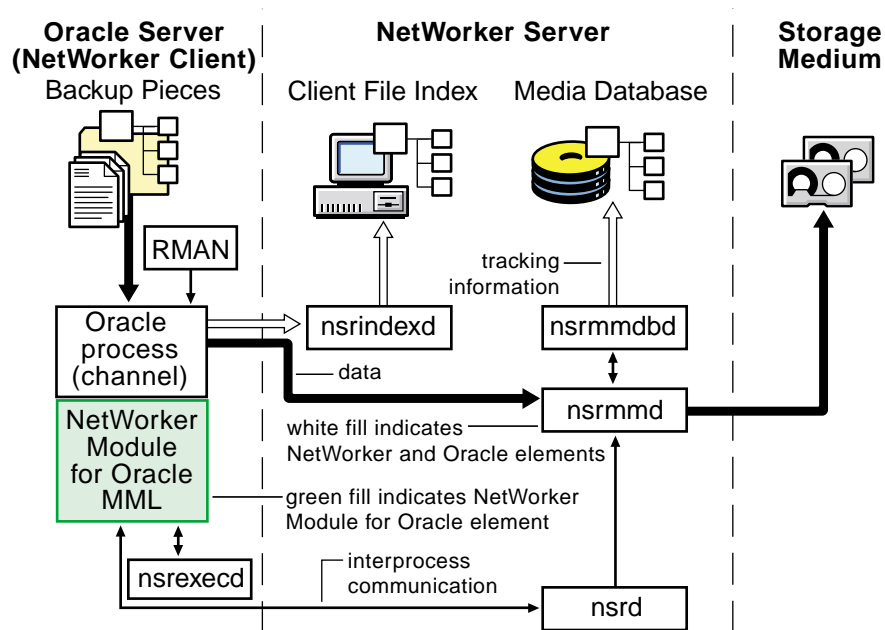
A regular manual Oracle backup includes the following process interactions:

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 **nsrmmmd** process that manages the requested backup device.
3. The Oracle Server processes send the backup data to the NetWorker media service, **nsrmmmd**, to store on the appropriate backup volumes.

4. Tracking information is stored in the NetWorker online indexes:
 - The **nsrmmdb** 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 27 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 59.

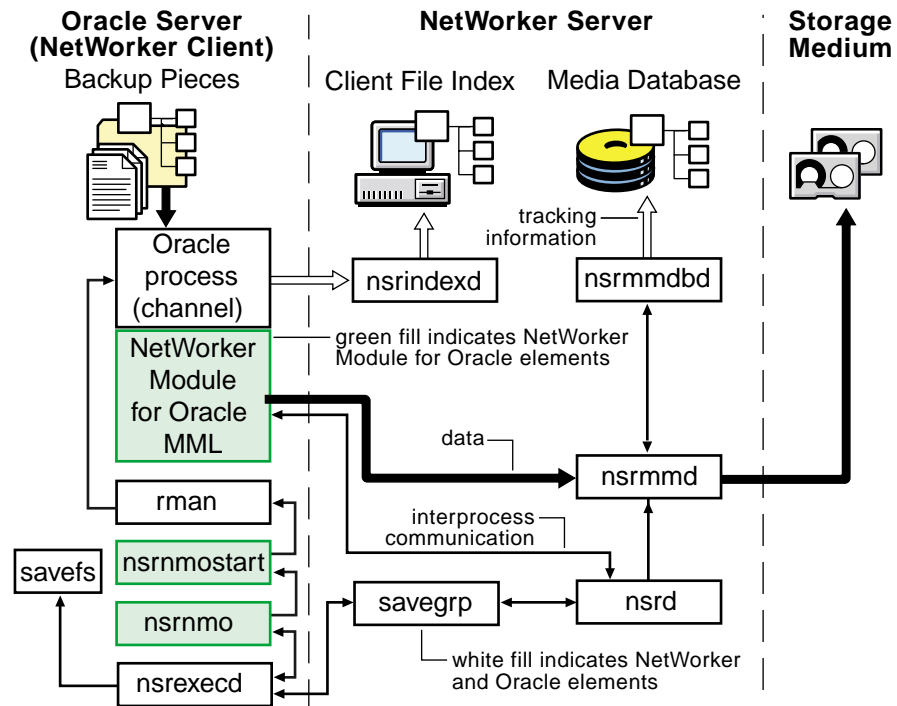
A regular scheduled Oracle backup includes the following process interactions:

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 **nsrnm** script for the scheduled backup.
 - b. The **nsrnm** 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 26](#).

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 29](#) 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 required PowerSnap Module software, see "[Chapter 7: Proxy Oracle Backups and Restores](#)" on page 109.

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.

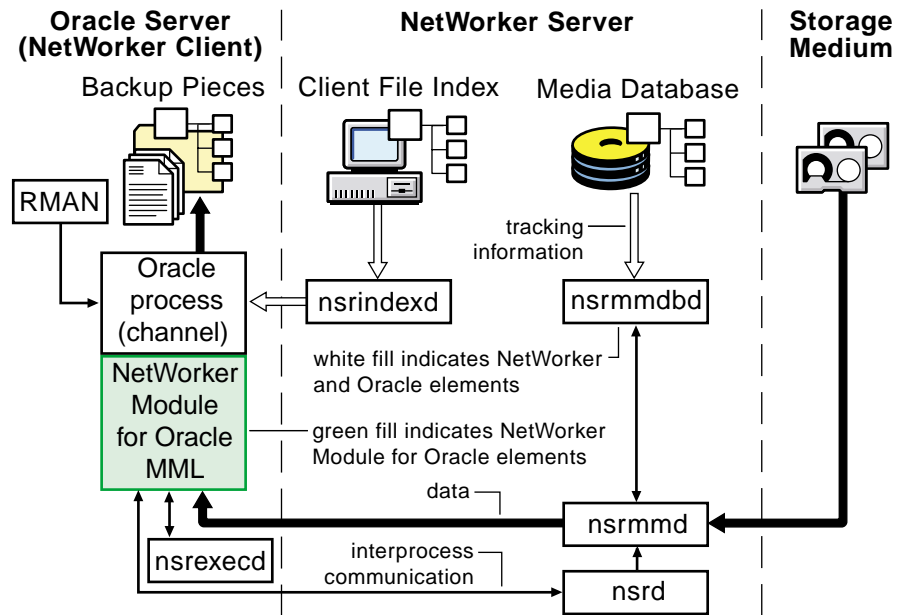
The RMAN utility starts Oracle Server processes on the target database. These Oracle Server processes initiate the restore by calling NetWorker Module for Oracle MML software routines.

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 31](#) 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 Recovery

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 54.

- 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 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 35](#) describes the procedures for configuring NetWorker Module for Oracle backups and restores.
- ["Chapter 3: Manual Oracle Backups" on page 49](#) describes the procedures for running manual NetWorker Module for Oracle backups.
- ["Chapter 4: Scheduled Oracle Backups" on page 59](#) describes the procedures for configuring and running scheduled NetWorker Module for Oracle backups.
- ["Chapter 5: Restoring and Recovering Oracle Data" on page 87](#) describes the procedures for restoring and recovering from NetWorker Module for Oracle backups.
- ["Chapter 6: Cluster, OPS, and RAC Systems" on page 95](#) describes the procedures for configuring and running NetWorker Module for Oracle backups and restores on cluster, OPS, and RAC systems.
- ["Chapter 7: Proxy Oracle Backups and Restores" on page 109](#) describes the procedures for proxy backups and restores of Oracle data on specific primary storage devices, performed by using NetWorker Module for Oracle and the required PowerSnap Module software.
- ["Appendix A: Environment Variables in the RMAN Session" on page 171](#) describes the environment variables that can be set for NetWorker Module for Oracle backups and restores.

- "[Appendix B: RMAN Commands](#)" on page 179 describes RMAN commands that concern the NetWorker Module for Oracle software.
- "[Appendix C: Oracle9i Support in NetWorker Module for Oracle](#)" on page 193 describes RMAN features introduced in Oracle9i that concern the NetWorker Module for Oracle software.
- "[Appendix D: Troubleshooting and Error Messages](#)" on page 201 describes troubleshooting guidelines, RMAN error messages, and NetWorker Module for Oracle error messages.

Related Documentation

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

- *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*
- *Legato NetWorker Module for Oracle Release Supplement, Release 4.1*
- *NetWorker PowerSnap Module Installation and Administrator's Guide* (for the appropriate PowerSnap Module)
- *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 NetWorker Command Reference Guide* (for NetWorker commands)
- *Legato NetWorker Module for Oracle Command Reference Guide* (for NetWorker Module for Oracle commands)
- UNIX man pages (for NetWorker and NetWorker Module for Oracle commands)
- Oracle backup and recovery documentation

The complete set of Legato documentation is provided in PDF form on the Legato Documentation Suite CD-ROM shipped with the Legato software. The *most* up-to-date Legato documentation is available on the Legato web site at www.legato.com.

Chapter 2: Software Configuration Procedures

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 35](#)
- ["Task 1: Verify the Oracle Server Configuration" on page 37](#)
- ["Task 2: Configure the NetWorker Server Resource" on page 37](#)
- ["Task 3: Verify the NetWorker User Group Privileges" on page 40](#)
- ["Task 4: Configure the NetWorker Client Resource" on page 42](#)
- ["Task 5: Configure the NetWorker Device Resources" on page 45](#)
- ["Task 6: Configure the NetWorker Volume Pools" on page 45](#)
- ["Task 7: Configure Firewall Support" on page 47](#)

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, Release 4.1*.

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 37](#).
2. Configure the NetWorker Server resource to:
 - Identify the correct NetWorker server.
 - Specify an appropriate parallelism value.
 - Specify the required NetWorker privileges.See ["Task 2: Configure the NetWorker Server Resource" on page 37](#).
3. With NetWorker server release 7.x, verify that the required user group privileges are assigned for NetWorker Module for Oracle operations. See ["Task 3: Verify the NetWorker User Group Privileges" on page 40](#).
4. Configure a NetWorker Client resource for the Oracle Server as a backup client of the NetWorker server. See ["Task 4: Configure the NetWorker Client Resource" on page 42](#).
5. 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 5: Configure the NetWorker Device Resources" on page 45](#).
6. Configure any required NetWorker Pool resources and corresponding Label Template resources. See ["Task 6: Configure the NetWorker Volume Pools" on page 45](#).
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*.
7. Configure firewall support, if required. See ["Task 7: Configure Firewall Support" on page 47](#).
8. Configure any required cluster, Oracle Parallel Server (OPS), or Real Application Cluster (RAC) systems. See ["Chapter 6: Cluster, OPS, and RAC Systems" on page 95](#).

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 Oracle Server 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 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.

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 38](#) 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 users with NetWorker Administrator privileges. 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 " Specifying the Required NetWorker Privileges " on page 38.

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*.

Specifying the Required NetWorker Privileges

Certain NetWorker Module for Oracle operations require specific NetWorker privileges. The method of specifying the privileges depends on the NetWorker server release:

- With NetWorker server release 6.x, any user can view NetWorker resource settings, but 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.
- With NetWorker server release 7.x, the NetWorker privileges are specified through the User Group resource. For more information, see "[Task 3: Verify the NetWorker User Group Privileges](#)" on page 40.

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

- 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 56](#)
 - ["Canceling a Scheduled Oracle Backup" on page 80](#)

Note: If the Oracle user is *not* granted the required NetWorker privileges in 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 enable NetWorker Module for Oracle to remove an entry from the NetWorker index, ensure that the Oracle user has the required NetWorker privileges:

- With NetWorker server release 6.x, add the required user name to the Administrator list in the Server resource:
 - For an Oracle Server on UNIX:
 - 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.
 - For an Oracle Server on Windows, add the name of the operating system user that runs the Oracle service (*OracleService<oracle_sid>*).
- With NetWorker server release 7.x, verify that the required user group privileges exist. For more information, see ["Task 3: Verify the NetWorker User Group Privileges" on page 40](#).

Task 3: Verify the NetWorker User Group Privileges

The NetWorker server release 7.x includes an access control feature that is configured through the User Group resource. This feature allows NetWorker administrators to assign users to NetWorker user groups. Each user group has a specific set of privileges associated with it, as defined in the Privileges attribute of the User Group resource.

The NetWorker server release 7.x is installed with two preconfigured user groups:

- Administrators — Members of this group have privileges to perform all NetWorker operations. The root user on UNIX, and members of the Microsoft Windows Administrators group, are always members of this group and cannot be removed from the group.
- Users — By default, members of this group have privileges to back up and recover local data and monitor NetWorker operations. They cannot view or edit configurations.

Note: The privileges associated with the Users group can be customized to fit the requirements of the NetWorker users in the group. The privileges associated with the Administrators group cannot be changed.

By default, the NetWorker server assigns the following privileges to all users:

- Monitor NetWorker
- Recover Local Data
- Backup Local Data

The default user group configurations are sufficient for RMAN backup, restore, and crosscheck operations using the NetWorker Module for Oracle. If the default user group configurations are changed, ensure that the required privileges are assigned for the operations.



Important: The default user group privileges are *not* sufficient for RMAN backup deletions. The Oracle user must have the additional Operate NetWorker privilege (and its prerequisite privileges) to perform RMAN backup deletions.

With NetWorker server release 7.x, verify that the required user group privileges exist for the NetWorker Module for Oracle operations, as described in [Table 2 on page 41](#). For information on how to modify existing privileges, refer to the *Legato NetWorker Administrator's Guide*.

Note: Proxy Oracle backups and restores require the same privileges as regular Oracle backups and restores, *plus* the privileges required by the PowerSnap Module. The PowerSnap Module requires that all the default privileges (Monitor NetWorker, Recover Local Data, Backup Local Data) are granted to the root user, or a member of the Microsoft Windows Administrators group, on *both* the Oracle Server and proxy client host. For more information, refer to the *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Table 2. User Group Privileges Required for NetWorker Module for Oracle Operations (Part 1 of 2)

Operation	NetWorker Users	Required User Group Privileges
Regular manual Oracle backup	Oracle user on the Oracle Server	Monitor NetWorker ^a , Recover Local Data, Backup Local Data
Regular scheduled Oracle backup	Oracle user on the Oracle Server	Monitor NetWorker ^a , Recover Local Data, Backup Local Data
	Root user, or a member of the Microsoft Windows Administrators group, on the Oracle Server	Monitor NetWorker, Backup Local Data
Regular Oracle restore	Oracle user on the Oracle Server	Recover Local Data
RMAN crosscheck	Oracle user on the Oracle Server	Monitor NetWorker ^a , Recover Local Data

Table 2. User Group Privileges Required for NetWorker Module for Oracle Operations (Part 2 of 2)

Operation	NetWorker Users	Required User Group Privileges
RMAN backup deletion	Oracle user on the Oracle Server	Operate NetWorker, and all its prerequisite privileges
Restore of NWORA resource file backup to the Oracle Server	Root user, or a member of the Microsoft Windows Administrators group, on the Oracle Server host	Recover Local Data

a. With NetWorker 7.1, the Oracle user does *not* require the Monitor NetWorker privilege for any NetWorker Module for Oracle operations.

The Oracle user is defined as the following:

- On UNIX:
 - If Net service is used, the operating system user that starts the Net service.
 - If Net service is *not* used, the operating system user that runs RMAN.
- On Windows, the operating system user that runs the Oracle service (*OracleService<oracle_sid>*).



Important: If the correct user group privileges are not assigned, an Oracle backup or restore fails with an error message indicating the required user group privileges. For more information on NetWorker user groups and setting user group privileges, refer to the *Legato NetWorker Administrator's Guide*.

Task 4: 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 3 on page 43](#) for a description of the attribute settings and enter the appropriate information for each attribute in the Client resource.

For information on how to configure the Client resource for proxy Oracle backups, see "[Configuring the NetWorker Client Resource](#)" on page 133.

Table 3. NetWorker Client Resource Attributes (Part 1 of 2)

Attribute	Description
Name	Specifies the hostname of the Oracle Server host.
Backup Command	Specifies the name of a single customized nsrnm script to be used for a <i>scheduled</i> Oracle backup. For more information, see " Task 5: Configure the Client Resource for a Scheduled Oracle Backup " on page 75.
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>Note: For a scheduled Oracle backup with NetWorker server 6.x or later, if the NSR_SAVESET_BROWSE environment variable is set as described in "Appendix A: Environment Variables in the RMAN Session" on page 171, 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 or later, 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 " Task 5: Configure the Client Resource for a Scheduled Oracle Backup " on page 75.
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 3. 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>Note: For a scheduled Oracle backup with NetWorker server 6.x or later, if the NSR_SAVESET_RETENTION environment variable is set as described in "Appendix A: Environment Variables in the RMAN Session" on page 171, 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 or later, 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 "Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 75.</p>
Schedule	<p>Specifies the NetWorker backup schedule to be used for a <i>scheduled</i> Oracle backup. For more information, see "Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 75.</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 87](#).

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 5: 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 6: 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*.

2 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 49](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 59](#)

Note: In the case of proxy backups, the variable is used to specify the volume pool *for live backups only* (backups to secondary storage only). The variable *cannot* specify the snapshot pool for instant backups. The only way to specify the snapshot pool is by configuring the NetWorker resources, as described in ["Configuring the NetWorker Pool Resources" on page 132](#).

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 179](#).

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 196](#).

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 171](#).

Task 7: 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.

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 through either the Oracle RMAN command line interface or the Oracle Enterprise Manager (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 49](#)
- ["Task 1: Create RMAN Scripts for Manual Backups" on page 50](#)
- ["Task 2: Perform the Manual Oracle Backup" on page 52](#)
- ["Using the OEM Backup Management Tools" on page 53](#)
- ["NetWorker Server Bootstrap Backup" on page 54](#)
- ["Archived Redo Log Backups" on page 55](#)
- ["Recovery Catalog Backups" on page 56](#)
- ["Canceling a Manual Oracle Backup" on page 56](#)
- ["Monitoring Manual Oracle Backups" on page 57](#)

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 35](#). 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 50.
 2. Run the manual Oracle backup by using the RMAN command line interface. See "[Task 2: Perform the Manual Oracle Backup](#)" on page 52.
- To use the OEM Backup Management Tools, see "[Using the OEM Backup Management Tools](#)" on page 53.



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 54.

For information on how to keep track of the status of a manual Oracle backup, see "[Monitoring Manual Oracle Backups](#)" on page 57.

For information on how to configure and run scheduled Oracle backups, see "[Chapter 4: Scheduled Oracle Backups](#)" on page 59.

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: In Oracle8i and Oracle9i, it is recommended that the **send** command be used in the script to set the environment variables. See ["The send Command" on page 181](#).

```
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;
}
```

Note: To prevent backup performance problems, use forward slashes in the **format** option in either the RMAN **backup** command or **configure** command. This generates backup piece names that resemble UNIX directory names. For more information on this issue, refer to the *Legato NetWorker Module for Oracle Release Supplement, Release 4.1*.

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 193](#).

To specify a Media Management (in this case, NetWorker Module for Oracle) device, set the **type** option in the RMAN **allocate channel** command to **SBT_TAPE**.

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, by using the RMAN **send** command (*recommended*).
- In Oracle9i *for manual backups only*, by using the **send** option in the **configure channel** command.

- In Oracle8i or Oracle9i, by using the **parms** option in *either* the **allocate channel** command *or* the **configure** command (*Oracle9i only*).

Note: The NSR_* environment variables *cannot* be set by 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 171.

In the RMAN backup script on [page 51](#), 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.

In Oracle8i and Oracle9i, if a backup piece name is *not* unique, the Oracle backup fails.

For more information, refer to the following sources:

- 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 179.

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 35.

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 35.
- 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 50.

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

For example, if the RMAN backup script on [page 51](#) is stored in the file `/disk1/scripts/full_backup.txt` on a UNIX Oracle Server, and the Net service has been configured to connect to the databases `payroll` and `rcvcatdb`, then 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'
```

With Oracle8i or Oracle9i on Microsoft Windows, the command to run the RMAN script is `rman`. 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.

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, then *no* backups of the online client index and NetWorker server bootstrap will be available for use in the event of a disaster recovery on the NetWorker server.

After finishing a manual Oracle backup, the bootstrap and client index must also be backed up.

How to Back Up the Bootstrap and Index

To back up the bootstrap and index:

1. Log in as follows:
 - On a UNIX NetWorker server as root.
 - On a Windows NetWorker server as administrator.
2. Enter the following **savegrp** command:

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

where:

- *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 by 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.

Note: 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.

For more information, refer to the following sources:

- For information on the **savegrp** command and options, refer to:
 - *Legato NetWorker Administrator's Guide* for the particular NetWorker server platform.
 - The **savegrp** entry in the *Legato NetWorker Command Reference Guide*.
 - The **savegrp** man page on UNIX.
- For information on bootstrap backups, refer to the *Legato NetWorker Administrator's Guide*.
- 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. Transactions that occurred between the time of the last consistent backup and that 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 106.

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, ensure that the Oracle user has the required NetWorker privileges for removing NetWorker index entries before you cancel a manual Oracle backup. For more information, see ["Specifying the Required NetWorker Privileges" on page 38](#).

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

- ["How to Cancel a Running Oracle Backup" on page 56](#)
- ["How to Cancel a Nonresponding Oracle Backup" on page 56](#)

How to Cancel a Running Oracle Backup

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

Note: 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 80](#).

How to Cancel a Nonresponding Oracle Backup

The following are the steps for canceling a nonresponding Oracle backup. However, *if* these steps do *not* work, contact Oracle for assistance.

Note: When using these steps, the NetWorker Module for Oracle does *not* attempt to remove the backup save set entries from the NetWorker index. As a result, the NetWorker index and RMAN catalog might become unsynchronized.

To cancel a nonresponding Oracle backup on UNIX:

1. Include the **set command id to 'xxx'** command in the RMAN backup script that is used for the 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 61.
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. Enter the following **kill** command to cancel the Oracle backup process:

```
kill -9 pid
```

where *pid* is the appropriate Oracle process ID.

To cancel a nonresponding Oracle backup on Windows, stop the **nsrsbctn.exe** process in Task Manager.

Monitoring Manual Oracle Backups

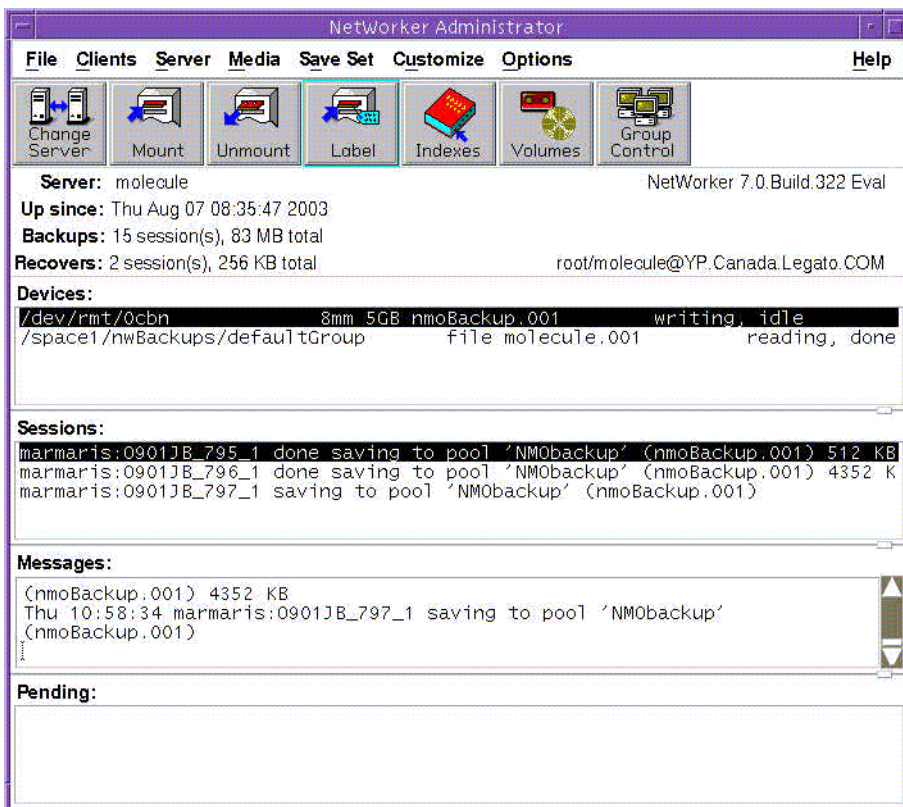
To monitor the status of Oracle backup and restore operations, use the NetWorker Administrator program. The Administrator program displays progress and completion messages that advise when a backup or restore is complete, and information on why a backup or restore cannot proceed.

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

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 201.

[Figure 5 on page 58](#) shows the types of messages displayed in the Sessions and Messages sections of the main NetWorker Administrator program window on UNIX during an Oracle backup.

Figure 5. Oracle Backup Messages in the NetWorker Administrator



3

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 by using the instructions in this chapter, execute a successful *manual* Oracle backup. See the instructions in ["Chapter 3: Manual Oracle Backups" on page 49](#).

This chapter includes the following main sections:

- ["Roadmap for Scheduled Oracle Backups" on page 60](#)
- ["Task 1: Create RMAN Scripts for Scheduled Backups" on page 61](#)
- ["Task 2: Customize the nsrnmo Script" on page 64](#)
- ["Task 3: Configure a NetWorker Backup Schedule" on page 73](#)
- ["Task 4: Configure a NetWorker Backup Group" on page 74](#)
- ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 75](#)
- ["Testing a Scheduled Oracle Backup" on page 79](#)
- ["Archived Redo Log Backups" on page 80](#)
- ["Recovery Catalog Backups" on page 80](#)
- ["Canceling a Scheduled Oracle Backup" on page 80](#)
- ["Monitoring Scheduled Oracle Backups" on page 82](#)
- ["Automation of NSR_SERVER and NSR_GROUP Variable Settings" on page 82](#)
- ["Scheduled Oracle Backup Information in the NetWorker Indexes" on page 84](#)

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 35](#). 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 61](#).
2. Customize the `nsrnm0` script for the scheduled backup (the file `nsrnm0` on UNIX or `nsrnm0.bat` on Windows) by setting the required environment variables in the script. See ["Task 2: Customize the nsrnm0 Script" on page 64](#).
3. Configure the required backup schedules. See ["Task 3: Configure a NetWorker Backup Schedule" on page 73](#).
4. Configure the required backup groups. See ["Task 4: Configure a NetWorker Backup Group" on page 74](#).
5. Configure a NetWorker Client resource for the scheduled backup. See ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 75](#).

After completing these configuration steps:

- Run a test scheduled Oracle backup by using the steps in ["Testing a Scheduled Oracle Backup" on page 79](#).
- Review the steps for canceling a scheduled Oracle backup in ["Canceling a Scheduled Oracle Backup" on page 80](#).

For information on how to keep track of the status of scheduled Oracle backups, see ["Monitoring Scheduled Oracle Backups" on page 82](#).

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 84.

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: In Oracle8i and Oracle9i, it is recommended that the **send** command be used in the script to set the environment variables. See ["The send Command"](#) on page 181.

```
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';
    allocate channel t2 type 'SBT_TAPE';
    send 'NSR_ENV=(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. This generates backup piece names that resemble UNIX directory names. For more information on this issue, refer to the *Legato NetWorker Module for Oracle Release Supplement, Release 4.1*.

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 rvc** *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 rvc** 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 80](#).

The remainder of the RMAN script on [page 61](#), starting with the first **allocate channel** command, is similar to the RMAN script on [page 51](#) *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 50](#).



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. Then that variable's 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 one associated with the backup group, the scheduled backup uses the NSR_DATA_VOLUME_POOL pool. It is the user's responsibility to set that variable 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 by 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 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:

- A sample **nsrnm0** script in the same directory as the NetWorker executables. The sample script filename is:
 - *nsrnm0* on UNIX
 - *nsrnm0.bat* on Windows
- A template of the script in the */etc/nsrnm0.sh* file on UNIX. *Do not modify this file.*

Note: On Windows, save a copy of the original *nsrnm0.bat* file before modifying it.

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*. On Windows, the name must also end in *.bat* or *.cmd*.

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

1. Copy the sample script file (*nsrnm0* on UNIX or *nsrnm0.bat* on Windows) to a file with a different name.
2. Customize the environment variables in the new file.

For example, you might create the new script file named *nsrnmoproddb* on UNIX or *nsrnmoproddb.bat* on Windows.

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

Note: A **nsrnmoproddb** script from NetWorker Module for Oracle release 3.x works with this release 4.1 software. However, the **nsrnmoproddb** script installed with the NetWorker Module for Oracle release 4.1 includes new functionality and settings, such as the environment variable TNS_ADMIN, which are not found in the script with previous releases.

Environment Variables in the nsrnmoproddb Script

The sample **nsrnmoproddb** 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 **nsrnmoproddb** script are all *undefined* by default.

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

- LD_LIBRARY_PATH appears in the script on:
 - HP-UX (64-bit only)
 - Linux
 - Solaris
 - Tru64 UNIX
- LIBPATH appears in the script on AIX.
- SHLIB_PATH appears in the script on HP-UX (32-bit and 64-bit).

Follow the instructions in the *Oracle Installation Guide* to determine which of the environment variables (LD_LIBRARY_PATH, LIBPATH, SHLIB_PATH) to set on a particular operating system and to what value.

The following environment variables are *mandatory*:

- ORACLE_HOME and PATH are mandatory for each scheduled backup; they *must* be set in the **nsrnmoproddb** script.
- LD_LIBRARY_PATH is mandatory on Tru64 UNIX *only*.

The other environment variables in the **nsrnmoproddb** 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. The use of either the UNIX **setenv** command or Windows **set** command 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 for details on the variables.

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

- "ORACLE_HOME" on page 66
- "PATH" on page 66
- "LD_LIBRARY_PATH" on page 67
- "LIBPATH" on page 67
- "SHLIB_PATH" on page 68
- "NSR_RMAN_ARGUMENTS" on page 68
- "NSR_RMAN_OUTPUT" on page 68
- "NSR_SB_DEBUG_FILE" on page 69
- "ORACLE_SID" on page 69
- "PRECMD" on page 70
- "POSTCMD" on page 71
- "TNS_ADMIN" on page 73

4

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/8.1.6*, ORACLE_HOME must be set in the **nsrnm0** script as follows:

```
ORACLE_HOME=/disk3/oracle/app/oracle/product/8.1.6
```

PATH

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

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

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

LD_LIBRARY_PATH

This environment variable is *mandatory* for a scheduled backup on Tru64 UNIX *only*. Set `LD_LIBRARY_PATH` in the **nsrnm** script file to the pathname of the directory that contains 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 “`export_environment_variables()`” function heading in the **nsrnm** script:

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

LIBPATH

This environment variable is *optional* for a scheduled backup. It appears in the **nsrnm** script on AIX *only*. Set `LIBPATH` in the **nsrnm** script file to the pathname of the directory that contains the Oracle libraries, typically `$ORACLE_HOME/lib`.

To set `LIBPATH` in the **nsrnm** script, follow the example shown in ["LD_LIBRARY_PATH" on page 67](#), replacing `LD_LIBRARY_PATH` with `LIBPATH`. Uncomment the line “`export LIBPATH`” in the script.

SHLIB_PATH

This environment variable is *optional* for a scheduled backup. It appears in the **nsrnm0** script on HP-UX *only*. Set SHLIB_PATH in the **nsrnm0** script file to the pathname of the directory that contains the Oracle libraries, typically `$ORACLE_HOME/lib`.

To set SHLIB_PATH in the **nsrnm0** script, follow the example shown in "[LD_LIBRARY_PATH](#)" on page 67, 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. Set NSR_RMAN_ARGUMENTS to a double-quoted string that contains any valid combination of options for the RMAN executable, **rman**. For a list of the valid options, 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_RMAN_OUTPUT

This environment variable is *optional* for a scheduled backup. It provides a way to direct RMAN standard output to a specified log file if the **msglog** or **log** option of RMAN is *not* set in the NSR_RMAN_ARGUMENTS variable in the **nsrnm0** script.

The difference between setting NSR_RMAN_OUTPUT and the **msglog** or **log** option in NSR_RMAN_ARGUMENTS to specify a log file is that setting NSR_RMAN_OUTPUT causes the connection strings to be hidden in the log file.

Set `NSR_RMAN_OUTPUT` to a double-quoted string that contains the log file name and the optional **append** keyword.

For example, to append RMAN output to the message log file `/nsr/applogs/msglog.log`, set `NSR_RMAN_OUTPUT` in the `nsrnm` script as follows:

```
NSR_RMAN_OUTPUT="/nsr/applogs/msglog.log append"
```

To write RMAN output to the message log file `/nsr/applogs/msglog.log` without appending (the file contents are overwritten), set `NSR_RMAN_OUTPUT` in the `nsrnm` script as follows:

```
NSR_RMAN_OUTPUT="/nsr/applogs/msglog.log"
```

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 debug information for the scheduled backup. This file will exclude MML-specific debug 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 debug information is generated. If a file with the specified pathname *cannot* be created, debug information is either directed to the default location or not generated.

For example, to send detailed debug information for the scheduled backup to the `/usr/logs/schedbkup.log` file, set the `NSR_SB_DEBUG_FILE` variable in the `nsrnm` script as follows:

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

For more information on how the debug 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 204](#).

ORACLE_SID

This environment variable is *optional* for a regular scheduled backup. It is *required* for a proxy backup when catalog synchronization is enabled. For more information on proxy backups and catalog synchronization, see ["Chapter 7: Proxy Oracle Backups and Restores" on page 109](#).

Set ORACLE_SID in the **nsrnm0** script file to the system identifier (SID) value of the Oracle database to be backed up. For example, if catalog synchronization is enabled for proxy backups and the SID of the Oracle database to be backed up is *orcl815*, ORACLE_SID must be set as follows:

```
ORACLE_SID=orcl815
```

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 that allow 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.

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A sample preprocessing script for UNIX is shown as follows. This script is stored in the file whose complete pathname is specified in the PRECMD variable in the **nsrnm0** 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 **nsrnm0** 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 maintenance 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 that contains 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 for UNIX 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 `nsrnm0` 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 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 `nsrnmno` script.

In this case, set the value of `TNS_ADMIN` to the pathname of the directory that contains the Oracle Net8 or Oracle Net configuration files. To set `TNS_ADMIN` in the `nsrnmno` script, follow the example shown in "[LD_LIBRARY_PATH](#)" on [page 67](#), 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*.



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 only.

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 75.

Task 4: Configure a NetWorker Backup Group

A NetWorker backup group is a set of NetWorker Client resources, all of which start to back up data at a specified time once the following occurs:

- The Autostart attribute is enabled.
- 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 by 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 scheduled for a time of day when performance demands on the database and NetWorker server are lower.

Note: To have a regular (non-proxy) 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.



Important: For a regular (non-proxy) scheduled Oracle backup, the Snapshot attribute in the NetWorker Group resource must be set to False.

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 by using the instructions in ["Task 4: Configure the NetWorker Client Resource" on page 42](#). 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 49](#).

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

For information on how to configure the Client resource for scheduled proxy Oracle backups, see ["Configuring the NetWorker Client Resource" on page 133](#).

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
```

Note: On Windows, forward slashes can be used in the pathname for the Save Set attribute. For example:

```
F:/scripts/incr_1_bkup
```

2. Specify a NetWorker backup schedule.

For more information on NetWorker backup schedules, see ["Task 3: Configure a NetWorker Backup Schedule" on page 73](#).

3. Specify a NetWorker backup group.

For more information on NetWorker backup groups, see "[Task 4: Configure a NetWorker Backup Group](#)" on page 74.

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* on UNIX or *nsrnm0.bat* or *nsrnm02.bat* on Windows.

5. Specify all known aliases for the Oracle Server host.

6. Leave the following attributes blank:

- Directive
- Archive Users
- Remote User
- Password

7. If backups from a cluster or recovery to a host other than the one being backed up are *not* required, leave the Remote Access attribute unmodified.

8. 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 77 shows a UNIX Client resource configured for scheduled Oracle backups.

Figure 7 on page 78 shows a Windows Client resource.

Figure 6. Oracle Client Resource in UNIX NetWorker Server

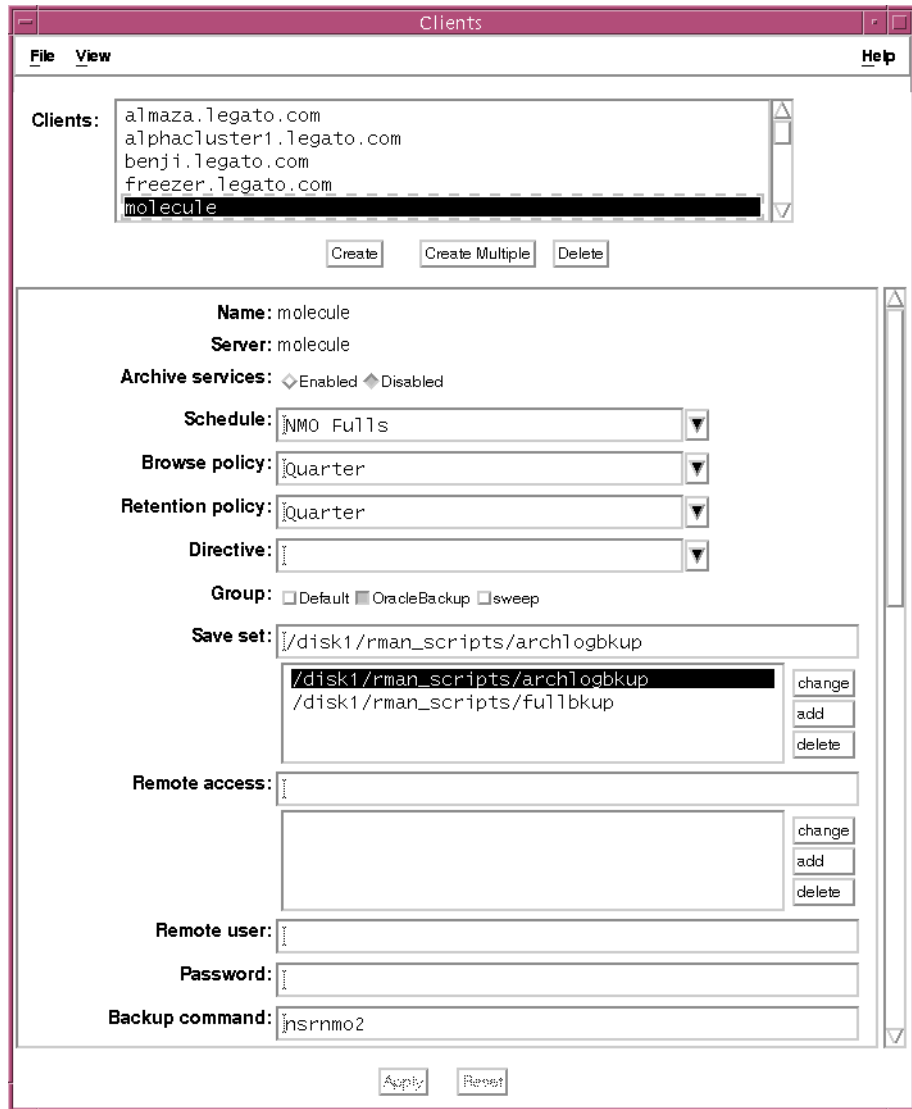
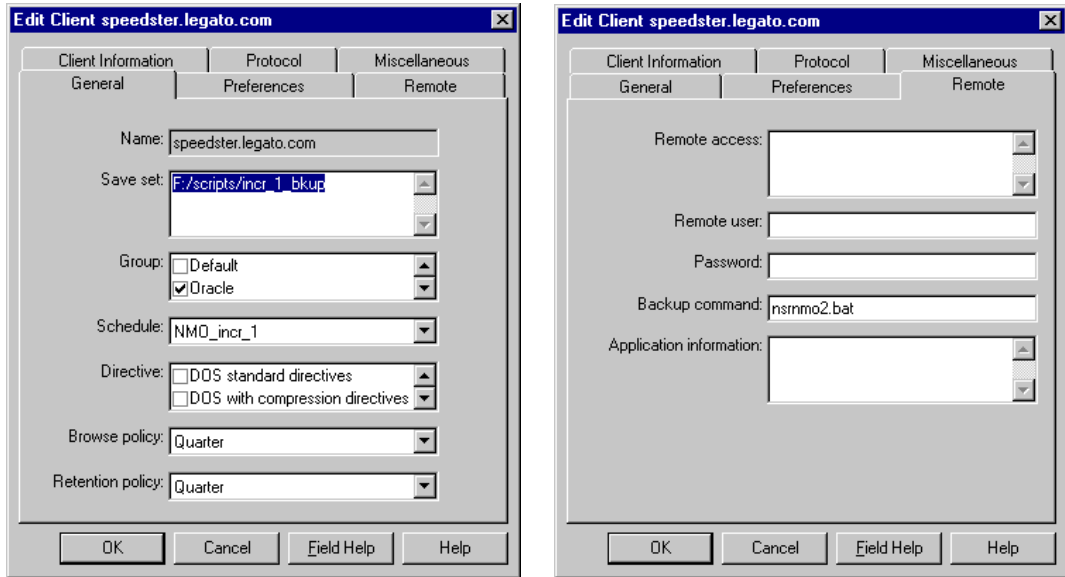


Figure 7. Oracle Client Resource in Windows NetWorker Server



4

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) as follows:

1. In the NetWorker Administrator program, specify the display of hidden attributes for the Client resource window:
 - On UNIX, select Details from the View menu in the Client resource window.
 - On Windows:
 - a. In the main NetWorker Administrator window, select Customize from the Options menu.
 - b. In the Customize window, select the Window Configurations tab.
 - c. In the Window Configurations tab, select Display Hidden Attributes.
2. In the Client resource window, edit the Owner Notification attribute (in the Preferences tab on Windows).

3. 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 63](#), 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 by using the NetWorker Administrator program.

All the required environment variables must be set in the `nsrnm` 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 on UNIX or the Groups window on Windows, highlight the correct Group name for the scheduled Oracle backup.
2. Start the scheduled backup:
 - On UNIX, click Start in the Group Control window.
 - On Windows, click the Start Group button on the NetWorker Administrator program toolbar.

Note: For information on how to cancel the scheduled Oracle backup, see ["Canceling a Scheduled Oracle Backup" on page 80](#).

The scheduled backup is complete when the Status of the selected group changes to Finished. An e-mail "savegroup completion" report provides information on 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 when using the NetWorker Administrator program, refer to the *Legato NetWorker Administrator's Guide*.

For additional debug information, set the environment variable `NSR_SB_DEBUG_FILE` in the `nsrnm` script. See ["NSR_SB_DEBUG_FILE" on page 69](#).

If the scheduling portion of a scheduled Oracle backup succeeds but the actual backup fails, error messages and debug information might be generated in the locations described in ["RMAN Error Messages" on page 203](#).

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 106](#).

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

4

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, ensure that the Oracle user has the required NetWorker privileges for removing NetWorker index entries before you cancel a scheduled Oracle backup. For more information, see ["Specifying the Required NetWorker Privileges" on page 38](#).

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 **nsrmmo** 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:
alter system kill session '*session_id*, *serial#*;
where:
 - *session_id* is the Oracle session ID from [step a](#).
 - *serial#* is the serial number from [step b](#).

To cancel a *nonresponding* scheduled Oracle backup, see ["How to Cancel a Nonresponding Oracle Backup" on page 56](#).

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 57](#).

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*.

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 181](#).
- 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 in most cases. However, the second method is used when one or more of the following occurs:

- 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.

Determining the Method Used for 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 `nsrnm0` script file. For more information, see ["Task 2: Customize the nsrnm0 Script" on page 64](#).

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.

Examples of Debug File Content

The following examples of debug file (`NSR_SB_DEBUG_FILE`) content are derived 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/ora816/app/oracle/product/8.1.6/bin/rman
(26057) cmd_args = msglog '/nsr/applogs/msglog.log'
append cmdfile '/home/ora816/nmosbBAa09'
(26057) rman_script = /home/ora816/nmosbBAa09
(26057) saveset_name = /home/ora816/backup5
(...)
(26057) nwora_delete_file: File /home/ora816/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 68](#).

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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 19](#).

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 commands, **nsrinfo** and **mminfo**.

- To query the NetWorker client file index, use the **nsrinfo** command.
For example:
`nsrinfo -n oracle Oracle_Server_hostname`
- To query the NetWorker media database, use the **mminfo** command.
For example:
`mminfo -v -c Oracle_Server_hostname`

For more information on these NetWorker commands, refer to the *Legato NetWorker 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 2002
```

- 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     08/14/02     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 by using the save time. For example:

```
mminfo -c molecule -t 997818351
```

```
nsrinfo -n oracle -t '08/14/02 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 87](#)
- ["Roadmap for Oracle Data Recovery" on page 88](#)
- ["Task 1: Create RMAN Restore Scripts" on page 89](#)
- ["Task 2: Restore the Oracle Data" on page 90](#)
- ["Using the OEM Backup Management Tools" on page 91](#)
- ["Completing the Oracle Data Recovery" on page 92](#)
- ["Disaster Recovery" on page 92](#)

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 by 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 49.

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 by using the instructions in the following chapters can be restored:

- "[Chapter 3: Manual Oracle Backups](#)" on page 49
- "[Chapter 4: Scheduled Oracle Backups](#)" on page 59

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

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

1. Perform the Oracle data restore operation by 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 89.
 - b. Run the Oracle restore using the RMAN command line interface. See "[Task 2: Restore the Oracle Data](#)" on page 90.

Note: To restore an Oracle database to a different system from the one backed up, see ["Restoring to a Different Host" on page 90](#).

- To use the OEM Backup Management Tools, see ["Using the OEM Backup Management Tools" on page 91](#).
2. Complete the Oracle data recovery, if required. See ["Completing the Oracle Data Recovery" on page 92](#).

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.

The 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: In Oracle8i and Oracle9i, it is recommended that the **send** command be used in the script to set the environment variables. See ["The send Command" on page 181](#).

```
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;
}
```

For more information on setting NSR_* environment variables in an RMAN script, see ["Task 1: Create RMAN Scripts for Manual Backups" on page 50](#).

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 35](#).
- The NetWorker server must have the following required resources configured as described in ["Chapter 2: Software Configuration Procedures" on page 35](#):
 - Server
 - Client
 - Device
 - Pool
- 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 89](#).

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 89](#) 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\'
```

With Oracle8i or Oracle9i on Windows, the command to run the RMAN script is `rman`. 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 from the one that 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 different system:

1. On the NetWorker server that contains the backup to be restored, specify the hostname of the different system for the Remote Access attribute in the Client resource of the original system.
2. Install and configure NetWorker Module for Oracle on the different system where the Oracle data is to be restored.
3. Install and configure RMAN on the different 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 88.

Using the OEM Backup Management Tools

The OEM Backup Management Tools include a graphical user interface to RMAN. This interface can be used *instead* of the RMAN command line interface to do the following:

- Generate the required RMAN commands.
- Perform 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 by 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 92](#)
- ["NetWorker Server Recovery" on page 93](#)

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 by 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 196.

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 54.

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 *Legato NetWorker Disaster Recovery Guide* is available on the Legato web site. For more information on how to access the guide, see "[Product Documentation](#)" on page 16.

Chapter 6: Cluster, OPS, and RAC Systems

This chapter describes the types of operations that NetWorker Module for Oracle supports on cluster, OPS, and RAC systems, and the configuration procedures required to enable those operations.

This chapter includes the following main sections:

- ["Considerations for Cluster, OPS, and RAC Systems" on page 95](#)
- ["Cluster Systems" on page 98](#)
- ["OPS and RAC Systems" on page 99](#)

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" on page 95](#)
- ["NetWorker Software Configuration" on page 97](#)
- ["Backup Failover" on page 97](#)

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. For more information on how to set the required environment variables, see ["Appendix A: Environment Variables in the RMAN Session" on page 171](#).

NSR_CLIENT

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.

Set the NSR_CLIENT variable 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 by using *either* the **rman send** command on the operating system command line *or* the **send** command in the RMAN script.

Note: Setting NSR_CLIENT in the system environment has *no* effect.

NSR_SERVER

Set the NSR_SERVER environment variable for a manual Oracle backup or restore if the NetWorker server is a *remote* system for the node running the RMAN session. The variable must be set to the server name for *each* channel.

Note: The `NSR_SERVER` variable does *not* need to be set for a scheduled Oracle backup.

NetWorker Software Configuration

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

1. Verify that the system is set up in *one* of the following ways:
 - 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.
 - In the directory that contains the NetWorker **savefs** program, there is an empty file named *pathownerignore*. If this file does not exist, then do one of the following:
 - If the RMAN script resides on the shared disk, then create the file on *each* NetWorker server host and client host.
 - If the RMAN script does *not* reside on the shared disk, then create the file on the client hosts only.

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.

2. Configure a Client resource on the NetWorker server for each OPS or RAC node 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 4: Configure the NetWorker Client Resource](#)" on page 42.
 - 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 75.
3. 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 101.](#)

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 that use NetWorker Module for Oracle, see ["Roadmap for Oracle Backup/Restore Configuration in a Cluster System" on page 98.](#)

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, Release 4.1.*
- The Oracle Server and NetWorker server system configurations are completed according to the instructions in the ["Software Configuration Roadmap" on page 35.](#)

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 ["NSR_CLIENT" on page 96](#).

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 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 computer 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. 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 "[NSR_CLIENT](#)" on page 96.

The 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 100.

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 101. 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, Release 4.1*.

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 103](#) and ["Creating RMAN Restore Scripts" on page 104](#).

7. Review the additional issues concerning Oracle recover operations in ["Archived Redo Logs" on page 106](#).

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.

- 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.
- 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 "[NSR_CLIENT](#)" on page 96.) 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 106](#).

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 103](#), 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 103](#).

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 or RAC system, see ["Restoring All Archived Logs from Each Node" on page 107](#).

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 106](#)
- ["Restoring All Archived Logs from Each Node" on page 107](#)

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*) by 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  
    (archivelog 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*) by 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 Backups and Restores

This chapter describes how to configure and run snapshot-based proxy backups and restores of Oracle data on supported primary storage devices by using the NetWorker Module for Oracle with the required NetWorker PowerSnap Module software.

This chapter includes the following main sections:

- ["Overview of Proxy Oracle Backups and Restores" on page 109](#)
- ["Proxy Oracle Backup and Restore System" on page 112](#)
- ["How a Proxy Oracle Backup Works" on page 114](#)
- ["How a Proxy Oracle Restore Works" on page 122](#)
- ["Software Configuration Requirements" on page 125](#)
- ["Proxy Oracle Backup Requirements" on page 135](#)
- ["Proxy Oracle Backup Information in the NetWorker Indexes" on page 139](#)
- ["Proxy Oracle Restore Requirements" on page 143](#)
- ["Catalog Synchronization for Proxy Oracle Backups" on page 149](#)
- ["Proxy Backups and Restores on Cluster Systems" on page 166](#)

Overview of Proxy Oracle Backups and Restores

Proxy Oracle backups and restores provide continuous snapshot-based protection and availability of Oracle data on specific types of primary storage.

The NetWorker Module for Oracle software supports proxy backups and restores of Oracle data with the following requirements:

- The proxy backups create snapshots of Oracle data that reside on primary storage devices supported by the PowerSnap Modules that work with the NetWorker Module for Oracle.

For a complete list of supported PowerSnap Modules, refer to the current *Legato Software Compatibility Guide* on the Legato web site.

- The proxy operations use the particular PowerSnap Module software designed for the primary storage.

For details on the installation requirements for proxy Oracle operations, refer to the following:

- *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*
- *NetWorker PowerSnap Module Installation and Administrator's Guide* (Refer to the PowerSnap Module version for the primary storage system.)

Types of Proxy Oracle Backups

The NetWorker Module for Oracle supports the following types of proxy Oracle backups, in cooperation with the appropriate PowerSnap Module:

- ["Instant Backups" on page 110](#)
- ["Live Backups" on page 111](#)

Instant Backups

An instant backup creates a point-in-time copy (snapshot) of Oracle data and stores this copy on the primary storage system. Instant backups can be scheduled to occur many times in a single day, with little impact to the Oracle Server or network.

The group of Oracle datafiles in the point-in-time copy is referred to as a *snap set*. A *snapshot policy* must be configured to control the lifecycle of the snap set. This policy specifies the frequency of instant backups and how long snapshots are retained before being recycled. For more information, see ["Software Configuration Requirements" on page 125](#).

Note: The NetWorker Module for Oracle supports scheduled instant backups only. Manual instant backups are *not* supported.

Live Backups

The NetWorker Module for Oracle supports the following two types of live backup:

- Deferred live backup — An existing point-in-time copy (snapshot), created during an instant backup, is backed up to secondary (traditional) storage such as tape. The snapshot is *retained* on the primary storage.
- Immediate live backup — A point-in-time copy (snapshot) is created, and *immediately* backed up to secondary storage such as tape. The snapshot is then automatically *deleted* from the primary storage.

A snapshot policy must be configured to enable live backups. For more information, see "[Software Configuration Requirements](#)" on page 125.



Important: Instant backups protect against logical failures only. To protect against physical failures, the point-in-time copy must be backed up to secondary storage.

A proxy client host that is separate from the Oracle Server host can be used to move the point-in-time copy to the traditional storage medium such as tape. Using a proxy client as a secondary host reduces the impact on the Oracle Server.

Note: The proxy client can be a NetWorker storage node.

Types of Proxy Oracle Restores

The NetWorker Module for Oracle supports the following types of proxy Oracle restores, in cooperation with the appropriate PowerSnap Module:

- "[Instant Restores](#)" on page 111
- "[Rollbacks](#)" on page 112
- "[Restores from Secondary Storage](#)" on page 112

Instant Restores

During an instant restore, the saved data is retrieved from a mounted point-in-time copy that was created with an instant backup. A minimal amount of time is required for this type of restore.

Rollbacks

A rollback restores a whole point-in-time copy to a source location by using the hardware's particular capabilities. Rollbacks are destructive restores because they overwrite the entire contents of a snapshot unit such as a volume or disk. To determine if a rollback is supported on a specific type of hardware, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Restores from Secondary Storage

If the point-in-time copy was backed up to secondary storage through a live backup, the PowerSnap Module software uses the NetWorker **recover** program to retrieve the data.

Proxy Oracle Backup and Restore System

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

The proxy Oracle backup and restore system consists of the following:

- Oracle Server
- Recovery Manager (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 24](#)
- ["Oracle Recovery Catalog" on page 25](#)

The Legato software components required for proxy Oracle backups are the following:

- NetWorker server
- NetWorker client (that is installed on the Oracle Server and proxy client host)

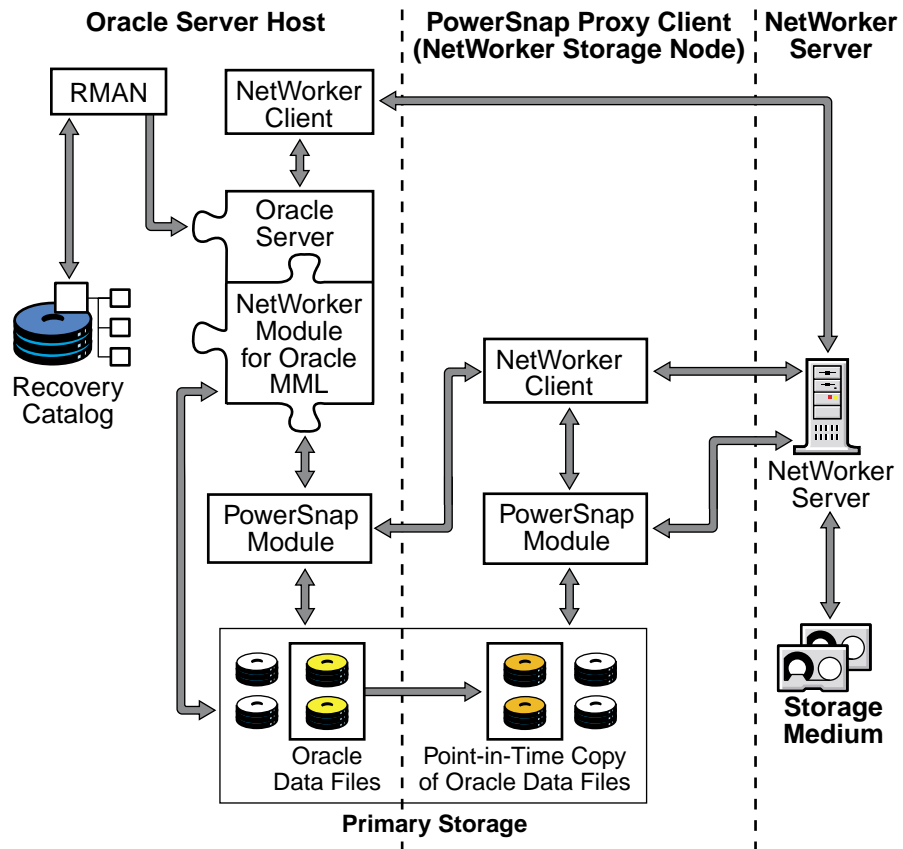
- NetWorker Module for Oracle (that is installed on the Oracle Server)
- NetWorker PowerSnap Module (that is installed on the Oracle Server and proxy client host)

Note: NetWorker storage node software can be optionally installed on the proxy client host.

[Figure 8 on page 113](#) illustrates the architecture of the proxy Oracle backup and restore system. It provides an overview of the functional relationship between the Oracle and NetWorker software components. The interactions of the components are described in the following sections:

- [" How a Proxy Oracle Backup Works" on page 114](#)
- [" How a Proxy Oracle Restore Works" on page 122](#)

Figure 8. Oracle Backup and Restore System for Proxy Backups



How a Proxy Oracle Backup Works

During a proxy backup of Oracle data, Oracle Server processes interact with the NetWorker server through the NetWorker Module for Oracle and PowerSnap Module 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 that 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 NetWorker Module for Oracle MML routines communicate with the PowerSnap Module service.

On the Oracle Server host, the PowerSnap Module uses a storage platform-specific application programming interface (API) to take a snapshot of the Oracle data on the primary storage.

If a live backup is performed, the PowerSnap Module moves the Oracle data from the point-in-time copy (snapshot) on the primary storage to the NetWorker server or storage node. The NetWorker server or storage node then stores the Oracle data on the secondary storage, such as a tape.

At the end of the proxy backup, the NetWorker server updates the online client and media indexes with information about the backup. For more information about NetWorker server and NetWorker client programs and services, refer to the *Legato NetWorker Administrator's Guide*.

Note: A proxy Oracle backup can be started only by automatic or manual invocation of the scheduled NetWorker backup group. A proxy backup *cannot* be scheduled through OEM or started from RMAN. For information on how to manually invoke a scheduled backup, refer to the *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Scheduled Proxy Backup

A scheduled backup is a backup of Oracle data that the NetWorker server initiates.

For the process steps involved in the three types of scheduled proxy backup, see the following:

- ["Scheduled Instant Backup" on page 115](#)
- ["Scheduled Immediate Live Backup" on page 118](#)
- ["Deferred Live Backup" on page 120](#)

Note: To simplify the descriptions and illustrations in these sections, certain steps have been omitted, such as the step to obtain the proper NetWorker authorization.

Scheduled Instant Backup

A scheduled instant backup involves the following steps:

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 Oracle Server host run the **saveefs** program to verify the existence of the RMAN scripts to be used for the backup.
3. If the **saveefs** program succeeds, the **savegrp** program starts the PowerSnap program, **nsrsnap**, on the Oracle Server host. Otherwise, the backup *fails*.
4. If an existing point-in-time copy needs to be removed (for example, it is expired according to the snapshot policy), the **nsrsnap** program invokes the **nsrsnapck** program to remove both the point-in-time copy from the storage system and the corresponding NetWorker index entries.

Note: If the point-in-time copy was *not* copied to secondary storage, the **nsrsnapck** program invokes the **nsroraclecat** program to remove the corresponding RMAN catalog entries. See ["Automatic Catalog Synchronization by Using the nsroraclecat Program" on page 162](#).

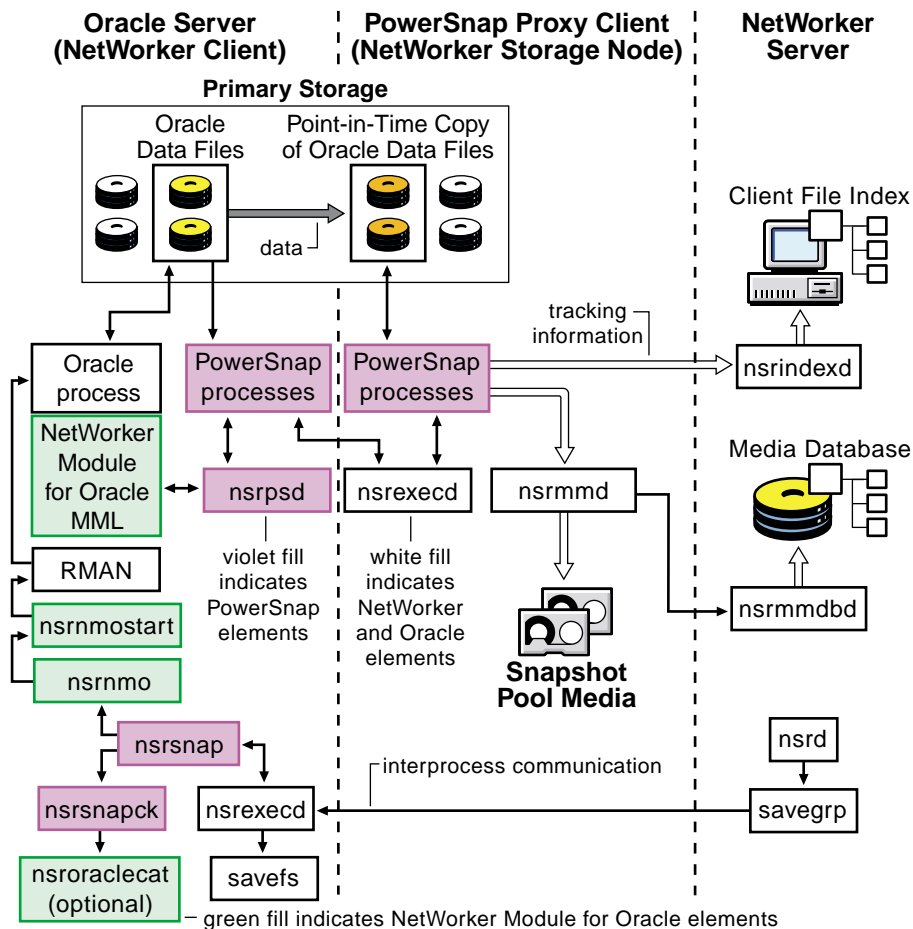
5. The **nsrsnap** program contacts the **nsrexecd** service, which starts the **nsrnmo** script for the scheduled backup.
6. The **nsrnmo** script sets the required environment variables and invokes the NetWorker Module for Oracle program, **nsrnmostart**.
7. The **nsrnmostart** program starts the RMAN utility to run the required RMAN backup script.

8. RMAN starts an Oracle process that calls the NetWorker Module for Oracle MML, which contacts the PowerSnap master program, **nsrpsd**, to perform the instant backup.
 - PowerSnap processes create the point-in-time copy that comprises the backup.
 - The **nsrmmmd** service stores metadata (used only by the PowerSnap Module) about the point-in-time copy on the media belonging to the configured snapshot pool, and records tracking information about the metadata in the NetWorker media database by using the **nsrmmdbd** service.
 - The **nsrindexd** service records information about the point-in-time metadata in the NetWorker client file index.
 - The **nsrindexd** service records tracking information about each backup piece name in the NetWorker client file index. The client index contains one entry per datafile.
 - The Oracle Server records the backup entry in the RMAN catalog.
9. After the RMAN script completes successfully, the **nsrnmstart** program backs up the NWORA resource file, described in ["The NWORA Resource File" on page 152](#).
10. If the Snapshot Policy resource specifies that the point-in-time copy must be copied to secondary storage, the **nsrsnap** program performs the steps in ["Deferred Live Backup" on page 120](#).

Note: The point-in-time copy is *not* deleted from the primary storage.
11. The **savegrp** program backs up the NetWorker server bootstrap and Oracle client file indexes.

[Figure 9 on page 117](#) shows how the Oracle Server and NetWorker processes interact during a scheduled instant backup.

Figure 9. Scheduled Instant Backup



Scheduled Immediate Live Backup

A scheduled immediate live backup involves the following steps:

Note: The first seven steps are the same as those in ["Scheduled Instant Backup" on page 115](#).

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 Oracle Server host run the **savefs** program to verify the existence of the RMAN scripts to be used for the backup.
3. If the **savefs** program succeeds, the **savegrp** program starts the PowerSnap program, **nsrsnap**, on the Oracle Server host. Otherwise, the backup *fails*.
4. If an existing point-in-time copy needs to be removed (for example, it is expired according to the snapshot policy), the **nsrsnap** program invokes the **nsrsnapck** program to remove both the point-in-time copy from the storage system and the corresponding NetWorker index entries.

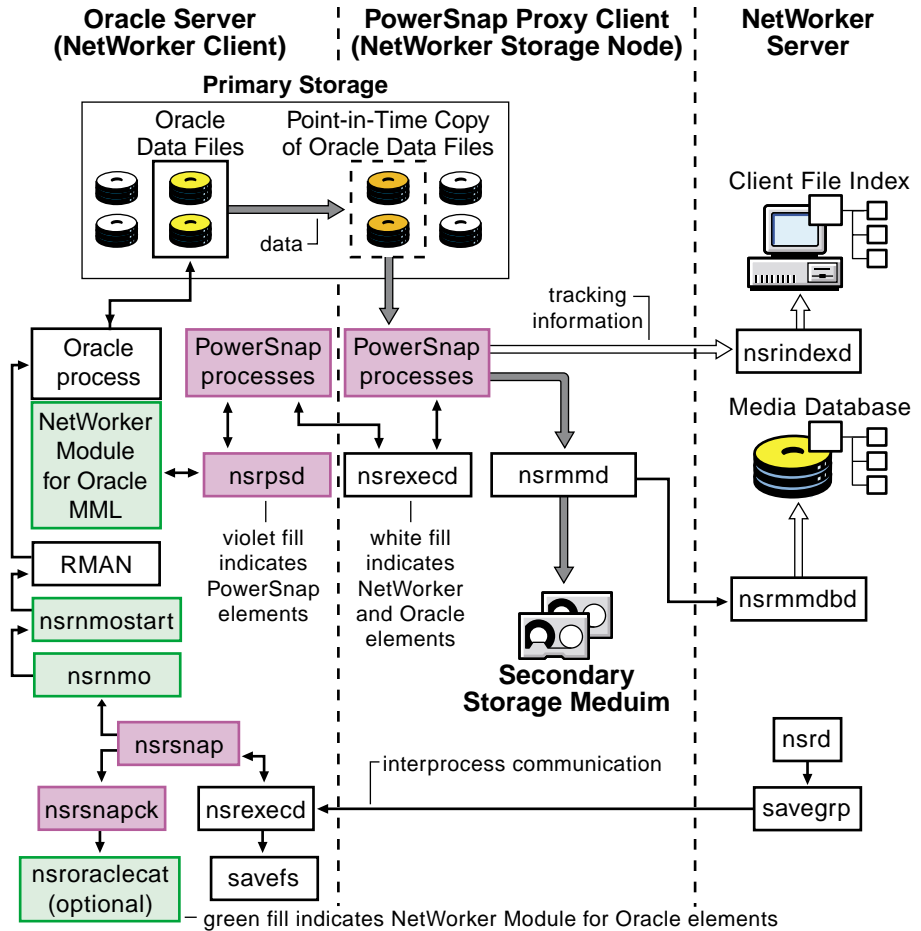
Note: If the point-in-time copy was *not* copied to secondary storage, the **nsrsnapck** program invokes the **nsroraclecat** program to remove the corresponding RMAN catalog entries. See ["Automatic Catalog Synchronization by Using the nsroraclecat Program" on page 162](#).

5. The **nsrsnap** program contacts the **nsrexecd** service, which starts the **nsrnmo** script for the scheduled backup.
6. The **nsrnmo** script sets the required environment variables and invokes the NetWorker Module for Oracle program, **nsrnmstart**.
7. The **nsrnmstart** program starts the RMAN utility to run the required RMAN backup script.
8. RMAN starts Oracle processes that call the NetWorker Module for Oracle MML, which contacts the PowerSnap master program, **nsrpsd**, to perform the immediate live backup.
 - PowerSnap processes create the point-in-time copy, move the data to secondary storage, and then delete the point-in-time copy from the primary storage.
 - The **nsrmmdb** service records tracking information about the secondary storage save sets in the NetWorker media database by using the **nsrmmdbd** service.

- The **nsrindexd** service records tracking information for each backup piece name and for each stored operating system datafile in the NetWorker client file index. The client index contains two entries per datafile.
 - The Oracle Server records the backup entry in the RMAN catalog.
9. After the RMAN script completes successfully, the **nsrnmstart** program backs up the NWORA resource file, described in "[The NWORA Resource File](#)" on page 152.
 10. The **savegrp** program backs up the NetWorker server bootstrap and Oracle client file indexes.

[Figure 10 on page 120](#) shows how the Oracle Server and NetWorker processes interact during a scheduled immediate live backup.

Figure 10. Scheduled Immediate Live Backup



Deferred Live Backup

A deferred live backup can be run in one of the following ways:

- Automatically as part of a scheduled Oracle backup, determined by the Backup Snapshots attribute of the Snapshot Policy resource.
- Manually by using the **nsrsnapadmin** command.

For more information, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

A deferred live backup involves the following steps:

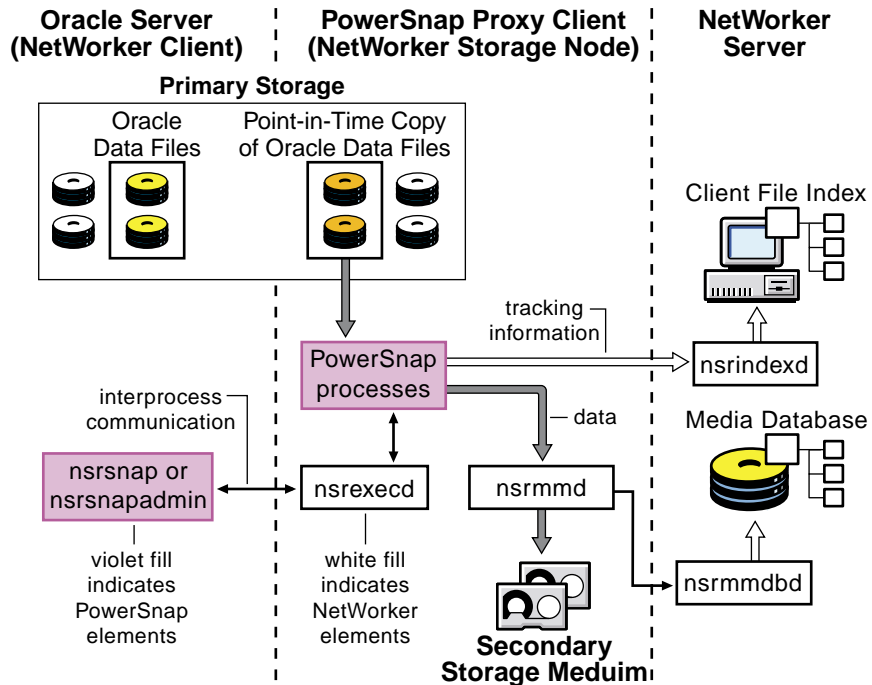
1. The **nsrsnap** or **nsrsnapadmin** program invokes the PowerSnap processes to copy the point-in-time copy to secondary storage.

Note: The point-in-time copy is *not* deleted from the primary storage.

2. The **nsrmmmd** service records tracking information about the deferred live backup in the NetWorker media database by using the **nsrmmdbd** service.
3. The **nsrindexd** service records tracking information for each stored operating system datafile in the NetWorker client file index.

Figure 11 on page 121 shows how the Oracle Server and NetWorker processes interact during a scheduled deferred live backup.

Figure 11. Deferred Live Backup



How a Proxy Oracle Restore Works

A proxy 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.

For the process steps involved in the three types of proxy restore, see the following:

- ["Instant Restore or Rollback" on page 122](#)
- ["Restore from Secondary Storage" on page 124](#)

Instant Restore or Rollback

An instant restore or rollback involves the following steps:

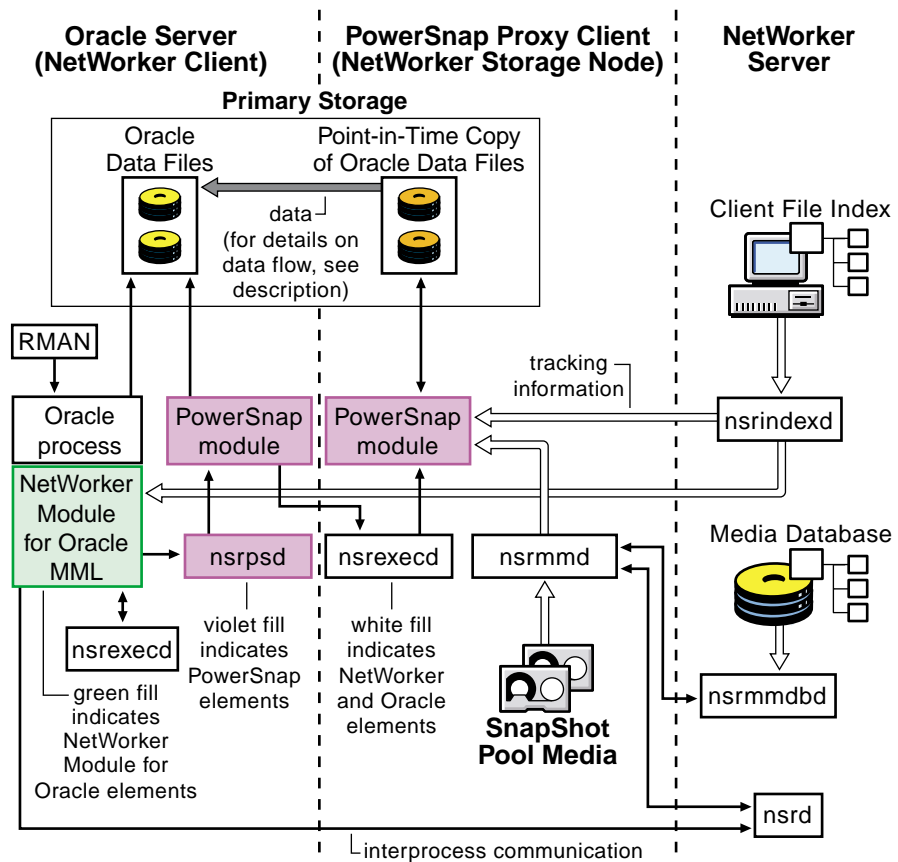
1. The NetWorker Module for Oracle MML performs the following:
 - a. Translates the instant backup object names requested by RMAN into a format that the NetWorker server understands.
 - b. Verifies the existence of the instant backup objects through the **nsrindexd** service.
 - c. Verifies that the restore destination directory exists and is accessible, and creates the *.nworapc* directory.
2. The NetWorker Module for Oracle MML contacts the PowerSnap master program, **nsrpsd**, on the Oracle Server host.
3. The **nsrpsd** program works with other PowerSnap and NetWorker programs to perform the restore operation.
 - PowerSnap processes retrieve the point-in-time metadata stored on the device associated with the snapshot pool by using the **nsrmmd** and **nsrmmdbd** processes.
 - PowerSnap processes perform *one* of the following:
 - During an instant restore, mount the point-in-time copy and copy the files into a destination requested by the NetWorker Module for Oracle.

- During a rollback, execute a command (specific to the primary storage) to move the whole point-in-time copy (snapshot unit) into the source destination.
4. If operating system files (not raw devices or volumes) are restored during an instant restore, the NetWorker Module for Oracle moves the restored files from the `.nworapc` directory to the parent directory.

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

Figure 12 on page 123 shows how the Oracle Server and NetWorker processes interact during an instant restore or rollback.

Figure 12. Instant Restore or Rollback



Restore from Secondary Storage

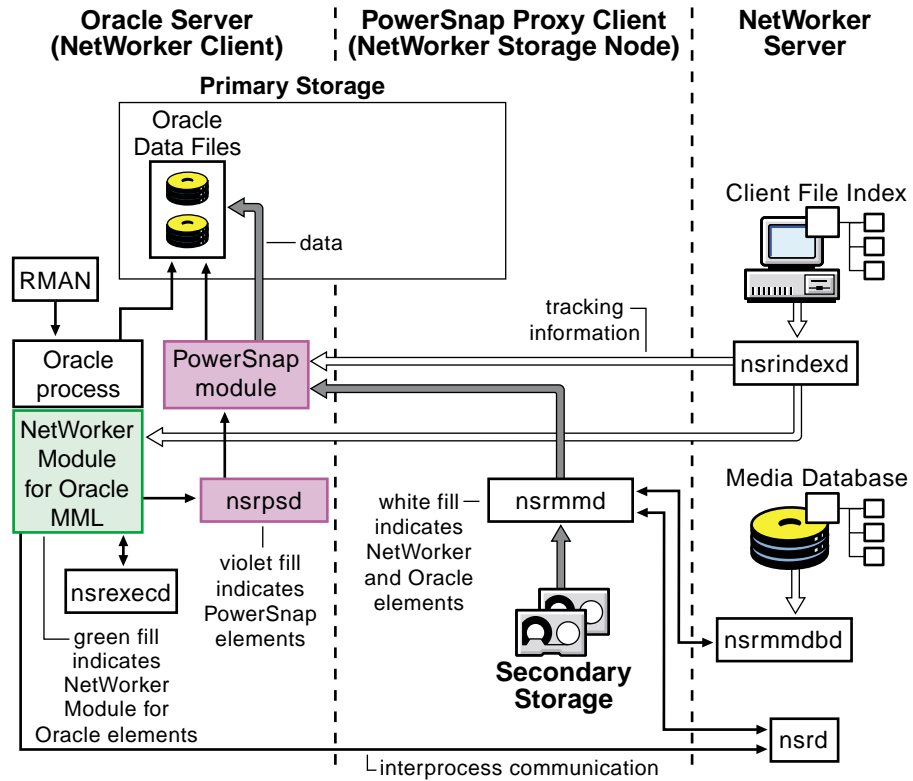
A restore of a proxy backup from secondary storage involves the following steps:

1. The NetWorker Module for Oracle MML performs the following:
 - a. Translates the instant backup object names requested by RMAN into a format that the NetWorker server understands.
 - b. Verifies the existence of the instant backup objects through the **nsrindexd** service.
 - c. Verifies that the restore destination directory exists, and creates the *.nworapc* directory.
2. The NetWorker Module for Oracle MML contacts the PowerSnap master program, **nsrpsd**, on the Oracle Server host.
3. The **nsrpsd** program works with other PowerSnap and NetWorker programs to retrieve the data from secondary storage, and perform the restore operation.
 - PowerSnap processes restore the files (save sets) into a destination requested by the NetWorker Module for Oracle. The processes use the **nsrmmmd** and **nsrmmdbd** processes to determine which media contain the requested save sets and to read the backup volumes.
4. If operating system files (not raw devices or volumes) are restored, the NetWorker Module for Oracle moves the restored files from the *.nworapc* directory to the parent directory.

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

[Figure 13 on page 125](#) shows how the Oracle Server and NetWorker processes interact during a restore from secondary storage.

Figure 13. Restore from Secondary Storage



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 required PowerSnap Module software are installed according to the instructions in the following:

- *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*
- *NetWorker PowerSnap Module Installation and Administrator's Guide* (Refer to the PowerSnap Module version for the primary storage system.)

Basic Configurations

Ensure that the following basic configurations are performed:

- Follow the ["Software Configuration Roadmap" on page 35](#) to complete the basic Oracle Server and NetWorker configurations. The NetWorker Server, Client, Device, and other resources must be configured.
 - For live Oracle backups, a Device resource must be configured for each secondary storage device, such as a tape drive, to be used for the backups. The devices must be mounted prior to the backups.
 - For instant Oracle backups, a snapshot Pool resource must be configured, as described in ["Additional Configurations for Proxy Operations" on page 126](#).
- Follow the ["Roadmap for Scheduled Oracle Backups" on page 60](#) to complete the required scheduled backup configurations.

Additional Configurations for Proxy Operations

For proxy operations, you must configure the Oracle database layout to position the datafiles on primary storage that is supported by the specific PowerSnap Module.

Ensure that the additional configuration procedures described in the following sections are performed:

- ["Configuring the NWORA Resource File" on page 127](#)
- ["Creating RMAN Scripts for Proxy Oracle Backups" on page 127](#)
- ["Configuring the NetWorker Pool Resources" on page 132](#)
- ["Configuring the NetWorker Snapshot Policy Resource" on page 133](#)
- ["Configuring the NetWorker Group Resource" on page 133](#)
- ["Configuring the NetWorker Client Resource" on page 133](#)
- ["Testing a Scheduled Proxy Oracle Backup" on page 134](#)

Once all the configuration requirements are met, review the information in the following sections prior to performing proxy Oracle backups and restores:

- ["Proxy Oracle Backup Requirements" on page 135](#)
- ["Proxy Oracle Backup Information in the NetWorker Indexes" on page 139](#)
- ["Proxy Oracle Restore Requirements" on page 143](#)

Configuring the NWORA Resource File

To enable proxy Oracle backups, the `NSR_ORACLECAT_MODE` parameter resource must be set to either enabled or disabled in the NWORA resource file, as described in ["The NWORA Resource File" on page 152](#). If the resource value is left *unset*, proxy backups *fail*.

To enable catalog synchronization, perform the configuration procedures in ["Catalog Synchronization for Proxy Oracle Backups" on page 149](#).

Notes:

- If catalog synchronization is enabled for instant backups, the NWORA resource file must contain an NWORA SID resource for each Oracle database to be backed up during instant backups.
- Catalog synchronization must be configured *before* any proxy backups of a database are performed.
- The `ORACLE_SID` variable in the `nsrnm0` script (used for the proxy backup) must be set to the same value as the `NSR_ORACLE_SID` variable in the NWORA SID resource.

Creating RMAN Scripts for Proxy Oracle Backups

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

- ["Chapter 3: Manual Oracle Backups" on page 49](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 59](#)

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

- The appropriate environment variables must be set, as described in ["Setting the Environment Variables" on page 130](#).
- The **proxy** or **proxy only** option must be specified with each 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_PS_SAVE_PARALLELISM`. For more information, see [Table 4 on page 131](#).

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

```
run {
    allocate channel t1 type 'SBT_TAPE';
    send 'NSR_ENV=(
NSR_PROXY_PFILE=/ora901/rman/proxy.cfg)';
    backup full proxy only
    format '/FULL_%d_%U/'
    (database);
    release channel t1;
}
```

`NSR_PROXY_PFILE` is an optional NetWorker Module for Oracle variable used for proxy Oracle backups. For details, see ["Setting the Environment Variables" on page 130](#).

Multiple Channels in RMAN Scripts

The allocation of multiple channels in an RMAN script does *not* control the degree of backup or restore parallelism. 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;
}

```

You might want to allocate more than one channel if you know that some of the data does not reside on supported primary storage devices. In this case, one channel is used for proxy backups and all the others are used for regular backups.

Setting the Environment Variables

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

- NetWorker Module for Oracle environment variables, as described in ["Appendix A: Environment Variables in the RMAN Session" on page 171](#). The variables must be set by using one of the methods in ["Setting the NSR_* Environment Variables" on page 171](#).
- PowerSnap Module environment variables, as described in ["How to Set the PowerSnap Variables" on page 130](#).

How to Set the PowerSnap Variables

The PowerSnap variables must be set by using one of the following methods:

- By setting the variables in the **send** command in one of these ways:
 - With the **rman** command on the operating system command line.
 - In the RMAN backup or restore script.For more information on how to enter the **send** command, see ["The send Command" on page 181](#).
- By setting the variables in a user-defined configuration file. The complete pathname of the file must be specified in the NSR_PROXY_PFILE variable, as described in ["NSR_PROXY_PFILE" on page 177](#).

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 RESTORE_TYPE_ORDER.
- *var_value* is the variable value, such as pit.

[Table 4 on page 131](#) lists supported PowerSnap environment variables. The list is *not* exhaustive. For a complete list of PowerSnap environment variables, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

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 4. PowerSnap Module Environment Variables

Variable	Description	Default and Valid Values
NSR_DATA_MOVER	<i>Mandatory for a proxy backup that uses a proxy client host.</i> Specifies the hostname of the proxy client host.	<ul style="list-style-type: none"> Local host (default). The valid hostname of the proxy client host.
NSR_PS_SAVE_PARALLELISM	<i>Optional.</i> Specifies the number of concurrent save streams on the proxy client host.	<ul style="list-style-type: none"> 16 (default). An integer value less than or equal to the Parallelism attribute value in the NetWorker Client resource.
NSR_MAX_STREAMS	<i>Optional.</i> Specifies the maximum number of restore streams.	<ul style="list-style-type: none"> 16 (default). An integer value.
RESTORE_TYPE_ORDER	<p><i>Optional.</i> Specifies the type of proxy Oracle restore to be performed.</p> <p>Note: If multiple values are specified, each type of restore is attempted—in the order specified—until a restore operation is successful.</p>	<ul style="list-style-type: none"> pit:conventional (default). One or more of the following values, each value delimited from the others by a colon(:): <ul style="list-style-type: none"> pit — Specifies an instant restore. conventional — Specifies a proxy Oracle restore from secondary storage media. rollback — Specifies a rollback restore from a point-in-time proxy copy. <p>For more information, see "Proxy Oracle Restore Requirements" on page 143.</p>



Example: Environment Variable Settings

To set the PowerSnap variable `RESTORE_TYPE_ORDER` for a proxy Oracle restore, a configuration file named `/ora901/rman/proxy.cfg` can be created, consisting of the following line:

```
RESTORE_TYPE_ORDER=rollback:pit:conventional
```

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 **allocate channel** or **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) ' ;
```

Notes:

- 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 operation.
- 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** or **configure channel** command to set PowerSnap variables is *not* supported.
- The use of the **setenv** command on the operating system command line to set PowerSnap variables is *not* supported.

Configuring the NetWorker Pool Resources

A separate pool must be configured to support proxy Oracle backups. The PowerSnap Module stores the metadata from the point-in-time copy (snapshot) in this pool. The pool is configured by using the same method as for a regular NetWorker Module for Oracle backup. However, it is recommended that the specified backup device be a *file* or *advanced file* type.

Note: Specify the pool name in the Snapshot Pool attribute of the NetWorker Group resource, as described in "[Configuring the NetWorker Group Resource](#)" on page 133.

For more information on configuring this extra pool, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Configuring the NetWorker Snapshot Policy Resource

A special NetWorker *snapshot policy* is required to perform proxy Oracle backups. You can either specify a preconfigured policy or create a new snapshot policy.

Configure a NetWorker Snapshot Policy resource by using the instructions in the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Configuring the NetWorker Group Resource

For proxy Oracle backups, configure a NetWorker Group resource by using the instructions in the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Configuring the NetWorker Client Resource

The basic NetWorker Client resource for the Oracle Server is configured according to the following:

- ["Task 4: Configure the NetWorker Client Resource" on page 42](#)
- ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 75](#)

Notes:

- Only members of a NetWorker user group with the Change Security Settings privilege can set the Remote Access attribute in the Client Resource.
- The Browse Policy attribute in the Client resource applies only to the NetWorker client file index entries for backups residing on secondary storage (live backups).
- The Retention Policy attribute in the Client resource applies only to the NetWorker media database entries for live backups.
- The life cycle of a point-in-time copy (instant backup) is governed by the snapshot policy specified in the Group resource to which the given client belongs.

How to Configure the NetWorker Client Resource

To configure the NetWorker Client resource for the Oracle Server:

1. In the Save Set attribute, specify the complete pathname of each RMAN script to be used for the backups.
2. In the Group attribute, specify the name of the NetWorker Group resource created for the proxy Oracle backups. See "[Configuring the NetWorker Group Resource](#)" on page 133.
3. In the Schedule attribute, specify a NetWorker backup schedule.
4. In the Backup Command attribute, specify the name of the **nsrnm0** script to use for the proxy Oracle backups.
5. In the Parallelism attribute (a hidden attribute), specify the number of data streams that the Oracle Server is allowed to send in parallel to the NetWorker server or storage node.
6. In the Storage Nodes attribute, specify the name of each storage node to which the Oracle Server can back up data.

The Oracle Server backs up to the first active, enabled storage node in the order listed in the attribute. The default storage node name, *nsrserverhost*, represents the NetWorker server.

7. In the Remote Access attribute, specify the user ID or hostnames of other clients that are allowed to back up or restore this client's files.

For proxy backups that use a proxy client host, the Remote Access attribute must include the proxy client hostname.

Testing a Scheduled Proxy Oracle Backup



Important: A proxy Oracle backup can be started only by automatic or manual invocation of the scheduled NetWorker backup group. A proxy backup *cannot* be scheduled through Oracle Enterprise Manager (OEM), or started by invoking RMAN from the operating system command line.

To verify the scheduled backup setup, follow the instructions for regular backups in "[Testing a Scheduled Oracle Backup](#)" on page 79.

Since manual proxy backups are not supported, you *cannot* test a proxy RMAN script by using the information in ["Testing RMAN Backup Scripts" on page 63](#). To determine if the script contains any errors, log the RMAN output into a file by setting the `NSR_RMAN_ARGUMENTS` variable in the `nsrnm` script used for the backup.

Proxy Oracle Backup Requirements

Review the following information, specific to proxy Oracle backups:

- ["Checking Configuration Consistency" on page 135](#)
- ["Performing Proxy Oracle Backups" on page 137](#)

For information on proxy Oracle backups in a cluster environment, see ["Proxy Backups and Restores on Cluster Systems" on page 166](#).

Checking Configuration Consistency

During a scheduled backup, the NetWorker Module for Oracle checks for consistency between the NetWorker Group resource configuration and the RMAN backup session.

If the NetWorker Module for Oracle finds a discrepancy between the Group resource configuration and the RMAN session, warning messages are generated or the backup fails, as described in the following sections:

- ["With a Group Configured for Proxy Backups" on page 135](#)
- ["With a Group Configured for Regular Backups" on page 136](#)

With a Group Configured for Proxy Backups

If the `Snapshot` attribute in the NetWorker Group resource is set to `True`, the resource is configured for proxy backups. However, this configuration does *not* guarantee that a proxy backup is executed. RMAN might still perform only regular Oracle backups if either of the following exists:

- None of the **backup** commands in the RMAN script include the **proxy** or **proxy only** option.
- The **backup** commands in the RMAN script include the **proxy** or **proxy only** option, but none of the Oracle database objects (tablespaces or datafiles) specified in the **backup** commands reside on a primary storage device that the PowerSnap Module supports.

If RMAN performs only regular Oracle backups due to one of these conditions, the NetWorker Module for Oracle generates the following warnings in the savegroup completion report:

```
WARNING: Snapshot savegrp is completed but no Oracle proxy backup is detected.
```

```
WARNING: Either fix your RMAN script or reconfigure the group resource without snapshot flag.
```

While the resulting backups are valid regular (non-proxy) backups, it is recommended that you correct the RMAN script or relocate the Oracle datafiles to a supported primary storage device, as required to enable proxy backups.

For details on the primary storage devices supported for proxy backups, refer to the current *Legato Compatibility Guides* on the web site at www.legato.com.

If a **backup** command in the RMAN script includes the **proxy only** option and the Oracle data objects reside on volumes that do *not* support snapshots, the scheduled backup *fails* since RMAN cannot perform a regular backup of the objects. For a detailed description of the difference between the **proxy** and **proxy only** options, refer to the Oracle documentation.

With a Group Configured for Regular Backups

If the Snapshot attribute in the NetWorker Group resource is set to False, the resource is configured for regular (non-proxy) backups. In this case, the use of the **proxy** or **proxy only** option with a **backup** command in the RMAN script is *not* supported. Any proxy backup specified in the RMAN script will fail. If there are regular and proxy backups in the same RMAN script, RMAN might complete one or more regular backups before a proxy backup fails.

Notes:

- If RMAN terminates any of the proxy backups in an RMAN script, the savegroup completion report lists failure of the scheduled backup.
- If any proxy backups in an RMAN script fail, RMAN still performs a regular backup of the corresponding archived redo logs.



Example: Proxy Backup Failure

A scheduled backup includes the following RMAN script, with the database files residing on volumes that support snapshots. However, the Snapshot attribute in the Group resource is set to False. As a result, the proxy database backup fails.


```
run {
    allocate channel ch1 type 'SBT_TAPE';
    allocate channel ch2 type 'SBT_TAPE';
    backup proxy database plus archivelog;
}
```

Despite the proxy backup failure, RMAN performs a regular backup of the archived redo logs. The savegroup completion report lists failure of the scheduled backup.

Performing Proxy Oracle Backups

A proxy Oracle backup can be started *only* by automatic or manual invocation of the scheduled NetWorker backup group.



Important: A proxy backup *cannot* be scheduled through OEM or started by invoking RMAN from the operating system command line. For information on how to manually invoke a scheduled backup, refer to the *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Specific types of Oracle files, such as control files, cannot be backed up through a proxy backup. *This is an Oracle constraint.* For more information on the Oracle file types that do *not* support proxy backups, refer to the Oracle documentation for the particular Oracle Server release.

Directory for Temporary Files

NetWorker Module for Oracle creates temporary files for processing purposes in the following directory:

- On UNIX, the directory is `/nsr/tmp`.
- On Microsoft Windows, the directory is `<NetWorker_install_path>\tmp`, where `<NetWorker_install_path>` is the root directory of the NetWorker installation path.

Note: During RMAN operations, do *not* touch any files in this directory.

Backup Summary Line in Savegroup Report

The savegroup completion report for a proxy backup contains a summary line that includes the backup size and number of files. The summary line refers to backup data written to NetWorker devices only.

The summary line for an instant backup includes the size of only the metadata stored for the backup—*not* the size of the files stored on the primary storage as a point-in-time copy. The number of files includes the number of entries generated for the metadata plus the number of entries generated for the backup pieces.

Savegroup Completion Status

When a deferred live backup is run as part of a scheduled group, the backup process involves two steps:

1. An instant backup is performed. At the end of the instant backup, the backup entries for the point-in-time copy are recorded in the NetWorker indexes and RMAN catalog.
2. The deferred live backup is performed. At the end of the deferred live backup, the backup entries for data stored on the secondary storage are recorded in the NetWorker indexes.

For more details, see ["How a Proxy Oracle Backup Works" on page 114](#).

If the instant backup succeeds but the deferred live backup fails, the entire scheduled backup is reported as failed. However, the point-in-time copy created during the instant backup is a valid backup and can be used for instant or rollback restore.

Note: If RMAN performs only a regular Oracle backup during the instant backup step (for details on when this can happen, see ["Checking Configuration Consistency" on page 135](#)), the deferred live backup fails because there is no point-in-time copy to be moved to secondary storage. The entire backup is reported as failed, but the data is stored on tape and can be used for restore.

NWORA Resource File Backup

If a scheduled proxy Oracle backup completes successfully, NetWorker Module for Oracle automatically backs up the NWORA resource file, as described in ["The NWORA Resource File" on page 152](#).

The NWORA resource file backup is performed at the backup level specified in the Schedule resource (for example, incremental). Oracle backups are

always performed at the *full* level. The NetWorker server selects the pool for the NWORA resource file backup based on existing resource configurations. The setting of the NSR_DATA_VOLUME_POOL environment variable does *not* affect the pool selection.

The savegroup completion report contains a summary line for the backup that includes the phrase "NWORA Resource Backup". The information is also written to the scheduled backup debug file, specified by the NSR_SB_DEBUG_FILE variable in the **nsrnm** script.

In the NetWorker indexes, the save set name for the NWORA resource file backup is the same as the file pathname. You can use the NetWorker **mminfo** command to display the save set name. For information on how the backup is represented in the NetWorker indexes, see ["NWORA Resource File Backup in the NetWorker Indexes" on page 142](#).

The NWORA resource file backup can be restored by using the NetWorker **recover** command or **nwrecover** GUI program. For more information, refer to the *Legato NetWorker Administrator's Guide*.

Note: The file is stored under the "backup" name space—*not* the "oracle" name space.

The browse and retention policies applied to the NWORA resource file backup are the most conservative policies associated with the given NetWorker client—*not* the policies that are applied to the Oracle backups.

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 56](#)
- ["Canceling a Scheduled Oracle Backup" on page 80](#)

Proxy Oracle Backup Information in the NetWorker Indexes

The NetWorker server maintains information about each backup in its online indexes. For more information, see ["Legato NetWorker Software" on page 20](#).

The index entry for a proxy Oracle backup is stored in the NetWorker client file index for the Oracle Server host, under the "oracle" name space (as is the case for a regular backup). The NetWorker client file index and media database

each contain a different value for the name of the save set for a proxy Oracle backup (as is the case for a regular scheduled backup).

Query the online NetWorker indexes by entering the NetWorker commands, **nsrinfo** and **mminfo**.

- Enter the **nsrinfo** command to query the NetWorker client file index.
For example:
`nsrinfo -n oracle -s NetWorker_server Oracle_Server_hostname`
- Enter the **mminfo** command to query the NetWorker media database.
For example:
`mminfo -v -s NetWorker_server -c Oracle_Server_hostname`

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

Entries in the Client File Index

For a backup piece created through a proxy backup, the client file index contains three types of backup entries under the "oracle" name space.

- One entry is generated for the backup piece name assigned by RMAN, such as `/PROXY_O901JB_811_1/` in ["Example: Proxy Backup Entries in the Client File Index" on page 140](#).
- The second entry is generated for the point-in-time metadata, such as `/brcmeta.1/` in ["Example: Proxy Backup Entries in the Client File Index" on page 140](#). This entry is created for an instant backup *only*.
- The third entry is generated for the Oracle datafile that is backed up to secondary storage, for example, `/JBOD13_NMO41_MVOL3/tbspc4_data1.dbf` in ["Example: Proxy Backup Entries in the Client File Index" on page 140](#). This entry is created for a live backup *only*.



Example: Proxy Backup Entries in the Client File Index

The **nsrinfo** command provides information on the proxy backup entries in the NetWorker client file index:

```
nsrinfo -n oracle marmaris
scanning client 'marmaris' for all savetimes from the
oracle namespace
/PROXY_O901JB_811_1/, date=1061568320 Fri Aug 22
```

```

12:05:20 2003
/brcmeta.1/, data=1061568321 Fri Aug 22 12:05:21 2003
Physical files to rollover:
/JBOD13_NMO41_MVOL3/tbspc4_data1.dbf
/JBOD13_NMO41_MVOL3/tbspc4_data1.dbf, date=1061568319
Fri Aug 22 12:05:19 2003

```

Entries in the Media Database

For a backup piece created through a proxy backup, the media database contains two types of entries.

- One entry is generated for the point-in-time metadata. This entry is created for an instant backup *only*.

In the **mminfo** command output for this entry:

- The size field contains the size of the metadata stored on the NetWorker device.
- The flag field (fl) includes the letter P, representing the point-in-time copy.

To list the entries for an instant backup only, you can enter the following **mminfo** command:

```
mminfo -v -c Oracle_Server_hostname -q 'snap'
```

For more information, refer to the *NetWorker PowerSnap Module Installation and Administrator's Guide*.

- The other entry is generated for the Oracle datafile that is backed up to secondary storage. This entry is created for a live backup *only*.

Both entries in the media database include the name of the RMAN backup script used for the proxy backup, such as `/space1/home/ora901/bp1` in ["Example: Proxy Backup Entries in the Media Database" on page 142](#).



Example: Proxy Backup Entries in the Media Database

The **mminfo** command provides information on the proxy backup entries in the NetWorker media database:

```
mminfo -v -c marmaris
```

<u>volume</u>	<u>client</u>	<u>date</u>	<u>time</u>	<u>size</u>
nmo.002	marmaris	08/22/03	12:05:19	102 MB
snap.001	marmaris	08/22/03	12:05:21	2 KB

<u>ssid</u>	<u>fl</u>	<u>lvl</u>	<u>name</u>
4064690015	cb	full	/space1/home/ora901/bp1
4098244417	cbP	full	/space1/home/ora901/bp1

NWORA Resource File Backup in the NetWorker Indexes

In the NetWorker indexes, the NWORA resource file backup is stored under the "backup" name space. As a result, the NetWorker **recover** program or **nwrecover** GUI program can be used to restore the backup. The save set name for the backup is the same as the file pathname.

Query the NetWorker indexes for information about the NWORA resource file backup by entering the NetWorker commands, **nsrinfo** and **mminfo**.



Example: Resource File Backup Entry in the Client File Index

The **nsrinfo Oracle_Server_hostname** command provides information on the NWORA resource file backup entry in the NetWorker client file index:

```
nsrinfo marmaris
scanning client 'marmaris' for all savetimes from the
backup namespace

/nsr/res/nwora.res, date=1061572719 Fri Aug 22 13:18:39
2003
/nsr/res/, date=1061572719 Fri Aug 22 13:18:39 2003
/nsr/, date=1061572719 Fri Aug 22 13:18:39 2003
/, date=1061572719 Fri Aug 22 13:18:39 2003
```

Note: This entry is *not* displayed with the `nsrinfo -n oracle` command because it is stored under the "backup" name space—*not* the "oracle" name space. The "backup" name space is the default name space for the `nsrinfo` command.



Example: Resource File Backup Entry in the Media Database

The `mminfo -v -c Oracle_Server_hostname` command provides information on the NWORA resource file backup entry in the NetWorker media database:

```
mminfo -v -c marmaris
volume      client      date        time        size
nmo.002     marmaris   08/22/03    13:18:39    4 KB
ssid        fl          lvl         name
3863367791 cb          full        /nsr/res/nwora.res
```

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

Proxy Oracle Restore Requirements

For basic information on how to configure and run Oracle data restore and recovery by using NetWorker Module for Oracle, see the ["Roadmap for Oracle Data Recovery"](#) on page 88.

Review the following information, specific to proxy Oracle restores:

- ["Creating RMAN Scripts for Proxy Oracle Restores"](#) on page 144
- ["Performing Proxy Oracle Restores"](#) on page 145
- ["Relocating Files during Proxy Oracle Restores"](#) on page 146
- ["Restoring to a Different Host"](#) on page 148
- ["RMAN Point-in-Time Recoveries without a Recovery Catalog"](#) on page 149

For information on proxy Oracle restores in a cluster environment, see ["Proxy Backups and Restores on Cluster Systems"](#) on page 166.

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.

Note: The RMAN **restore** command does *not* include a **proxy** option.

To create an RMAN script for a proxy Oracle restore, follow the instructions in "[Chapter 5: Restoring and Recovering Oracle Data](#)" on page 87.

To perform a proxy Oracle restore, the appropriate environment variables must be set, as described in "[Setting the Environment Variables](#)" on page 130.

The RESTORE_TYPE_ORDER Variable

The RESTORE_TYPE_ORDER variable setting determines the type of proxy restore that is performed.

1. RMAN determines which backup needs to be restored and passes the required backup piece name to the NetWorker Module for Oracle.
2. The RESTORE_TYPE_ORDER variable specifies whether the backup piece is to be restored by using one of the following:
 - The point-in-time copy.
 - The copy stored on secondary storage.



Example: RESTORE_TYPE_ORDER Variable Settings

If the RESTORE_TYPE_ORDER variable is set to the value `rollback:pit`, a rollback restore is attempted first. If it fails, an instant restore (indicated by `pit`) is attempted. If the variable is *not* set, the default order—`pit:conventional`—is used, where `conventional` represents a restore from secondary storage.

If the `rollback` option is *not* set explicitly, a rollback is not attempted. For more information on setting up a rollback operation, see "[Performing Proxy Oracle Restores](#)" on page 145.



Important: For the `RESTORE_TYPE_ORDER` variable, the NetWorker Module for Oracle does *not* support the `force_rollback` option, which is supported by PowerSnap Modules. If the option is specified, the restore fails—even if *other* valid restore options are also specified.

The `NSR_CLIENT` Variable

To restore Oracle data to a different host, the `NSR_CLIENT` environment variable must be set to the required hostname. For more information, see ["Restoring to a Different Host" on page 148](#).

Performing Proxy Oracle Restores

The following requirements apply to proxy Oracle restores:

- The PowerSnap Module software must be installed, according to the instructions in the *NetWorker PowerSnap Module Installation and Administrator's Guide* (refer to the PowerSnap Module version for the primary storage system).
- Each element of the restore path must exist. Otherwise, the restore fails. For example, to restore a file backup to `/space1/oradata/file.dbf`, the path `/space1/oradata` must exist.
- A proxy restore of a symbolic link restores the Oracle file to the location pointed to by the symbolic link. Both the symbolic link and the restore path must exist. Otherwise, the restore fails.
- For a rollback restore, the `psrollback.res` file must be set up properly, as described in ["Rollback Restore" on page 146](#).
- For user-specified relocation of files during a proxy Oracle restore, the relocation path must be specified as described in ["Relocating Files during Proxy Oracle Restores" on page 146](#).
- After an Oracle restore is complete, a database administrator must recover the database by using the standard Oracle **recover** command.

Concurrent Restore Streams

During a proxy restore, the PowerSnap Module creates concurrent restore streams to optimize the restore.

The maximum number of concurrent restore streams is defined by the PowerSnap variable `NSR_MAX_STREAMS`. For more information, see [Table 4 on page 131](#).

Directory Created for Filesystem Data Restore

During a proxy restore of regular filesystem data, a `.nworapc` subdirectory (with 0700 permissions) is created under the restore directory for the temporary relocation of the files being restored. (This relocation is independent of user-specified relocation.) The empty `.nworapc` subdirectory persists after the restore and can be deleted manually, if required.

If a proxy restore of filesystem data fails, the nonempty `.nworapc` subdirectory persists after the restore, and can be deleted manually, if required. Do *not* use any datafiles from this subdirectory for Oracle recovery, or database corruption might occur. If you restart the failed restore, NetWorker Module for Oracle automatically cleans up this subdirectory.

Rollback Restore

For a rollback restore, the `psrollback.res` file must contain the directory name `.nworapc`. The file is located as follows:

- On UNIX: `/nsr/res/psrollback.res`
- On Microsoft Windows: `<NetWorker_install_path>\res\psrollback.res`, where `<NetWorker_install_path>` is the root directory of the NetWorker installation path

Add the directory name to the file by using a text editor as either the root user on UNIX or a member of the Microsoft Windows Administrators group.

For more information on the `psrollback.res` file, refer to the:

- *NetWorker PowerSnap Module Installation and Administrator's Guide* for the primary storage system.
- Comments within the `psrollback.res` file itself.

Note: To find out if rollback is supported on your particular storage platform, refer to the *NetWorker PowerSnap Module Installation and Administrator's Guide*.

Relocating Files during Proxy Oracle Restores

This section describes the user-specified relocation of a proxy Oracle restore with NetWorker Module for Oracle.



Important: Relocation is *not* supported during a rollback restore. If the `RESTORE_TYPE_ORDER` variable includes the rollback value and the RMAN restore script specifies relocation, the restore fails—even if the variable includes *other* values.

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 RMAN **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 where the file will be restored.



Example: Symbolic Link Specified in the set newname Command

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`.



Important: The procedure to relocate a raw volume includes a restriction that does *not* apply when relocating a regular file.

To relocate a raw volume, the base filename (the filename without the directory path) of the original backed-up raw volume must be identical to *one* of the following:

- The base filename of the relocation path specified in the **set newname** command.
- If the **set newname** command specifies a symbolic link, the base filename in the symbolic link.



Example: Relocation of a Raw Volume

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. This can occur because 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`.

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 90](#). Task 2 of that section explains that NetWorker Module for Oracle must be installed and configured on the system where the Oracle data is to be restored. For proxy Oracle restores to a different host, the required PowerSnap Module must *also* be installed and configured on that system.

RMAN Point-in-Time Recoveries without a Recovery Catalog

Note: If point-in-time recoveries are performed with 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 end 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.

Catalog Synchronization for Proxy Oracle Backups

During Oracle backups, RMAN stores information about each backup piece in the RMAN repository, also known as the "RMAN catalog". Similarly, the NetWorker Module for Oracle stores information about each backup piece in the NetWorker indexes—or what Oracle documentation refers to as the "MML catalog".

During Oracle restores, the following occurs:

- The RMAN catalog determines the data to be restored.
- The NetWorker indexes provide information that the NetWorker Module for Oracle requires to perform the restore.

It is important to keep the RMAN catalog and NetWorker indexes synchronized, especially when performing instant backups.

The catalogs are unsynchronized when one of the following exists:

- The RMAN catalog contains backup piece entries that do *not* have corresponding NetWorker index entries.
- The NetWorker indexes contain backup piece entries that do *not* have corresponding RMAN catalog entries.

Note: If catalog synchronization is enabled for the NetWorker Module for Oracle, *proxy* backup entries in the catalogs are synchronized automatically.

Extra Entries in the Catalogs

Extra entries in the NetWorker indexes do *not* cause problems as long as the extra entries contain unique backup piece names that RMAN does *not* attempt to reuse for backups.

However, extra entries in the RMAN catalog can cause serious problems. These extra entries can occur when corresponding NetWorker index entries are removed through either expiration or NetWorker commands such as **nsrmm**. For example, instant backups are often configured to expire quickly (within hours), causing the NetWorker index entries to be removed.

Removing Instant Backup Entries from the NetWorker Indexes

Instant backup entries in the NetWorker indexes are removed in one of the following ways:

- At the start of an instant backup, if the number of existing instant backups equals the value of the Retain Snapshots attribute in the NetWorker Snapshot Policy resource, the oldest instant backup is automatically expired and its NetWorker index entries are removed.

Note: This automatic expiration and index entry removal does *not* apply to instant backups specified with the **nsrnm** -c *client_name* command. For more information on using this command, see the following:

- ["Proxy Backups from a Virtual Cluster Client" on page 167](#)
- ["Proxy Backups from a Physical Cluster Client" on page 169](#)
- When the expiration policy for an instant backup expires, the NetWorker process **nsrim** prunes the backup entries from the NetWorker indexes.
- The NetWorker process **nsrexecd** performs consistency checking that can remove backup entries from the NetWorker indexes.
- DBA uses a NetWorker command such as **nsrmm** to remove a save set that includes an instant backup.

Problems with Extra Entries in the RMAN Catalog

When the RMAN catalog contains extra entries (without corresponding entries in the NetWorker indexes), the following types of problems can occur:

- When RMAN backup optimization is enabled, RMAN might skip backing up certain files.

- The RMAN catalog might expire backups that are required for restores.
- RMAN restores might fail when RMAN attempts to restore backup pieces that have no corresponding NetWorker index entries.

The RMAN repository can be stored in either the control file of the target database or in an RMAN recovery catalog. An RMAN recovery catalog is an Oracle database.

Note: For proxy instant backups, the use of an RMAN recovery catalog (instead of a control file) is recommended. For more information, see "[Control File Versus Recovery Catalog](#)" on page 151.



Important: To enable automatic catalog synchronization for proxy backups:

- The ORACLE_SID variable must be properly set in the **nsrnmno** scheduled backup script *at the time of the proxy backup*. See "[Task 2: Customize the nsrnmno Script](#)" on page 64.
- An NWORA resource file must include the required resources, as described in "[The NWORA Resource File](#)" on page 152.

The NetWorker Module for Oracle program **nsroraclecat** uses the NWORA resources in the file to perform automatic synchronization of the RMAN catalog and NetWorker indexes. DBAs can also synchronize the catalogs *manually* by using RMAN commands.

For complete information on how to configure and perform catalog synchronization, see the following:

- "[The NWORA Resource File](#)" on page 152
- "[Automatic Catalog Synchronization by Using the nsroraclecat Program](#)" on page 162

Control File Versus Recovery Catalog

The control file of an Oracle database can store only a limited number of backup entries. When the maximum number of entries is exceeded, old entries in the control file are overwritten by new ones. You can determine the number of entries in a control file from the appropriate Oracle dynamic view. For more information, refer to the Oracle documentation.

Instant backups use control file entries of type PROXY COPY. For instant backups, an RMAN recovery catalog (instead of a control file) can be used, since there is *no* limit on the number of entries a recovery catalog can contain.



Important: If you use a control file as the RMAN catalog during an instant backup, ensure that the control file contains enough free entries for the backup. RMAN creates a new entry in the control file for each file backed up in an instant backup. The backup of a large database with many files can quickly use all the free entries in the control file and start overwriting old entries. When entries are overwritten, the corresponding backups cannot be restored.

The NWORA Resource File

Proxy Oracle backups require that the NWORA resource file exist in the following location:

- On UNIX: `/nsr/res/nwora.res`
- On Microsoft Windows: `<NetWorker_install_path>\res\nwora.res`, where `<NetWorker_install_path>` is the root directory of the NetWorker installation path

If the NetWorker Module for Oracle software is installed in a *nondefault* location on UNIX, a default NWORA resource file (containing only the `NSR_NWPATH` resource setting) is created during the installation. Otherwise, the NWORA resource file is created by the **nsrnmoadmin** program when it is run for the first time.

To enable instant backups and catalog synchronization, specific NWORA resources must be added to the file with the **nsrnmoadmin** program.

Note: The NWORA resource file must *not* be edited manually. All resources in the file must be added, modified, or deleted by using the **nsrnmoadmin** program only. The **nsrnmoadmin** program must be run by either the root user on UNIX or a member of the Microsoft Windows Administrators group.

For more information on the **nsrnmoadmin** program, see ["Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 159](#).

The NWORA resource file for instant backups must contain two types of resources, NWORA parameter resources and NWORA SID resources.

For more information, see the following:

- ["NWORA Parameter Resources" on page 153](#)
- ["NWORA SID Resources" on page 155](#)

NWORA Parameter Resources

An NWORA parameter resource comprises one specific variable setting, such as for the `NSR_ORACLECAT_MODE` variable. For instant backups, the NWORA resource file must contain the five parameter resources described in [Table 5 on page 153](#).

Note: The parameter resources listed in [Table 5 on page 153](#) are the only ones supported. Do *not* attempt to add other parameter resources to the NWORA resource file.

Table 5. NWORA Parameter Resources (Part 1 of 2)

Parameter Resource	Description	Default and Valid Values
NSR_NWPATH	Specifies the directory location of the NetWorker binaries <code>nsrmm</code> and <code>nsrsnapck</code> .	<ul style="list-style-type: none"> Directory pathname for the location of <code>nsrmm</code> and <code>nsrsnapck</code> (default). Valid directory pathname for the location of the NetWorker binaries.
NSR_ORACLECAT_DEBUG_FILE	Specifies the debug file used by the <code>nsroraclecat</code> program. Set this variable only for the purpose of debugging the <code>nsroraclecat</code> program. Note: The <code>nsroraclecat</code> debug file must be created in a <i>secure</i> location since it includes a copy of the strings from the RMAN connection file.	<ul style="list-style-type: none"> Undefined (default). Valid pathname of the <code>nsroraclecat</code> debug file. Note: If undefined, debug information is <i>not</i> generated.
NSR_ORACLECAT_LOG_FILE	Specifies the operations log file used by the <code>nsroraclecat</code> program. The logged information includes the backup pieces successfully removed from the RMAN catalog, and those that failed to be removed during automatic catalog synchronization.	<ul style="list-style-type: none"> Undefined (default). Valid pathname of the <code>nsroraclecat</code> log file. Note: If undefined, logging information is written to the <code>/nsr/applogs/nsroraclecat.log</code> file by default.

Table 5. NWORA Parameter Resources (Part 2 of 2)

Parameter Resource	Description	Default and Valid Values
NSR_ORACLECAT_MODE	Specifies whether automatic catalog synchronization is enabled or disabled during proxy Oracle backups.	<ul style="list-style-type: none"> • Undetermined (default). • Enabled. • Disabled. <p>Note: Instant backups require that the resource value is set to either "enabled" or "disabled". If the value is unset, instant backups <i>fail</i>.</p>
NSR_REMOVE_ON_FAILURE	Specifies whether the corresponding NetWorker index entries are removed when the nsroraclecat program <i>fails</i> to remove one or more RMAN catalog entries during automatic catalog synchronization. For more information, see " Automatic Catalog Synchronization by Using the nsroraclecat Program " on page 162.	<ul style="list-style-type: none"> • FALSE (default). • TRUE.

Using the nsrnmoadmin Command to Set Parameter Resources

When the **nsrnmoadmin** command (with any options) is entered for the first time after the NetWorker Module for Oracle installation, the NWORA resource file is automatically populated with the five parameter resources from Table 5. Depending on the **nsrnmoadmin** command options used, the parameter resources are set to either default or customized values.

Note: Once an NWORA parameter resource is added to the resource file, it *cannot* be deleted. However, its value can be modified.

To view the NWORA parameter resources in the resource file, enter the **nsrnmoadmin -r list** command.

To modify NWORA parameter resource settings, enter the **nsrnmoadmin -r update** command.

For more information on how to use the **nsrnmoadmin** command, see "[Configuring the NWORA Resource File with the nsrnmoadmin Program](#)" on page 159.



Example: Default NWORA Parameter Resources

After the NetWorker Module for Oracle installation, if the first **nsrnmoadmin** command entered is **nsrnmoadmin -r list** (to list the NWORA resource file contents), it adds the following default settings for the NWORA parameter resources to the resource file:

```
NSR_NWPATH=NetWorker_binary_path
NSR_ORACLECAT_MODE=undetermined
NSR_REMOVE_ON_FAILURE=FALSE
NSR_ORACLE_LOG_FILE=
NSR_ORACLECAT_DEBUG_FILE=
```

NetWorker_binary_path is the pathname of the directory that contains the NetWorker binaries **nsrmm** and **nsrsnapck**.

To enable instant backups, NSR_ORACLECAT_MODE must be set to either enabled or disabled by using the **nsrnmoadmin -r update** command.

This default NWORA resource file does *not* yet contain any NWORA SID resources, as described in "[NWORA SID Resources](#)" on page 155.

NWORA SID Resources

An NWORA SID resource comprises a specific group of variables for a single Oracle database. If automatic catalog synchronization is enabled (NSR_ORACLECAT_MODE is set to enabled), the NWORA resource file must contain an NWORA SID resource for *each* Oracle database (ORACLE_SID). The NWORA SID resource can include only the variables described in [Table 6 on page 156](#).

However, an unlimited number of NWORA SID resources can be added to the resource file.



Important: If automatic catalog synchronization is enabled, but you do *not* create an NWORA SID resource for an Oracle database, the catalogs will *not* be synchronized during instant backups of that database. As a result, the catalogs can become unsynchronized unless you synchronize them *manually* by using

RMAN commands. See ["Automatic Catalog Synchronization by Using the nsroraclecat Program" on page 162.](#)

Note: Each NWORA SID resource must have a *unique* NSR_ORACLE_SID value.

Table 6. NWORA SID Resource Components (Part 1 of 2)

Variable	Description	Default and Valid Values
NSR_ORACLE_CONNECT_FILE	<i>Mandatory.</i> Specifies the location of the file containing the connection strings required to create an RMAN session. For more information, see "The Connection File" on page 158.	<ul style="list-style-type: none"> Undefined (default). Valid pathname of the RMAN connection file.
NSR_ORACLE_HOME	<i>Mandatory.</i> Specifies the home directory of the Oracle installation. The RMAN executable must be located in subdirectory <i>bin</i> of this directory.	<ul style="list-style-type: none"> Undefined (default). Valid pathname of the Oracle home directory. <p>Note: The value must be equal to the Oracle variable \$ORACLE_HOME value.</p>
NSR_ORACLE_LIB_PATH	<i>Optional.</i> Specifies the pathname of the directory containing the Oracle shared libraries on UNIX, typically \$ORACLE_HOME/lib.	<ul style="list-style-type: none"> Undefined (default). Valid pathname of the Oracle shared library directory on UNIX. <p>Note: This variable is <i>not</i> required on Windows.</p>
NSR_ORACLE_SID	<i>Mandatory.</i> Specifies the SID value of the Oracle database whose RMAN catalog is to be synchronized.	<ul style="list-style-type: none"> Undefined (default). Valid SID value of the Oracle database. <p>Note: The value must be equal to the ORACLE_SID value in the particular nsrnmo script used for the database backup. See "ORACLE_SID" on page 69.</p>

Table 6. NWORA SID Resource Components (Part 2 of 2)

Variable	Description	Default and Valid Values
NSR_ORACLE_TNS_ADMIN	<i>Optional.</i> Specifies the pathname of the directory containing the Oracle Net8 or Oracle Net configuration files.	<ul style="list-style-type: none"> • Undefined (default). • Valid pathname of Oracle network configuration directory. <p>Note: The value must be equal to the Oracle variable \$TNS_ADMIN value.</p>

Using the nsrnmoadmin Command to Set SID Resources

To add an NWORA SID resource to the resource file, enter the **nsrnmoadmin -r add** command.

To modify NWORA SID resource settings, enter the **nsrnmoadmin -r update** command.

For more information on how to use the **nsrnmoadmin** command, see ["Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 159.](#)



Example: NWORA SID Resource

Automatic catalog synchronization is enabled for instant backups when the NSR_ORACLECAT_MODE parameter resource is set to enabled. Prior to performing instant backups of an Oracle database with an ORACLE_SID value of orcl815, add an NWORA SID resource to the resource file by using the **nsrnmoadmin -r add** command. The SID resource must include the following:

- NSR_ORACLE_SID set to orcl815.
- NSR_ORACLE_CONNECT_FILE and NSR_ORACLE_HOME set to suitable values.

The NSR_ORACLE_LIB_PATH and NSR_ORACLE_TNS_ADMIN *optionally* set to suitable values.

The following type of NWORA SID resource can be added for the Oracle database:

```
NSR_ORACLE_CONNECT_FILE=/dbapps/orcl815/connect.file
NSR_ORACLE_HOME=/dbapps/orcl815/app/oracle/product/8.1.5
```

```
NSR_ORACLE_LIB_PATH=/usr/lib
NSR_ORACLE_SID=orcl815
NSR_ORACLE_TNS_ADMIN=/dbapps/orcl815/tns
```

In this example, the RMAN connection file is `/dbapps/orcl815/connect.file` and the Oracle home directory is `/dbapps/orcl815/app/oracle/product/8.1.5`.

The Connection File

Catalog synchronization requires the connection file for an Oracle database. The **nsroraclecat** program uses the information in the connection file to delete RMAN catalog entries.

In the NWORA SID resource for the target database, the `NSR_ORACLE_CONNECT_FILE` variable must be set to the pathname of the connection file. See ["NWORA SID Resources" on page 155](#).



Important: A DBA must create the connection file in a *secure* location.

The connection file must include the following:

- The connection string required to connect to the target database.
- If an RMAN recovery catalog is used, the connection string required to connect to the RMAN recovery catalog.

Note: The connection file must *not* include any lines starting with the # symbol.

If the connection file does *not* contain a connection string for an RMAN recovery catalog, the **nsroraclecat** program assumes that a control file is used as the RMAN repository during instant backups.



Example: Connection File Contents

If the following lines exist in the connection file, an RMAN recovery catalog is used as the RMAN repository:

```
connect target sys/oracle@orcl815;
connect rcvcat rman/rman@oracat;
```

Note: RMAN catalog deletions *fail* if the connection file for a backup piece does not exist or does not contain valid connection strings.

Configuring the NWORA Resource File with the nsrnmoadmin Program

All resources in the NWORA resource file must be added, modified, or deleted by using the **nsrnmoadmin** program *only*.

Note: Run the program as the root user on UNIX, or as a member of the Microsoft Windows Administrators group.

To run the program, enter the **nsrnmoadmin** command at the operating system command line.

Note: For the **nsrnmoadmin** command:

- Only the **-D** and **-r** options are supported.
 - The **-D** option causes the **nsrnmoadmin** command to print debug information.
 - The **-r** option must be followed by the appropriate keywords, which determine the NWORA resource operation to be performed.
- Brackets ([]) are used to denote the optional portions of the command (for example, command options and corresponding settings). When entering the command, do *not* include the brackets.
- The equal sign between the resource name and value is *optional*.

The **nsrnmoadmin** command and its supported options are as follows:

```
nsrnmoadmin [-D] -r list [resource_name | sid_value]
nsrnmoadmin [-D] -r add [resource_name resource_value |
resource_name=resource_value]
nsrnmoadmin [-D] -r add sid=sid_value home=Oracle_home
connect=connect_filepath [lib=Oracle_libpath] [tns=Oracle_tnsadmin]
```

```
nsrnmoadmin [-D] -r update [resource_name resource_value |  
resource_name=resource_value]  
  
nsrnmoadmin [-D] -r update sid=sid_value [home=Oracle_home]  
[connect=connect_filepath] [lib=Oracle_libpath] [tns=Oracle_tnsadmin]  
  
nsrnmoadmin [-D] -r delete sid_value
```

where:

- *resource_name* is the name of an NWORA parameter resource.
- *sid_value* is the value of the NSR_ORACLE_SID variable of an NWORA SID resource.
- *resource_value* is the value of the NWORA parameter resource.
- *Oracle_home* is the value of the NSR_ORACLE_HOME variable of the NWORA SID resource.
- *connect_filepath* is the value of the NSR_ORACLE_CONNECT_FILE variable of the NWORA SID resource.
- *Oracle_libpath* is the value of the NSR_ORACLE_LIB_PATH variable of the NWORA SID resource.
- *Oracle_tnsadmin* is the value of the NSR_ORACLE_TNS_ADMIN variable of the NWORA SID resource.

For examples of how to use the **nsrnmoadmin** command to list, add, update, and delete NWORA resources, see the following:

- ["How to List NWORA Resources" on page 160](#)
- ["How to Add NWORA Resources" on page 161](#)
- ["How to Update NWORA Resources" on page 161](#)
- ["How to Delete NWORA SID Resources" on page 162](#)

For more information on the **nsrnmoadmin** command, refer to the following:

- The **nsrnmoadmin** man page on a UNIX Oracle Server that contains the NetWorker Module for Oracle software.
- The **nsrnmoadmin** entry in the *Legato NetWorker Module for Oracle Command Reference Guide* on the Legato web site (www.legato.com).

How to List NWORA Resources

To display the entire NWORA resource file contents, enter the following:

```
nsrnmoadmin -r list
```


To display the NSR_ORACLECAT_MODE parameter resource only, enter the following:

```
nsrnmoadmin -r list NSR_ORACLECAT_MODE
```

To display an NWORA SID resource with the NSR_ORACLE_SID value of orcl815, enter the following:

```
nsrnmoadmin -r list orcl815
```

How to Add NWORA Resources

To add the NSR_ORACLECAT_MODE parameter resource with the value of enabled, enter one of the following:

```
nsrnmoadmin -r add NSR_ORACLECAT_MODE enabled
```

```
nsrnmoadmin -r add NSR_ORACLECAT_MODE=enabled
```

Note: If the NWORA parameter resource already exists in the resource file, using the **add** keyword causes the resource value to be *updated*.

To add a new NWORA SID resource with the NSR_ORACLE_SID value of orcl815 and other values as specified in ["Example: NWORA SID Resource" on page 157](#), enter the following:

```
nsrnmoadmin -r add sid=orcl815
home=/dbapps/orcl815/app/oracle/product/8.1.5
connect=/dbapps/orcl815/connect.file lib=/usr/lib
tns=/dbapps/orcl815/tns
```

Notes:

- When adding an NWORA SID resource, the keywords **sid**, **home**, and **connect** are *mandatory*; the keywords **lib** and **tns** are *optional*.
- If an NWORA SID resource with the same NSR_ORACLE_SID value already exists, the command *updates* the values of the existing resource.

How to Update NWORA Resources

To update the value of the NSR_ORACLECAT_MODE parameter resource to enabled, enter one of the following:

```
nsrnmoadmin -r update NSR_ORACLECAT_MODE enabled
```

```
nsrnmoadmin -r update NSR_ORACLECAT_MODE=enabled
```

To update the values of the NSR_ORACLE_HOME and NSR_ORACLE_CONNECT_FILE variables in an NWORA SID resource with the NSR_ORACLE_SID value of orcl815, enter the following:

```
nsrnmoadmin -r update sid=orcl815
home=/dbapps/oracle/8.1.5/bin
connect=/dbapps/oracle/connect/orcl815.connect
```

Note: When updating an NWORA SID resource, the keyword **sid** is *mandatory*; the keywords **home**, **connect**, **lib**, and **tns** are *optional*.

How to Delete NWORA SID Resources

To delete an NWORA SID resource with the NSR_ORACLE_SID value of orcl815, enter the following:

```
nsrnmoadmin -r delete orcl815
```

Note: Only NWORA SID resources can be deleted from the resource file. NWORA parameter resources *cannot* be deleted.

Automatic Catalog Synchronization by Using the nsroraclecat Program

Automatic catalog synchronization is managed jointly by NetWorker server and NetWorker Module for Oracle programs. To remove instant Oracle backup entries from the NetWorker indexes, the NetWorker server invokes the **nsrsnapck** program. Prior to removing the index entries, **nsrsnapck** invokes the **nsroraclecat** program to remove the corresponding RMAN catalog entries.

Note: To perform *manual* catalog synchronization, you can use specific RMAN commands. See ["The change...crosscheck and crosscheck Commands" on page 180](#). For more information on RMAN commands, refer to the appropriate Oracle documentation.

Review the following information on automatic catalog synchronization:

- ["RMAN Catalog Entry Removals with nsroraclecat" on page 163](#)
- ["Failure of the nsroraclecat Program" on page 164](#)
- ["NetWorker Index Entry Removals with nsrsnapck" on page 165](#)

RMAN Catalog Entry Removals with `nsroraclecat`

The `nsroraclecat` program runs on the Oracle Server host that performed the instant backup.

- Do *not* attempt to run the `nsroraclecat` program manually.
- The `nsroraclecat` program is run automatically by the `nsrsnapck` program.
- Only one `nsroraclecat` program can run at a time. If two `nsroraclecat` programs are started, the one started first completes its operation before the second one proceeds.

To remove the RMAN catalog entries, `nsroraclecat` obtains information from the NWORA resource file and generates temporary RMAN scripts that include an RMAN `change...delete` command for each backup piece to be removed.

A separate script is created for all the backup pieces from the same database (or ORACLE_SID).

The `nsroraclecat` program names each RMAN script as follows:

- On UNIX:
`/nsr/tmp/.nworapc/nsroraclecat_<date>_<pid>`
 - On Microsoft Windows:
`<NetWorker_install_path>\tmp\.nworapc\nsroraclecat_<date>_<pid>`
- where:
- `<NetWorker_install_path>` is the root directory of the NetWorker installation path.
 - `<date>` is the current date.
 - `<pid>` is the `nsroraclecat` process ID.

The `nsroraclecat` program runs each script in an RMAN session. After the scripts have finished running, the program removes them.

Note: The `nsroraclecat` program generates information about the backup piece entries removed from the RMAN catalog. The information is written to the `nsroraclecat` log and debug files. For more information on these files, see "[NSR_ORACLECAT_LOG_FILE](#)" and "[NSR_ORACLECAT_DEBUG_FILE](#)" on page 153.

For more information on the **nsroraclecat** program, refer to the following:

- The **nsroraclecat** man page on a UNIX Oracle Server that contains the NetWorker Module for Oracle software.
- The **nsroraclecat** entry in the *Legato NetWorker Module for Oracle Command Reference Guide* on the Legato web site (www.legato.com).

Failure of the nsroraclecat Program

A fatal error that causes **nsroraclecat** to fail can be produced by the following:

- The **nsrsnapck** program passes invalid information to **nsroraclecat**, for example, an invalid NetWorker client name or an invalid save time of a backup piece.
- The **nsroraclecat** program cannot connect to the NetWorker server to query the NetWorker indexes.
- The **nsroraclecat** program cannot locate the required backup pieces in the NetWorker indexes.

To diagnose the cause of a **nsroraclecat** program failure, review the **nsroraclecat** log files specified by `NSR_ORACLECAT_DEBUG_FILE` and `NSR_ORACLECAT_LOG_FILE`. The operations log file is `/nsr/applogs/nsroraclecat.log` by default.

If the **nsroraclecat** program fails, the **nsrsnapck** program removes the corresponding NetWorker index entries by using the procedures described in ["NetWorker Index Entry Removals with nsrsnapck" on page 165](#).

The following files (if they exist) need to be removed:

- Files in one of these directories:
 - On UNIX: `/nsr/tmp/.nworapc`
 - On Microsoft Windows: `<NetWorker_install_path>\tmp\.nworapc`, where `<NetWorker_install_path>` is the root directory of the NetWorker installation path
- Files in either the temporary directory `/tmp` on UNIX or the temporary directory specified by the `TEMP` system variable on Microsoft Windows, where the files have the name `nwora_bp_<sid>_<pid>`
 - `<sid>` is an `ORACLE_SID` value.
 - `<pid>` is a **nsroraclecat** process ID.

Note: If **nsroraclecat** fails continuously, disable catalog synchronization (by setting `NSR_ORACLECAT_MODE` to disabled) until the cause of the problem is determined.



Important: After a **nsroraclecat** program failure occurs or while catalog synchronization is disabled, the DBA must synchronize the catalogs manually by using specific RMAN commands. For more information, refer to the appropriate Oracle documentation.

NetWorker Index Entry Removals with **nsrsnapck**

Once the **nsroraclecat** program has finished the RMAN catalog operations, the **nsrsnapck** program removes the NetWorker index entries for all the backups that were successfully removed from the RMAN catalog.

If some of the backup entries *failed* to be removed from the RMAN catalog, the **nsrsnapck** program does the following:

- Removes the corresponding NetWorker index entries when `NSR_REMOVE_ON_FAILURE` is set to `TRUE`.
- Does *not* remove the corresponding NetWorker index entries when `NSR_REMOVE_ON_FAILURE` is set to `FALSE`.

Note: When `NSR_REMOVE_ON_FAILURE` is set to `FALSE`, **nsrsnapck** removes only those NetWorker index entries that correspond to removed RMAN catalog entries.



Important: The `NSR_REMOVE_ON_FAILURE` setting controls the result of the **nsroraclecat** program failure to remove RMAN catalog entries.

- In general, `NSR_REMOVE_ON_FAILURE` should be set to `TRUE`, to enable NetWorker index entries to be removed, even if the RMAN catalog entries are *not* removed. Otherwise, if entries are not removed from the NetWorker indexes, the snapshot resources are not freed and subsequent backups might fail.
 - If RMAN backup optimization is enabled, `NSR_REMOVE_ON_FAILURE` should be set to `FALSE`, to prevent the removal of NetWorker index entries. Otherwise, RMAN might skip backing up certain files.
-

When the **nsroraclecat** program *fails* to run properly, the **nsrsnapck** program's actions depend on whether the instant backup on the primary storage is intact.

- If the instant backup on the primary storage is destroyed or invalid, the **nsrsnapck** program removes the corresponding entry from the NetWorker indexes.
- If the instant backup on the primary storage is intact, the **nsrsnapck** program does *not* remove any entries from the NetWorker indexes and generates an error message about the failure in the following file:
 - On UNIX: `/nsr/logs/daemon.log`
 - On Microsoft Windows: `<NetWorker_install_path>\logs\daemon.log`, where `<NetWorker_install_path>` is the root directory of the NetWorker installation path

Proxy Backups and Restores on Cluster Systems

The NetWorker Module for Oracle can perform proxy backups and restores of an Oracle database configured on a cluster system. The software also enables cluster failover for proxy backups.

Review the following information, specific to proxy Oracle operations on a cluster system:

- ["Proxy Backup Failover" on page 166](#)
- ["Proxy Backups from a Virtual Cluster Client" on page 167](#)
- ["Proxy Backups from a Physical Cluster Client" on page 169](#)
- ["Restores from Proxy Backups on a Cluster System" on page 170](#)

Proxy Backup Failover

During a scheduled proxy backup where the Oracle software is configured to fail over (for example, using Oracle Fail Save with MSCS on Microsoft Windows), the NetWorker server retries the backup on the failover node if the Client Retries attribute is set to a nonzero value in the Group resource. The retry occurs at the RMAN script level, whereby the RMAN script restarts from the beginning.

Note: To avoid restarting the backups of all objects in the RMAN script during the NetWorker retry, you can use the Oracle9i restartable backups feature. This feature enables you to back up only the files that have *not* been backed up since a specified time, for example, by using the `'sysdate -1'` option. For more information, see ["Restartable Backups" on page 200](#).

Proxy Backups from a Virtual Cluster Client

A proxy backup from a virtual cluster client (virtual host) protects Oracle data on shared cluster disks.

To set up a proxy backup from a virtual cluster client, perform the following:

1. Install the NetWorker Module for Oracle software on *each* physical node of the cluster, along with the NetWorker client and appropriate PowerSnap Module software.
2. Create a NetWorker Client resource for the virtual host and *each* physical host, as described in "[Configuring the NetWorker Client Resource](#)" on [page 133](#).
 - In the Remote Access attribute in the Client resource for a virtual cluster client, specify the Oracle user from each physical client that can store and retrieve backups.
 - In the Save Set attribute, specify the complete pathname of the RMAN script to back up the Oracle data on the shared disk.
3. Configure the other NetWorker resources required for proxy backups, as described in "[Additional Configurations for Proxy Operations](#)" on [page 126](#).
 - To enable backup failover, specify a nonzero value in the Client Retries attribute in the NetWorker Group resource for the scheduled backup. This value causes the NetWorker server to restart the backup of uncompleted Oracle save sets on the failover node.
 - Specify other recommended attribute settings in the Group resource, as described in the cluster support chapter of the *Legato NetWorker Administrator's Guide, Release 7.1*.
4. Configure the NWORA resource file on *each* node of the cluster, as described in "[Configuring the NWORA Resource File](#)" on [page 127](#).
5. If the Save Set attribute in the Client resource for a virtual client specifies an RMAN script that resides on a private disk, ensure that an empty *pathownerignore* file exists on the Oracle Server host as follows:
 - On UNIX:
`<NetWorker_install_path>/bin/pathownerignore`
 - On Microsoft Windows:
`<NetWorker_install_path> \bin \pathownerignore`

Here, `<NetWorker_install_path>` is the root directory of the NetWorker installation path.

Without the *pathownerignore* file on the Oracle Server, the scheduled backup fails due to the path-ownership rules used to distinguish between data associated with a physical host and data managed by a virtual client.

6. To specify that the proxy backup entries be stored in a NetWorker client file index other than the virtual client index, for example, in a physical client index:
 - Add `-c client_name` to the **nsrnm0** script name in the Backup Command attribute in the Client resource.
 - Specify the Oracle user from the virtual host in the Remote Access attribute in the Client resource for *client_name*.

The expiration of instant backups created with the **nsrnm0 -c client_name** command *differs* from the expiration of instant backups created without the `-c` option. For details on the expiration and removal of backups specified with **nsrnm0 -c client_name**, see ["Removing Instant Backup Entries from the NetWorker Indexes" on page 150](#).

Notes:

- The host specified with `-c client_name` must have access to instant backups.
- The NetWorker Module for Oracle and PowerSnap Module must be installed and configured on the host specified with `-c client_name`.
- When the backup is started from the virtual cluster client, the backup entries are stored in the NetWorker client file index of the virtual client by default.
- The entries for the NWORA resource file backup are always stored in the NetWorker index of the physical client.



Example: Nondefault NetWorker Index for Proxy Backup Entries

To specify that the backup entries be stored in the index of the physical cluster client *mars.legato.com*, where the script name is **nsrnm0901**, specify the following in the Backup Command attribute:

```
nsrnm0901 -c mars.legato.com
```



Important: The `NSR_CLIENT` environment variable is *not* supported for proxy Oracle backups on a cluster system. This variable is used for restores and regular Oracle backups on a cluster system, as described in ["Chapter 6: Cluster, OPS, and RAC Systems" on page 95.](#)

Proxy Backups from a Physical Cluster Client

A proxy backup from a physical cluster client protects Oracle data on private disks. This type of backup is similar to a regular scheduled Oracle backup on a non-cluster system.

For information on how to set up a proxy backup from a physical cluster client, refer to the following:

- ["Proxy Oracle Backup Requirements" on page 135](#)
- *Legato NetWorker Administrator's Guide, Release 7.1* (chapter on cluster support)

When the backup is started from the physical client, the backup entries are stored in the NetWorker index of the physical client by default.

Note: The entries for the NWORA resource file backup are always stored in the NetWorker index of the physical client.

To specify that the proxy backup entries be stored in a NetWorker client file index other than the physical client index, for example, in a virtual client index:

- Add `-c client_name` to the `nsrnm` script name in the Backup Command attribute in the Client resource.
- Specify the Oracle user from the physical host in the Remote Access attribute in the Client resource for `client_name`.

The expiration of instant backups created with the `nsrnm -c client_name` command *differs* from the expiration of instant backups created without the `-c` option. For details on the expiration and removal of backups specified with `nsrnm -c client_name`, see ["Removing Instant Backup Entries from the NetWorker Indexes" on page 150.](#)

Notes:

- The host specified with `-c client_name` must have access to instant backups.
- The NetWorker Module for Oracle and PowerSnap Module must be installed and configured on the host specified with `-c client_name`.



Example: Nondefault NetWorker Index for Proxy Backup Entries

To specify that the backup entries be stored in the index of the virtual client *monalisa.legato.com*, where the script name is **nsrnmo901**, specify the following in the Backup Command attribute:

```
nsrnmo901 -c monalisa.legato.com
```



Important: The NSR_CLIENT environment variable is *not* supported for proxy Oracle backups on a cluster system. This variable is used for restores and regular Oracle backups on a cluster system, as described in ["Chapter 6: Cluster, OPS, and RAC Systems" on page 95](#).

Restores from Proxy Backups on a Cluster System

To set up a restore from a proxy backup on a cluster system, perform the following:

1. Set the NSR_CLIENT environment variable to the correct value by using one of the methods in ["Setting the NSR_* Environment Variables" on page 171](#).
 - To restore a backup from a virtual cluster client, set NSR_CLIENT to the name of the virtual cluster client.
 - To restore a backup from a physical cluster client, set NSR_CLIENT to the name of the physical cluster client.
2. In the Remote Access attribute of the Client resource, specify the hostname of the client on which the restore is to be started.

Note: When a failover occurs during a restore, the restore must be restarted *manually* on the failover node.

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 that use 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 ["Setting the Environment Variables" on page 130](#).

This appendix includes the following main sections:

- ["Setting the NSR_* Environment Variables" on page 171](#)
- ["NSR_* Environment Variable Definitions" on page 173](#)

Setting the NSR_* Environment Variables

The NSR_* environment variables described in [Table 7 on page 173](#) 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, by 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*, by using the **send** option in the **configure channel** command.
- In Oracle8i or Oracle9i, by 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 188.

Note: Each NSR_* environment variable set by using the **parms** option in the **allocate channel** command must be included for *each* allocated channel. For more information, see ["The send Command"](#) on page 181.

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

On Windows, when an NSR_* environment variable is set using the **parms** option in *either* the **allocate channel** command (as in the RMAN script on [page 51](#)) *or* the **configure channel** command (used for automatic channel allocation in Oracle9i), the value of that NSR_* variable remains in effect for all subsequent allocated channels, and for all subsequent RMAN sessions until either:

- The Oracle database is shut down; or
- The NSR_* variable is unset for the channel by using the **parms** option, as in the following example:

```
run {
    allocate channel t1 type 'SBT_TAPE'
    parms 'ENV=(NSR_SERVER=,NSR_DATA_VOLUME_POOL=)';
    :
    :
    release channel t1;
}
```

Note: On Windows, this does *not* occur if the environment variables are set with the **send** command in all RMAN sessions.

The use of a UNIX **setenv** command or Windows **set** 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 7 on page 173 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 7. Environment Variables in the RMAN Command or Script (Part 1 of 6)

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. Note: In the parms 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"> • FALSE (default) = The NetWorker software performs <i>no</i> checksumming. • TRUE = The NetWorker software performs checksumming.
NSR_CLIENT	<p><i>Recommended</i> for a backup of Oracle running on a cluster, OPS, or RAC system.</p> <p><i>Recommended</i> for all restores.</p> <p>Specifies the NetWorker Client resource to use for a backup or restore session.</p> <p>Might be needed for disaster recovery.</p>	<ul style="list-style-type: none"> • The physical host on which the session runs (default). • A valid NetWorker client hostname.

Table 7. Environment Variables in the RMAN Command or Script (Part 2 of 6)

Variable	Description	Default and Valid Values
NSR_COMPRESSION	<i>Optional.</i> Specifies whether or not the NetWorker software performs compression on the backup data.	<ul style="list-style-type: none"> FALSE (default) = The NetWorker software performs <i>no</i> compression. TRUE = The NetWorker software performs compression.
NSR_DATA_VOLUME_POOL	<p><i>Mandatory</i> if using set duplex command (set to 1, 2, 3, or 4).</p> <p>Specifies the name of the volume pool to use for the Oracle backup, including a <i>duplexed</i> Oracle backup.</p> <p>In the case of proxy backups, specifies the volume pool <i>for live backups only</i> (backups to secondary storage only).</p> <p>Note: 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"> The most appropriate pool, selected by the NetWorker server (default). A valid NetWorker pool name. The name must be different from the name used by another NSR_DATA_VOLUME_POOL* variable.
NSR_DATA_VOLUME_POOL1	<p><i>Mandatory</i> if using set duplex command (set to 2, 3, or 4).</p> <p>Specifies the name of the volume pool to use for a <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> Undefined (default). A valid NetWorker pool name. The name must be different from the name used by another NSR_DATA_VOLUME_POOL* variable.
NSR_DATA_VOLUME_POOL2	<p><i>Mandatory</i> if using set duplex command (set to 3 or 4).</p> <p>Specifies the name of the volume pool to use for a <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> Undefined (default). A valid NetWorker pool name. The name must be different from the name used by another NSR_DATA_VOLUME_POOL* variable.

Table 7. Environment Variables in the RMAN Command or Script (Part 3 of 6)

A

Variable	Description	Default and Valid Values
NSR_DATA_VOLUME_POOL3	<p><i>Mandatory</i> if using set duplex command (set to 4).</p> <p>Specifies the name of the volume pool to use for a <i>duplexed</i> Oracle backup.</p>	<ul style="list-style-type: none"> Undefined (default). A valid NetWorker pool name. The name must be different from the name used by another NSR_DATA_VOLUME_POOL* variable.
NSR_DEBUG_FILE	<p><i>Optional</i>. Enables debugging by specifying the complete pathname of the log file on the Oracle Server that receives debug information during a proxy or non-proxy backup or restore.</p> <p>Only used for debugging of the NetWorker Module for Oracle media management library (MML).</p>	<ul style="list-style-type: none"> Undefined (default). The valid pathname of the debug file to use on the Oracle Server. <p>Note: If undefined, no debug information is generated. If a file with the specified pathname <i>cannot</i> be created, debug information is either directed to the default location or not generated.</p>
NSR_DEBUG_LEVEL	<p><i>Optional</i>. Controls the amount of debug information the NetWorker Module for Oracle writes to the debug log file, which is specified by NSR_DEBUG_FILE.</p> <p>The debug level limits only the amount of debug information generated by the three functions—sbtread(), sbtwrite(), and sbtpcstatus()—that are called most often during backups and restores. All the debug messages for other functions are always written to the log file, regardless of the debug level.</p>	<ul style="list-style-type: none"> 0 (default) = Only operational messages are written for the sbtread(), sbtwrite(), and sbtpcstatus() functions. No entry or exit messages are written for the functions. 1 = Only entry and exit messages are written for the sbtread(), sbtwrite(), and sbtpcstatus() functions. No operational messages are written for the functions. 2 = All debug messages for all the functions are written to the log file.

Table 7. Environment Variables in the RMAN Command or Script (Part 4 of 6)

Variable	Description	Default and Valid Values
NSR_ENCRYPTION	<i>Optional.</i> Specifies whether or not the NetWorker software performs encryption on the backup data.	<ul style="list-style-type: none"> FALSE (default) = The NetWorker software performs <i>no</i> encryption. TRUE = The NetWorker software performs encryption.
NSR_GROUP	<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. Note: Do <i>not</i> set this variable for a scheduled backup.	<ul style="list-style-type: none"> Default group (default). A valid NetWorker backup group name. Note: A NetWorker Group resource must be configured for the specified backup group.
NSR_NO_BUSY_ERRORS	<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. Note: For proxy Oracle backups, this variable is always set to FALSE.	<ul style="list-style-type: none"> FALSE (default) = The scheduled backup waits for the NetWorker server to accept the connection. TRUE = The scheduled backup fails immediately when the NetWorker server is busy.
NSR_NWPATH	<i>Mandatory</i> when removing a backup from the NetWorker server if both: <ul style="list-style-type: none"> The nsrmm and nsrsnapck binaries are in a nondefault location; and The NWORA resource file does not contain the correct location of the NetWorker client binaries.^a For details on the resource file, see "The NWORA Resource File" on page 152. Specifies the complete pathname of the directory containing the nsrmm and nsrsnapck binaries.	<ul style="list-style-type: none"> The platform-specific default location of the NetWorker client binaries (default). A valid pathname of the directory containing the nsrmm and nsrsnapck binaries, for example, <i>/usr/local/bin.</i>

Table 7. Environment Variables in the RMAN Command or Script (Part 5 of 6)

A

Variable	Description	Default and Valid Values
NSR_PROXY_PFILE	<p>Supported <i>only</i> for a proxy Oracle backup or restore.</p> <p><i>Mandatory</i> if setting PowerSnap variables in a configuration file.</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"> • Undefined (default). • A valid pathname of the configuration file. <p>Note: 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>Specifies the date when the entry for the backup is to be removed from the NetWorker client index.</p> <p>Note: 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"> • The most appropriate policy for the client, as selected by the NetWorker server (default). • A valid date in nsr_getdate(3) format.
NSR_SAVESET_EXPIRATION	<p><i>Not recommended.</i> This NetWorker Module for Oracle release 3.5 variable has been replaced by the NSR_SAVESET_RETENTION variable.</p>	<p>If this variable is used, its value is assigned to the NSR_SAVESET_RETENTION variable.</p> <p>Note: In the parms option, a value assigned to NSR_SAVESET_RETENTION takes precedence over one assigned to NSR_SAVESET_EXPIRATION.</p>

Table 7. Environment Variables in the RMAN Command or Script (Part 6 of 6)

Variable	Description	Default and Valid Values
NSR_SAVESET_RETENTION	<p><i>Mandatory</i> if setting a nondefault retention policy for a <i>manual</i> Oracle backup with NetWorker server 6.x or later.</p> <p>Specifies the date when the save set becomes recyclable.</p> <p>Note: 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.</p>	<ul style="list-style-type: none"> The most appropriate policy for the client, as selected by the NetWorker server (default). A valid date in nsr_getdate(3) format.
NSR_SERVER	<p><i>Mandatory</i> for a <i>manual</i> backup if the NetWorker server host is different from the Oracle Server host.</p> <p><i>Recommended</i> for a local manual backup.</p> <p>Specifies the hostname of the NetWorker server to perform the Oracle backup.</p>	<ul style="list-style-type: none"> The local physical host (default). A valid NetWorker server name.

a. Instead of setting the NSR_NWPATH variable in the RMAN script, the **nsrnmoadmin** command can be used to set NSR_NWPATH in the NWORA resource file. The NSR_NWPATH variable must be set to the complete pathname of the directory containing the **nsrmm** and **nsrsnapck** binaries. For example, the following **nsrnmoadmin** command sets the NSR_NWPATH value in the resource file to `/opt/networker/bin`: **nsrnmoadmin -r add NSR_NWPATH /opt/networker/bin**. For details on the NWORA resource file and how to use the **nsrnmoadmin** command to set a value in the file, see "[The NWORA Resource File](#)" on page 152.

Appendix B: RMAN Commands

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

Note: In this appendix, brackets ([]) are used to denote the optional portions of a command (for example, command options and corresponding settings). When entering the command, do *not* include the brackets.

This appendix includes the following main sections:

- ["The change...delete and delete expired backup Commands" on page 180](#)
- ["The change...crosscheck and crosscheck Commands" on page 180](#)
- ["The pool Option of the backup Command" on page 181](#)
- ["Proxy Copy" on page 181](#)
- ["The send Command" on page 181](#)
- ["The set duplex Command" on page 189](#)
- ["The trace Option of the backup Command" on page 191](#)

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 193](#).

The change...delete and delete expired backup Commands

For a particular user to be able to use the **change...delete** or **delete expired backup** command with a NetWorker server, the user must have the required NetWorker privileges, as described in "[Specifying the Required NetWorker Privileges](#)" on page 38.

If the user does *not* have the required NetWorker privileges, 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 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 NetWorker 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 NWORA resource file was *not* created during NetWorker Module for Oracle installation, the NSR_NWPATH environment variable might need to be set in the NWORA resource file or in the RMAN script. For more information, see "[NSR_NWPATH](#)" on page 176.

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 causes the status of the corresponding backup pieces to change to *expired* in the RMAN catalog.

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



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

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 204](#).

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 171](#).

Proxy Copy



Important: If the required NetWorker PowerSnap Module software is *not* installed and properly configured, NetWorker Module for Oracle does *not* support proxy copy, and a proxy Oracle backup will fail.

For more information on how to perform proxy backups with the NetWorker Module for Oracle and PowerSnap Module, see ["Chapter 7: Proxy Oracle Backups and Restores" on page 109](#).

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 171](#).

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 182](#).

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 (*in Oracle9i only*) **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 182](#)
- ["Two Ways to Run the send Command" on page 185](#)
- ["The parms Option in the allocate channel Command" on page 188](#)
- ["Precedence Rules" on page 188](#)

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 183](#)
- ["The send Command Options" on page 184](#)

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 the **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 186](#).

Specify the correct option values in the **send** command, as described in [Table 8 on page 185](#). The sample RMAN script referred to in [Table 8](#) is the script shown under "[The send Command Options](#)" on page 184.

Table 8. Option Values in the send Command

Option Value	Description
<i>device_specifier</i>	The device type as specified in an allocate channel command in the RMAN script. For a backup tape device, use SBT_TAPE.
<i>channel_id</i>	The channel identifier as specified in an allocate channel command in the RMAN script. In the preceding sample RMAN script, the identifier is t1.
<i>var_name1</i>	The first NetWorker Module for Oracle environment variable name. In the preceding sample RMAN script, the first variable name is NSR_SERVER.
<i>value1</i>	The value assigned to the first environment variable. In the preceding sample RMAN script, the first value is server1.
<i>var_name2</i>	The second NetWorker Module for Oracle environment variable name. In the preceding sample RMAN script, the second variable name is NSR_DATA_VOLUME_POOL.
<i>value2</i>	The value assigned to the second environment variable. In the preceding sample RMAN script, 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 186.
- In the **run** job of the RMAN script, as described in "[The send Command in the RMAN Script](#)" on page 187.

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, ...])'"
```

- 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 183](#)—*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 184](#)).
- 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 188](#).

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 183](#).
- 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 184](#).
- Specify the correct option values in the **send** command, as described in ["The send Command Options" on page 184](#).
- 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 51](#), *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. This generates 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, Release 4.1*.

The parms Option in the allocate channel Command

In Oracle8i and Oracle9i, use of the **send** command *only* is recommended. However, if environment variables are set by using *both* the **send** command and the **parms** option in the **allocate channel** command, the variables are set in the order of the "[Precedence Rules](#)" on [page 188](#).

On Windows, when an NSR_* environment variable is set using the **parms** option, the value of that NSR_* variable remains in effect for all subsequent allocated channels and for all subsequent RMAN scripts until certain conditions exist. For more information, see "[Setting the NSR_* Environment Variables](#)" on [page 171](#).

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. (The **configure channel** command is supported in 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 instead of 2, set it to **on**), 3, or 4 to produce 1, 2, 3, or 4 copies, respectively, of every Oracle backup set generated by subsequent **backup** commands.

[Table 9 on page 190](#) describes the results of setting **duplex** to each of the valid values.

Table 9. Set Duplex Command Values

Set Duplex Command	Oracle Backup Results
set duplex=1	The backup set is directed to NSR_DATA_VOLUME_POOL.
set duplex=2 or set duplex=on	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.
set duplex=3	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.
set duplex=4	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 171.

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 *init<oracle_sid>.ora* file. 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 196.

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 197 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 following file:

- On UNIX: */nsr/applogs/nmo.messages*
- On Windows: *<NetWorker_install_path>\applogs\nmo.messages*, where *<NetWorker_install_path>* is the root directory of the NetWorker installation path

[Table 10 on page 192](#) outlines the conditions traced when the **trace** option is set to each of the three valid values.

Table 10. Trace Option Values and Conditions Traced

Trace Value	Conditions Traced
0 (default)	All error conditions.
1	<ul style="list-style-type: none"> • All error conditions. • Entry and exit for each System Backup to Tape (SBT) function (the NetWorker Module for Oracle implementation of the Oracle SBT interface).
2	<ul style="list-style-type: none"> • All error conditions. • Entry and exit for each SBT function (the NetWorker Module for Oracle implementation of the Oracle SBT interface). • Values of all function parameters. • First 32 bytes of each read/write buffer.

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 193](#)
- ["Control File Autobackup" on page 196](#)
- ["Backup Copies" on page 196](#)
- ["Retention Policies" on page 197](#)
- ["Backup and Restore Optimization" on page 198](#)
- ["Backup of Backup Sets" on page 199](#)
- ["Restartable Backups" on page 200](#)

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 with 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 by using the **configure** commands.

- Specify the default device type with the **configure default device type** command. For example, specify the automatic channel, default device type for NetWorker Module for Oracle backups with the following command:

```
configure default device type to 'sbt_tape'
```

- Specify the number of automatic channels with the **parallelism** option. For example, specify two automatic channels for NetWorker Module for Oracle backups with the following command:

```
configure device type 'sbt_tape' parallelism 2
```

- Specify generic automatic channel options with 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` with 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, and it requires the channel allocation.

One example is 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* with 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), with 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 uses 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 with 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 with 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 with 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 with NetWorker Module for Oracle, the control file autobackup will also be performed with 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 189](#).

Backups can be duplexed (up to four copies) with 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 with 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 that of the NetWorker server, and there is no mechanism to synchronize these policies, the NetWorker and Oracle policies could conflict.



Example: Expiring a Backup

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 4: Configure the NetWorker Client Resource](#)" on page 42.



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 with 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.

The restore optimization function 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 Oracle9i data has been backed up with **device type disk**, NetWorker Module for Oracle can be used to back up these backup sets from disk to NetWorker volumes.

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 with 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 56](#)
- ["Canceling a Scheduled Oracle Backup" on page 80](#)

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 201](#)
- ["RMAN Error Messages" on page 203](#)
- ["NetWorker Module for Oracle Error Messages" on page 204](#)

Troubleshooting Tips

The following list of troubleshooting tips refers to sections of this Administrator's Guide and the *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*. 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. 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 4.1*.

2. 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 37.

3. Install and configure the NetWorker server and client software.

For more information, see "[Chapter 2: Software Configuration Procedures](#)" on page 35. Refer to the *Legato NetWorker Administrator's Guide* for additional details.

4. Install and enable the NetWorker Module for Oracle software using the instructions in the *Legato NetWorker Module for Oracle Installation Guide, Release 4.1*.

To relink the library file on UNIX, use the linking commands listed in the Installation Guide. Shut down and restart Oracle when required. Use the correct *libnwor.** library file.

To verify the version of NetWorker Module for Oracle installed, check the version of the *nsrnmstart* program file or *libnwor.** library file:

- On UNIX, use one of the following commands, where *filenm* is either the *nsrnmstart* or *libnwor.** filename:

```
# what filenm
# strings filenm | grep "@(#)"
# pkginfo -l LGTONmo (Solaris only)
```

- On Windows:
 - a. Find the *nsrnmstart.exe* or *libwor.dll* file.
 - b. Right-click the file icon and select Properties.
 - c. In the Properties window, select the Version tab and view the file version information.

Compare the library file with the *libnwor.** file in the NetWorker Module for Oracle software package—the two files should be identical. Ensure that Oracle is not linked to another *libnwor.**, *libobk.** (NetWorker BusinessSuite™ Module for Oracle version of *libnwor.**), 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 either the RMAN backup script or the **rman send** command on the operating system command line. For information on how to set the NSR_* environment variables, see

["Appendix A: Environment Variables in the RMAN Session" on page 171.](#) For a simple startup RMAN script, see ["Task 1: Create RMAN Scripts for Manual Backups" on page 50.](#)

If the manual backup *fails*, check the debug files for NetWorker Module for Oracle and the NetWorker server. For NetWorker Module for Oracle debug information, set the NSR_DEBUG_FILE environment variable. For more information, see ["NetWorker Module for Oracle Error Messages" on page 204.](#)

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 61.](#) Customize the **nsrnm** script, as described in ["Task 2: Customize the nsrnm Script" on page 64.](#)

If the manual backup succeeds but the scheduled backup *fails*, set the NSR_SB_DEBUG_FILE environment variable to generate debug information for the scheduled backup. For more information, see ["RMAN Error Messages" on page 203.](#)

RMAN Error Messages

RMAN stores information and RMAN-specific error messages in the log file specified by 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, specify 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 68.](#)

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 following default log file on the Oracle Server host:

- On UNIX: */nsr/applogs/nmo.messages*
- On Windows: *<NetWorker_install_path>\applogs\nmo.messages*, where *<NetWorker_install_path>* is the root directory of the NetWorker installation path

To obtain more debug information for a backup or restore, set the environment variable *NSR_DEBUG_FILE* to the valid pathname of a log file to store the information. If the variable is set to an invalid pathname or the specified file does *not* have write permissions, the debug information is written as follows:

- On UNIX, in the */nsr/applogs/nmosbt.log* file.
Otherwise, the information is *not* written.
- On Windows, in the *<NetWorker_install_path>\applogs\nmosbt.log* file, where *<NetWorker_install_path>* is the root directory of the NetWorker installation path.
Otherwise, the information is *not* written.

The environment variable *NSR_DEBUG_LEVEL* controls the amount of debug information written to the log file specified by *NSR_DEBUG_FILE*. The debug level setting limits only the amount of debug information generated by the three functions—*sbtread()*, *sbtwrite()*, and *sbtpcstatus()*—that are called most often during backups and restores. All the debug messages for other functions are always written to the log file, regardless of the debug level. For more information on *NSR_DEBUG_LEVEL*, see "[NSR_DEBUG_LEVEL](#)" on [page 175](#).

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 debug information is written as follows:

- On UNIX, in the */nsr/applogs/nsrnmstart.log* file.
Otherwise, the information is *not* written.
- On Windows, in the *<NetWorker_install_path>\applogs\nsrnmstart.log* file, where *<NetWorker_install_path>* is the root directory of the NetWorker installation path.
Otherwise, the information is *not* written.

If the `NSR_SB_DEBUG_FILE` environment variable is *not* set in the `nsrnm` script file, the debug information is *not* written. For more information on the `NSR_SB_DEBUG_FILE` variable, see "[NSR_SB_DEBUG_FILE](#)" on page 69.

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*.

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 171.

[Table 11](#) describes the main NetWorker Module for Oracle error messages and recommended actions to resolve the associated problems.

Table 11. NetWorker Module for Oracle Error Messages (Part 1 of 12)

Error Message	Description	Resolution
nwora_do_cfx_lookup: The lookup of ' <i>backup_piece_name</i> ' on server ' <i>NetWorker_server</i> ' failed - ' <i>reason</i> '.	NetWorker Module for Oracle could not locate <i>backup_piece_name</i> in the indexes due to the <i>reason</i> . The indexes might be corrupted.	Run the nsrck program to resolve any corruption of the indexes.
nwora_do_mmdb_lookup: Could not get the volume information.	NetWorker Module for Oracle located the media database record, but could not obtain any volume information for it.	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the volume information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.

Table 11. NetWorker Module for Oracle Error Messages (Part 2 of 12)

Error Message	Description	Resolution
nwora_do_mmdb_lookup: There is no SS in the MMDB for time ' <i>save_time</i> ' on server ' <i>NetWorker_server</i> ' .	NetWorker Module for Oracle could not locate a media database record for the save time. The record is probably missing.	Enter the mminfo command to verify the status of the media database record.
nwora_get_metadata: Cannot decode BRC metadata.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker Module for Oracle backup entries were not recorded correctly in the NetWorker indexes. • The NetWorker indexes are corrupted. 	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the backup information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.
nwora_get_metadata: Incorrect size of SBTPC metadata stored in saverec (size: 2).	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker Module for Oracle backup entries were not recorded correctly in the NetWorker indexes. • The NetWorker indexes are corrupted. 	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the backup information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.
nwora_get_metadata: The NWORA meta data could not be encoded.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker Module for Oracle backup entries were not recorded correctly in the NetWorker indexes. • The NetWorker indexes are corrupted. 	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the backup information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.

Table 11. NetWorker Module for Oracle Error Messages (Part 3 of 12)

Error Message	Description	Resolution
nwora_get_metadata: The NWORA meta data is too small to contain the magic number.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker Module for Oracle backup entries were not recorded correctly in the NetWorker indexes. • The NetWorker indexes are corrupted. 	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the backup information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.
nwora_get_metadata: The NWORA sinfo handle contains no meta data.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker Module for Oracle backup entries were not recorded correctly in the NetWorker indexes. • The NetWorker indexes are corrupted. 	Restart the NetWorker daemons, and enter the mminfo and nsrinfo commands to verify whether the backup information is in the indexes. Run the nsrck program to resolve any corruption of the indexes.
nwora_index_cfx_pconn: A connection to NW server ' <i>NetWorker_server</i> ' could not be established because ' <i>reason</i> ' .	NetWorker Module for Oracle could not establish a connection to the NetWorker indexes due to the <i>reason</i> . This was probably caused by the server daemons being shutdown.	Implement the problem correction that is listed in the <i>reason</i> .
nwora_index_cfx_pconn: The NW authentication for client ' <i>NetWorker_client</i> ' was refused by server ' <i>NetWorker_server</i> ' because ' <i>reason</i> ' .	NetWorker Module for Oracle could not obtain the authentication required to connect to the NetWorker indexes due to the <i>reason</i> . This was probably caused by the client not having permission to browse the indexes on the server.	Implement the problem correction that is listed in the <i>reason</i> .

Table 11. NetWorker Module for Oracle Error Messages (Part 4 of 12)

Error Message	Description	Resolution
nwora_index_cfx_start: A connection to NW server ' <i>NetWorker_server</i> ' could not be established because ' <i>reason</i> ' .	NetWorker Module for Oracle could not establish a connection to the NetWorker indexes due to the <i>reason</i> . This was probably caused by the server daemons being shutdown.	Implement the problem correction that is listed in the <i>reason</i> .
nwora_index_cfx_start: The NW authentication for client ' <i>NetWorker_client</i> ' was refused by server ' <i>NetWorker_server</i> ' because: <i>reason</i> .	NetWorker Module for Oracle could not obtain the authentication required to connect to the NetWorker indexes due to the <i>reason</i> . This was probably caused by the client not having permission to browse the indexes on the server.	Implement the problem correction that is listed in the <i>reason</i> .
nwora_index_evaluate_cfx_lookup_results: Could not locate the NWORA save file ' <i>backup_piece_name</i> ' on server ' <i>NetWorker_server</i> ' .	NetWorker Module for Oracle could not locate an index record for the backup piece. The index record is probably missing.	Enter the mminfo and nsrinfo commands to verify the status of the index record.
nwora_index_evaluate_cfx_lookup_results: Could not locate the NWORA save time ' <i>save_time</i> ' on server ' <i>NetWorker_server</i> ' .	NetWorker Module for Oracle could not locate an index record for the save time. The index record is probably missing.	Enter the mminfo and nsrinfo commands to verify the status of the index record.
nwora_index_evaluate_cfx_lookup_results: The record obtained has the wrong save time ' <i>save_time_1</i> ' . The save time queried was ' <i>save_time_2</i> ' .	NetWorker Module for Oracle located an index record, but it has the wrong save time. The indexes might be corrupted.	Restart the NetWorker daemons, and run the nsrck program to resolve any corruption of the indexes.

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Table 11. NetWorker Module for Oracle Error Messages (Part 5 of 12)

Error Message	Description	Resolution
nwora_index_make_mmdb_connection: Cannot connect to media index server ' <i>NetWorker_server</i> ' .	NetWorker Module for Oracle could not establish a connection to the media database. This was probably caused by one of the following conditions: <ul style="list-style-type: none"> • <i>NetWorker_server</i> is specified incorrectly for the operation. • The NetWorker server daemons are shutdown. 	Based on the condition, perform one of the following: <ul style="list-style-type: none"> • Specify the correct <i>NetWorker_server</i> for the operation. • Start the NetWorker server daemons.
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.	Change the format option string of the RMAN command to produce a unique backup name, and restart the backup operation.
nwora_open_backup: browse time <i>date</i> not in future.	The value of the NSR_SAVESET_BROWSE environment variable is less than or equal to the current date.	Check the value of the NSR_SAVESET_BROWSE environment variable in the RMAN script.
nwora_open_backup: expiration time <i>date</i> not in future.	The value of the NSR_SAVESET_RETENTION environment variable is less than or equal to the current date.	Check the value of the NSR_SAVESET_RETENTION environment variable in the RMAN script.
nwora_open_backup: invalid browse time: <i>date</i> .	The NSR_SAVESET_BROWSE environment variable has an invalid <i>date</i> value.	Check the NSR_SAVESET_BROWSE environment variable in the RMAN script. It should have a value in the NetWorker date format.

Table 11. NetWorker Module for Oracle Error Messages (Part 6 of 12)

Error Message	Description	Resolution
nwora_open_backup: invalid expiration time: <i>date</i> .	The NSR_SAVESET_RETENTION environment variable has an invalid <i>date</i> value.	Check the NSR_SAVESET_RETENTION environment variable in the RMAN script. It should have a value in the NetWorker date format.
nwora_open_backup: unable to start save session with server ' <i>NetWorker_server</i> ' : ' <i>reason</i> ' .	NetWorker Module for Oracle could not establish a save session with the NetWorker server.	Check the <i>Legato NetWorker 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</i> ' : ' <i>reason</i> ' .	NetWorker Module for Oracle could not establish a recover session with the NetWorker server.	Check the <i>Legato NetWorker 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 ' <i>nsrmm</i> ' binary.	NetWorker Module for Oracle could not find the nsrmm binary, which is probably in a nondefault location.	Set the NSR_NWPATH environment variable in either the NWORA resource file or the RMAN script. See "NSR_NWPATH" on page 176.

Table 11. NetWorker Module for Oracle Error Messages (Part 7 of 12)

Error Message	Description	Resolution
nwora_remove_nmo41_ss: Could not find the 'nsrsnapck' binary.	NetWorker Module for Oracle could not find the nsrsnapck binary, which is probably in a nondefault location.	Set the NSR_NWPATH environment variable in either the NWORA resource file or the RMAN script. See "NSR_NWPATH" on page 176 .
nwora_restore_mmdconn: #: could not prepare restore session: 'reason' .	NetWorker Module for Oracle could not connect to the nsrmmmd daemon. The # can be 1 or 2.	Check the <i>Legato NetWorker Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nwora_session_close: could not end session: 'reason' .	NetWorker Module for Oracle could not close the session with the NetWorker server.	Check the <i>Legato NetWorker 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> ' : 'reason' .	Unable to establish a connection with the NetWorker server.	Check the <i>Legato NetWorker Error Message Guide</i> for the <i>reason</i> and follow the given instructions.
nworapc_are_rollbacks_ legal: Forced rollbacks are not supported.	The unsupported value force_rollback was specified for the PowerSnap variable RESTORE_TYPE_ORDER .	Do <i>not</i> specify the force_rollback value for the RESTORE_TYPE_ORDER variable.

Table 11. NetWorker Module for Oracle Error Messages (Part 8 of 12)

Error Message	Description	Resolution
nworapc_are_rollbacks_legal: Relocation cannot be performed when 'rollback' is listed in the 'RESTORE_TYPE_ORDER' parameter.	A file restore to a new location was attempted during a rollback. Relocation is <i>not</i> supported for a rollback restore.	Do <i>not</i> attempt a file relocation during a rollback restore.
nworapc_check_link_contents: Could not read link - <i>file_name</i> .	The <i>file_name</i> is an invalid symbolic link.	Ensure that the symbolic link is a valid link.
nworapc_determine_restore_paths: Attempted to restore file ' <i>file_name</i> ' to raw device ' <i>device_name</i> ' .	The restore of a regular file to a raw device was attempted. This type of restore is <i>not</i> supported.	Do <i>not</i> attempt to restore a regular file to a raw device.
nworapc_determine_restore_paths: Attempted to restore raw device ' <i>device_name</i> ' to file ' <i>file_name</i> ' .	The restore of a raw device to a regular file was attempted. This type of restore is <i>not</i> supported.	Do <i>not</i> attempt to restore a raw device to a regular file.
nworapc_determine_restore_paths: The raw device ' <i>device_name</i> ' must exist.	A restore was attempted to a raw device that does not exist.	Configure the required raw device file and restart the restore.
nworapc_device_file_lstat: Could not lstat - <i>file_name</i> .	The <i>file_name</i> either does not exist or has invalid permissions.	Ensure that <i>file_name</i> is an existing file with valid permissions.
nworapc_device_file_lstat: Could not lstat secondary link - <i>file_name</i> .	The <i>file_name</i> is a symbolic link that points to a file that either does not exist or has invalid permissions.	Ensure that the symbolic link points to an existing file with valid permissions.

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Table 11. NetWorker Module for Oracle Error Messages (Part 9 of 12)

Error Message	Description	Resolution
nworapc_follow_links: The full path of ' <i>file_name</i> ' could not be determined.	The destination directory for <i>file_name</i> might not exist.	Ensure that the destination directory for <i>file_name</i> exists.
nworapc_fsprobe: Unidentified data source - <i>file_name</i> .	NetWorker Module for Oracle could not determine whether <i>file_name</i> is a regular file or a raw device.	Ensure that <i>file_name</i> is either a regular file or a raw device, as required.
nworapc_prepare_staging_area: Error creating staging directory ' <i>.nworapc</i> '.	During a proxy restore of a regular file, the permissions of the destination directory might be invalid.	Ensure that the destination directory has valid permissions.
nworapc_prepare_staging_area: The file ' <i>file_name</i> ' cannot be removed from the staging directory (2).	During a proxy restore of <i>file_name</i> , the file was found to already exist in the <i>.nworapc</i> subdirectory, probably left there by a previous failed restore.	Remove the <i>file_name</i> file from the <i>.nworapc</i> subdirectory and restart the proxy restore.
nworapc_relocatedir_restore: Could not rename file - <i>/dirpath/.nworapc/file_name</i> to <i>/dirpath/file_name</i> (22).	During a proxy restore of <i>file_name</i> , NetWorker Module for Oracle could not move the file from the <i>.nworapc</i> staging directory to the <i>/dirpath</i> destination directory. The file might <i>not</i> have been restored properly.	Ensure that the <i>/dirpath</i> destination directory has permissions that enable the file to be moved there during the restore, and then restart the restore.
nworapc_relocatedir_validate: Cannot unlink original file - <i>file_name</i> .	During a file restore, the NetWorker Module for Oracle could not remove the original file on the disk (as required for the restore), probably due to invalid permissions.	Ensure that the original file on the disk has permissions that enable it to be removed, and then restart the restore.

Table 11. NetWorker Module for Oracle Error Messages (Part 10 of 12)

Error Message	Description	Resolution
nworapc_resolve_raw_basename: The destination does not have the same terminating name as the source <i>'device_name'</i> .	A restore of a raw device was attempted to a location with a different basename from the backed-up source.	Restore the raw device to a location with the same basename as the backed-up source.
sbtbackup: Oracle pool is not supported.	NetWorker Module for Oracle does not support Oracle pools. Only NetWorker pools are supported.	Remove the pool option of the backup command in the RMAN script or set the pool option to zero. See " The pool Option of the backup Command " on page 181.
sbtcommand: <i>string</i> should be in format: KEY=(xxxxxx).	Invalid syntax of string in the RMAN send command.	For the correct send command syntax, see " The send Command " on page 181.
sbtbackup: Could not obtain NSR_ORACLECAT_MODE from NWORA resource file.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NWORA resource file does not exist. • The NWORA resource file has incorrect permissions. • The NWORA resource file is corrupted. 	Based on the condition, perform one of the following: <ul style="list-style-type: none"> • If the NWORA resource file does not exist, create the file. • Ensure that the NWORA resource file has correct permissions. • If the NWORA resource file is corrupted, recreate the file. For more information, see " The NWORA Resource File " on page 152.
sbtbackup: The NWORA resource NSR_ORACLECAT_MODE is in the 'undetermined' state.	In the NWORA resource file, NSR_ORACLECAT_MODE is set to the default value of undetermined.	Set the value of NSR_ORACLECAT_MODE to either enabled or disabled (as required) by using the nsrnmoadmin command.

Table 11. NetWorker Module for Oracle Error Messages (Part 11 of 12)

Error Message	Description	Resolution
sbtpcbbackup: The ORACLE_SID must be set when performing proxy copy backups.	The ORACLE_SID variable is not set in the nsrnm script used for the proxy backup.	In the nsrnm script, set the ORACLE_SID variable to the SID value of the Oracle database.
sbtpcquerybackup: Cannot back up object <i>file_name</i> with proxy copy.	The RMAN backup command includes the proxy only option, and the <i>file_name</i> object does <i>not</i> reside on a primary storage device that the PowerSnap Module supports.	When the backup command includes the proxy only option, ensure that the <i>file_name</i> object resides on a primary storage device that the PowerSnap Module supports.
sbtpcquerybackup: Could not initialize BRCAPI connection.	The PowerSnap master program, nsrpsd , might not be running.	Ensure that the PowerSnap program, nsrpsd , is running prior to a proxy operation. For more information, refer to the appropriate <i>NetWorker PowerSnap Module Installation and Administrator's Guide</i> .
sbtpcquerybackup: Could not initialize proxy session.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker server is shutdown. • The NetWorker server is not connected to the network. • The NetWorker server does not have a NetWorker Module for Oracle license. • The NetWorker Module for Oracle configuration file for proxy backups is missing. 	Based on the condition, perform one of the following: <ul style="list-style-type: none"> • Start the NetWorker server. • Ensure that the NetWorker server is connected to the network. • Ensure that the NetWorker server contains the required NetWorker Module for Oracle license. • Ensure that the NetWorker Module for Oracle configuration file exists.
sbtpcquerybackup: The <i>file_name</i> file is specified multiple times for the backup.	The backup commands in the RMAN script specify the same filename more than once.	Ensure that the backup commands in the RMAN script specify a filename only once.

Table 11. NetWorker Module for Oracle Error Messages (Part 12 of 12)

Error Message	Description	Resolution
sbtpcquerybackup: The <i>file_name</i> file is specified multiple times for the restore.	The restore commands in the RMAN script specify the same filename more than once.	Ensure that the restore commands in the RMAN script specify a filename only once.
sbtpcqueryrestore: Could not initialize proxy session.	The error was caused by one of the following conditions: <ul style="list-style-type: none"> • The NetWorker server is shutdown. • The NetWorker server is not connected to the network. • The NetWorker server does not have a NetWorker Module for Oracle license. • The NetWorker Module for Oracle configuration file for proxy backups is missing. 	Based on the condition, perform one of the following: <ul style="list-style-type: none"> • Start the NetWorker server. • Ensure that the NetWorker server is connected to the network. • Ensure that the NetWorker server contains the required NetWorker Module for Oracle license. • Ensure that the NetWorker Module for Oracle configuration file exists.
sbtpcvalidate: Backup is not started by Snapshot savegrp.	In the NetWorker Group resource for the proxy backup, the Snapshot attribute is <i>not</i> set to True.	In the NetWorker Group resource for the proxy backup, set the Snapshot attribute to True.

D

Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to Legato NetWorker products.

administrator	The person normally responsible for installing, configuring, and maintaining NetWorker software.
API	An abbreviation for application programming interface, a standard set of computer library routines designed to accomplish a particular set of tasks.
archived redo log	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 redo log .
attribute	A feature of a NetWorker resource. It is a service or information that the resource provides.
autochanger	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.

auto media management	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.
backup	The writing of saved data to a volume.
backup group	See <i>group</i> .
backup host	See <i>proxy client host</i> .
backup level	See <i>level</i> .
backup volume	See <i>volume</i> .
bootstrap	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.
browse policy	A policy that determines how long entries for a regular Oracle backup and proxy live backup are retained in the NetWorker client file index.
catalog synchronization	The process that removes a proxy backup entry from the RMAN catalog when the corresponding backup piece is being removed from the NetWorker indexes. Catalog synchronization is enabled by the addition of specific resources to the <i>NWORA resource file</i> .
client	A computer that accesses the NetWorker server to back up or restore files. Clients may be workstations, computers, or file servers.
client file index	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.
cluster	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 <i>high-availability system</i> .

cold Oracle backup	See <i>offline backup</i> .
connection port	The port NetWorker processes use to perform backup and restore sessions through a firewall.
daemon	A program that lies dormant waiting for a specified condition to occur.
DBA	An abbreviation for database administrator, the person normally responsible for installing, configuring, and maintaining Oracle database systems.
deferred live backup	A type of proxy backup where an existing point-in-time copy (snapshot), created during an instant backup, is backed up to secondary storage such as tape. The snapshot is <i>retained</i> on the primary storage.
device	<ol style="list-style-type: none">1. A storage unit that reads from and writes to storage volumes (see <i>volume</i>) during backups and restores. A storage unit can be a tape device, optical drive, <i>autochanger</i>, or file connected to the <i>server</i> or <i>storage node</i>.2. When dynamic drive sharing (DDS) is enabled, refers to the access path to the physical drive.
drive	When dynamic drive sharing (DDS) is enabled, refers to the physical backup object, such as a tape drive, disk, or file. See also <i>device</i> .
enabler code	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.
exit code	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.
expiration date	The date when the volume changes from “read/write” to “read-only.”

expired save set	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.
failover	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.
file index	See client file index .
filesystem	<ol style="list-style-type: none">1. A file tree that is on a specific disk partition or other mount point.2. The entire set of all files.3. A method of storing files.
firewall	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.
full backup	See level .
group	A client or group of clients configured to start backing up files to the NetWorker server at a designated time of day.
high-availability system	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.
hot Oracle backup	See online backup .
immediate live backup	A type of proxy backup where a point-in-time copy (snapshot) is created during an instant backup and <i>immediately</i> backed up to secondary storage such as tape. The snapshot is automatically <i>deleted</i> from the primary storage.

incremental	See level .
index policy	A policy that specifies how long file and data index entries should remain valid. Clients specify which index policies they wish to use.
instance	The combination of Oracle processes that runs each time a database starts up.
instant backup	A type of proxy backup that creates a snapshot of Oracle data as a point-in-time copy on a primary storage unit. See proxy backup .
instant restore	A type of proxy restore that restores Oracle data from a mounted point-in-time copy that was created during an instant backup. See proxy restore .
level	<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">• A <i>full</i> backup backs up all files, regardless of when they last changed.• An <i>incremental</i> backup backs up only files that have changed since the last backup.
library	See autochanger .
license enabler	The enabler code that enables you to run a feature or product.
live backup	<p>One of the following two types of proxy backup:</p> <ul style="list-style-type: none">• deferred live backup• immediate live backup
manual backup	A backup that a user requests from the client's save program. The user specifies participating files, filesystems, and directories. A manual backup does not generate a bootstrap save set.
media	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 volume .

media database	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 volume .
media management library	See MML .
mean time to recover	See MTTR .
MML	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.
MTTR	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.
multiplexing	A NetWorker feature that permits data from more than one save set to be simultaneously written to the same storage device.
NetWorker client	See client .
NetWorker server	See server .
NetWorker storage node	See storage node .
notification	A message generated and sent to the NetWorker administrator about important NetWorker events.
NWORA resource file	A resource file installed during the NetWorker Module for Oracle installation, which must be extended to include specific additional resources to enable proxy backups and (optionally) catalog synchronization.
OEM	Oracle Enterprise Manager Backup Management Tools, which include an optional graphical user interface to the RMAN utility.

offline backup	A backup of Oracle database objects performed while the corresponding Oracle instance is shut down and unavailable to users.
online backup	A backup of Oracle database objects performed while the corresponding Oracle instance is running and available to users.
online indexes	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>).
operator	The person who monitors the server status, loads backup volumes into the server devices, and otherwise executes the day-to-day NetWorker tasks.
Oracle Enterprise Manager	See <i>OEM</i> .
Oracle8i Server	A computer running an Oracle8i release 8.1.x RDBMS. See <i>RDBMS</i> .
Oracle9i Server	A computer running an Oracle9i release 9.x RDBMS. See <i>RDBMS</i> .
override	A NetWorker feature that allows you to configure a different backup level for a specific date listed in a Schedule resource.
parallelism	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.
pathname	A set of instructions to the operating system for accessing a file. <ul style="list-style-type: none">• 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.
physical host	Any one of the nodes (or machines) that form a cluster.
point-in-time copy	A snapshot of Oracle data created on a supported type of primary storage during an instant backup.

- policy** 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.
- For a regular Oracle backup and proxy live backup, the Client resource specifies two policies, a browse policy and a retention policy. For more information, refer to the **nsr_policy (5)** man page or the *Legato NetWorker Command Reference Guide*.
 - For a proxy instant backup, the Group resource specifies a snapshot policy that is configured with a Snapshot Policy resource. For more information, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.
- pool** 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.
- primary storage** A storage subsystem that holds the Oracle source data or its point-in-time copy (snapshot). For information on the supported types of primary storage, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.
- proxy backup** An Oracle data backup that creates a point-in-time copy (snapshot) on primary storage, using the PowerSnap Module software. The snapshot can be *optionally* backed up to secondary storage, with or without deletion of the snapshot on the primary storage. There are two basic types of proxy backup: *instant backup*, *live backup*.
- proxy client host** A computer that is separate from the Oracle Server host, with access to the primary storage unit and running the following software:
- NetWorker client software, and optionally NetWorker server or storage node software.
 - Appropriate PowerSnap Module software.
- During a proxy live backup, either the Oracle Server host or proxy client host backs up an Oracle database point-in-time copy (snapshot) to secondary storage.

proxy restore	The restore of Oracle data that was backed up during a proxy backup. A proxy restore requires PowerSnap Module software. There are three types of proxy restore: <i>instant restore</i> , <i>rollback restore</i> , <i>restore from secondary storage</i> .
purging	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.
RDBMS	An abbreviation for Relational Database Management System, which refers to the primary architecture of an Oracle database.
recover	<ol style="list-style-type: none">1. A recovery method that re-creates an image of the client filesystems and database on the NetWorker server.2. An Oracle datafile recovery method that uses Oracle commands to apply archived redo logs and online redo logs to make the database consistent.
Recovery Catalog	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 <i>target database</i> schema. RMAN maintains and uses the information in the Recovery Catalog to determine how to perform requested backup and restore operations.
Recovery Manager	See <i>RMAN</i> .
recyclable save set	A save set whose browse and retention policies have been reached; therefore, the save set has been removed from the media database.
recyclable volume	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.
redo log	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 <i>archived redo log</i> .

remote device	A storage device that is attached to a NetWorker storage node.
RMAN	An abbreviation for Recovery Manager, the Oracle utility (in 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.
RMAN catalog	The RMAN repository that stores information about each Oracle backup piece in either a control file of the target database or an RMAN recovery catalog.
RPC	An abbreviation for remote procedure call, which is the protocol the NetWorker server uses to perform client requests over a network.
resource	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.
resource database	A database that contains information about each of the configured backup server's resources.
restore	The process of retrieving individual Oracle datafiles from backup storage and storing the files on disk.
restore from secondary storage	A type of proxy restore that restores a proxy backup from a secondary storage medium, such as tape. See proxy restore .
retention policy	A policy that determines how long save set entries for a regular Oracle backup or proxy live backup are retained in the NetWorker media database.
rollback restore	A type of proxy restore that restores a specific point-in-time copy of Oracle data by using the hardware's particular capabilities. A rollback is a destructive save set restore. See proxy restore .

root	<ol style="list-style-type: none">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.2. (Windows NT/Windows 2000 and UNIX) The top node of the system directory structure; the home directory of the root user.
save set	A group of files or a filesystem from a single client computer backed up onto storage media.
save set ID	An internal identification number that NetWorker software assigns to a save set.
save set status	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.
save stream	The data and save set information being written to a storage volume during a backup. A save stream originates from a single save set.
scanner	A NetWorker utility used to read a backup volume when the online indexes are not available.
secondary storage	A traditional type of backup device such as a tape device. A NetWorker Device resource must be configured for the secondary storage device.
server	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.
server index	A file that lists all the server files that were backed up during a scheduled backup.
service port	The port used by a server or storage node to listen for backup and restore requests from clients through a firewall.
shared disk	The storage disk that is connected between multiple nodes in the cluster.

shell prompt	A cue for input in a shell window where you enter a command.
SID	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.
silo	A repository for holding hundreds or thousands of volumes. Silo volumes are identified by barcodes, not by slot numbers.
skip	A backup level in which designated files are not backed up. See also level .
snapshot	A point-in-time copy of Oracle data created on a supported type of primary storage during an instant backup.
snapshot policy	A policy configured through a NetWorker Snapshot Policy resource, to control the lifecycle of snapshots created during instant backups. A snapshot policy specifies the frequency of instant backups and how long snapshots are retained before being recycled.
ssid	See save set ID .
stand-alone device	A storage device that contains a single drive for backing up data.
storage device	The hardware that reads and writes data during backup, restore, or other NetWorker operations.
storage node	A storage device physically attached to a computer other than the NetWorker server, whose backup operations are administered from the controlling NetWorker server.
system administrator	The person normally responsible for installing, configuring, and maintaining NetWorker software.
tablespace	An Oracle database structure that comprises one or more datafiles.

target database	The Oracle database that has been backed up or that the NetWorker server is to back up as a safeguard against data loss.
TNS	An abbreviation for Transparent Network Substrate, an Oracle networking technology that provides a single interface to all standard network protocols.
traditional restore	A type of proxy restore that restores a point-in-time copy from a secondary storage medium, such as tape. A traditional restore is performed as a regular Oracle restore. See proxy restore .
traditional storage	See secondary storage .
versions	The date-stamped collection of available backups for any single file.
volume	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).
volume ID	The internal identification assigned to a backup volume by NetWorker software.
volume name	The name you assign to a backup volume when it is labeled.
volume pool	See pool .

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