

NetWorker™

Module for Oracle®

Release 4.2
Multiplatform Version
Administrator's Guide

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Preface

This guide is part of the Legato NetWorker[®] Module for Oracle release 4.2 documentation set. For a complete list of documents related to the use of this product, see "[Related Documentation](#)" on page 18.

For the most up-to-date information on the features of NetWorker[™] Module for Oracle (NMO), refer to the Release Notes. This document is available at www.legato.com.

Audience

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

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

Organization

This guide is organized as follows:

- "[Chapter 1: Introduction](#)" on page 21 provides an overview of the main features of NMO release 4.2.
- "[Chapter 2: Software Configuration Procedures](#)" on page 35 provides information on the procedures for configuring NMO backups and restores.
- "[Chapter 3: Manual Oracle Backups](#)" on page 47 provides information on how to set up and run manual NMO backups.

- ["Chapter 4: Scheduled Oracle Backups" on page 59](#) provides information on how to set up and run scheduled NMO backups.
- ["Chapter 5: Restore and Recover Procedures" on page 89](#) provides information on how to restore and recover from NMO backups.
- ["Chapter 6: Cluster, OPS, and RAC Systems" on page 101](#) provides information on the NMO support of cluster, Oracle Parallel Server (OPS), and Real Application Cluster (RAC) systems.
- ["Chapter 7: Proxy Oracle Backups and Restores" on page 115](#) provides information on how to configure and run snapshot-based proxy backups and restores of Oracle data that involve NMO.
- ["Appendix A: Parameters in the RMAN Session" on page 179](#) provides information on the parameters that can be used for NMO backups and restores.
- ["Appendix B: RMAN Commands" on page 191](#) provides information on the RMAN commands that concern the NMO software.
- ["Appendix C: Oracle9i and Oracle10g Support" on page 205](#) provides information on RMAN features introduced in Oracle9i and Oracle10g that concern the NMO software.
- ["Appendix D: Troubleshooting and Error Messages" on page 215](#) provides information on troubleshooting guidelines, RMAN error messages, and NMO error messages.

Related Documentation

The information in this guide may be supplemented with the following resources:


- The appropriate versions of the following NetWorker documentation:
 - *NetWorker Module for Oracle Installation Guide*
 - *NetWorker Module for Oracle Release Notes*
 - *NetWorker PowerSnap™ Module Installation and Administrator's Guide*
 - *NetWorker Administrator's Guide*
 - *NetWorker Release Supplement*
 - NetWorker Administrator program Online Help
 - *NetWorker Command Reference Guide* (for NetWorker commands)
 - *NetWorker Module for Oracle Command Reference Guide* (for NMO commands)

- UNIX man pages (for NetWorker and NMO commands)
- Oracle backup and recovery documentation

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

Conventions Used in This Guide

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
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	 Important: Use the no_verify option with extreme caution.

Where to Get Help

EMC® support, product, and licensing information can be obtained as follows.

Technical Support

For information about software patches, technical documentation, and support programs:

- Customers *with* an active support agreement, go to:
<http://softwaresupport.EMC.com>
- Customers *without* an active support agreement, please contact Support Sales and Renewals.

Support Sales, Renewals, and Licensing

- For additional information about EMC storage products and services, go to:
<http://www.legato.com/support/contact/index.htm>
- To license and register this product, go to:
<http://www.legato.com/support/licensing>

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 - To tell us how you prefer to use documentation, click Document Survey.

Chapter 1: Introduction

This chapter describes the main features of the NetWorker server and client, NetWorker Module for Oracle (NMO), 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.

This chapter includes the following main sections:

- ["Revision History" on page 22](#)
- ["Terminology Used in This Guide" on page 22](#)
- ["Importance of Backing Up Mission-Critical Data" on page 23](#)
- ["About the NMO Software" on page 23](#)
- ["About the NetWorker Software" on page 24](#)
- ["About the NetWorker PowerSnap Module Software" on page 25](#)
- ["Oracle Backup and Recovery System" on page 26](#)
- ["How NMO Backs Up Data" on page 28](#)
- ["How NMO Restores Data" on page 32](#)
- ["Disaster Recovery Preparation" on page 34](#)

Revision History

The following table summarizes the changes since the initial release of this document.

Date	Revision Description
June 22, 2006	In the section " Setting the NSR* Parameters " on page 179, changed the information in the last paragraph about setting an NSR* parameter with the parms option on Windows.
March 13, 2006	In the section " Oracle10g Support " on page 212, added information on the term Oracle ASM.
July 11, 2005	In the section " About Scheduled Oracle Backups " on page 60, clarified the NetWorker 7.2 software requirements for the NetWorker Configuration Wizard, which is used to configure scheduled NMO backups.
May 5, 2005	Initial release of this document.

Terminology Used in This Guide

Consider the following terminology used in this guide:

- Unlike the NetWorker software, which uses the term *recover* for *all* data retrieval activities, 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.

- Throughout this guide, references to *regular* backups and restores indicate *non-proxy* backups and restores.
- "Windows" refers to all the supported Microsoft Windows operating systems, unless specified otherwise.

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.

About the NMO Software

The NMO 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

NMO provides the following features:

- Capability to integrate database and file system 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, NMO 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 NMO, with the NetWorker server and the appropriate NetWorker PowerSnap Module software.

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

About the NetWorker Software

The 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 *NetWorker Installation Guide*.
- Configuring and using NetWorker software, refer to the *NetWorker Administrator's Guide*.

About the NetWorker PowerSnap Module Software

The NetWorker PowerSnap Module software works with the NetWorker server and NMO 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 NMO and PowerSnap Module software:

- See "[Chapter 7: Proxy Oracle Backups and Restores](#)" on page 115.
- Refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

For a complete list of supported PowerSnap Modules, refer to the current *Software Compatibility Guide* at www.legato.com.

Oracle Backup and Recovery System

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

The NMO 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 the following:

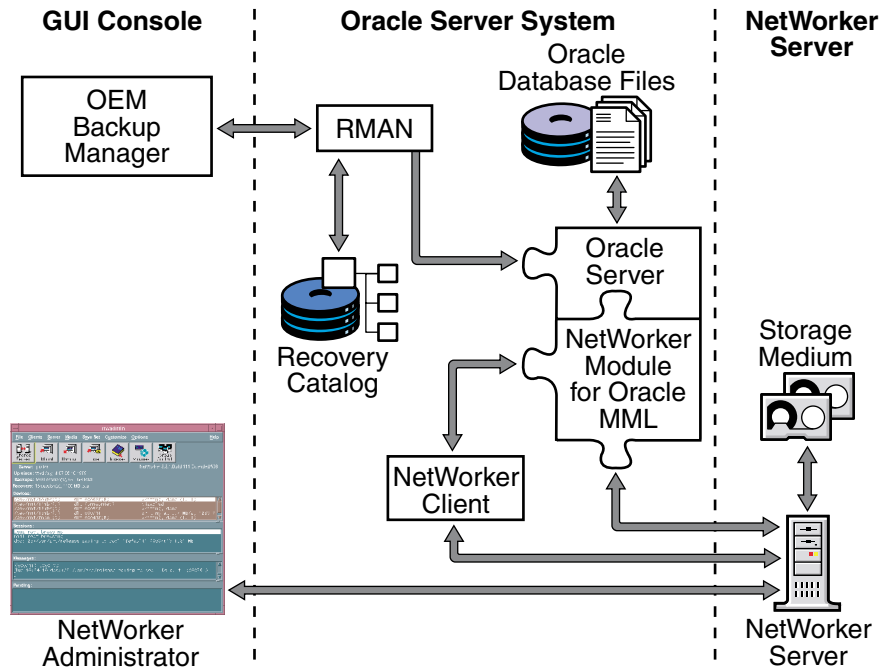
- Oracle Server
- RMAN
- Recovery Catalog (optional)
- Backup Management Tools for Oracle Enterprise Manager (OEM) (optional)

The NetWorker software consists of the following components:

- NetWorker server
- NetWorker client
- NMO

[Figure 1 on page 27](#) illustrates the architecture of the regular Oracle backup and recovery system, and shows the functional relationship between the NetWorker and Oracle software components. The NetWorker Administrator program (used to configure the NetWorker resources) and the OEM Backup Manager can be optionally located on a separate platform, referred to as the GUI console in [Figure 1 on page 27](#).

Figure 1. Regular Oracle Backup and Recovery System



Oracle Recovery Manager

During the Oracle backup and restore operations, NMO acts as an intermediary between the NetWorker server and Oracle Recovery Manager (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

- Checks 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 NMO Backs Up Data

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

To provide storage management services for Oracle Server data, NMO 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 NMO 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 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 MML.
2. The NetWorker server 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.

Regular Manual Oracle Backup

A manual Oracle backup is initiated by an Oracle backup utility, Recovery Manager (RMAN) or Oracle Enterprise Manager (OEM). NMO 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 47](#).

When the RMAN utility is invoked for a backup, Oracle Server processes call the NMO media management library software routines to initiate the backup.

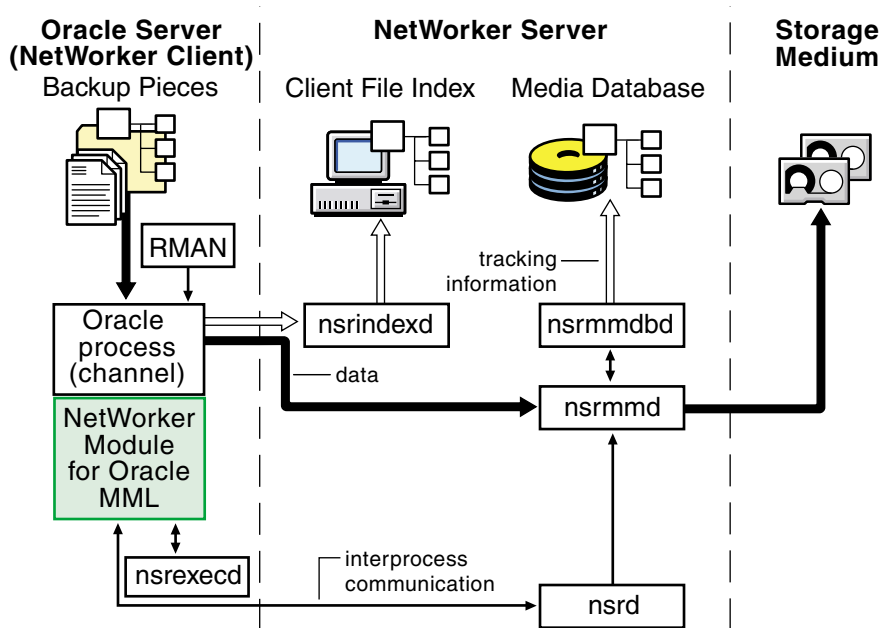
A regular manual Oracle backup includes the following interactions:

1. The Oracle Server processes (one for each allocated channel) contact the **nsrexecd** service to obtain the NetWorker client information.
2. The Oracle Server processes contact the main NetWorker service, **nsrd**, to obtain the required authorization and the identifier of the **nsrmmd** process that manages the requested backup device.
3. The Oracle Server processes send the backup data to the NetWorker media service, **nsrmmd**, to store on the appropriate backup volumes.

4. Tracking information is stored in the NetWorker online indexes:
 - The **nsrmmmd** 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 30 shows how the Oracle Server, NetWorker server, and NMO processes interact during a regular manual Oracle backup.

Figure 2. 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.

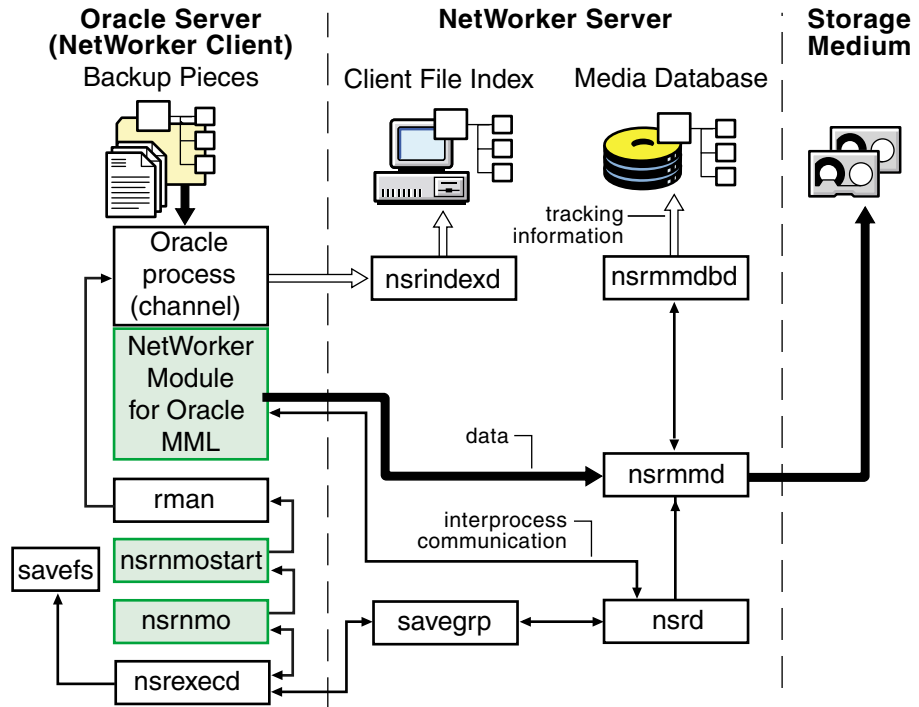
A regular scheduled Oracle backup includes the following interactions:

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 parameters and invokes the NMO 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 29](#).

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 32](#) shows how the Oracle Server, NetWorker server, and NMO processes interact during a regular scheduled Oracle backup.

Figure 3. Regular Scheduled Oracle Backup



How NMO Restores Data

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

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.

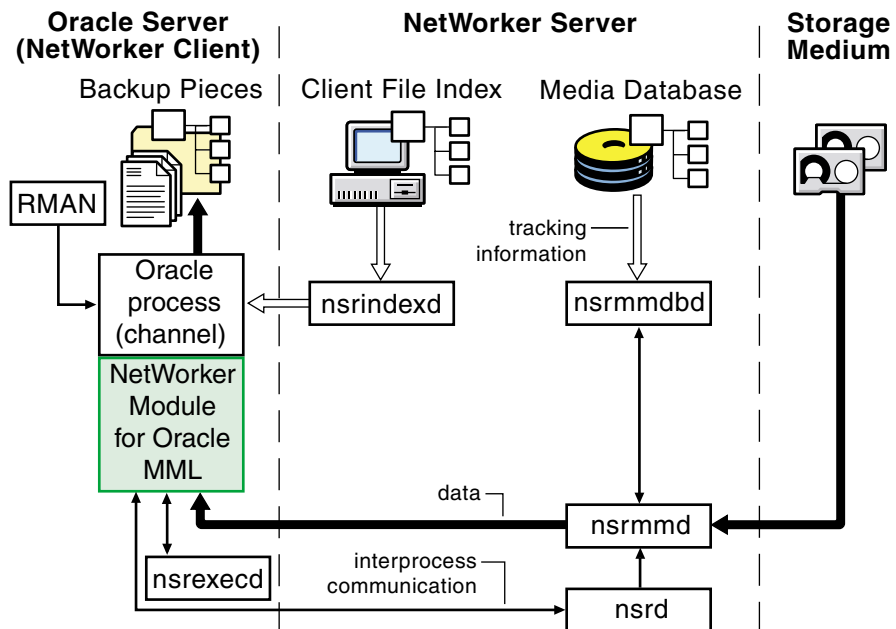
The RMAN utility starts Oracle Server processes on the target database. These Oracle Server processes initiate the restore by calling NMO media management library software routines.

A regular Oracle data restore includes the following interactions:

1. The 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 NMO media management library.
6. The Oracle Server processes write the data to the disk.

Figure 4 on page 33 shows how the Oracle Server, NetWorker server, and NMO processes interact during a regular Oracle data restore.

Figure 4. 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.

Disaster Recovery Preparation

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.
- 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.
- Back up the archived redo logs frequently between database backups.
- After 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 53.
- In addition to backing up the Oracle database, back up other important Oracle files (for example, *init<oracle_sid>.ora*) by using regular file system backups. For more information, refer to the following:
 - Oracle backup and recovery documentation
 - *NetWorker Administrator's Guide*

Chapter 2: Software Configuration Procedures

This chapter describes the available NetWorker Module for Oracle (NMO) configuration options. Procedures to configure the Oracle Server and NetWorker server to perform Oracle backup and restore operations by using the NMO 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 39](#)
- ["Task 4: Configure the NetWorker Client Resource" on page 42](#)
- ["Task 5: Configure the NetWorker Device Resources" on page 44](#)
- ["Task 6: Configure the NetWorker Volume Pools" on page 45](#)
- ["Task 7: Configure Firewall Support" on page 46](#)

Software Configuration Roadmap

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

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

You can use the NetWorker Administrator program to view and configure the required NetWorker resources. For more information on the NetWorker Administrator program, refer to the NetWorker server Online Help and the *NetWorker Administrator's Guide*.

As an alternative to the NetWorker Administrator program, you can use the NetWorker Configuration Wizard to create the RMAN and NMO scripts and NetWorker resources for a scheduled Oracle backup. The configuration wizard requires NetWorker release 7.2 server and client software to be installed. Once the wizard creates a NetWorker resource, that resource can be edited by using the NetWorker Administrator program.

- For more information on installation of the configuration wizard, refer to *NetWorker Module for Oracle Installation Guide*.
- For more information on configuration of scheduled Oracle backups with the configuration wizard, see ["About Scheduled Oracle Backups" on page 60](#).
- For more information on the configuration wizard, refer to the *NetWorker, Release 7.2, Release Supplement*.

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 NMO operations. See ["Task 3: Verify the NetWorker User Group Privileges" on page 39](#).
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 44](#).
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 *NetWorker Administrator's Guide*.

7. Configure firewall support, if required. See "[Task 7: Configure Firewall Support](#)" on page 46.
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 101.

Task 1: Verify the Oracle Server Configuration

The Oracle Server system must be properly installed and configured before the NetWorker server and NMO 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 appropriate *Oracle Installation Guide*.
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, Oracle Net in either Oracle9i or Oracle10g.
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 is available at the Oracle web site.

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 *NetWorker Administrator's Guide*.

Specifying the Required NetWorker Privileges

Certain NMO operations require specific NetWorker privileges. 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 39](#).

NMO attempts to remove an entry from the NetWorker index in the following cases:

- With Oracle9i or Oracle10g, if the RMAN **delete** command is used.
- If a *running* Oracle backup is canceled according to the instructions in one of the following sections:
 - ["Canceling a Manual Oracle Backup" on page 54](#)
 - ["Canceling a Scheduled Oracle Backup" on page 82](#)

Note: If the Oracle user is *not* granted the required NetWorker privileges in these cases, NMO 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 NMO to remove an entry from the NetWorker index, ensure that the Oracle user has the required NetWorker privileges. 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 39](#).

Task 3: Verify the NetWorker User Group Privileges

The NetWorker server release 7.x includes an access control feature. 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
- Back Up Local Data

The default user group configurations are sufficient for RMAN backup, restore, and crosscheck operations that use NMO. 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.

2

With NetWorker server release 7.x, verify that the required user group privileges exist for the NMO operations, as described in [Table 2 on page 40](#). For information on how to modify existing privileges, refer to the *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, Back Up 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 NMO 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, Back Up Local Data
Regular scheduled Oracle backup	Oracle user on the Oracle Server	Monitor NetWorker ^a , Recover Local Data, Back Up Local Data
	Root user, or a member of the Microsoft Windows Administrators group, on the Oracle Server	Monitor NetWorker, Back Up Local Data

**Table 2. User Group Privileges Required for NMO Operations
(Part 2 of 2)**

Operation	NetWorker Users	Required User Group Privileges
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
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 and later, the Oracle user does not require the Monitor NetWorker privilege for any NMO 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 that indicates the required user group privileges. For more information on NetWorker user groups and setting user group privileges, refer to the *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 NMO software can be used for Oracle backups and restores, a NetWorker Client resource must be configured for the Oracle Server host.

You can use the NetWorker Administrator program to create the required Client resource. For more information on how to create a Client resource and its attributes with the NetWorker Administrator program, refer to the NetWorker server Online Help and the *NetWorker Administrator's Guide*.

As an alternative, you can use the NetWorker Configuration Wizard to create the Client resource for a scheduled backup, as described "[About Scheduled Oracle Backups](#)" on page 60. Once the wizard creates a resource, that resource can be edited by using the NetWorker Administrator program.

To configure the NetWorker Client resource for an Oracle Server, refer to [Table 3 on page 42](#) for the information required in each attribute of the resource.

For information on how to configure the Client resource for proxy Oracle backups, see "[Configuring the NetWorker Client Resource](#)" on page 140.

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

Attribute	Description
Name	Specifies the hostname of the Oracle Server host.
Backup Command	Specifies the name of a single customized <code>nsrnm</code> script to be used for a scheduled Oracle backup. For more information, see " Task 5: Configure the Client Resource for a Scheduled Oracle Backup " on page 76.

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

Attribute	Description
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 scheduled Oracle backups.</p> <p>Note: For a scheduled Oracle backup, if the parameter <code>NSR_SAVESET_BROWSE</code> is set as described in "Appendix A: Parameters in the RMAN Session" on page 179, its value overrides the Browse Policy attribute setting in the Client resource.</p> <p>To set a specific browse policy for a <i>manual</i> Oracle backup, use the parameter <code>NSR_SAVESET_BROWSE</code>. If the parameter is <i>not</i> set, the NetWorker server uses the most appropriate value for the browse policy.</p>
Group	<p>Specifies the NetWorker backup group to be used for a scheduled Oracle backup.</p> <p>For more information, see "Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 76.</p>
Remote Access	<p>Specifies the fully qualified IP name of a remote system, to enable restores of the Oracle Server backups to that remote system.</p>
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 scheduled Oracle backups.</p> <p>Note: For a scheduled Oracle backup, if the parameter <code>NSR_SAVESET_RETENTION</code> is set as described in "Appendix A: Parameters in the RMAN Session" on page 179, its value overrides the Retention Policy attribute setting in the Client resource.</p> <p>To set a specific retention policy for a <i>manual</i> Oracle backup, use the parameter <code>NSR_SAVESET_RETENTION</code>. If the parameter is <i>not</i> set, the NetWorker server uses the most appropriate value for the retention policy.</p>

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

Attribute	Description
Save Set	<p>Specifies the complete pathname of each RMAN script to be used for a scheduled Oracle backup, preceded by <i>RMAN</i>:</p> <p>For more information, see "Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 76.</p>
Schedule	<p>Specifies the NetWorker backup schedule to be used for a scheduled Oracle backup.</p> <p>For more information, see "Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 76.</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 ["Preparation for Oracle Data Restore"](#) on page 89.

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.

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, you can use the NetWorker Administrator program. For more information on storage devices and how to configure the NetWorker Device resources with the NetWorker Administrator program, refer to the NetWorker server Online Help and the *NetWorker Administrator's Guide*.

As an alternative, you can use the NetWorker Device Configuration Wizard to configure a Device resource, if NetWorker release 7.2 server and client software is installed. For more information on the wizard, refer to the *NetWorker, Release 7.2, Release Supplement*.

For a complete list of the storage devices that the NetWorker server supports, refer to the *Hardware Compatibility Guide* available at www.legato.com.

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.

2

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: With NMO, 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 *NetWorker Administrator's Guide*.

Setting the NSR_DATA_VOLUME_POOL Parameter

To send the data from a manual or scheduled Oracle backup to a specific pool, the parameter `NSR_DATA_VOLUME_POOL` 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 47](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 59](#)

Note: In the case of proxy backups, the parameter is used to specify the volume pool for *live backups only* (backups to secondary storage only). The parameter 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 139](#).

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 191](#).

Note: The **set duplex** command is no longer supported, but still functional in Oracle9i. For more information on new Oracle9i duplexing commands, see ["Backup Copies" on page 208](#).

Depending on the value used with the duplexing command in the RMAN script, one or more of the parameters `NSR_DATA_VOLUME_POOL1`, `NSR_DATA_VOLUME_POOL2`, and `NSR_DATA_VOLUME_POOL3` might need to be set.

For more information on the `NSR_DATA_VOLUME_POOL` parameters, see ["Appendix A: Parameters in the RMAN Session" on page 179](#).

Task 7: Configure Firewall Support

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

To configure the firewall that the NMO software uses, follow the firewall configuration instructions in the *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 (NMO) enables manual Oracle backups through either the Oracle Recovery Manager (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 47](#)
- ["Task 1: Create RMAN Scripts for Manual Backups" on page 48](#)
- ["Task 2: Perform the Manual Oracle Backup" on page 51](#)
- ["Using the OEM Backup Management Tools" on page 52](#)
- ["NetWorker Server Bootstrap Backup" on page 53](#)
- ["Archived Redo Log Backups" on page 54](#)
- ["Canceling a Manual Oracle Backup" on page 54](#)
- ["Monitoring Manual Oracle Backups" on page 56](#)

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 48](#).
 2. Run the manual Oracle backup by using the RMAN command line interface. See ["Task 2: Perform the Manual Oracle Backup" on page 51](#).
- To use the OEM Backup Management Tools, see ["Using the OEM Backup Management Tools" on page 52](#).



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 by using the instructions in ["NetWorker Server Bootstrap Backup" on page 53](#).

For information on how to keep track of the status of a manual Oracle backup, see ["Monitoring Manual Oracle Backups" on page 56](#).

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.

With Oracle9i and Oracle10g, use the **send** command to set the parameters in the RMAN script. See ["The send Command" on page 193](#).



Example: RMAN Script for a Manual Oracle Backup

The following 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;
}
```

Note: To prevent backup performance problems with NetWorker release 7.1.x and earlier, 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. With NetWorker server release 7.2 and later, the forward slashes are *not* required in the **format** option. For more information on this issue, refer to the *NetWorker Module for Oracle Release Notes*.

If automatic channel allocation and persistent settings are used, the **backup** command can be run as a stand-alone command. See "[Automatic Channel Allocation](#)" on page 205.

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

If a device is allocated by using the **allocate channel t1 type disk** command (with Oracle correctly configured and NMO uninstalled), backups can be directed to disk files through Oracle's backup implementation.

To ensure that the required NSR* parameters (parameters described in ["Setting the NSR* Parameters" on page 179](#)) are set during an Oracle backup, set them with the following:

- With the RMAN **send** command (*recommended*).
- For automatic channels *only* if the RMAN **send** command cannot be used:
 - With the **parms** option in the **configure channel** command.
 - With the **send** option in the **configure channel** command in the following *only*:
 - In an RMAN backup script that will *not* be scheduled through the NetWorker server.
 - In an RMAN restore script.

Note: The NSR* parameters *cannot* be set with another command, such as **setenv** or **set**, on the operating system command line.

For complete information on setting the NSR* parameters in the RMAN script or session, see ["Appendix A: Parameters in the RMAN Session" on page 179](#).

In the RMAN backup script on [page 49](#), 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 a unique Oracle system-generated filename.

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.



Important: If a backup piece name is *not* unique, the Oracle backup fails.

During a manual backup, the prefix *RMAN:* automatically precedes the backup piece name in the NetWorker media database. For example, if the backup piece name specified in the RMAN script is *accounts_data_file*, the manual backup records the save set name as *RMAN:accounts_data_file* in the media database. The **mminfo** command displays the save set name in this form.

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 information on RMAN commands, see ["Appendix B: RMAN Commands" on page 191](#).

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](#).
- One of the following applies:
 - A volume must be labeled (and mounted as required) in each configured backup device.
 - 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 48](#).

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



Example: Command to Start a Manual Oracle Backup

If the RMAN backup script on [page 49](#) 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\ '
```

On Microsoft Windows, the command to run the RMAN script is `rman.exe`. For more information on the `rman` or `rman.exe` command line options, refer to the appropriate Oracle backup and recovery documentation.

3

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 an NMO 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 (unscheduled) 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 the root user.
 - On a Windows NetWorker server as the Windows system 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:
 - *NetWorker Administrator's Guide* for the particular NetWorker server platform.
 - The **savegrp** entry in the *NetWorker Command Reference Guide*.
 - The **savegrp** man page on UNIX.
- For information on bootstrap backups, refer to the *NetWorker Administrator's Guide*.
- For information on how to use the bootstrap backup during a disaster recovery, refer to the *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 112.

For more information on setting up and running archived redo log 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 55](#)
- ["How to Cancel a Nonresponding Oracle Backup" on page 55](#)

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 82](#).

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, NMO 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 62](#).
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

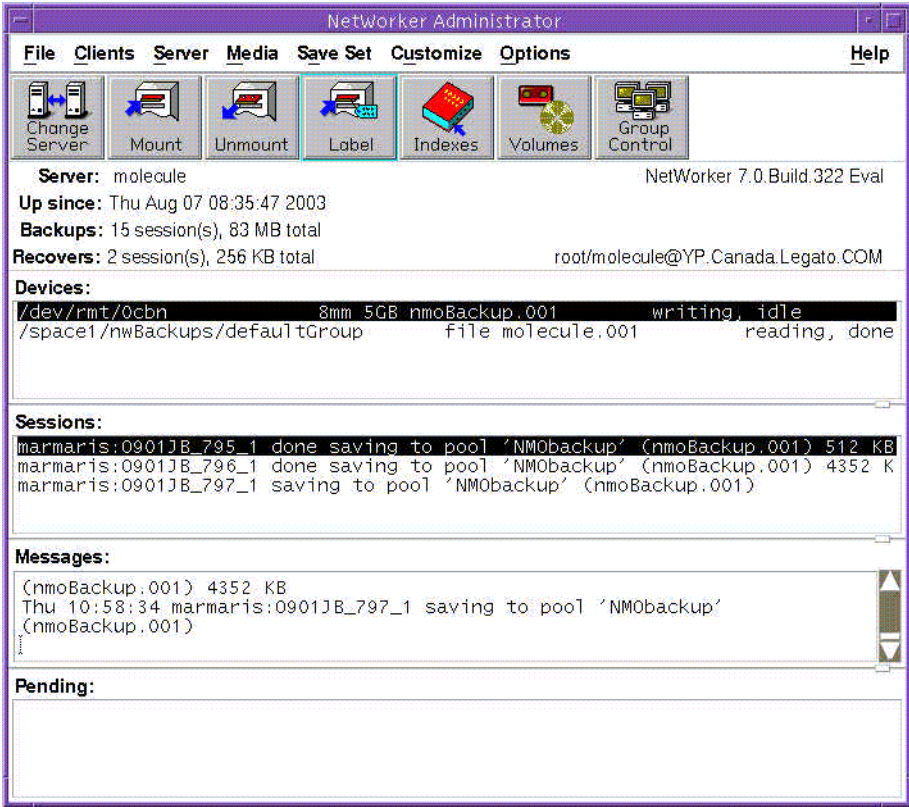
To monitor the status of Oracle backup and restore operations, use the NetWorker Administrator program. The Administrator program displays progress and completion messages that advise when a backup or restore is complete, and information on why a backup or restore cannot proceed.

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

For information on how to obtain RMAN-specific and NMO diagnostic and error messages, see "[Appendix D: Troubleshooting and Error Messages](#)" on [page 215](#).

[Figure 5 on page 57](#) 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. The Sessions section displays progress messages. The Messages section displays completion messages. For more information, refer to *Administrator's Guide*.

Figure 5. Oracle Backup Messages in NetWorker Administrator



3

Chapter 4: Scheduled Oracle Backups

This chapter describes how to use NetWorker Module for Oracle (NMO) 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 *manual* Oracle backup. See the instructions in ["Chapter 3: Manual Oracle Backups" on page 47](#).

This chapter includes the following main sections:

- ["Roadmap for Scheduled Oracle Backups" on page 61](#)
- ["Task 1: Create RMAN Scripts for Scheduled Backups" on page 62](#)
- ["Task 2: Customize the nsrnmo Script" on page 66](#)
- ["Task 3: Configure a NetWorker Backup Schedule" on page 75](#)
- ["Task 4: Configure a NetWorker Backup Group" on page 75](#)
- ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup" on page 76](#)
- ["Testing a Scheduled Oracle Backup" on page 81](#)
- ["Archived Redo Log Backups" on page 82](#)
- ["Canceling a Scheduled Oracle Backup" on page 82](#)
- ["Monitoring Scheduled Oracle Backups" on page 84](#)
- ["Automation of NSR_SERVER and NSR_GROUP Parameter Settings" on page 84](#)
- ["Scheduled Oracle Backup Information in the NetWorker Indexes" on page 85](#)

About Scheduled Oracle Backups

The most reliable way to protect Oracle data is to configure the NetWorker server to run RMAN on a regular basis, through scheduled backups of the Oracle Server. For example, the scheduled backups might include a daily backup of the archived logs and a weekly full backup of the Oracle database.

The NetWorker server works with NMO 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 containing details on what Oracle data to back up and how.

Before configuring scheduled Oracle backups, the Oracle and NetWorker systems must be properly set up, as described in the "[Software Configuration Roadmap](#)" on page 35. The NetWorker Server, Device, and Pool resources must be in place, and the required backup volumes must be labeled and mounted in the storage devices.

To configure the scheduled Oracle backups, create the required RMAN and NMO scripts and configure the NetWorker Client and Group resources. You can create the scripts and resources by either of the following methods:

- Manually create the RMAN and NMO scripts, and use the NetWorker Administrator program to configure the Client and Group resources. For more information, see "[Roadmap for Scheduled Oracle Backups](#)" on page 61.
- Use the NetWorker Configuration Wizard to create the RMAN and NMO scripts and the Client and Group resources. The configuration wizard requires NetWorker release 7.2 server and client software to be installed on the appropriate computers:
 - NetWorker 7.2 server software must be installed on the NetWorker server.
 - NetWorker 7.2 client software must be installed on the NetWorker clients.

Once the wizard creates a NetWorker resource, that resource can be edited by using the NetWorker Administrator program.

- For more information on how to install the configuration wizard, refer to *NetWorker Module for Oracle Installation Guide*.
- For more information on how to run the configuration wizard, refer to the following:
 - *NetWorker, Release 7.2, Release Supplement*
 - Descriptive inline text on the wizard screens
 - What's This Help in the wizard

If you use the configuration wizard, review the information starting with ["Testing a Scheduled Oracle Backup"](#) on page 81.

Roadmap for Scheduled Oracle Backups

Note: As an alternative to the following steps, you can use the NetWorker Configuration Wizard to create the RMAN and NMO scripts and the resources for a scheduled Oracle backup. For more information, see ["About Scheduled Oracle Backups"](#) on page 60.

To configure scheduled Oracle backups, perform the following:

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 62.
2. Customize the `nsrnm0` script for the scheduled backup (the file `nsrnm0` on UNIX or `nsrnm0.bat` on Windows) by setting the required parameters in the script. See ["Task 2: Customize the nsrnm0 Script"](#) on page 66.
3. Configure the required backup schedules. See ["Task 3: Configure a NetWorker Backup Schedule"](#) on page 75.
4. Configure the required backup groups. See ["Task 4: Configure a NetWorker Backup Group"](#) on page 75.
5. Configure a NetWorker Client resource for the scheduled backup. See ["Task 5: Configure the Client Resource for a Scheduled Oracle Backup"](#) on page 76.

After completing these configuration steps:

- Run a test scheduled Oracle backup by using the steps in ["Testing a Scheduled Oracle Backup"](#) on page 81.
- Review the steps for canceling a scheduled Oracle backup in ["Canceling a Scheduled Oracle Backup"](#) on page 82.

For information on how to keep track of the status of scheduled Oracle backups, see ["Monitoring Scheduled Oracle Backups"](#) on page 84.

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 85.

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.

With Oracle9i and Oracle10g, use the **send** command to set the parameters in the script. See "[The send Command](#)" on page 193.



Important: For scheduled backups (*both* regular and proxy backups), do *not* include **send** as part of the **allocate channel** or **configure channel** command. The **send** command must be *separate*.

For example, NMO does *not* support the following for scheduled backups:

```
allocate channel t1 type 'SBT_TAPE' send
'NSR_ENV=(NSR_SERVER=mars.legato.com)';
```

The correct form of the commands is as follows:

```
allocate channel t1 type 'SBT_TAPE';
send channel t1 'NSR_ENV=(NSR_SERVER=mars.legato.com)';
```

With automatic channel allocation, specifying the **send** command before the **backup** or **restore** command causes the following error:

```
RMAN-06422: no channels found for SEND command
```

For more information on automatic channel allocation, see "[Automatic Channel Allocation](#)" on page 205.



Example: RMAN Script for a Scheduled Oracle Backup

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.

```
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 with NetWorker release 7.1.x and earlier, use forward slashes in the **format** option in either the RMAN **backup** or **configure** command. This generates backup piece names that resemble UNIX directory names. With NetWorker server release 7.2 and later, the forward slashes are *not* required in the **format** option. For more information on this issue, refer to the *NetWorker Module for Oracle Release Notes*.

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

The command **connect target** *target_user/target_passwd@target_Netservicename* is mandatory in each RMAN script for a scheduled Oracle backup. This command establishes the proper connection to the target database.

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

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

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

Notes:

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

The command **connect rcvcat** *rcvcat_user/rcvcat_passwd@rcvcat_Netservicename* is *mandatory* if the Recovery Catalog is used for the scheduled Oracle backup. This command establishes the proper connection to the Recovery Catalog database.

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

- *rcvcat_user* is the owner of the Recovery Catalog database.
- *rcvcat_passwd* is the password of the *rcvcat_user*.
- *rcvcat_Netservicename* is the Net service name of the Recovery Catalog database.

To enable the scheduled backup to be canceled, the scheduled Oracle backup script must include **set command id to 'xxx'** (where *xxx* can be any string of characters *enclosed in single quotes*). For more information on how to cancel a scheduled Oracle backup, see ["Canceling a Scheduled Oracle Backup" on page 82](#).

The remainder of the RMAN script on [page 62](#), starting with the first **allocate channel** command, is similar to the RMAN script on [page 49](#) *except* that the `NSR_SERVER` parameter setting is *not* included. For more information on creating RMAN backup scripts, see ["Task 1: Create RMAN Scripts for Manual Backups" on page 48](#).



Important: Do *not* set the parameters `NSR_SERVER` or `NSR_GROUP` in a scheduled RMAN backup script. NMO sets these two parameters 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 parameter `NSR_DATA_VOLUME_POOL` is set in the RMAN script. Then that parameter'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 parameter 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. This way, 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, enter one of the following 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 `nsrnm` Script

Customize the `nsrnm` script on the Oracle Server host by modifying the parameters in the script.

The NMO installation on the Oracle Server host stores the following:

- A sample `nsrnm` script in the same directory as the NetWorker executables. The sample script filenames are:
 - `nsrnm` on UNIX
 - `nsrnm.bat` on Windows
- A template of the script in the `/etc/nsrnm.sh` file on UNIX. Do not modify this file.

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

Multiple versions of the `nsrnm` 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 `nsrnm` script:

1. Copy the sample script file (`nsrnm` on UNIX or `nsrnm.bat` on Windows) to a file with a different name.
2. Customize the parameters in the new file.

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

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

Note: A `nsrnm` script from NMO release 3.x works with this release 4.2 software. However, the `nsrnm` script installed with the NMO release 4.2 includes new functionality and settings, such as the parameter `TNS_ADMIN`, which are not found in the script with previous releases.

Parameters in the `nsrnm` Script

The sample `nsrnm` script installed with NMO contains parameters that must be customized for a particular scheduled Oracle backup. The parameters in the sample `nsrnm` script are all undefined by default.

The **nsrnm** script contains only the parameters required on the particular system where the script is installed. The following parameters appear in the **nsrnm** 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 parameters (LD_LIBRARY_PATH, LIBPATH, SHLIB_PATH) to set on a particular operating system and to what value.

The following parameters are *mandatory*:

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

The other parameters in the **nsrnm** script are *optional*; they can be left undefined in the script, if preferred.

Note: For other parameters to be in effect during a scheduled Oracle backup, lines must be added in the **nsrnm** script to define and export the parameters. The use of either the UNIX **setenv** command or Windows **set** command to set the parameters has no effect.

The following sections describe all the parameters that can be set in the **nsrnm** script for scheduled backups. Refer to the comments in the **nsrnm** script file for details on the parameters.

The parameters in the **nsrnm** script are as follows:

- "ORACLE_HOME" on page 68
- "PATH" on page 68
- "LD_LIBRARY_PATH" on page 68
- "LIBPATH" on page 69
- "SHLIB_PATH" on page 69
- "NSR_RMAN_ARGUMENTS" on page 69
- "NSR_RMAN_OUTPUT" on page 70
- "NSR_SB_DEBUG_FILE" on page 71

- "ORACLE_SID" on page 71
- "PRECMD" on page 71
- "POSTCMD" on page 73
- "TNS_ADMIN" on page 74

ORACLE_HOME

This parameter is mandatory for each scheduled backup. Set ORACLE_HOME in the **nsrnm** 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/9.2*, ORACLE_HOME must be set in the **nsrnm** script as follows:

```
ORACLE_HOME=/disk3/oracle/app/oracle/product/9.2
```

PATH

This parameter is mandatory for each scheduled backup. Set PATH in the **nsrnm** script file to include the pathname of the directory that contains the NMO **nsrnmstart** 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 parameter 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/9.2/lib*, set LD_LIBRARY_PATH in the **nsrnm** script as follows:

```
LD_LIBRARY_PATH=/disk3/oracle/app/oracle/product/9.2/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 **nsrnm0** script:

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

LIBPATH

This parameter is optional for a scheduled backup. It appears in the **nsrnm0** script on AIX *only*. Set LIBPATH in the **nsrnm0** script file to the pathname of the directory that contains the Oracle libraries, typically `$ORACLE_HOME/lib`.

To set LIBPATH in the **nsrnm0** script, follow the example shown in ["LD_LIBRARY_PATH" on page 68](#), replacing LD_LIBRARY_PATH with LIBPATH. Uncomment the line “export LIBPATH” in the script.

SHLIB_PATH

This parameter 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 68](#), replacing LD_LIBRARY_PATH with SHLIB_PATH. Uncomment the line “export SHLIB_PATH” in the script.

NSR_RMAN_ARGUMENTS

This parameter 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 **nsrnm** 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 **nsrnm** script as follows:

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

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

NSR_RMAN_OUTPUT

This parameter 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 parameter `NSR_RMAN_ARGUMENTS` in the **nsrnm** 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 the former 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 parameter is optional for a scheduled backup. It is used only 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 parameter `NSR_SB_DEBUG_FILE` in the `nsrnmo` script as follows:

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

For more information on how the debug information is written if the parameter `NSR_SB_DEBUG_FILE` is set to an invalid pathname, see ["NMO Error Messages" on page 218](#).

ORACLE_SID

This parameter is optional for a regular scheduled backup. However, 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 115](#).

Set `ORACLE_SID` in the `nsrnmo` 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 `orcl92`, `ORACLE_SID` must be set as follows:

```
ORACLE_SID=orcl92
```

PRECMD

This parameter 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 pre-command 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.

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

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

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

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

```
#!/bin/ksh
# Define Site Specifics Here
TARGET_DATABASE=orcl92
ERRFILE=/tmp/precmd.log
ORACLE_USER=oracle92
#
# 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 parameter 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 parameter POSTCMD in the **nsrnm0** script.

For example, if the script is stored in the */usr/scripts/orastartup* file, set the parameter POSTCMD 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=orcl92
ERRFILE=/tmp/postcmd.log
ORACLE_USER=oracle92
#
# Scheduled backup launches as "root" run POSTCMD as user
oracle92
```

```
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
```

4

TNS_ADMIN

This parameter is mandatory if the Oracle Net configuration files are located in a directory other than the default `$ORACLE_HOME/network/admin` directory.

In this case, set the value of `TNS_ADMIN` to the pathname of the directory that contains the Oracle Net configuration files. To set `TNS_ADMIN` in the `nsrnm` script, follow the example shown in ["LD_LIBRARY_PATH" on page 68](#), replacing `LD_LIBRARY_PATH` with `TNS_ADMIN`. Uncomment the line `"export TNS_ADMIN"` in the script.

Task 3: Configure a NetWorker Backup Schedule

Use the Schedule resource in the NetWorker Administrator program 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 NetWorker Administrator program, refer to the *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 76.

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.

By configuring one or more NetWorker backup groups for scheduled Oracle backups, the backups can be:

- Distributed to alleviate network traffic.
- Scheduled for a time of day when performance demands on the database and NetWorker server are lower.

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.

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.

You can create a NetWorker Group resource with either of the following:

- The NetWorker Administrator program. For more information, refer to the *NetWorker Administrator's Guide*.
- The NetWorker Configuration Wizard. For more information, see "[About Scheduled Oracle Backups](#)" on page 60.

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

Note: Instead of using the information in this section, you can configure the Client resource by using the NetWorker Configuration Wizard, as described in "[About Scheduled Oracle Backups](#)" on page 60.

At this point, it is assumed that a Client resource has been configured for the Oracle Server. This Client resource is required to run manual Oracle backups.

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

To complete the Client resource configuration for scheduled backups 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. Precede each pathname with the prefix *RMAN:*. Do *not* include any spaces between the prefix *RMAN:* and the script name.

Note: The scheduled backup records the save set name with the prefix *RMAN:* in the media database. In **mminfo** command output, the save set name is displayed with the prefix *RMAN:*. If you schedule the backup by using the NetWorker Configuration Wizard, the wizard automatically adds the prefix *RMAN:* to the script name in the Save Set attribute.

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 prepended by *RMAN:* in the Save Set attribute:

```
RMAN:/disk/rman_scripts/archlogbkup
```

```
RMAN:/disk/rman_scripts/fullbkup
```

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

```
RMAN: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 75.

3. Specify a NetWorker backup group.

For more information on NetWorker backup groups, see "[Task 4: Configure a NetWorker Backup Group](#)" on page 75.

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, do not modify the Remote Access attribute.
8. Save the Client resource.

Note: Each Oracle installation requires a separate NetWorker Client resource. The Backup Command attribute of the Client resource can contain only one **nsrnm** script name and ORACLE_HOME is a *mandatory* parameter for each **nsrnm** 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 **nsrnm** script also contains a well-defined parameter (PRECMD and/or POSTCMD), 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. To include pre- and postprocessing with the backups of the various Oracle database instances of an Oracle installation, define a separate NetWorker Client resource for each Oracle instance.

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

[Figure 6 on page 79](#) shows a UNIX Client resource configured for scheduled Oracle backups.

[Figure 7 on page 80](#) shows a Windows Client resource.

Figure 6. Oracle Client Resource in UNIX NetWorker Server

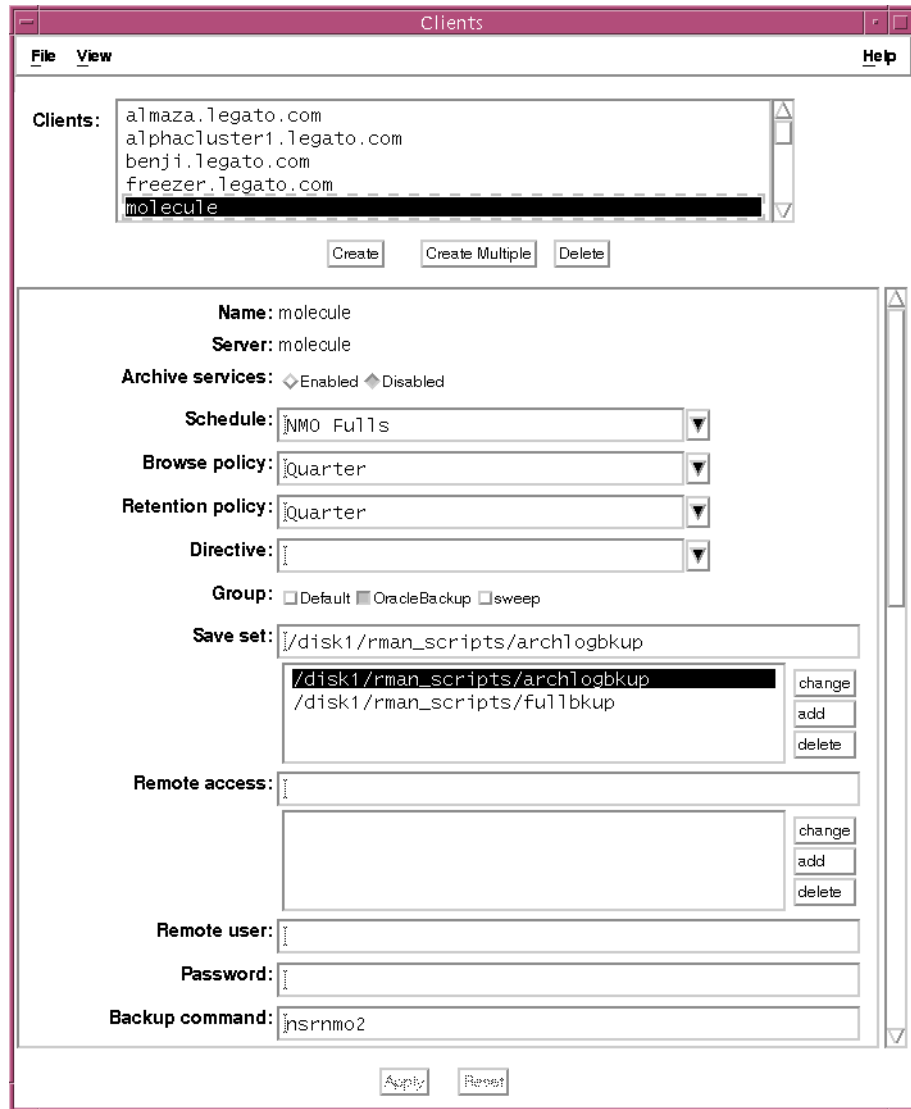
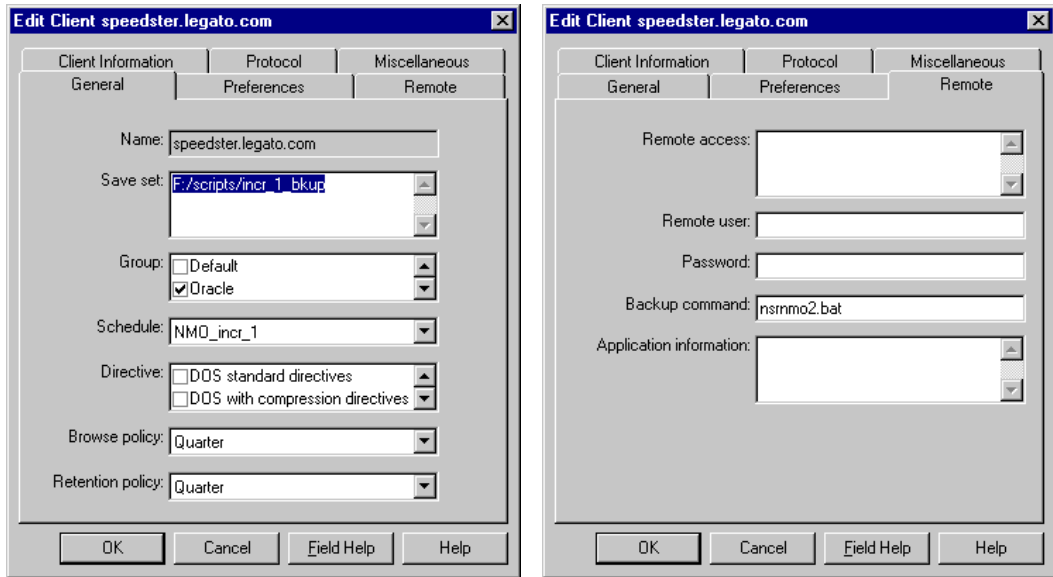


Figure 7. Oracle Client Resource in Windows NetWorker Server



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 65](#), the RMAN script created for a scheduled Oracle backup should be tested.

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

Check for the following:

- All the required parameters must be set in the `nsrnmno` and RMAN scripts.
- The pre- and postprocessing scripts (optional) must be in place.
- 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 82](#).

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 *NetWorker Administrator's Guide*.

For additional debug information, set the parameter `NSR_SB_DEBUG_FILE` in the `nsrnm0` script. See "[NSR_SB_DEBUG_FILE](#)" on page 71.

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 217.

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 by 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 112.

For more information on setting up and running archived redo log 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 canceling a scheduled Oracle backup. For more information, see "[Specifying the Required NetWorker Privileges](#)" on page 38.

NMO currently supports use of the Stop button in the NetWorker Administrator program to cancel a running scheduled Oracle backup *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 NMO 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 NMO from retrying the backup.
2. For each allocated channel, perform the following:
 - a. View the RMAN message log file to determine the Oracle session ID for the channel. (The log filename is specified in the parameter `NSR_RMAN_ARGUMENTS` in the `nsrnm` script.)
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:
select serial# from v\$session where sid=session_id;
where `session_id` is the Oracle session ID from the RMAN message log in [step a](#).
 - 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 55.

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 56](#).

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 *NetWorker Administrator's Guide*.

Automation of NSR_SERVER and NSR_GROUP Parameter Settings

The parameters NSR_SERVER and NSR_GROUP must *not* be set in a scheduled backup RMAN script. NMO automatically passes server and group information (received from the NetWorker server that started the backup) to Oracle Server processes, created for each allocated channel.

NMO also passes an *internal* parameter, NSR_SAVESET_NAME, to set the save set name.



Important: Do *not* set the parameter NSR_SAVESET_NAME.

To pass the information to the Oracle Server processes, NMO invokes the RMAN executable with **send** as a command line option. For more information, see ["The send Command" on page 193](#).

Information in the Scheduled Backup Debug File

To determine the information that NMO passes to the Oracle Server processes, view the debug file for the scheduled backup.

The name of the scheduled backup debug file is set in the parameter NSR_SB_DEBUG_FILE in the **nsrnm** script file. For more information, see ["Task 2: Customize the nsrnm Script" on page 66](#).

The debug file contains the following information:

exepath — The location of the RMAN binary.

cmd_args — The command line options 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.



Example: Sample Debug File for a Scheduled Backup

The following sample debug file (NSR_SB_DEBUG_FILE) includes *cmd_args*, which contains the command line options that NMO uses to invoke the RMAN executable. NMO passes the NSR_SERVER, NSR_GROUP, and NSR_SAVESET_NAME parameter settings to the Oracle processes through the **send** option.

```
(...)  
(25275) exepath =  
/db/ora92/app/oracle/product/9.2/bin/rman  
(25275) cmd_args = msglog '/nsr/applogs/msglog.log'  
append cmdfile '/home/ora92/backup0' send  
'NSR_ENV=(NSR_SERVER=molecule, NSR_GROUP=OracleBackup,  
NSR_SAVESET_NAME=/home/ora92/backup0) '  
(25275) rman_script = /home/ora92/backup0  
(25275) saveset_name = RMAN:/home/ora92/backup0  
(...)
```

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 21](#).

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 *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_ORCL92_731*:
nsrinfo -n oracle molecule
full_ORCL92_731, date=997818351 Tue Aug 14 15:45:51 2004
- The media database contains the name of the RMAN backup script used for the scheduled backup, for example, */db/home/ora92/backup0*:

mminfo -v -c molecule

<u>volume</u>	<u>client</u>	<u>date</u>	<u>time</u>	<u>size</u>
NMO.001	molecule	08/14/04	15:45:51	129 KB
<u>ssid</u>	<u>fl</u>	<u>lvl</u>	<u>name</u>	
2038427393	cb	full	RMAN:/db/home/ora92/backup0	

Note: In the media database, the prefix *RMAN:* is included the backup script name in both the following cases:

- When you schedule the backup with the NetWorker Configuration Wizard. The wizard automatically includes the prefix *RMAN:* with the script name in the Save Set attribute in the Client resource.
- When you configure the Client resource for the scheduled backup, and you specify the prefix *RMAN:* with the script name in the Save Set attribute of the resource. Do *not* include any spaces between *RMAN:* and the script name in the attribute.

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 '08/14/04 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: Restore and Recover Procedures

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:

- ["Preparation for Oracle Data Restore" on page 89](#)
- ["Roadmap for Oracle Data Recovery" on page 90](#)
- ["Task 1: Create RMAN Restore Scripts" on page 91](#)
- ["Task 2: Restore the Oracle Data" on page 92](#)
- ["Using the OEM Backup Management Tools" on page 97](#)
- ["Completing the Oracle Data Recovery" on page 97](#)
- ["Disaster Recovery" on page 98](#)

Preparation for Oracle Data Restore

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 (NMO) 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 47.

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 *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 47
- "[Chapter 4: Scheduled Oracle Backups](#)" on page 59

The NetWorker server interface *cannot* be used to restore Oracle data that was backed up with NMO. The following steps 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 91.
 - b. Run the Oracle restore using the RMAN command line interface. See "[Task 2: Restore the Oracle Data](#)" on page 92.

Note: To restore an Oracle database to a different system from the one backed up, see "[Restoring to a Different Host](#)" on page 96.
 - To use the OEM Backup Management Tools, see "[Using the OEM Backup Management Tools](#)" on page 97.

2. Complete the Oracle data recovery, if required. See ["Completing the Oracle Data Recovery" on page 97](#).

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.

With Oracle9i and Oracle10g, use the **send** command to set the parameters in the RMAN script. See ["The send Command" on page 193](#).



Example: RMAN Restore Script

The following RMAN script performs a restore of an Oracle tablespace by using the (remote) NetWorker server *mars.legato.com*. The Oracle data is restored to the NetWorker client *jupiter.legato.com*. This RMAN script also includes the recover step, which is explained in ["Completing the Oracle Data Recovery" on page 97](#).

```
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;
    recover tablespace users;
    sql 'alter tablespace users online';
}
```

```
release channel t1;  
release channel t2;  
}
```

For more information on setting NSR* parameters in an RMAN script, see ["Task 1: Create RMAN Scripts for Manual Backups" on page 48](#).

Task 2: Restore the Oracle Data

Before starting an Oracle restore, ensure that the required configurations, volumes, 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.
 - If you use a stand-alone tape drive, the volume must be mounted manually.
 - If you use an autochanger, the NetWorker server mounts the volume automatically.
- To determine the volumes required for the restore, you can use the **nsrnmoinfo** command, as described in ["Using the nsrnmoinfo Command to Determine the Volumes for Restore" on page 93](#).
- If using an RMAN restore script, the script must be created, as described in ["Task 1: Create RMAN Restore Scripts" on page 91](#).

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



Example: Command to Start an Oracle Restore

If the RMAN restore script on [page 91](#) 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\'
```

On Microsoft Windows, the command to run the RMAN script is `rman.exe`. For more information on the `rman` or `rman.exe` command line options, refer to the appropriate Oracle backup and recovery documentation.

Using the `nsrnmoinfo` Command to Determine the Volumes for Restore

To determine the NetWorker volumes that contain the Oracle backup pieces to be restored, you can use the `nsrnmoinfo` command. The `nsrnmoinfo` program is installed with the NMO software in the same directory as the NetWorker client software.

Note: On Windows, the command name is `nsrnmoinfo.exe`.

The `nsrnmoinfo` command syntax and options are as follows:

```
nsrnmoinfo [.exe] [-c NetWorker_client_name]  
[-s NetWorker_server_name] [-f filename] [backup_piece_name1]  
[backup_piece_name2 . . .]
```

where:

- `NetWorker_client_name` specifies the hostname of the NetWorker client whose index contains information on the Oracle backup pieces. By default, the client is the local host.
- `NetWorker_server_name` specifies the hostname of the NetWorker server to query for the volumes. By default, the server is the local host.

- *filename* specifies the name of a text file that contains a list of one or more backup piece names for restore.
 - The file must contain each backup piece name on a separate line.
 - The file *cannot* contain spaces or comments (for example, comment lines preceded with the # symbol).
- *backup_piece_name1* and *backup_piece_name2* specify backup piece names for restore.

Command options in brackets ([]) are optional. Do *not* include the brackets when entering the command.

To use the **nsrnmoinfo** command, specify the names of the backup pieces by either or both of the following:

- List the backup piece names as options of the **nsrnmoinfo** command.
- List the backup piece names in a text file, and specify the name of the file with the **-f** option of the **nsrnmoinfo** command.

The **nsrnmoinfo** command displays a list of one or more volumes required for the Oracle restore.

- For each backup piece, the list includes the accessible volumes containing the backup piece, which the NetWorker server will use for the restore.
- For each volume, the list includes the following:
 - The name and location of the volume.
 - The save time of the backup piece on the volume.

The listed volumes are the most accessible ones, which the NetWorker server intends to use for the restore at the time that the command is entered.

- The command lists clones of volumes if the original volumes are not accessible.
- If any listed volumes are removed from the NetWorker devices or deleted after the **nsrnmoinfo** command is entered, the server can perform the restore by using different volumes that are accessible. For example, the server can use an accessible clone (already mounted in a drive or available for mounting in a jukebox) instead of a listed volume.



Example: Sample `nsrnmoinfo` Commands for Oracle Restores

Each of the following `nsrnmoinfo` commands displays a list of the volumes required to restore the specified backup pieces.

- The following command searches in the NetWorker index of the client *mars* on the server *jupiter* for information on the volumes that contain the backup pieces *backupc_1* and *backupc_2*.

```
nsrnmoinfo -c mars -s jupiter backupc_1 backupc_2
```

- The following command searches in the NetWorker index of the local host for information on the volumes that contain the backup pieces listed in the file *backup2.txt*. (Both the NetWorker client and server are assumed to be the local host.)

```
nsrnmoinfo -f backup2.txt
```

- The following command searches in the NetWorker index of the client *mars* for information on the volumes that contain both:

- The backup piece *backupc_3*.
- The backup pieces listed in the file *backup3.txt*.

(The NetWorker server is assumed to be the local host.)

```
nsrnmoinfo -c mars backupc_3 -f backup3.txt
```



Example: Volume Information Displayed by the `nsrnmoinfo` Command

The following `nsrnmoinfo` command searches in the NetWorker index of the local host on the server *mars* for information on the volumes containing the backup pieces *backup1* and *backup2*.

```
nsrnmoinfo -s mars backup1 backup2
```

The `nsrnmoinfo` command displays the following type of information:

```
backup1:
  mars.003 at /space/nw_volume1 (save time 1098886937)
  mars.004 at /space/nw_volume2 (save time 1098883454)
backup2:
  mars.005 at /dev/rmt/0cbn (save time 1098883452)
```

According to this command display:

- Volumes *mars.003* and *mars.004* are required to restore the backup piece *backup1*.
 - Volume *mars.005* is required to restore the backup piece *backup2*.
-

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 NMO 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 parameter `NSR_SERVER` to the name of the NetWorker server that contains the backup.
6. In the RMAN script, set the parameter `NSR_CLIENT` 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.

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 an NMO 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 NMO 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 use the Oracle recovery commands:

- Include the Oracle commands in the RMAN restore script. See the sample RMAN script on [page 91](#).
- After the RMAN restore script has completed successfully, enter the commands at the operating system command line.

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:

- ["NetWorker Server Recovery" on page 98](#)
- ["Oracle Database Recovery" on page 99](#)

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 53](#).

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
- File system configuration
- IP addresses and hostnames
- Bootstrap information

For information on how to recover the NetWorker server from various types of disasters, refer to the *NetWorker Disaster Recovery Guide*, available at www.legato.com. For more information on how to access the guide, see ["Conventions Used in This Guide" on page 19](#).

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. For more information, see "[Disaster Recovery Preparation](#)" on page 34.

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 207.

Chapter 6: Cluster, OPS, and RAC Systems

This chapter describes the types of operations that NetWorker Module for Oracle (NMO) supports on cluster, Oracle Parallel Server (OPS), and Real Application Cluster (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 101](#)
- ["Cluster Systems" on page 104](#)
- ["OPS and RAC Systems" on page 105](#)

Considerations for Cluster, OPS, and RAC Systems

To prepare for successful NMO operations on cluster, OPS, and RAC systems, consider the following:

- ["Parameters in the RMAN Script or Session" on page 101](#)
- ["NetWorker Software Configuration" on page 103](#)
- ["Backup Failover" on page 104](#)

Parameters in the RMAN Script or Session

The parameters `NSR_CLIENT` and `NSR_SERVER` must be correctly set in the RMAN script or session. For more information on how to set the required parameters, see ["Appendix A: Parameters in the RMAN Session" on page 179](#).

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

Note: The parameter `NSR_SERVER` 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. 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 *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 76.
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 NMO 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 107](#).

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 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 NMO 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, NMO can be used 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 NMO, see ["Roadmap for Oracle Backup/Restore Configuration in a Cluster System" on page 104](#).

Roadmap for Oracle Backup/Restore Configuration in a Cluster System

The Oracle Server and NetWorker server systems must be configured before NMO 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 NMO software is properly installed according to the instructions in the *NetWorker Module for Oracle Installation Guide*.
- 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 NMO 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 parameter settings. For more information, see ["NSR_CLIENT" on page 102](#).

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 Oracle Net services 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 NMO 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 *databs1*) 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, NMO 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 parameter `NSR_CLIENT` must be set to the *same* value for *each* channel. For more information on setting the parameter, see ["NSR_CLIENT" on page 102](#).

NMO 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 106](#).

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

To properly configure Oracle backup and restore operations with NMO 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 Oracle Net services to allow connect-time (SQL Net) failover. For guidelines, see ["Connect-Time Failover" on page 107](#). For more information, refer to the appropriate Oracle documentation.

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

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

5. Configure a Client resource on the NetWorker server for the virtual host and each physical host that will run backups and restores.
6. Create the appropriate RMAN backup and restore scripts for the preferred types of Oracle backups and restores on the OPS or RAC system.
For more information, see ["Creating RMAN Backup Scripts" on page 109](#) and ["Creating RMAN Restore Scripts" on page 110](#).
7. Review the additional issues concerning Oracle recover operations in ["Archived Redo Logs" on page 112](#).

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 parameters:

```
o92pa.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 = orcl92)
    )
  )
```

- 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 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_DESC` 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 NMO 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.



Example: RMAN Script for a Manual Oracle Backup on an OPS System

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* by 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 102.) 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_node2' ;
allocate channel t4 type 'SBT_TAPE'
connect 'user_name/user_passwd@connect_string_of_node2' ;

send 'NSR_ENV=(NSR_CLIENT=node1.legato.com,
NSR_SERVER=server1.legato.com) ;

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 112](#).

Creating RMAN Restore Scripts

A single RMAN restore script can be used to run a parallel Oracle restore with NMO 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: NMO does *not* support multiple RMAN restores that are 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 that is running the RMAN restore script needs to be mounted.



Example: RMAN Script for an Oracle Restore on an OPS System

Refer to ["Example: RMAN Script for a Manual Oracle Backup on an OPS System" on page 109](#), and 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*. The script restores the backup that was created by the backup script in ["Example: RMAN Script for a Manual Oracle Backup on an OPS System"](#) on page 109. 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 *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 113.

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 112](#)
- ["Restoring All Archived Logs from Each Node" on page 113](#)

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'
    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_CLIENT=ops1.legato.com)';
    backup filesperset 10
    (archive log all delete input format '/al_%s_%p/');
    release channel t1;
    release channel t2;
}
```

Restoring All Archived Logs from Each Node

All the archived log files in an OPS or RAC system can be restored from a single node (for example, a node named *ops1.legato.com*) 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 (NMO) with the required NetWorker PowerSnap Module software.

This chapter includes the following main sections:

- ["Overview of Proxy Oracle Backups and Restores" on page 116](#)
- ["Proxy Oracle Backup and Restore System" on page 118](#)
- ["How a Proxy Oracle Backup Works" on page 120](#)
- ["How a Proxy Oracle Restore Works" on page 128](#)
- ["Software Configuration Requirements" on page 131](#)
- ["Proxy Oracle Backup Requirements" on page 142](#)
- ["Proxy Oracle Backup Information in the NetWorker Indexes" on page 147](#)
- ["Proxy Oracle Restore Requirements" on page 150](#)
- ["Catalog Synchronization for Proxy Oracle Backups" on page 156](#)
- ["Proxy Backups and Restores on Cluster Systems" on page 173](#)

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 NMO 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 NMO.

For a complete list of supported PowerSnap Modules, refer to the current *Software Compatibility Guide* available at www.legato.com.

- 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:

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

Types of Proxy Oracle Backups

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

- ["Instant Backups" on page 116](#)
- ["Live Backups" on page 117](#)

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 *snapshot set*. A *snapshot policy* must be configured to control the lifecycle of the snapshot 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 131](#).

Note: NMO supports scheduled instant backups only. Manual instant backups are *not* supported.

Live Backups

NMO supports these two types of live backup:

- Deferred live backup — An existing point-in-time copy (snapshot), that is 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 131](#).



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

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

- ["Instant Restores" on page 117](#)
- ["Rollbacks" on page 118](#)
- ["Restores from Secondary Storage" on page 118](#)

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 NMO, 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" on page 27](#)
- ["Oracle Recovery Catalog" on page 28](#)

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)

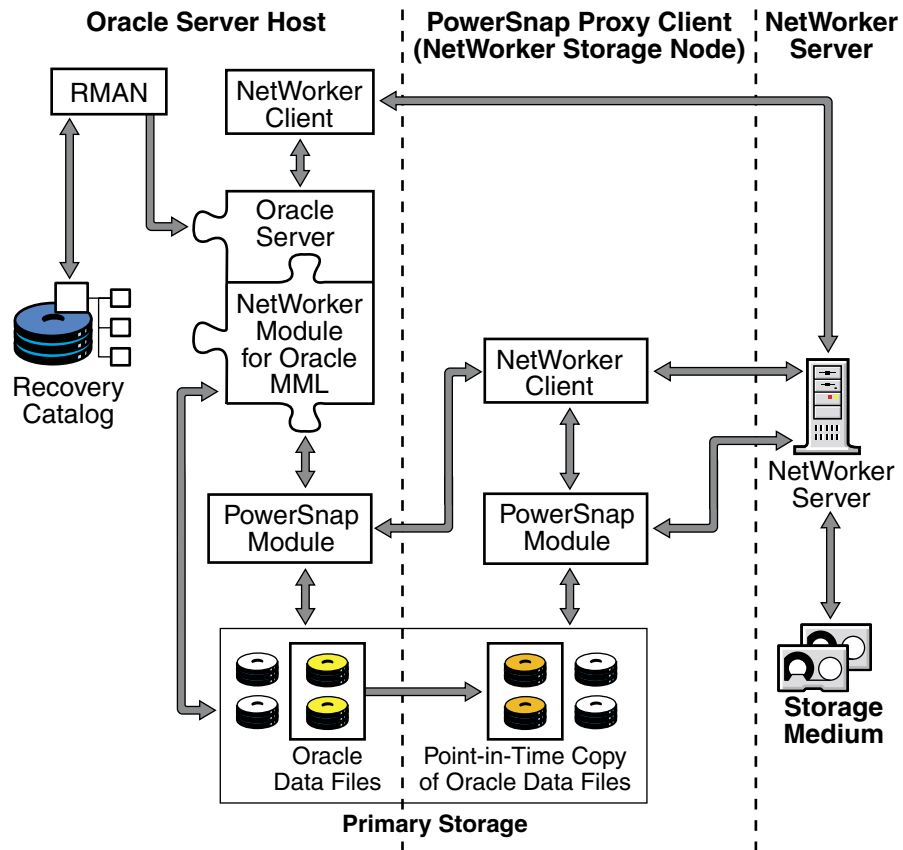
- NMO (that is installed on the Oracle Server)
- NetWorker PowerSnap Module (that is installed on the Oracle Server and proxy client host)

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

Figure 8 on page 119 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 120
- "How a Proxy Oracle Restore Works" on page 128

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 NMO and PowerSnap Module software. The NMO 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 MML controls that process.

When a proxy backup is initiated, the RMAN utility starts the Oracle Server processes that call the MML proxy-specific routines. The 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 *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 121](#)
- ["Scheduled Immediate Live Backup" on page 124](#)
- ["Deferred Live Backup" on page 126](#)

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 169.

5. The **nsrsnap** program contacts the **nsrexecd** service, which starts the **nsrnmo** script for the scheduled backup.
6. The **nsrnmo** script sets the required parameters and invokes the NMO program, **nsrnmstart**.
7. The **nsrnmstart** program starts the RMAN utility to run the required RMAN backup script.
8. RMAN starts an Oracle process that calls the 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 159.
 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 126.
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 123](#) shows how the Oracle Server and NetWorker processes interact during a 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 121](#).

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.

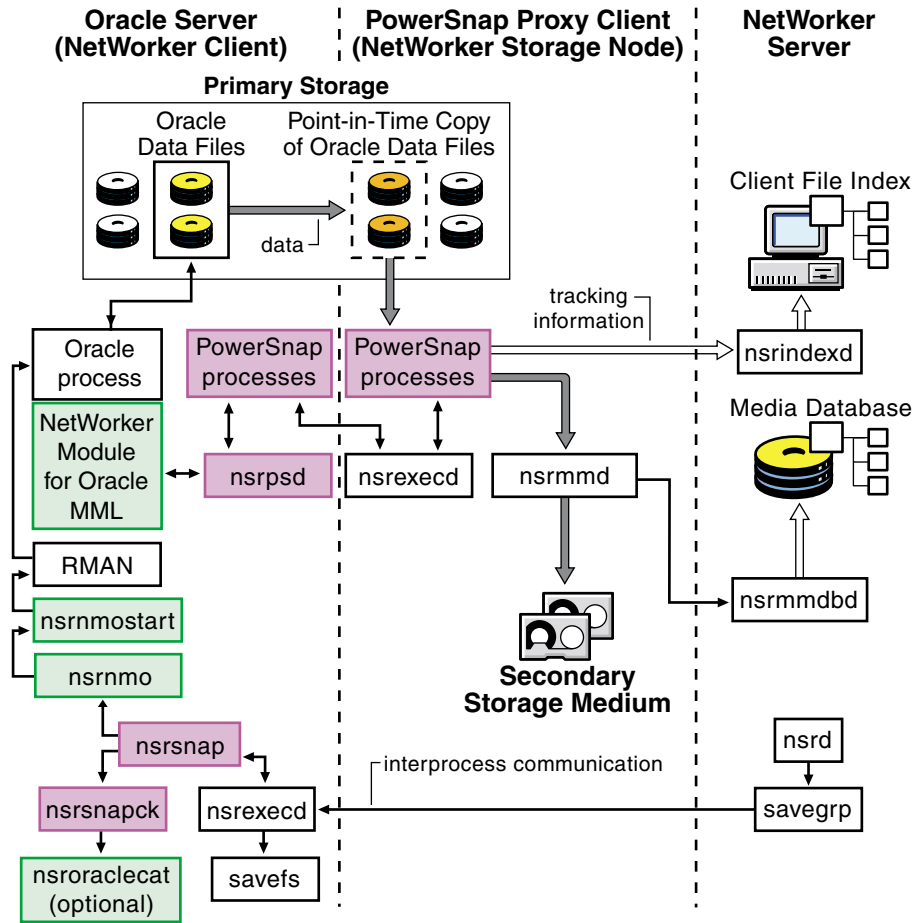
Note: If the point-in-time copy was *not* copied to secondary storage, the **nsrsnapck** program invokes the **nsroraclecat** program to remove the corresponding RMAN catalog entries. See ["Automatic Catalog Synchronization by Using the nsroraclecat Program" on page 169](#).

5. The **nsrsnap** program contacts the **nsrexecd** service, which starts the **nsrnmo** script for the scheduled backup.
6. The **nsrnmo** script sets the required parameters and invokes the NMO 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 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 the tracking information about the secondary storage save sets in the NetWorker media database by using the **nsrmmdbd** service.

- The **nsrindexd** service records the 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 159.
 10. The **savegrp** program backs up the NetWorker server bootstrap and Oracle client file indexes.

[Figure 10 on page 126](#) 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:

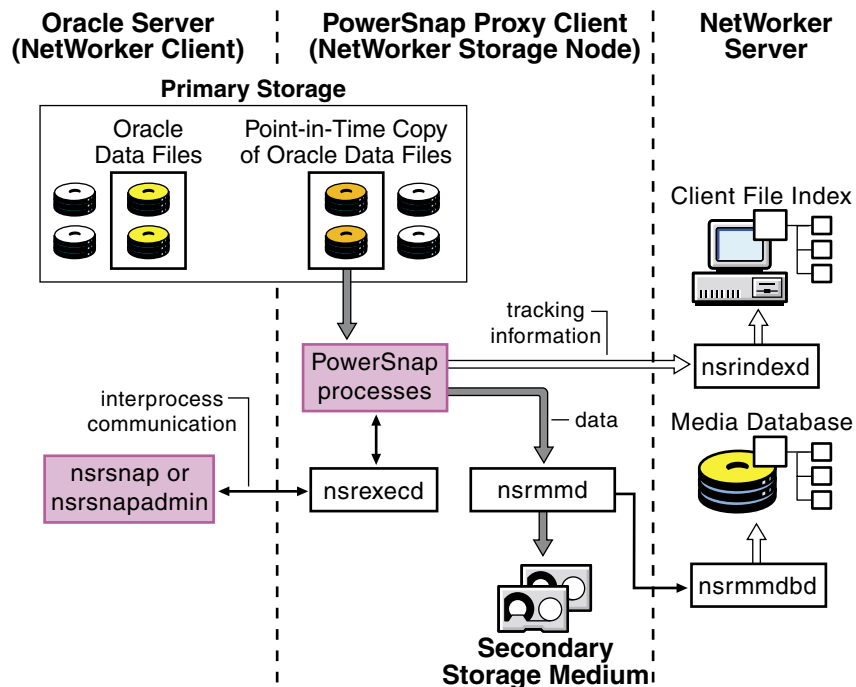
1. The **nsrsnap** or **nsrsnapadmin** program invokes the PowerSnap processes to copy the point-in-time copy to secondary storage.

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

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

Figure 11 on page 127 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 MML routines.

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

- ["Instant Restore or Rollback" on page 128](#)
- ["Restore from Secondary Storage" on page 130](#)

Instant Restore or Rollback

An instant restore or rollback involves the following steps:

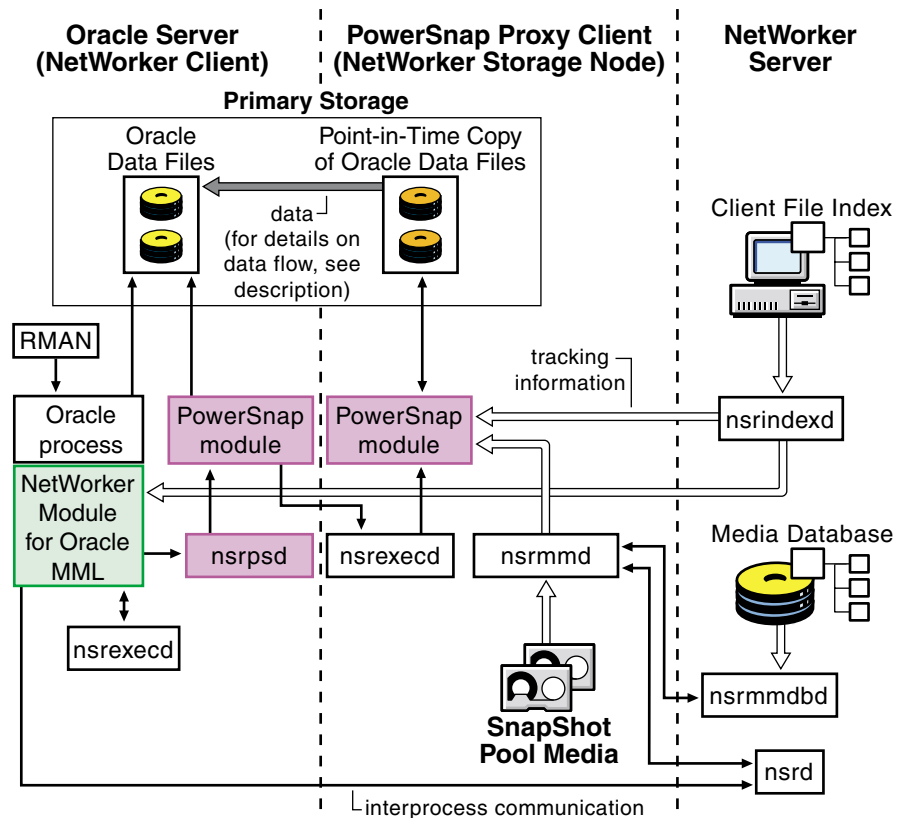
1. The MML performs the following:
 - a. Translates the instant backup object names requested by RMAN into a format that the NetWorker server understands.
 - b. Verifies the existence of the instant backup objects through the **nsrindexd** service.
 - c. Verifies that the restore destination directory exists and is accessible, and creates the *.nworapc* directory.
2. The 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 NMO.
 - 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, NMO 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 129 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 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 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 NMO. 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, NMO 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 131](#) shows how the Oracle Server and NetWorker processes interact during a restore from secondary storage.

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 132](#).
- Follow the ["Roadmap for Scheduled Oracle Backups" on page 61](#) 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 Required Oracle Settings" on page 133](#)
- ["Configuring the NWORA Resource File" on page 133](#)
- ["Creating RMAN Scripts for Proxy Oracle Backups" on page 134](#)
- ["Configuring the NetWorker Pool Resources" on page 139](#)
- ["Configuring the NetWorker Snapshot Policy Resource" on page 140](#)
- ["Configuring the NetWorker Group Resource" on page 140](#)
- ["Configuring the NetWorker Client Resource" on page 140](#)
- ["Testing a Scheduled Proxy Oracle Backup" on page 141](#)

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 142](#)
- ["Proxy Oracle Backup Information in the NetWorker Indexes" on page 147](#)
- ["Proxy Oracle Restore Requirements" on page 150](#)

Configuring the Required Oracle Settings

Do *not* locate the database control files and online redo log files on the same volume (snapshot unit) as the datafiles that will be backed up through proxy Oracle backups.

If the Oracle database is expected to have a lot of read or write activity, or an error, such as “skgfdisp: async read/write failed” appears, specify the following values in the Registry and Initialization Parameter file:

- In the Registry, specify the following parameters under HKEY_LOCAL_MACHINE\SOFTWARE\ORACLE:
 - ORA_<oracle_sid>_WORKINGSETMAX
 - ORA_<oracle_sid>_WORKINGSETMIN

Possible values to set for these parameters are as follows:

- ORA_<oracle_sid>_WORKINGSETMAX = 1600
- ORA_<oracle_sid>_WORKINGSETMIN = 1200

For more information on these parameters and Oracle memory management on Windows, refer to the Oracle document number 46001.1, “Oracle Database and the Windows NT Memory Architecture, Technical Bulletin”.

- In the Initialization Parameter file (such as *init<oracle_sid>.ora*), increase the value of LARGE_POOL_SIZE to a large value that is appropriate for the particular system.

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 159](#). 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 156](#).

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 parameter ORACLE_SID in the **nsrnm** script (used for the proxy backup) must be set to the same value as the parameter NSR_ORACLE_SID 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 47](#)
- ["Chapter 4: Scheduled Oracle Backups" on page 59](#)

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

- The appropriate parameters must be set, as described in ["Setting the Parameters" on page 137](#).
- The **proxy** or **proxy only** option must be specified with each RMAN **backup** command.

Note: Certain options of the RMAN **backup** command, such as **maxsets** 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.
- Allocate only one channel in the RMAN script. Do *not* allocate more than one channel in the RMAN script, in an attempt to distribute the proxy backup over more than one channel.

Note: Proxy backup parallelism is defined by the PowerSnap parameter NSR_PS_SAVE_PARALLELISM. For more information, see [Table 4 on page 138](#).

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 NMO parameter used for proxy Oracle backups. For details, see ["Setting the Parameters" on page 137](#).

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.



Example: RMAN Scripts with Multiple Channels

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';
    allocate channel c2 type 'SBT_TAPE';
    send channel c1
'NSR_ENV=(NSR_DATA_VOLUME_POOL=OracleVolume1)';
    send channel c2
'NSR_ENV=(NSR_DATA_VOLUME_POOL=OracleVolume2)';
    backup proxy only tablespace tbs1, tbs2, tbs3, tbs4;
```

```
release channel c1;
release channel c2;
}
```

The following RMAN script uses specific backup options to enforce distribution of the proxy backup over two channels.

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

Use the following RMAN script to *replace* both of the preceding two backup scripts.

```
run {
  allocate channel c1 type 'SBT_TAPE';
  send channel c1
  'NSR_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 Parameters

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

- NMO parameters, as described in ["Appendix A: Parameters in the RMAN Session" on page 179](#).
The parameters must be set by using one of the methods in ["Setting the NSR* Parameters" on page 179](#).
- PowerSnap Module parameters, as described in ["How to Set the PowerSnap Parameters" on page 137](#).

How to Set the PowerSnap Parameters

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

- By setting the parameters 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 193](#).
- By setting the parameters in a user-defined configuration file. The complete pathname of the file must be specified in the parameter `NSR_PROXY_PFILE`, as described in ["NSR_PROXY_PFILE" on page 187](#). The configuration file consists of a separate line such as the following for each parameter setting:


```
parameter_name=parameter_value
```

 where:
 - `parameter_name` is the parameter name, such as `RESTORE_TYPE_ORDER`.
 - `parameter_value` is the parameter value, such as `pit`.

[Table 4 on page 138](#) lists supported PowerSnap parameters. The list is *not* exhaustive. For a complete list of PowerSnap parameters, refer to the appropriate *NetWorker PowerSnap Module Installation and Administrator's Guide*.

For each parameter, the table includes:

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

Table 4. PowerSnap Module Parameters

Parameter	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 150.</p>



Example: Parameter Settings

To set the PowerSnap parameter 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 NMO parameter `NSR_PROXY_PFILE` must be set to `/ora901/rman/proxy.cfg` by using the **send** command. For example, the following command sets the parameter correctly:

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

Notes:

- A parameter setting in the **send** command takes *precedence* over a parameter setting in the configuration file.
If the same PowerSnap parameter 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 parameter takes *precedence* over any other occurrences of the same parameter in the same file.
- The following are *not* supported:
 - The use of the **parms** option in the **configure channel** command to set PowerSnap parameters.
 - The use of the **setenv** command on the operating system command line to set PowerSnap parameters.

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 NMO backup. However, the specified backup device should 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 140](#).

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 76](#)

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 140.
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 81.

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 65](#). To determine if the script contains any errors, log the RMAN output into a file by setting the parameter `NSR_RMAN_ARGUMENTS` 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 142](#)
- ["Performing Proxy Oracle Backups" on page 144](#)

For information on proxy Oracle backups in a cluster environment, see ["Proxy Backups and Restores on Cluster Systems" on page 173](#).

Checking Configuration Consistency

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

If NMO 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 142](#)
- ["With a Group Configured for Regular Backups" on page 143](#)

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, NMO 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, 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*.

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

NMO 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 120](#).

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 142](#)), 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, NMO automatically backs up the NWORA resource file, as described in ["The NWORA Resource File" on page 159](#).

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 parameter `NSR_DATA_VOLUME_POOL` 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 parameter `NSR_SB_DEBUG_FILE` 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 149](#).

The NWORA resource file backup can be restored by using the NetWorker `recover` command or `nwrecover` GUI program. For more information, refer to the *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 54](#)
- ["Canceling a Scheduled Oracle Backup" on page 82](#)

Proxy Oracle Backup Information in the NetWorker Indexes

The NetWorker server maintains information about each backup in its online indexes. For more information, see ["About the NetWorker Software" on page 24](#).

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 *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 148](#).
- 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 148](#). 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 148](#). 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 2004  
  
/brcmeta.1/, data=1061568321 Fri Aug 22 12:05:21 2004  
  
Physical files to rollover:  
  
/JBOD13_NMO41_MVOL3/tbspc4_data1.dbf  
  
/JBOD13_NMO41_MVOL3/tbspc4_data1.dbf, date=1061568319  
Fri Aug 22 12:05:19 2004
```

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, 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 149.



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	08/22/04	12:05:19	102 MB
snap.001	marmaris	08/22/04	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` or `nwrecover` 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
2004
```

```

/nsr/res/, date=1061572719 Fri Aug 22 13:18:39 2004
/nsr/, date=1061572719 Fri Aug 22 13:18:39 2004
/, date=1061572719 Fri Aug 22 13:18:39 2004

```

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

```

<u>volume</u>	<u>client</u>	<u>date</u>	<u>time</u>	<u>size</u>
nmo.002	marmaris	08/22/04	13:18:39	4 KB
<u>ssid</u>	<u>fl</u>	<u>lvl</u>	<u>name</u>	
3863367791	cb	full	/nsr/res/nwora.res	

For more information on these NetWorker commands, refer to the *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 NMO, see the ["Roadmap for Oracle Data Recovery" on page 90](#).

Review the following information, specific to proxy Oracle restores:

- ["Creating RMAN Scripts for Proxy Oracle Restores" on page 151](#)
- ["Performing Proxy Oracle Restores" on page 152](#)
- ["Relocating Files during Proxy Oracle Restores" on page 154](#)
- ["Restoring to a Different Host" on page 155](#)
- ["RMAN Point-in-Time Recoveries without a Recovery Catalog" on page 156](#)

For information on proxy Oracle restores in a cluster environment, see ["Proxy Backups and Restores on Cluster Systems"](#) on page 173.

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: Restore and Recover Procedures"](#) on page 89.

To perform a proxy Oracle restore, the appropriate parameters must be set, as described in ["Setting the Parameters"](#) on page 137.

The RESTORE_TYPE_ORDER Parameter

The `RESTORE_TYPE_ORDER` parameter 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 NMO.
2. The `RESTORE_TYPE_ORDER` parameter 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 Parameter Settings

If the `RESTORE_TYPE_ORDER` parameter 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 parameter 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 152.



Important: For the `RESTORE_TYPE_ORDER` parameter, NMO 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` Parameter

To restore Oracle data to a different host, the parameter `NSR_CLIENT` must be set to the required hostname. For more information, see ["Restoring to a Different Host" on page 155](#).

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.
- With Oracle 9.2.x on Windows, if a restore is attempted after a cold proxy Oracle backup and the database remains in a mounted state between the backup and restore operations, the restore fails with the following error:

```
nworapc_complete_recover: Could not finish restore for -  
Oracle_datafile_name
```

This error is caused by the Oracle bug number 3095423. Contact Oracle Corporation for the available fix.

As a workaround, shut down and restart the database before attempting the restore.

- 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 153](#).

- 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 154.
- 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 parameter `NSR_MAX_STREAMS`. For more information, see [Table 4 on page 138](#).

Directory Created for File System Data Restore

During a proxy restore of regular file system 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 file system data fails, the non-empty `.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, NMO automatically cleans 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:

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

Note: To learn 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 NMO.



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

During a proxy Oracle restore, NMO 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/orcl92/file2` and the symbolic link `/tmp/file1` is specified in the **set newname** command, the backed-up file will be restored to `/dbapps/orcl92/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 96. Task 2 of that section explains that NMO 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, NMO 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 NMO 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 NMO, *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 **nsrmm -c *client_name*** command. For more information on using this command, see the following:
 - ["Proxy Backups from a Virtual Cluster Client" on page 174](#)
 - ["Proxy Backups from a Physical Cluster Client" on page 176](#)
- 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, use an RMAN recovery catalog instead of a control file. For more information, see "[Control File Versus Recovery Catalog](#)" on page 159.



Important: To enable automatic catalog synchronization for proxy backups:

- The parameter `ORACLE_SID` 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 66.
 - An NWORA resource file must include the required resources, as described in "[The NWORA Resource File](#)" on page 159.
-

The NMO 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 159
- "[Automatic Catalog Synchronization by Using the nsroraclecat Program](#)" on page 169

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 NMO 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 166](#).

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 160](#)
- ["NWORA SID Resources" on page 162](#)

NWORA Parameter Resources

An NWORA parameter resource comprises one specific parameter setting, such as for the parameter `NSR_ORACLECAT_MODE`. For instant backups, the NWORA resource file must contain the five parameter resources described in [Table 5 on page 160](#).

Note: The parameter resources listed in [Table 5 on page 160](#) 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 nsrmm and nsrsnapck .	<ul style="list-style-type: none"> • Directory pathname for the location of nsrmm and nsrsnapck (default). • Valid directory pathname for the location of the NetWorker binaries.
NSR_ORACLECAT_DEBUG_FILE	Specifies the debug file used by the nsroraclecat program. Set this parameter only for the purpose of debugging the nsroraclecat program. Note: The nsroraclecat 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 nsroraclecat debug file. <p>Note: If undefined, debug information is <i>not</i> generated.</p>

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

Parameter Resource	Description	Default and Valid Values
NSR_ORACLECAT_LOG_FILE	Specifies the operations log file used by the nsroraclecat 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 nsroraclecat log file. <p>Note: If undefined, logging information is written to the <i>/nsr/applogs/nsroraclecat.log</i> file by default.</p>
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 169.	<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 NMO installation, the NWORA resource file is automatically populated with the five parameter resources from [Table 5 on page 160](#).

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 166](#).



Example: Default NWORA Parameter Resources

After the NMO installation, if the first **nsrnmoadmin** command entered is **nsrnmoadmin -r list** (to list the NWORA resource file contents), the command 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 162](#).

NWORA SID Resources

An NWORA SID resource comprises a specific group of parameters 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 parameters described in [Table 6 on page 163](#).

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 169.

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

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

Parameter	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 165.	<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 parameter \$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 parameter is <i>not</i> required on Windows.</p>

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

Parameter	Description	Default and Valid Values
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 71.</p>
NSR_ORACLE_TNS_ADMIN	<i>Optional.</i> Specifies the pathname of the directory containing the 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 parameter \$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 166](#).



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 `orcl92`, 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 `orcl92`.
- `NSR_ORACLE_CONNECT_FILE` and `NSR_ORACLE_HOME` set to suitable values.
- `NSR_ORACLE_LIB_PATH` and `NSR_ORACLE_TNS_ADMIN` *optionally* set to suitable values.

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

```
NSR_ORACLE_CONNECT_FILE=/dbapps/orcl92/connect.file
NSR_ORACLE_HOME=/dbapps/orcl92/app/oracle/product/9.2
NSR_ORACLE_LIB_PATH=/usr/lib
NSR_ORACLE_SID=orcl92
NSR_ORACLE_TNS_ADMIN=/dbapps/orcl92/tns
```

In this sample, the RMAN connection file is `/dbapps/orcl92/connect.file` and the Oracle home directory is `/dbapps/orcl92/app/oracle/product/9.2`.

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 parameter `NSR_ORACLE_CONNECT_FILE` must be set to the pathname of the connection file. See "[NWORA SID Resources](#)" on page 162.



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

The connection file must include the following:

- The connection string that is required to connect to the target database.
- If an RMAN recovery catalog is used, the connection string that is 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@orcl92;  
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.
- Command options and settings in brackets ([]) are optional. Do *not* include the brackets when entering the command.
- 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 parameter 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 parameter of the NWORA SID resource.
- *connect_filepath* is the value of the NSR_ORACLE_CONNECT_FILE parameter of the NWORA SID resource.
- *Oracle_libpath* is the value of the NSR_ORACLE_LIB_PATH parameter of the NWORA SID resource.
- *Oracle_tnsadmin* is the value of the NSR_ORACLE_TNS_ADMIN parameter 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 168](#)
- ["How to Add NWORA Resources" on page 168](#)
- ["How to Update NWORA Resources" on page 169](#)
- ["How to Delete NWORA SID Resources" on page 169](#)

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

- The **nsrnmoadmin** man page on a UNIX Oracle Server that contains the NMO software.
- The **nsrnmoadmin** entry in the *NetWorker Module for Oracle Command Reference Guide* available at 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 orcl92, enter the following:

```
nsrnmoadmin -r list orcl92
```

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, use of the **add** keyword causes the resource value to be *updated*.

To add a new NWORA SID resource with the NSR_ORACLE_SID value of orcl92 and other values as specified in "[Example: NWORA SID Resource](#)" on [page 164](#), enter the following:

```
nsrnmoadmin -r add sid=orcl92  
home=/dbapps/orcl92/app/oracle/product/9.2  
connect=/dbapps/orcl92/connect.file lib=/usr/lib  
tns=/dbapps/orcl92/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 parameters NSR_ORACLE_HOME and NSR_ORACLE_CONNECT_FILE in an NWORA SID resource with the NSR_ORACLE_SID value of orcl92, enter the following:

```
nsrnmoadmin -r update sid=orcl92
home=/dbapps/oracle/9.2/bin
connect=/dbapps/oracle/connect/orcl92.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 orcl92, enter the following:

```
nsrnmoadmin -r delete orcl92
```

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 NMO 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 192](#). 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 170](#)
- ["Failure of the nsroraclecat Program" on page 171](#)
- ["NetWorker Index Entry Removals with nsrsnapck" on page 172](#)

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 160.

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

- The **nsroraclecat** man page on a UNIX Oracle Server that contains the NMO software.
- The **nsroraclecat** entry in the *NetWorker Module for Oracle Command Reference Guide* available at 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 172.

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

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



Important: The parameter `NSR_CLIENT` is *not* supported for proxy Oracle backups on a cluster system. This parameter is used for restores and regular Oracle backups on a cluster system, as described in ["Chapter 6: Cluster, OPS, and RAC Systems" on page 101](#).

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

- ["Proxy Backup Failover" on page 173](#)
- ["Proxy Backups from a Virtual Cluster Client" on page 174](#)
- ["Proxy Backups from a Physical Cluster Client" on page 176](#)
- ["Restores from Proxy Backups on a Cluster System" on page 177](#)

Proxy Backup Failover

During a scheduled proxy backup where the Oracle software is configured to fail over (for example, using Oracle Fail Safe 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 211](#).

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:

1. Install the NMO 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 140](#).
 - 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 132](#).
 - 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 *NetWorker Administrator's Guide*.
4. Configure the NWORA resource file on *each* node of the cluster, as described in ["Configuring the NWORA Resource File" on page 133](#).

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 **nsrnm** 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 **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 157.

Notes:

- The host specified with `-c client_name` must have access to instant backups.
- NMO and the 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
```

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 142](#)
- *NetWorker Administrator's Guide* (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 **nsrnm0** 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 **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 157](#).

Notes:

- The host specified with `-c client_name` must have access to instant backups.
- NMO and the 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 **nsrnm0901**, specify the following in the Backup Command attribute:

```
nsrnm0901 -c monalisa.legato.com
```

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 parameter `NSR_CLIENT` to the correct value by using one of the methods in ["Setting the NSR* Parameters" on page 179](#).
 - 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: Parameters in the RMAN Session

This appendix describes the NSR* parameters that can be set in the RMAN command or script for Oracle backups and restores that use NetWorker Module for Oracle (NMO).

Note: Unless noted otherwise, the parameters are supported for *both* non-proxy and proxy Oracle backups and restores. For information specific to proxy Oracle operations, see ["Setting the Parameters" on page 137](#).

This appendix includes the following main sections:

- ["Setting the NSR* Parameters" on page 179](#)
- ["NSR* Parameter Definitions" on page 181](#)

Setting the NSR* Parameters

The NSR* parameters described in [Table 7 on page 181](#) are parameters specific to NetWorker that can be set for an RMAN session of:

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

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To ensure that the required NSR* parameters are set during an Oracle backup or restore, set them in one of the following ways:

- By using the RMAN **send** command (*recommended*), as *one* of the following:
 - The **rman send** command on the operating system command line.
 - The **send** command in the RMAN session or script.
- For automatic channels *only* if the RMAN **send** command *cannot* be used:
 - By using the **parms** option in the **configure channel** command.
 - By using the **send** option in the **configure channel** command in the following *only*:
 - In an RMAN backup script that will *not* be scheduled through the NetWorker server.
 - In an RMAN restore script.

For more information on automatic channels, see "[Automatic Channel Allocation](#)" on page 205.

Do *not* mix these different ways of setting the NSR* parameters in the same RMAN session.

The use of a UNIX **setenv** command or Windows **set** command on the operating system command line to set the NSR* parameters has *no effect*.

On Windows, when an NSR* parameter is set with the **parms** option, the value of that NSR* parameter remains in effect for all subsequent allocated channels, and for all subsequent RMAN sessions until one of the following occurs:

- The Oracle database is shut down.
- The NSR* parameter 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 parameters are set with the **send** command in all RMAN sessions.

NSR* Parameter Definitions

Table 7 on page 181 lists all the NSR* parameters to set in the RMAN session. For each parameter, the table includes:

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

Table 7. Parameters in the RMAN Command or Script (Part 1 of 9)

Parameter	Description	Default and Valid Values
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.
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.

Table 7. Parameters in the RMAN Command or Script (Part 2 of 9)

Parameter	Description	Default and Valid Values
NSR_DATA_VOLUME_POOL	<p><i>Mandatory</i> if using the set duplex command (with duplex set to 1, 2, 3, or 4).</p> <p>Specifies the name of the volume pool to use for the Oracle backup, including a duplexed Oracle backup.</p> <p>In the case of proxy backups, specifies the volume pool for <i>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 the parameter NSR_DATA_VOLUME_POOL1, NSR_DATA_VOLUME_POOL2, or NSR_DATA_VOLUME_POOL3.
NSR_DATA_VOLUME_POOL1	<p><i>Mandatory</i> if using the set duplex command (with duplex set to 2, 3, or 4).</p> <p>Specifies the name of the volume pool to use for a duplexed 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 the parameter NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL2, or NSR_DATA_VOLUME_POOL3.
NSR_DATA_VOLUME_POOL2	<p><i>Mandatory</i> if using the set duplex command (with duplex set to 3 or 4).</p> <p>Specifies the name of the volume pool to use for a duplexed 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 the parameter NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL1, or NSR_DATA_VOLUME_POOL3.

Table 7. Parameters in the RMAN Command or Script (Part 3 of 9)

Parameter	Description	Default and Valid Values
NSR_DATA_VOLUME_POOL3	<p><i>Mandatory</i> if using the set duplex command (with duplex set to 4).</p> <p>Specifies the name of the volume pool to use for a duplexed 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 the parameter NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL1, or NSR_DATA_VOLUME_POOL2.
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 NMO media management library (MML).</p> <p>Note: NSR_DEBUG_FILE <i>must</i> be set through the parms option. Do <i>not</i> set it through the send option or command.</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>

Table 7. Parameters in the RMAN Command or Script (Part 4 of 9)

Parameter	Description	Default and Valid Values
NSR_DEBUG_LEVEL	<p><i>Optional.</i> Controls the amount of debug information that NMO writes to the debug log file, which is specified by NSR_DEBUG_FILE.</p> <p>Set this parameter through the parms option. Do <i>not</i> set it through the send option or command.</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.
NSR_DPRINTF_FILE	<p><i>Optional.</i> Enables debugging by specifying the complete pathname of a log file on the Oracle Server that receives messages from the NetWorker dprintf() function during NMO operations.</p> <p>Set this parameter through the parms option. Do <i>not</i> set it through the send option or command.</p> <p>If this parameter is set:</p> <ul style="list-style-type: none"> • NSR_DEBUG_FILE must be set. • NSR_DEBUG_LEVEL must be set to a value of 1 or greater. The level of messages printed is determined by the NSR_DEBUG_LEVEL value. 	<ul style="list-style-type: none"> • Undefined(default). • The valid pathname of a log file to which the NetWorker dprintf() messages are printed for debugging purposes.

Table 7. Parameters in the RMAN Command or Script (Part 5 of 9)

Parameter	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.</i> Use for a manual backup <i>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.	<ul style="list-style-type: none"> • The predefined NetWorker group named Default (default). • A valid NetWorker backup group name. <p>Note: A NetWorker Group resource must be configured for the specified backup group.</p>
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 parameter 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.

Table 7. Parameters in the RMAN Command or Script (Part 6 of 9)

Parameter	Description	Default and Valid Values
NSR_NO_MULTIPLEX	<p><i>Optional.</i> When set for a specific RMAN channel, specifies whether multiplexing is disabled during a backup on the NetWorker device that the RMAN channel is using. If multiplexing is disabled, no other save sets can be written to the device.</p> <p>To optimize restore operations, RMAN requires NMO backups to <i>not</i> be multiplexed.</p> <p>Setting the parameter to TRUE may affect the backup performance. For example, the device may sit idle during part of the backup. If the performance is adversely affected, reset the parameter to FALSE.</p>	<ul style="list-style-type: none"> • FALSE (default) = Multiplexing is <i>enabled</i> on the device that the RMAN channel is using. • TRUE = Multiplexing is <i>disabled</i> on the device that the RMAN channel is using. <p>Note: If a random access NetWorker device such as an advanced file device is used, do <i>not</i> set the parameter to TRUE.</p>
NSR_NWPATH	<p><i>Mandatory</i> when removing a backup from the NetWorker server if both:</p> <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 159. <p>Specifies the complete pathname of the directory containing the nsrmm and nsrsnapck binaries.</p>	<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. Parameters in the RMAN Command or Script (Part 7 of 9)

Parameter	Description	Default and Valid Values
NSR_PROXY_PFILE	Supported <i>only</i> for a proxy Oracle backup or restore. <i>Mandatory</i> if setting PowerSnap parameters in a configuration file. Specifies the complete pathname of a configuration file that contains PowerSnap parameter settings for a proxy Oracle backup or restore.	<ul style="list-style-type: none"> Undefined (default). A valid pathname of the configuration file. <p>Note: If undefined or an invalid pathname, parameter settings in the preferred configuration file are ignored.</p>
NSR_RETENTION_DISABLED	<i>Optional.</i> Specifies whether the NetWorker browse and retention policies are disabled. Set to TRUE to use Oracle policies only (<i>not</i> NetWorker policies) to manage the backup data life cycle. Then the RMAN catalog and NetWorker indexes cannot become unsynchronized, for example, when a NetWorker index entry is expired but the corresponding RMAN catalog entry is <i>not</i> expired.	<ul style="list-style-type: none"> FALSE (default) = NetWorker browse and retention policies are enabled, and used to manage the life cycle of the NMO backup data. TRUE = NetWorker browse and retention policies are disabled. Only Oracle policies are used to manage the life cycle of the NMO backup data.
NSR_SAVESET_BROWSE	<i>Mandatory</i> if setting a nondefault browse policy for a <i>manual</i> Oracle backup. Specifies the date when the entry for the backup is to be removed from the NetWorker client index. Note: For a <i>scheduled</i> Oracle backup, this parameter <i>overrides</i> the Browse Policy attribute setting in the NetWorker Client resource.	<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.

Table 7. Parameters in the RMAN Command or Script (Part 8 of 9)

Parameter	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.</p> <p>Specifies the date when the save set becomes recyclable.</p> <p>Note: For a <i>scheduled</i> Oracle backup, this parameter <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 manual 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.

Table 7. Parameters in the RMAN Command or Script (Part 9 of 9)**A**

Parameter	Description	Default and Valid Values
NSR_SERVER_NIC	<p><i>Optional.</i> Specifies the name of a network interface card (NIC) on a NetWorker server.</p> <p>When this parameter is set with the RMAN send command for an allocated channel, its value overrides the NSR_SERVER setting for that channel only.</p> <p>Note: This parameter must be explicitly set for <i>each</i> channel to which applies. Setting this parameter is the only supported way to override the NSR_SERVER value for a scheduled backup.</p>	<ul style="list-style-type: none"> • Undefined (default). • A valid name of a NetWorker server NIC.

a. Instead of setting the parameter NSR_NWPATH in the RMAN script, the **nsrnmoadmin** command can be used to set NSR_NWPATH in the NWORA resource file. The parameter NSR_NWPATH 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 159](#).

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Appendix B: RMAN Commands

This appendix describes RMAN commands, such as the **delete expired backup** command, that are dependent on the media management (in this case, NetWorker Module for Oracle (NMO)) implementation. This appendix also addresses the behaviors of certain other RMAN commands, such as the **change backupset...validate** command, that involve the NMO 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 delete expired backup Command" on page 191](#)
- ["The change...crosscheck and crosscheck Commands" on page 192](#)
- ["The pool Option of the backup Command" on page 192](#)
- ["The send Command" on page 193](#)
- ["The set duplex Command" on page 201](#)
- ["The trace Option of the backup Command" on page 202](#)

The delete expired backup Command

For a particular user to be able to use the **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 **delete expired backup** command runs, NMO *fails* to remove the required entries in the NetWorker client file index and media database.

Despite this failure, the **delete expired backup** command 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 *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 the NMO installation, the parameter NSR_NWPATH might need to be set in the NWORA resource file or in the RMAN script. For more information, see ["NSR_NWPATH" on page 186](#).

The change...crosscheck and crosscheck Commands

For all NetWorker client file index entries that are *not* browsable, the running of 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 has expired.

The pool Option of the backup Command



Important: NMO 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 terminates and NMO returns the following error message:

```
sbtbackup: Oracle pools are not supported
```

For more information on this error message, see ["NMO Error Messages" on page 218](#).

To specify the NetWorker volume pool to be used by NMO, set the parameter NSR_DATA_VOLUME_POOL in the RMAN script. For more information, see ["Appendix A: Parameters in the RMAN Session" on page 179](#).

The send Command

The NMO implementation of the **send** command enables the NSR* parameters to be set, as described in "[Appendix A: Parameters in the RMAN Session](#)" on page 179.

Set the NSR* parameter values with the following:

- With the RMAN **send** command (*recommended*).
- For automatic channels *only*, if the RMAN **send** command *cannot* be used:
 - With the **parms** option in the **configure channel** command.
 - With the **send** option in the **configure channel** command in the following *only*:
 - In an RMAN backup script that will *not* be scheduled through the NetWorker server.
 - In an RMAN restore script.

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

- "[Syntax Rules](#)" on page 193
- "[Two Ways to Run the send Command](#)" on page 196
- "[Precedence Rules](#)" on page 199

Syntax Rules

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

```
send [ device_type 'device_specifier' | channel channel_id ]
'NSR_ENV=(name1=value1 [, name2=value2, ...])'
```

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

- "[The send Command String](#)" on page 194
- "[The send Command Options](#)" on page 195

The send Command String

The command string in the **send** command is the string inside the quotes, 'NSR_ENV=(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 parameter 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 NMO parameter names and the corresponding parameter values.
- Inside the parentheses, spaces are *not* allowed around the equal signs. A space *before* an equal sign becomes part of the parameter name. A space *after* an equal sign becomes part of the parameter's value.
- Commas separating the *name=value* entries are *mandatory*.
- Comments are *not* allowed inside the quotes. In the following example, "# NSR_SERVER" is considered the first parameter'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:

- **send** with no option—only the quoted command string—sets the parameters for *all* allocated channels.
- **send device_type 'SBT_TAPE'** sets the parameters for all channels of the backup tape device.

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

- **send channel** sets the parameters for the specified channels only.



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 197](#).



Example: A send Command Sets the Parameters for a Specified Channel

In the following sample script, the parameters 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)';
    :
}
```

This sample RMAN script is referenced in [Table 8 on page 196](#).

Table 8 on page 196 lists the values for options used with the **send** command. The example referred to is "A send Command Sets the Parameters for a Specified Channel" on page 195.

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 example, the identifier is t1.
<i>name1</i>	The first NMO parameter name. In the example, the first parameter name is NSR_SERVER.
<i>value1</i>	The value assigned to the first parameter. In the example, the first value is server1.
<i>name2</i>	The second NMO parameter name. In the example, the second parameter name is NSR_DATA_VOLUME_POOL.
<i>value2</i>	The value assigned to the second parameter. In the example, the second value is MondayFalls.

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 197.
- In the **run** job of the RMAN script, as described in "The send Command in the RMAN Script" on page 198.

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=(name1=value1[, 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 194](#)—*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 195](#)).
- 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=(name1=value1[, 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 parameter values in the quoted string are applied to *all* channels allocated during the RMAN session. These values are applied *before* any parameter values specified in **send** commands within the RMAN script itself. For more information, see ["Precedence Rules" on page 199](#).



Example: An `rman send` Command Sets a Parameter for All Channels

In the following example, the `NSR_SERVER` parameter 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';
    :
}
```

B

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=(name1=value1 [, name2=value2, ...])'
```

- Follow all the `send` command syntax rules listed in ["The send Command String" on page 194](#).
- 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 195](#).
- Specify the correct option values in the `send` command, as described in ["The send Command Options" on page 195](#).
- RMAN commands are run in the order that they appear in the backup or restore script. For a parameter 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 parameter 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 49](#). The single **send** command sets the parameters for *both* channels.

Note: To prevent backup performance problems with NetWorker release 7.1.x and earlier, 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. With NetWorker *server* release 7.2 and later, the forward slashes are *not* required in the **format** option. For more information on this issue, refer to the *NetWorker Module for Oracle Release Notes*.

Precedence Rules

Parameters are set for channels allocated during the RMAN session in the following order:

1. In the **parms** option in the **allocate channel** or **configure channel** command (**configure channel** is used only for automatic channel allocation).
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.



Important: 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 in the **configure channel** command is executed by Oracle.

B

To prevent confusion and simplify the task of setting parameters in a specific order, do *not* mix these different ways of setting parameters in the same RMAN session.



Example: Order of Parameters Set According to the Precedence Rules

In the following example, the parameters `NSR_SERVER` and `NSR_CLIENT` are set in this order:

- `NSR_SERVER` is set to `server1` (by **rman send**), changed to `server2` (by the first **send** command), and finally changed to `server3` (by **send channel**).
- `NSR_CLIENT` is set to `client1` (by **rman send**), changed to `client2` (by the first **send** command), 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';
    send 'NSR_ENV=(NSR_SERVER=server2,
NSR_CLIENT=client2)';
    send channel t1 'NSR_ENV=(NSR_SERVER=server3,
NSR_CLIENT=client3)';
    :
}
```

The set duplex Command

The **set duplex** command can be set in the RMAN backup script to generate up to four copies of an Oracle backup and then 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 201](#) 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 parameters NSR_DATA_VOLUME_POOL, NSR_DATA_VOLUME_POOL1, NSR_DATA_VOLUME_POOL2, and NSR_DATA_VOLUME_POOL3. The values of these parameters must be defined. For more information on how to set parameters, see ["Appendix A: Parameters in the RMAN Session" on page 179](#).

Each pool specified by one of these `NSR_DATA_VOLUME_POOL*` parameters 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 208](#).

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 NMO, 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 209](#) 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 203](#) outlines the conditions that are 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 NMO implementation of the Oracle SBT interface).
2	<ul style="list-style-type: none"> • All error conditions. • Entry and exit for each SBT function (the NMO implementation of the Oracle SBT interface). • Values of all function parameters. • First 32 bytes of each read/write buffer.

B

Appendix C: Oracle9i and Oracle10g Support

This appendix describes how to use specific RMAN features introduced in Oracle9i and Oracle10g with the NetWorker Module for Oracle (NMO) software. For complete information on the features, refer to the appropriate Oracle9i and Oracle10g backup and recovery documentation.

This appendix includes the following main sections:

- ["Oracle9i Support" on page 205](#)
- ["Oracle10g Support" on page 212](#)

Oracle9i Support

The following sections describe the features introduced in Oracle9i that are applicable to the NMO software.

Automatic Channel Allocation

In Oracle9i and later, RMAN supports automatic channel allocation. This feature enables the configuration of persistent settings for automatic channels, for use in all RMAN sessions.



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 NMO 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 NMO; otherwise, RMAN reports an error.

With automatic channel allocation, specifying the **send** command before the **backup** or **restore** command causes the following error:

```
RMAN-06422: no channels found for SEND command
```

The preferred method to set the NSR* parameters for automatic channels for an NMO backup is to run the RMAN executable (for example, enter the **rman** command on UNIX) with the **send** command line option on the operating system command line.



Example: Using the the send Command Line Option for Automatic Channels

An RMAN script named */space10/home/ora920/backup* includes the following commands for an NMO backup:

```
connect target sys/passwd@ora920;
backup database;
```

To set an automatic channel for the backup with the NetWorker server *jupiter.legato.com*, the preferred method is to enter the following command at the command line:

```
rman cmdfile='/space10/home/ora920/backup' send
" 'NSR_ENV=(NSR_SERVER=jupiter.legato.com)' "
```

Running the RMAN executable with the **send** command line option sets the NSR* parameters for *all* the allocated channels. To set specific NSR* parameter values for different channels (for example, a separate setting of the parameter `NSR_DEBUG_FILE` for each channel), use the **parms** option of the **configure channel n** command.

Note: If, for any reason, you *cannot* use the **send** command line option, specify generic automatic channel options by entering the RMAN command **configure channel device type...parms...**



Example: Using the `configure channel` Command with the `parms` Option for Automatic Channels

If the `send` command line option cannot be used, an automatic channel can be configured for NMO backups with the NetWorker server *jupiter.legato.com* by entering the following `configure channel` command:

```
configure channel device type 'sbt_tape' parms
'ENV=(NSR_SERVER=jupiter.legato.com)'
```

This command sets the default parameters for all the automatic channels.

To configure the NSR* parameter values per channel, specify automatic channel options for a *specific* channel number by entering the `configure channel n device type...parms...` command.



Example: Specifying Parameter Values Per Automatic Channel

An NMO debug file is specified for the second automatic channel by entering the following `configure channel` command:

```
configure channel 2 device type 'sbt_tape' parms
'ENV=(NSR_DEBUG_FILE=/db/logs/backup.log)'
```

Note: You can use the `configure channel` command with the `send` command line option to set any NSR* parameters in the following:

- In an RMAN backup script by using automatic channels that will *not* be scheduled through the NetWorker server.
- In an RMAN restore script.

Control File Autobackup

In Oracle9i and later, 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 NMO, the control file autobackup will also be performed with NMO. As a result, one or more channels of device type **sbt_tape** must be allocated for the restore.

Note: Oracle 9.2 and later supports autobackup of the current server parameter file together with control file autobackup.

C

Backup Copies

In Oracle9i and later, the **set duplex** command is deprecated. Despite the fact that RMAN in Oracle9i and later provides different commands for duplexing backups, the rules for duplexing through NMO 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 201.

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 NMO. For example, specify persistent settings for duplex copies of datafiles and archived redo logs (respectively) in NMO 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.

Retention Policies

In Oracle9i and later, 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.

NMO 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 an NMO backup that is not yet obsolete in RMAN, depending on the NetWorker browse and retention policies. Use of NMO *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 parameters. For more information on how to set NetWorker policies for NMO backups, see ["Task 4: Configure the NetWorker Client Resource" on page 42](#).



Important: Run the **crosscheck** command on the NMO 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 and later, RMAN skips selected files 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 NMO 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 has already expired in NetWorker.

The restore optimization function prevents RMAN from restoring 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.

Backup of Backup Sets

In Oracle9i and later, RMAN supports the backup of backup sets. If Oracle data has been backed up with **device type disk**, NMO 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 and later, 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 NMO backups, see the appropriate section:

- ["Canceling a Manual Oracle Backup" on page 54](#)
- ["Canceling a Scheduled Oracle Backup" on page 82](#)

Oracle10g Support

NMO release 4.2 provides support for Oracle release 10.1. Some examples of the supported Oracle 10.1 RMAN features are as follows:

- Fast incremental backups that use change tracking files.
- Proxy backups and restores of archived redo logs.

Note: Oracle does *not* support proxy backups of data files or archived redo logs residing on Oracle Automated Storage. Oracle Automated Storage is also known by the term Oracle ASM (Automated Storage Management).

- Channel backup failover, and backup piece restore failover.
- Managing backup duration and throttling.
- Backups and restores of data residing on Oracle Automated Storage.
- The flash recovery area and flashback database.

For a complete list of the RMAN features, refer to the Oracle 10.1 Recovery Manager documentation.

When using Oracle 10.1 RMAN features with NMO, consider the following:

- A flash recovery area stores and manages files related to the recovery of a particular database.

To back up RMAN disk backups, control file autobackups, and archived redo logs from the flash recovery area to NetWorker volumes:

1. Allocate or configure one or more channels with the **sbt_tape** device type.
2. Back up the files with one of the following RMAN commands:

backup recovery area

backup recovery files

Note: Whether or not a flash recovery area is enabled, the **backup recovery files** command can be used to perform the backup.

For example, the following sequence of RMAN commands can be used to configure an automatic channel for NMO and back up the files from the flash recovery area:

```
configure default device type to 'sbt_tape';
configure channel device type 'sbt_tape' send
'NSR_ENV=(NSR_SERVER=jupiter)';
backup recovery files;
```

- If multiple channels are used for an RMAN **backup** command and one of the channels fails, Oracle fails over to another channel to continue the backup job.

For example, if two channels are configured with different NetWorker volume pools and one of the channels fails during a backup, the entire backup might go to volumes in the same pool, depending on when the failover occurs.

- Before using the **backup** command with the **duration...minimize load** option, consider:
 - The **minimize load** option might impact the tape streaming since the transfer rate of data sent by RMAN might be slow with this option, depending on the **duration** value.
Note: This is *not* a concern if you use the NetWorker backup to disk feature.
 - The **minimize load** option might cause an NMO scheduled backup to be timed out if RMAN does not send data to the NetWorker Module within the time frame specified in the Inactivity Timeout field of the corresponding NetWorker Group resource.
- Starting with release 10.1, RMAN does *not* print database connection strings (*user/password@Netservername*) to the session output. As a result, the parameter NSR_RMAN_OUTPUT is *not* required (to suppress the connection strings in the log files) for an RMAN 10g scheduled backup.

C

Appendix D: Troubleshooting and Error Messages

This appendix describes troubleshooting guidelines to follow if the NetWorker Module for Oracle (NMO) software does not function properly. It also describes RMAN error messages and common NMO error messages that might be encountered.

This appendix includes the following main sections:

- ["Troubleshooting Tips" on page 215](#)
- ["RMAN Error Messages" on page 217](#)
- ["NMO Error Messages" on page 218](#)

Troubleshooting Tips

The following list of troubleshooting tips refers to sections of this Administrator's Guide and the *NetWorker Module for Oracle Installation Guide*. Use the following list to troubleshoot any problems in running Oracle backup and restore operations when using NMO.

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 *NetWorker Module for Oracle Installation Guide*.

2. Configure the Oracle Server and Net service (if used) according to the instructions in the Oracle documentation.

Without NMO installed on the Oracle Server host, it should be possible to perform a backup and restore by 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, and refer to the *NetWorker Administrator's Guide*.

4. Install and enable the NMO software according to the instructions in the *NetWorker Module for Oracle Installation Guide*.

To relink the library file on UNIX, use the linking commands listed in the Installation Guide. Use the correct *libnwora.** library file.

To verify the version of NMO installed, check the version of the *nsrnmstart* program file or *libnwora.** library file:

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

```
# what filenm
```

```
# strings filenm | grep "@(#)"
```

```
# pkginfo -l LGTONmo (Solaris only)
```

- On Windows:
 - a. Find the *nsrnmstart.exe* or *libwora.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 *libnwora.** file in the NMO software package—the two files should be identical. Ensure that Oracle is not linked to another *libnwora.**, *libobk.** (NetWorker BusinessSuite™ Module for Oracle version of *libnwora.**), or *liblsm.** (from Legato Storage Manager or Legato Single Server Version) file.

5. Perform a *manual* Oracle backup by using NMO and the proper RMAN script.

Set the required NSR* parameters 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* parameters, see "[Appendix A: Parameters in the RMAN Session](#)" on page 179. For a simple startup RMAN script, see "[Task 1: Create RMAN Scripts for Manual Backups](#)" on page 48.

If the manual backup *fails*, check the debug files for NMO and the NetWorker server. For NMO debug information, set the parameters `NSR_DEBUG_FILE` and `NSR_DEBUG_LEVEL`. To direct the messages from the NetWorker `dprintf()` function to a file, set the parameter `NSR_DPRINTF_FILE`. For more information, see ["NMO Error Messages" on page 218](#).

6. Perform a *scheduled* Oracle backup by using NMO and the proper RMAN and `nsrnmo` 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 62](#). Customize the `nsrnmo` script, as described in ["Task 2: Customize the nsrnmo Script" on page 66](#).

If the manual backup succeeds but the scheduled backup *fails*, set the parameter `NSR_SB_DEBUG_FILE` to generate debug information for the scheduled backup. For more information, see ["RMAN Error Messages" on page 217](#).

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 parameter `NSR_RMAN_ARGUMENTS` in the `nsrnmo` script. For more information, see ["NSR_RMAN_ARGUMENTS" on page 69](#).

For more information on specific RMAN error messages and recommended courses of action, refer to the appropriate Oracle Error Messages guide.

NMO Error Messages

During a backup or restore, the NMO 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 parameter `NSR_DEBUG_FILE` to the valid pathname of a log file to store the information. If the parameter 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.

For more information, see ["NSR_DEBUG_FILE" on page 183](#).

The parameter `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, see ["NSR_DEBUG_LEVEL" on page 184](#).

To direct the messages from the NetWorker `dprintf()` function to a file during NMO operations, set the parameter `NSR_DPRINTF_FILE`. For more information, see ["NSR_DPRINTF_FILE" on page 184](#).

During a *scheduled* backup, the NMO software records additional information and error messages in the file specified by the parameter `NSR_SB_DEBUG_FILE` in the **nsrnm** script. If the parameter 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 parameter `NSR_SB_DEBUG_FILE` is *not* set in the `nsrnm` script file, the debug information is *not* written. For more information, see ["NSR_SB_DEBUG_FILE" on page 71](#).

The NetWorker server also writes diagnostic information from the manual or scheduled Oracle backup to specific log files on the NetWorker server. For more information on these log files, refer to the *NetWorker Administrator's Guide*.

NMO error messages can be grouped into three categories, according to the program that generates the message and the message format:

- ["Error Messages from the libnwora Library" on page 219](#)
- ["Error Messages from the nsrnmoadmin Program" on page 236](#)
- ["Error Messages from the nsrnmoinfo Program" on page 241](#)

Error Messages from the libnwora Library

[Table 11, "Error Messages from the libnwora Library," on page 220](#) lists the error messages generated by the *libnwora* library, in alphabetical order.

The error messages appear in the following format:

```
function_name: error_message (error_type:error_code:error_number)
```

where:

- *function_name* is the name of the NMO function that produced the error.
- *error_message* is the text of the error message, as shown in the table.
- *error_type*, *error_code*, *error_number* are internal numbers that represent an error type or code. Their significance for the user is as follows:
 - If *error_code* is 1, the system is out of memory.
 - If *error_code* is 3, 13, or 17, a code-level error has occurred. Report the error message to Technical Support.

Table 11. Error Messages from the libnwor Library (Part 1 of 17)

Error Message	Description	Resolution
A connection to NW server ' <i>server</i> ' could not be established because ' <i>reason</i> '.	NMO could not connect to the NetWorker client file index due to the given reason. The client might not be configured as a client on the server.	Take the corrective action suggested by the error message.
Attempted to restore file ' <i>filename</i> ' to raw device ' <i>device_name</i> '.	A proxy 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.
Attempted to restore raw device ' <i>device_name</i> ' to file ' <i>filename</i> '.	A proxy restore of a raw device file 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 file to a regular file.
Cannot back up object ' <i>object_name</i> ' with proxy copy.	The RMAN backup command included the proxy only option, but the object ' <i>object_name</i> ' did <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 object ' <i>object_name</i> ' resides on a primary storage device that the PowerSnap Module supports.
Could not create the LNM index lock file ' <i>filename</i> ' (<i>errno</i>)	NMO failed to create the lock file required for an index deletion operation.	Report the error number (<i>errno</i>) to Technical Support.
Could not decode the ' <i>sf_check</i> ' value: xdrs = <i>0xvalue</i>	This is an internal XDR error caused by a network read or write operation.	Report the error to Technical Support.
Could not decode the ' <i>sf_magic</i> ' value: xdrs = <i>0x%value</i>	This is an internal XDR error caused by a network read or write operation.	Report the error to Technical Support.
Could not decode the ' <i>sf_more</i> ' flag: xdrs = <i>0xvalue</i>	This is an internal XDR error caused by a network read or write operation.	Report the error to Technical Support.

Table 11. Error Messages from the libnwor Library (Part 2 of 17)

Error Message	Description	Resolution
Could not find the nsrsnapck binary.	During an index removal for a proxy backup, NMO could not locate the nsrsnapck binary, which is probably in a nondefault location.	Ensure that the parameter NSR_NWPATH is set correctly.
Could not locate the LNM save file ' <i>backup_piece_name</i> ' on server ' <i>server</i> '.	NMO 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.
Could not locate the LNM save time ' <i>save_time</i> ' on server ' <i>server</i> '.	NMO could not locate an index record for the save time in the client file index. The index record is probably missing.	Enter the mminfo and nsrinfo commands to verify the status of the index record.
Could not lock ' <i>filename</i> ' for index deletion. There were <i>number</i> attempts. (<i>errno</i>)	NMO was able to create the lock file required for an index deletion operation, but could <i>not</i> lock the file after the given number of attempts.	Report the error number (<i>errno</i>) to Technical Support.
Could not lstat - <i>filename</i>	The lstat() system call failed. The file <i>filename</i> either did not exist or had invalid permissions.	Ensure that the file is an existing file with valid permissions.
Could not lstat secondary link - <i>pathname</i>	The lstat() system call failed. The file <i>file_name</i> was a symbolic link that pointed to a file that either did not exist or had invalid permissions.	Ensure that the symbolic link points to an existing file with valid permissions.

Table 11. Error Messages from the libnwora Library (Part 3 of 17)

Error Message	Description	Resolution
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, re-create the file. For more information, see " The NWORA Resource File " on page 159.
Could not read link - <i>pathname</i>	A proxy backup failed due to the pathname that was an invalid symbolic link.	Before a proxy backup, ensure that any symbolic link is a valid link.
Direct saves are not enabled.	NMO attempted to connect to an old release of NetWorker server software that is no longer supported.	Update the NetWorker server software to a release supported by NMO 4.2. For details on the supported server releases, refer to the <i>Legato Compatibility Guide</i> on the web site.
Error creating staging directory ' <i>directory</i> '.	During a proxy restore of a regular file, the permissions of the destination directory were possibly invalid. NMO was <i>not</i> able to create the required staging subdirectory, <i>.nworapc</i> .	Ensure that the destination directory has valid permissions for a proxy restore.
Error in mmdb lookup by time: <i>reason</i>	A lookup in the media database failed for the given reason.	Enter the mminfo command to verify the status of the media database record. Take the corrective action suggested by the error message.

Table 11. Error Messages from the libnwor Library (Part 4 of 17)

Error Message	Description	Resolution
Exceeded the number of retries. The NetWorker server may be down or unreachable.	NMO could not contact the NetWorker index service nsrindexd . This was probably caused by the NetWorker services being shutdown.	Restart the NetWorker services on the server, as required.
Exceeded the number of retries for <code>nsr_init()</code> . The NetWorker server may be down or unreachable.	After a maximum of five attempts, NMO failed to call the NetWorker core function, <code>nsr_init()</code> . This was probably caused by the NetWorker services being shut down.	Restart the NetWorker services on the server, as required.
Exceeded the number of retries for <code>nsr_start()</code> . The NetWorker server may be down or unreachable.	After a maximum of five attempts, NMO failed to call the NetWorker core function, <code>nsr_start()</code> . This was probably caused by the NetWorker services being shut down.	Restart the NetWorker services on the server, as required.
Invalid browse and retention policies. Values Ignored.	The <code>NSR_SAVESET_BROWSE</code> and <code>NSR_SAVESET_RETENTION</code> parameters both had invalid time values.	Ensure that the parameters <code>NSR_SAVESET_BROWSE</code> and <code>NSR_SAVESET_RETENTION</code> in the RMAN script both have valid values in the NetWorker date format.
Invalid browse policy <code>browse_time</code> . Value Ignored.	The <code>NSR_SAVESET_BROWSE</code> parameter had an invalid time value, <code>browse_time</code> .	Ensure that the parameter <code>NSR_SAVESET_BROWSE</code> in the RMAN script has a valid value in the NetWorker date format.
Invalid KEY word	The syntax of the string in the RMAN send command was incorrect.	For the correct send command syntax, see " The send Command " on page 193.

Table 11. Error Messages from the libnwor Library (Part 5 of 17)

Error Message	Description	Resolution
Invalid retention policy: <i>retention_time</i> . Value Ignored.	The NSR_SAVESET_RETENTION parameter had an invalid time value, <i>retention_time</i> .	Ensure that the parameter NSR_SAVESET_RETENTION in the RMAN script has a valid value in the NetWorker date format.
Invalid source path argument	A proxy backup failed due to an invalid source pathname.	Perform a proxy backup with a valid source pathname only.
NSR_DATA_VOLUME_POOL <i>n</i> is not set.	Multiple copies of the backup data were requested, but the required NSR_DATA_VOLUME_POOL parameters were <i>not</i> set. In the message, <i>n</i> was replaced by a number corresponding to the missing pool parameter.	When multiple copies of backup data are requested, set the required NSR_DATA_VOLUME_POOL parameters. For more information, see "NSR_DATA_VOLUME_POOL" on page 182 .
<i>nsrsnapck_binary_name</i> process failed with error - <i>reason</i>	During an index removal for a proxy backup, the nsrsnapck binary failed. The binary name is nsrsnapck on UNIX and nsrsnapck.exe on Windows.	Report the error to Technical Support.
Oracle pools are not supported	NMO does <i>not</i> support Oracle pools. NMO supports NetWorker pools only.	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 192 .
Path <i>pathname</i> is too long.	A proxy backup failed because the given pathname exceeded the limit of 1,024 bytes.	Ensure that any pathname involved in a proxy backup does <i>not</i> exceed 1,024 bytes.
pb_init() failed with (<i>reason</i>): invalid BRC API version	The version number of the BRC API that was reported by the PowerSnap Module was corrupted.	Report the error to Technical Support.

Table 11. Error Messages from the libnwor Library (Part 6 of 17)

Error Message	Description	Resolution
Proxy copy is not supported.	A proxy operation was attempted on a platform that NMO does <i>not</i> support for proxy operations.	Do <i>not</i> attempt a proxy operation on an unsupported platform. For details on supported platforms, refer to the <i>Legato Compatibility Guide</i> on the web site.
'string' should be in format: KEY=(xxxxx)	The syntax of the string in the RMAN send command was incorrect.	For the correct send command syntax, see " The send Command " on page 193.
The ASDF body could not be unwrapped.	The incoming recover stream of data could not be decoded due to a possible network error or data corruption.	Report the error to Technical Support.
The backup file already exists: <i>backup_piece_name</i>	NMO could not complete the backup because the backup piece name already existed in the NetWorker client file index.	Change the format option string of the RMAN command to produce a unique backup piece name, or remove obsolete backup pieces. Then restart the backup operation.
The BRC API did not return an error string for the SBTPC object: <i>object_name</i>	An unknown error occurred during a BRC API function call by the PowerSnap Module.	Report the error to Technical Support.
The BRC status of logical object ' <i>filename</i> ' was failure: <i>file_status</i>	The PowerSnap Module reported a failure during a proxy backup of the file <i>filename</i> .	Report the error to Technical Support.
The call to <code>nsr_init()</code> failed with the message: <i>reason</i>	A call of the NetWorker core function, <code>nsr_init()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.

Table 11. Error Messages from the libnworu Library (Part 7 of 17)

Error Message	Description	Resolution
The call to <code>nsr_start()</code> failed with the message: <i>reason</i>	A call of the NetWorker core function, <code>nsr_rstart()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The call to <code>pb_environment()</code> failed with error: <i>reason</i>	During a proxy operation, a <code>pb_environment()</code> function call failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The call to <code>pb_open()</code> failed with error: <i>reason</i>	During a proxy operation, a <code>pb_open()</code> function call failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The call to <code>pb_prepare()</code> failed with error: <i>reason</i>	During a proxy operation, a <code>pb_prepare()</code> function call failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The call to <code>pb_status()</code> failed for object ' <i>object_name</i> ' with the error: <i>reason</i>	During a proxy operation, a <code>pb_status()</code> function call failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The call to <code>pb_status()</code> for object ' <i>object_name</i> ' failed with error: <i>reason</i>	During a proxy operation, a <code>pb_status()</code> function call failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The canonical OS file name path is invalid: <i>filename</i>	The operating system <i>filename</i> specified for a proxy operation was not a valid pathname.	Ensure that the file pathname specified for a proxy operation is a valid full pathname that is <i>not</i> a directory.
The current time could not be obtained (<i>errno</i>).	NMO could not obtain the current time due to an operating system error.	Report the operating system error (<i>errno</i>) to the appropriate vendor.

Table 11. Error Messages from the libnwor Library (Part 8 of 17)

Error Message	Description	Resolution
The data could not be XDR'd from the stream.	The incoming recover stream of data could not be decoded due to a possible network error or data corruption.	Report the error to Technical Support.
The data source is neither a file or a RAW volume - <i>filename</i>	The file <i>filename</i> involved in a proxy backup was not recognized as a regular file or raw volume. For proxy backups, NMO supports only regular files and raw volumes.	Ensure that <i>filename</i> is either a regular file or raw volume, as required for proxy backups.
The destination does not have the same terminating name as the source ' <i>device_name</i> '.	A proxy restore of a raw device was attempted to a location with a different basename from the backed-up source. For example, <i>c1t2d0s2</i> is the basename (or terminating name) of <i>/dev/rdisk/c1t2d0s2</i> .	Perform a proxy restore of the raw device to a location with the same basename as the backed-up source.
The file being recovered could not be found in its staging location: <i>filename</i>	During a proxy restore, an error occurred at the point where the file <i>filename</i> was to be moved from the staging directory <i>.nworapc</i> to the destination directory.	Ensure that there are no permission or other problems with the destination directory and the staging directory <i>.nworapc</i> , and then restart the proxy restore. If the error recurs, report it to Technical Support.
The file ' <i>filename</i> ' cannot be removed from the staging directory (<i>errno</i>).	During a proxy restore of the file <i>filename</i> , a file with the same name was found in the <i>.nworapc</i> subdirectory, probably left there by a previous failed restore. The <i>errno</i> is the error number from the failed attempt to remove the existing file.	Remove the file <i>file_name</i> from the <i>.nworapc</i> subdirectory, and restart the proxy restore.

Table 11. Error Messages from the libnwor Library (Part 9 of 17)

Error Message	Description	Resolution
The function <code>mm_retrieve()</code> failed with the error: <i>reason</i>	During a restore, a call of the NetWorker core function, <code>mm_retrieve()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The function <code>nsr_bind_recov_mm()</code> failed with the error: <i>reason</i>	During a restore, a call of the NetWorker core function, <code>nsr_bind_recov_mm()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The function <code>nsr_end()</code> failed with the error message: <i>reason</i>	A call of the NetWorker core function, <code>nsr_end()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The function <code>nsr_rstart()</code> failed with the error: <i>reason</i>	During a restore, a call of the NetWorker core function, <code>nsr_rstart()</code> , failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The function <code>sbtinit2()</code> has already been called.	This is an internal error caused by Oracle calling the function <code>sbinit2()</code> twice.	Report the error to Technical Support.
The functions <code>sbtinit()</code> or <code>sbtinit2()</code> have not been called.	This is an internal error caused by Oracle not calling the two SBT initialization routines.	Report the error to Technical Support.
The index entry failed the cross check: <code>cfx_name(backup_piece_name)</code> <code>save_time(save_time)</code>	During an index lookup, the entry was located in the client file index but <i>not</i> in the media database.	Restart the NetWorker services, and enter the mminfo and nsrinfo commands to verify the backup information in the indexes. Run the nsrck program to resolve any corruption of the indexes.
The lookup of <code>'backup_piece_name'</code> on server <code>'server'</code> failed - <i>'reason'</i>	NMO could not locate <code>backup_piece_name</code> 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.

Table 11. Error Messages from the libnwora Library (Part 10 of 17)

Error Message	Description	Resolution
The name of the NSR client could not be determined.	The name of the NetWorker client could not be determined.	Set the parameter NSR_CLIENT to the NetWorker client name by using the send command.
The name of the NSR server could not be determined.	The name of the NetWorker server could not be determined.	Set the parameter NSR_SERVER to the NetWorker server name by using the send command.
The NMO BRCAPI version <i>version</i> is outside the range supported by the BRC service: <i>earliest_version</i> - <i>latest_version</i>	NMO release 4.2 does not support the PowerSnap Module release that was used for a proxy operation.	Ensure that a supported release of the PowerSnap Module is installed. For details on supported releases, refer to the <i>Legato Compatibility Guide</i> on the web site.
The NSR client name could not be determined.	The name of the NetWorker client could not be determined.	Set the parameter NSR_CLIENT to the NetWorker client name by using the send command.
The NSR server name could not be determined.	The name of the NetWorker server could not be determined.	Set the parameter NSR_SERVER to the NetWorker server name by using the send command.
The NSR_CLIENT parameter was not set.	The name of the NetWorker client could not be determined.	Set the parameter NSR_CLIENT to the NetWorker client name by using the send command.
The NSR_DMO_BENCHMARK_1 parameter is no longer supported.	The undocumented parameter NSR_DMO_BENCHMARK_1 was specified, but it is no longer supported.	Do <i>not</i> set the unsupported parameter NSR_DMO_BENCHMARK_1.
The NSR_SERVER parameter was not set.	The name of the NetWorker server could not be determined.	Set the parameter NSR_SERVER to the NetWorker server name by using the send command.

Table 11. Error Messages from the libnwora Library (Part 11 of 17)

Error Message	Description	Resolution
The NW authentication for client ' <i>client</i> ' was refused by server ' <i>server</i> ' because ' <i>reason</i> '.	NMO could not obtain the required authentication to connect to the NetWorker client file index due to the given reason. The client might not be configured as a client on the server.	Take the corrective action suggested by the error message.
The NW client has not been set.	The name of the NetWorker client could not be determined.	Set the parameter <code>NSR_CLIENT</code> to the NetWorker client name by using the send command.
The NW server does not have a valid NMO proxy copy license.	The NetWorker server attempted a proxy operation without the required license.	Ensure that the NetWorker server has the required license for the proxy operation.
The NW server has not been set.	The name of the NetWorker server could not be determined.	Set the parameter <code>NSR_SERVER</code> to the NetWorker server name by using the send command.
The NWORA file ID could not be XDR'd. xdrm: <i>0xvalue</i> NWORA fid: <i>0xvalue</i> ssid: <i>0xvalue</i> ssoff: <i>0xvalue</i>	This is an internal XDR error caused by a network read or write operation.	Report the error to Technical Support.
The NWORA resource file does not exist. Please create it with <code>nsrnmoadmin</code> .	A proxy backup failed because the NWORA resource file did not exist.	Create the NWORA resource file by using the nsrnmoadmin command, and restart the proxy backup. For details, see "The NWORA Resource File" on page 159 .

Table 11. Error Messages from the libnwora Library (Part 12 of 17)

Error Message	Description	Resolution
The NWORA resource lock file does not exist. Please create it by running 'nsrnmoadmin -r list'	A proxy backup failed because the NWORA resource lock file did not exist.	Create the NWORA resource lock file by using the nsrnmoadmin -r list command, and restart the proxy backup. For details, see "The NWORA Resource File" on page 159.
The NWORA resource NSR_ORACLECAT_MODE is in the 'undetermined' state.	In the NWORA resource file, NSR_ORACLECAT_MODE was 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.
The object ' <i>filename</i> ' is not a file.	A proxy backup failed because the file <i>filename</i> is <i>not</i> a data file—neither a raw file nor a regular file.	Perform a proxy backup of a supported type of data file only.
The ORACLE_SID must be set when performing proxy copy backups.	During a scheduled proxy backup, the parameter ORACLE_SID was <i>not</i> set in the nsrnmoo script.	In the nsrnmoo script, set the parameter ORACLE_SID to the SID value of the Oracle database.
The OS file name has been specified multiple times by Oracle: <i>filename</i>	This is an internal Oracle error caused by Oracle specifying the same filename twice during a proxy operation.	Report the error to Technical Support.
The parameter file cannot be open: <i>filename</i>	The configuration file specified by the parameter NSR_PROXY_PFILE could not be opened. The file should contain PowerSnap parameter settings for a proxy backup or restore.	Ensure that the value specified by the parameter NSR_PROXY_PFILE is a valid pathname of the configuration file.
The pb_cancel() call for object ' <i>object_name</i> ' returned the error message: <i>error</i>	The pb_cancel() function call failed during a proxy operation.	Report the error to Technical Support.

Table 11. Error Messages from the libnwora Library (Part 13 of 17)

Error Message	Description	Resolution
The pb_inquiry() call failed for object ' <i>object_name</i> ': <i>error</i>	The pb_inquiry() function call failed during a proxy operation.	Report the error to Technical Support.
The pb_inquiry() for object ' <i>object_name</i> ' failed because: <i>error</i>	The pb_inquiry() function call failed during a proxy operation.	Report the error to Technical Support.
The pb_inquiry() of object ' <i>object_name</i> ' returned error: <i>error</i>	The pb_inquiry() function call failed during a proxy operation.	Report the error to Technical Support.
The pb_restore() for object ' <i>object_name</i> ' failed with error: <i>error</i>	The pb_restore() function call failed during a proxy operation.	Report the error to Technical Support.
The pb_save() of object ' <i>object_name</i> ' returned error: <i>error</i>	The pb_save() function call failed during a proxy operation.	Report the error to Technical Support.
The pb_snapshot() call for object ' <i>object_name</i> ' failed with error: <i>error</i>	The pb_snapshot() function call failed during a proxy operation.	Report the error to Technical Support.
The record obtained has the wrong save time ' <i>save_time1</i> '. The save time queried was ' <i>save_time2</i> '.	NMO located an index record in the client file index, but it had an unexpected save time. The indexes might be corrupted.	Restart the NetWorker services, and run the nsrck program to resolve any corruption of the indexes.
The removal of SSID ' <i>save_set_id</i> ' failed with error: <i>reason</i>	An index deletion operation failed for the given reason.	Enter the mminfo and nsrinfo commands to verify the status of the index record. If required, report the error to Technical Support.

Table 11. Error Messages from the libnwora Library (Part 14 of 17)

Error Message	Description	Resolution
The restore destination path is not valid: <i>filename</i>	During a proxy restore operation, NMO found the specified restore destination, <i>filename</i> , to be invalid.	Ensure that the specified restore destination is a valid pathname.
The restore operation for the file failed for an unknown reason: <i>filename</i>	During a proxy restore, an error occurred at the point where the file <i>filename</i> was to be moved from the staging directory <i>.nworapc</i> to the destination directory.	Ensure that there are no permission or other problems with the destination directory and the staging directory <i>.nworapc</i> , and then retry the proxy restore. If the error occurs again, report it to Technical Support.
The savefile_fini() call failed. <i>reason</i>	During a restore, a call of the NetWorker core function, savefile_fini(), failed due to the given reason.	Take the corrective action suggested by the error message. If required, report the error to Technical Support.
The SBTPC object could not determine the destination of the restore.	During a proxy restore operation, NMO was unable to determine where to restore the file.	Report the error to Technical Support.
The SBTPC object is not in the PB_TYPE_PREPARE state: <i>object_name</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object is not in the SBTPCSTATUS_NOTREADY state: <i>object_name</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' failed with the error message: <i>reason</i>	The proxy backup or restore of a file failed during a PowerSnap Module operation, for the given <i>reason</i> .	Report the error to Technical Support.

Table 11. Error Messages from the libnwora Library (Part 15 of 17)

Error Message	Description	Resolution
The SBTPC object ' <i>object_name</i> ' is entering the SBTPCSTART backup state but its BRC type is: <i>type</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' is entering the SBTPCSTART restore state but its BRC type is: <i>type</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' is entering the SBTPCSTART state but its status is: <i>status</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' is leaving the BRC prepare state but its status is: <i>status</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' is leaving the BRC save state but its status is: <i>status</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' is leaving the BRC snapshot state but its status is: <i>status</i>	During a proxy operation, NMO and the PowerSnap Module became unsynchronized as to the status of the object <i>object_name</i> .	Report the error to Technical Support.
The SBTPC object ' <i>object_name</i> ' was aborted by the BRC service. Please check the PowerSnap logs for an explanation.	The PowerSnap Module terminated the proxy operation.	Examine the PowerSnap Module logs for a possible reason for the termination.

Table 11. Error Messages from the libnwor Library (Part 16 of 17)

Error Message	Description	Resolution
The sbtpccommit() function was called during restore.	This is an internal Oracle error that occurred during a proxy restore.	Report the error to Technical Support.
The sfhead could not be XDR'd.	This is an internal XDR error caused by a network write operation.	Report the error to Technical Support.
The SS browse time is not in the future: current time: <i>current_time</i> browse: <i>browse_time</i>)	The specified browse policy time was in the past. This might be due to a problem with the operating system time setting.	Ensure that the browse policy time is set correctly. If required, ensure that the operating system time is set correctly.
The SS retention time is not in the future: current time: <i>current_time</i> retention: <i>retention_time</i>)	The specified retention policy time was in the past. This might be due to a problem with the operating system time setting.	Ensure that the retention policy time is set correctly. If required, ensure that the operating system time is set correctly.
The staging directory ' <i>directory</i> ' has invalid permissions (<i>errno</i>).	During a proxy restore, NMO was unable to write to the staging directory, <i>directory</i> . The <i>errno</i> is the error number from the function call that failed.	Ensure that the staging directory has valid permissions for a proxy restore.
The UNIX attributes could not be XDR'd. xdrm: <i>0xvalue</i> ua: <i>0xvalue</i>	This is an internal XDR error caused by a network read or write operation.	Report the error to Technical Support.
There are no SBTPC objects that have not returned their status.	This is an internal error during a proxy operation caused by Oracle expecting more files to be processed whereas NMO has completed its file processing.	Report the error to Technical Support.

Table 11. Error Messages from the libnwora Library (Part 17 of 17)

Error Message	Description	Resolution
This backup piece name is already used in the SBTPC session: <i>backup_piece_name</i>	This is an Oracle error caused by Oracle specifying the same backup piece name twice during a proxy operation.	Report the error to Technical Support.

Error Messages from the nsrnmoadmin Program

Table 12, "Error Messages from the nsrnmoadmin Program," on page 236 lists the error messages generated by the **nsrnmoadmin** program, in alphabetical order.

The error messages appear in the following format:

```
nsrnmoadmin: error_message
```

where *error_message* is the text of the error message, as shown in the table.

Table 12. Error Messages from the nsrnmoadmin Program (Part 1 of 6)

Error Message	Description	Resolution
Command line arguments are not understood.	The nsrnmoadmin command included one or more invalid options.	Enter the nsrnmoadmin command with the correct options. For details, see "Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 166.
Could not create the NWORA resource file (<i>errno</i>)	The nsrnmoadmin command could not create the NWORA resource file, possibly due to invalid permissions.	Ensure that valid permissions exist to allow the nsrnmoadmin command to create the NWORA resource file. For details, see "The NWORA Resource File" on page 159.

Table 12. Error Messages from the nsrnmoadmin Program (Part 2 of 6)

Error Message	Description	Resolution
Could not create the NWORA resource lock file (<i>errno</i>)	The nsrnmoadmin command could not obtain the required lock file in the <i>/nsr/tmp</i> or <i><NetWorker_install_path>\tmp</i> directory. The lock file is required for accessing the NWORA resource file.	Report the error to Technical Support.
Could not open resource file ' <i>filename</i> ' (<i>errno</i>).	The nsrnmoadmin command could not open the NWORA resource file, possibly due invalid permissions.	Verify that the NWORA resource file exists and has valid permissions. If required, create or repair the file by using the nsrnmoadmin command, or modify the file permissions.
No command line parameters are set.	The nsrnmoadmin command options were missing.	Enter the nsrnmoadmin command with the correct options.
NSR_ORACLECAT_MODE can only be set to 'enabled', 'disabled' or 'undetermined'.	In the nsrnmoadmin command, the NSR_ORACLE_CAT_MODE parameter resource was set to a value other than enabled, disabled, or undetermined.	In the nsrnmoadmin command, set the NSR_ORACLE_CAT_MODE parameter resource to enabled or disabled for instant backups. For details, see "Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 166.
NSR_REMOVE_ON_FAILURE can only be set to 'TRUE' or 'FALSE'.	In the nsrnmoadmin command, the NSR_REMOVE_ON_FAILURE parameter resource was set to a value other than TRUE or FALSE.	In the nsrnmoadmin command, set the NSR_REMOVE_ON_FAILURE parameter resource to either TRUE or FALSE only.

Table 12. Error Messages from the nsrnmoadmin Program (Part 3 of 6)

Error Message	Description	Resolution
NWORA parameter resources must be specified in the 'ResourceName ResourceValue' format.	In the nsrnmoadmin command, an NWORA parameter resource name and value were not specified in the correct format.	In the nsrnmoadmin command, specify the NWORA parameter resource name and value in the correct format.
NWORA SID resource must be specified when doing deletion.	In the nsrnmoadmin command with the -r delete option, the SID value of an Oracle database was not specified.	In the nsrnmoadmin command with the -r delete option, specify the correct SID value.
The '-r' flag cannot be set multiple times.	The nsrnmoadmin command contained more than one -r option.	Enter the nsrnmoadmin command with only one -r option.
The '-r' option requires an NWORA resource specification.	The nsrnmoadmin command with the -r option did not include the required resource specification.	In the nsrnmoadmin command with the -r option, specify the required resource name and value.
The '-r' option requires either an 'add', 'update', 'list' or 'delete' option.	In the nsrnmoadmin command, the -r option did not include one of the required keywords: add , update , list , or delete .	In the nsrnmoadmin command, include one of the required keywords with the -r option. For details, see "Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 166.
The first NWORA resource is not a header (<i>errno</i>).	The NWORA resource file is probably corrupted.	Verify the contents of the NWORA resource file. If required, repair the resource file by using the nsrnmoadmin command.
The NWORA resource file does not contain the NSR_NWPATH resource.	The NWORA resource file does not contain the mandatory NSR_NWPATH parameter resource. The file might be corrupted.	Verify the contents of the NWORA resource file. If required, repair the resource file by using the nsrnmoadmin command.

Table 12. Error Messages from the `nsrnmoadmin` Program (Part 4 of 6)

Error Message	Description	Resolution
The NWORA resource file does not exist.	The NWORA resource file does not yet exist.	Create the NWORA resource file by using the <code>nsrnmoadmin</code> command.
The NWORA resource named ' <i>resource_name</i> ' is not found.	The <code>nsrnmoadmin</code> command specified the name of a resource that does not exist in the NWORA resource file.	In the <code>nsrnmoadmin</code> command, specify a valid resource name from the NWORA resource file.
The NWORA resource parameter list can only contain one entry.	The NWORA resource file includes multiple values for a resource, which is <i>not</i> supported. The file is probably corrupted. The file might have been edited manually, which is <i>not</i> supported.	Repair the NWORA resource file by using the <code>nsrnmoadmin</code> command.
The NWORA resource parameter list contains the invalid element ' <i>resource_name</i> '.	The NWORA resource file contains an invalid resource name. The file is probably corrupted. The file might have been edited manually, which is <i>not</i> supported.	Repair the NWORA resource file by using the <code>nsrnmoadmin</code> command. For details, see "Configuring the NWORA Resource File with the <code>nsrnmoadmin</code> Program" on page 166.
The NWORA resource parameter list for a SID requires the <i>item1</i> , <i>item2</i> and <i>item3</i> information.	The <code>nsrnmoadmin</code> command for creating or updating an NWORA SID resource was missing the required items.	In the <code>nsrnmoadmin</code> command for creating or updating an NWORA SID resource, include the required items.
The NWORA resource ' <i>resource_name</i> ' is not a SID resource.	The <code>nsrnmoadmin</code> command with the <code>-r delete</code> option did not include a valid name of an NWORA SID resource.	In the <code>nsrnmoadmin</code> command with the <code>-r delete</code> option, specify a valid name of an NWORA SID resource.

Table 12. Error Messages from the nsrnmoadmin Program (Part 5 of 6)

Error Message	Description	Resolution
The NWORA resource specified is not supported: <i>resource_name = resource_value</i>	In the nsrnmoadmin command, an invalid name or value were specified for an NWORA parameter resource.	In the nsrnmoadmin command, specify a valid name and value for an NWORA parameter resource. For details, see "NWORA Parameter Resources" on page 160.
The NWORA SID resource for ' <i>sid_value</i> ' already exists.	The nsrnmoadmin command attempted to add an NWORA SID resource that already existed.	In the nsrnmoadmin command, specify the values for a new NWORA SID resource.
The SID token 'connect' is an empty string.	The nsrnmoadmin command did not include the required pathname of the RMAN connection file with the connect keyword.	In the nsrnmoadmin command, specify a valid pathname of the RMAN connection file with the connect keyword. For details, see "Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 166.
The SID token 'home' is an empty string.	The nsrnmoadmin command did <i>not</i> include the required pathname of the Oracle home directory with the home keyword.	In the nsrnmoadmin command, specify a valid pathname of the Oracle home directory with the home keyword.
The SID token ' <i>ORACLE_SID</i> ' is invalid.	In the nsrnmoadmin command with the sid keyword, the specified SID value of the Oracle database was invalid.	In the nsrnmoadmin command, specify a valid SID value with the sid keyword.
The SID token 'sid' is an empty string.	The nsrnmoadmin command did not include the required SID value of the Oracle database with the sid keyword.	In the nsrnmoadmin command, specify a valid SID value with the sid keyword.

Table 12. Error Messages from the nsrnmoadmin Program (Part 6 of 6)

Error Message	Description	Resolution
The tokens 'sid', 'home' and 'connect' must be set when adding a SID.	The nsrnmoadmin command to add an NWORA SID resource did not include the settings of the mandatory sid , home , and connect keywords.	In the nsrnmoadmin command to add an NWORA SID resource, include the settings of the sid , home , and connect keywords.
The value of the NWORA resource is missing.	In the nsrnmoadmin command with the -r update option, the NWORA resource value was not specified with the resource name.	In the nsrnmoadmin command with the -r update option, specify the NWORA resource value with the resource name.
Unrecognized argument ' <i>option</i> '.	The nsrnmoadmin command included the unrecognized option <i>option</i> .	Enter the nsrnmoadmin command with the correct options. For details, see "Configuring the NWORA Resource File with the nsrnmoadmin Program" on page 166.
You must be the super-user to update the NWORA resource file.	The nsrnmoadmin command was entered by the wrong user.	Enter the nsrnmoadmin command as the root user on UNIX, or as a member of the Microsoft Windows Administrators group.

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Error Messages from the nsrnmoinfo Program

[Table 13, "Error Messages from the nsrnmoinfo Program,"](#) on page 242 lists the error messages generated by the **nsrnmoinfo** program, in alphabetical order.

The error messages appear in the following format:

The NW volume information lookup failed:

error_message

where *error_message* is the text of the error message, as shown in the table.

Table 13. Error Messages from the nsrnmoinfo Program (Part 1 of 2)

Error Message	Description	Resolution
A connection to NW server ' <i>server</i> ' could not be established because ' <i>reason</i> '.	NMO could not connect to the NetWorker client file index due to the given reason. The client might not be configured as a client on the server.	Take the corrective action suggested by the error message.
Could not locate the LNM save file ' <i>backup_piece_name</i> ' on server ' <i>server</i> '.	NMO 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.
Could not locate the LNM save time ' <i>save_time</i> ' on server ' <i>server</i> '.	NMO could not locate an index record for the save time in the client file index. The index record is probably missing.	Enter the mminfo and nsrinfo commands to verify the status of the index record.
Error in mmdb lookup by time: <i>reason</i>	A lookup in the media database failed for the given reason.	Enter the mminfo command to verify the status of the media database record. Take the corrective action suggested by the error message.
Exceeded the number of retries. The NetWorker server may be down or unreachable.	NMO could not contact the NetWorker index service nsrindexd . This was probably caused by the NetWorker services being shutdown.	Restart the NetWorker services on the server, as required.
The file ' <i>filename</i> ' could not be opened.	The file specified with the -f option of the nsrnmoinfo command could not be accessed.	Ensure that the specified file exists, and then enter the nsrnmoinfo command again with the -f option.
The file name provided is NULL.	In the nsrnmoinfo command, the -f option did not include the required filename.	In the nsrnmoinfo command, include the required filename with the -f option.

Table 13. Error Messages from the nsrnmoinfo Program (Part 2 of 2)

Error Message	Description	Resolution
The index entry failed the cross check: cfx_name(<i>backup_piece_name</i>) save_time(<i>save_time</i>)	During an index lookup, the entry was located in the client file index but <i>not</i> in the media database.	Restart the NetWorker services, and enter the mminfo and nsrinfo commands to verify the backup information in the indexes. Run the nsrck program to resolve any corruption of the indexes.
The lookup of ' <i>backup_piece_name</i> ' on server ' <i>server</i> ' failed - ' <i>reason</i> '	NMO 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.
The NW authentication for client ' <i>client</i> ' was refused by server ' <i>server</i> ' because ' <i>reason</i> '.	NMO could not obtain the required authentication to connect to the NetWorker client file index due to the given reason. The client might not be configured as a client on the server.	Take the corrective action suggested by the error message.
The record obtained has the wrong save time ' <i>save_time1</i> '. The save time queried was ' <i>save_time2</i> '.	NMO located an index record in the client file index, but it had an unexpected save time. The indexes might be corrupted.	Restart the NetWorker services, and run the nsrck program to resolve any corruption of the indexes.

D

Glossary

This glossary contains the definitions of terms found in this manual. Most of the terms are specific to the NetWorker Module for Oracle (NMO) software. For more information on terms specific to the NetWorker software, refer to the latest *NetWorker Administrator's Guide*.

administrator	The person that typically installs, configures, and maintains the NetWorker software.
Administrators group	Windows user group whose members have all the rights and abilities of users in other groups, plus the ability to create and manage all the users and groups in the domain. Only members of the Administrators group can modify Windows OS files, maintain the built-in groups, and grant additional rights to groups.
API	An abbreviation for application programming interface, a standard set of computer library routines designed to accomplish a particular set of tasks.
Application-Specific Module (ASM)	A program that, when used in a directive, specifies the way a set of files or directories is to be backed up and recovered.
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 .

ASM	See <i>Application-Specific Module (ASM)</i> .
attribute	A feature of a NetWorker resource. It is a service or information that the <i>resource</i> provides.
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.
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.
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 Operators group	A Windows group whose members have the capability of logging on to a domain from a workstation or a server, backing it up, and restoring the data. Backup Operators also can shut down servers or workstations.
backup volume	See <i>volume</i> .
bootstrap	Information that includes the server index, media index, and configuration files needed for recovering NetWorker after a disk crash.
browse policy	A policy that determines how long entries for a regular Oracle backup and proxy live backup are retained in the online 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, PCs, or file servers.
client file index	A database of information maintained by the NetWorker server that tracks every data object, file, or <i>file system</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> .
command line	The shell prompt, where you enter commands.
connection port	The port that 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.
database	The database instance of a third-party <i>DBMS</i> vendor. NMO backs up and restores Oracle database files.
DBA	An abbreviation for database administrator, the person that typically installs, configures, and maintains Oracle database systems.
DBMS	An abbreviation for Database Management System, which refers to the primary architecture of an Oracle database.
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.
directive	An instruction directing NetWorker to take special actions on a given set of files.
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 EMC that activates a NetWorker software product. An enabler code that unlocks the base features for the purchased software is a base enabler. An enabler code for an additional feature or product (for example, autochanger support) is an add-on enabler.
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 status of a 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 <i>client file index</i> .

file system	<ol style="list-style-type: none">1. A file tree on a specific disk partition or other mount point.2. The entire set of all files.3. A method of storing files.
filesERVER	A computer with disks that provides services to other computers on the network.
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 <i>level</i> .
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 computer.
hot Oracle backup	See <i>online backup</i> .
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 backup	See <i>level</i> .
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 when 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	A measurement that determines how much data NetWorker software saves during a scheduled or manual backup. The level of an NMO backup must be specified in the RMAN backup script. <ul style="list-style-type: none">• A <i>full</i> backup includes all files, regardless of when they last changed.• An <i>incremental</i> backup includes only files that have changed since the last backup.
license enabler	The enabler code that enables you to run a feature or product.
live backup	One of the following two types of proxy backup: <ul style="list-style-type: none">• deferred live backup• immediate live backup
manual backup	A type of backup that a user initiates through the NetWorker client's save program. The user specifies participating files, file systems, and directories. A manual backup does <i>not</i> generate a bootstrap save set.
mean time to recover (MTTR)	The set 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.
media	The physical storage medium to which backup data is written. NetWorker software supports tape, magnetic or optical disk, and file systems 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 (MML)	A library of media management routines provided by the NMO software and linked with the Oracle kernel software during the installation of NMO on the Oracle Server host.
media manager	The NetWorker component that tracks save sets to backup volumes.
MML	See <i>media management library (MML)</i> .
MTTR	See <i>mean time to recover (MTTR)</i> .
multiplexing	A NetWorker feature that permits data from more than one save set to be simultaneously written to the same storage device.
NetWorker	An EMC network-based software product to back up and restore file systems.
NetWorker client	See <i>client</i> .
NetWorker server	See <i>server</i> .
NetWorker storage node	See <i>storage node</i> .
notice	A response to a NetWorker event.
notification	A message generated and sent to the NetWorker administrator about important NetWorker events.
nsrhost	The logical <i>hostname</i> of the computer that is the NetWorker server.
NWORA resource file	A resource file installed during the NMO installation, which must be extended to include specific additional resources to enable proxy backups and (optionally) catalog synchronization.
OEM	See <i>Oracle Enterprise Manager</i> .
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 day-to-day NetWorker tasks.
Oracle Enterprise Manager	Oracle Enterprise Manager Backup Management Tools, which include an optional graphical user interface to the RMAN utility.
Oracle9i Server	A computer running an Oracle9i release 9.x DBMS. See DBMS .
Oracle10g Server	A computer running an Oracle10g release 10.x DBMS. See DBMS .
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> specifies how to find a file starting from the root directory and working down the directory tree.• A <i>relative pathname</i> specifies how to find a file starting from where you are now.
physical host	Any one of the nodes (or computers) 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	<p>A set of constraints that specify how long an entry is retained in an online NetWorker index. When a policy expires, the save sets associated with that policy are marked recyclable.</p> <ul style="list-style-type: none">• 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 <i>NetWorker Command Reference Guide</i>.• 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 <i>NetWorker PowerSnap Module Installation and Administrator's Guide</i>.
pool	<p>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.</p>
preconfigured	<p>Existing selections or configurations for different NetWorker features.</p>
primary storage	<p>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 <i>NetWorker PowerSnap Module Installation and Administrator's Guide</i>.</p>
print	<p>Send data to a printer.</p>
proxy backup	<p>An Oracle data backup that creates a point-in-time copy (snapshot) on primary storage by using the PowerSnap Module software. The snapshot can be <i>optionally</i> backed up to secondary storage, with or without deletion of the snapshot on the primary storage. There are two basic types of proxy backup: <i>instant backup</i>, <i>live backup</i>.</p>

proxy client host	<p>A computer that is separate from the Oracle Server host, with access to the primary storage unit and running the following software:</p> <ul style="list-style-type: none">• NetWorker client software, and optionally NetWorker server or storage node software.• Appropriate PowerSnap Module software. <p>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.</p>
proxy restore	<p>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>.</p>
purging	<p>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.</p>
recover	<ol style="list-style-type: none">1. A recovery method that re-creates an image of the client file systems 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	<p>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.</p>
Recovery Manager (RMAN)	<p>The Oracle utility that acts as an intelligent interface to Oracle databases and works with third-party media management products, such as NMO, to back up and restore Oracle database objects.</p>
recyclable save set	<p>A save set whose browse and retention policies have been reached; as a result, the save set has been removed from the media database.</p>

recyclable volume	A volume whose data has passed both its browse and retention policies and is now available for relabeling and reuse 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 archived redo log .
remote device	A storage device that is attached to a NetWorker storage node.
resource	<p>A component of either the NetWorker server configuration or the NWORA resource file.</p> <ul style="list-style-type: none">• A NetWorker resource 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.• The NWORA resource file contains resources that enable proxy backups and (optionally) catalog synchronization.
resource database	A database that contains information about each of the configured NetWorker server's resources.
restore	The process of retrieving individual Oracle datafiles from backup storage and copying the files to 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.
RMAN	See Recovery Manager (RMAN) .
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.

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 <i>proxy restore</i> .
root	<ol style="list-style-type: none">1. On UNIX, the superuser account with the user name "root" and user ID. By extension, the privileged system maintenance login on any operating system.2. On Windows, the top node of the system directory structure; the home directory of the root user.
RPC	An abbreviation for remote procedure call, which is the protocol that the NetWorker server uses to perform client requests over a network.
save	The NetWorker command that backs up client files to backup volumes and makes data entries in the online index.
save set	A group of files or a file system from a single client computer backed up onto storage media through the NetWorker software.
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, and 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	The NetWorker command used to read a backup volume when the online indexes are not available.
scheduled backup	A type of backup that is configured to start automatically at a specified time for a group of one or more NetWorker clients. A scheduled backup is configured through either the NetWorker Configuration Wizard or the NetWorker Administrator program on the NetWorker server. A scheduled backup generates a <i>bootstrap</i> save set.

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 parameter.
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 <i>level</i> .
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 <i>save set ID</i> .

stand-alone device	A storage <i>device</i> that contains a single drive for backing up data. Stand-alone devices cannot store or automatically load backup volumes.
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 that typically installs, configures, and maintains the 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 <i>proxy restore</i> .
traditional storage	See <i>secondary storage</i> .
user	A person who can use NetWorker from his or her workstation to back up and restore files.
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 <i>pool</i> .

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