Legato NetWorker® Module For SAP® R/3® On Oracle®

Administrator's Guide

Release 2.1

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Legato NetWorker Module for SAP R/3 on Oracle Administrator's Guide

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Preface

The *Legato NetWorker® Module for SAP® R/3® on Oracle® Administrator's Guide* contains information on how to configure and manage the Legato NetWorker Module for SAP R/3 on Oracle software.

You *must* install the NetWorker Module software on your server and clients to use the information presented in this guide. If you have not yet installed the software, refer to the *Legato NetWorker Module for SAP R/3 on Oracle Installation Guide* for installation instructions.

Audience

The information in this guide is intended for system administrators who are responsible for installing software and maintaining the servers and clients on a network. Operators who monitor the daily backups may also find this manual useful.

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

Convention	Indicates	Example
boldface	Names of DOS or UNIX line commands, daemons, options, programs, or scripts	The **nsradmin** command starts the command line version of the administration program.
italic in text	Pathnames, filenames, computer names, new terms defined in the Glossary or within the chapter, or emphasized words	Displayed messages are also written to */nsr/logs/daemon.log*.
italic in command line	A variable that you need to provide in the command line	**`nwadmin -s`** *server-name*
`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 you must type exactly as shown	**`nsr_shutdown -a`**
Menu_Name> Command	A path or an order to follow for making selections in the GUI	Volume>Change Mode>Appendable
Important:	Information that you must read and follow to ensure successful backup and recovery of your data	**Important:** You must install the NetWorker Module software in the same directory where you installed the NetWorker client binaries.

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Chapter 1: Introduction

This chapter contains information about the features provided by the Legato NetWorker Module for SAP R/3 on Oracle software and a suggested roadmap to follow when configuring the NetWorker Module for SAP R/3 on Oracle.

Assumptions

This information in the guide assumes:

- You have a storage management server with NetWorker for Windows or NetWorker for UNIX® server software installed.
- You have NetWorker Module for SAP R/3 on Oracle software installed on each Oracle database server that requires backup and recovery services.
- You have a database server with SAP R/3 for Oracle.
- The database server is running Windows® NT (Intel®) and Windows 2000, AIX®, Tru64™ UNIX, HP-UX®, or Solaris™ system software.

About the NetWorker Module for SAP R/3 on Oracle

It is important to back up computer systems to protect them from the loss of valuable data. In a network environment, where users depend on shared data and the amount of data continuously grows, the need to manage data becomes crucial.

The NetWorker Module for SAP R/3 on Oracle is an add-on module for NetWorker that provides a backup and restore interface between the SAP Database Administration (SAPDBA) program and the NetWorker server.

The NetWorker Module for SAP R/3 on Oracle provides you with:

- Support for local or distributed backup to a centralized backup server.
- Support for cloning of Oracle save sets.

- Support for client-side compression and encryption of filesystem data.
- SAP-specific notifications above and beyond standard NetWorker notifications.

The NetWorker Module, in conjunction with the NetWorker server, provides reliable, high-performance data protection for Oracle databases within an SAP R/3 environment. The NetWorker Module integrates backup and restore procedures for Oracle databases within an SAP R/3 environment into the network-wide data protection solutions that NetWorker provides. NetWorker software, in combination with the NetWorker Module, provides a comprehensive storage management solution that addresses the need for cross-platform support of enterprise applications running on Windows NT/2000 and UNIX.

About NetWorker

Legato NetWorker is a network data storage management solution that protects and helps manage data across an entire network. NetWorker simplifies the storage management process and reduces the administrative burden by automating and centralizing data storage operations. Furthermore, as a network expands or the amount of data grows, NetWorker provides the capacity and performance to handle the load.

With NetWorker, you can:

- Perform automated backups during nonpeak hours.
- Administer, configure, monitor, and control NetWorker functions from any system on a network.
- Centralize and automate data management tasks.
- Increase backup performance by simultaneously sending more than one save stream to the same device.
- Use parallelism to send several save streams to multiple backup devices or storage nodes.

Recovery Manager (RMAN)

NetWorker Module for SAP R/3 on Oracle now supports the use of Oracle's backup/restore utility, RMAN. The RMAN utility is available with Oracle8 or greater implementations of the Oracle database, and can be used by the SAPDBA program to backup the Oracle database.

Using RMAN with the NetWorker Module is optional; you can continue to use **backint** as your sole backup tool. If RMAN is used to back up your Oracle data, **backint** must still be used to back up SAP-specific profiles, logs, and other files.

RMAN acts as an integral component of an Oracle8 or Oracle8i database backup and recovery system. RMAN provides the following features:

- Online/offline Oracle database backup
- High performance through parallel backups and restores
- Intelligent interface to Oracle databases
- Parallel processing
- Error checking
- Block level incremental

Roadmap of NetWorker Module for SAP R/3 on Oracle Configuration

This section provides a suggested roadmap to follow when setting up and configuring the NetWorker Module.

1. Install and enable the NetWorker Module for SAP R/3 on Oracle on each Oracle database server with SAP R/3 that requires backup and recover services. Installation instructions can be found in the *Installation Guide*.
2. Set the PATH environment variable for the Oracle user, *ora<oracle_sid>*, to point to the location of the NetWorker client executables (typically */usr/bin*).
3. Also set the PATH environment variable for the Oracle user to point to the location of **nsrinfo**.
4. Set the owner of **backint** to *root*.
5. Tru64 only: Set the *sticky bit* on.
6. Add each Oracle server with SAP R/3 to the NetWorker server's list of clients, following the instructions detailed in "Configure the Server Resource on Windows" on page 39 or "Configure the Server Resource on UNIX" on page 76.
7. Instruct the SAPDBA program to use the NetWorker Module for SAP R/3 on Oracle **backint** program (and the RMAN program, if appropriate) by editing the SAP initialization profile, *init<oracle_sid>.sap*, as described in "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.
8. Customize the NetWorker Module parameter file, *init<oracle_sid>.utl*, on each SAP R/3 on Oracle server, as described in *"Coordinating Backup Processes for Windows Clients" on page 62* or *"Coordinating Backup Processes for UNIX Clients" on page 99*.

9. If scheduled backups will be used, configure the client and edit the example scheduled backup configuration file, as described in *"Configuring the Windows Client Resource for Scheduled Backups" on page 47* or "Configuring the UNIX Client Resource for Scheduled Backups" on page 84.
10. Add the <*oracle_sid*> as a valid user in the administration list.

Chapter 2: NetWorker Functionality

This chapter provides a brief overview of how NetWorker performs backup and restore processes. Illustrations of the backup and restore processes provide a graphical overview of the storage management processes employed by NetWorker and the NetWorker Module for SAP R/3 on Oracle.

The following topics are addressed in this chapter:

- "How NetWorker Backs Up Data" on page 24
- "NetWorker Services and Programs" on page 24
- "What Happens during a Scheduled NetWorker Backup" on page 26
- "How NetWorker Restores Data" on page 29
- "SAP R/3 on Oracle Backup and Recovery Systems" on page 30
- "Using backint" on page 30
- "Using RMAN" on page 30
- "How NetWorker Module for SAP R/3 on Oracle Connects to NetWorker" on page 31
- "What Happens During a NetWorker Module for SAP R/3 on Oracle Backup" on page 31
- "What Happens During a NetWorker Module for SAP R/3 on Oracle Restore?" on page 32

How NetWorker Backs Up Data

NetWorker client-server technology uses a remote procedure call (RPC) network protocol to back up data. The NetWorker server software consists of several server-side services and programs that oversee backup and restore processes. The NetWorker client software consists of client-side services and user interface programs. These services and programs maintain:

- Client configuration files.
- An online client file index.
- An online media database.

NetWorker calls upon several services and programs when a request for a backup is received. These services coordinate the tasks associated with a backup or restore, and record information about what was backed up and the media containing the backed-up data.

NetWorker Services and Programs

Table 1 provides a description of the NetWorker services and programs that contact the client for backup and maintain the server's client file index and media databases.

Table 1. Services and Programs Managed by the NetWorker Server (Part 1 of 2)

Service/Program	Function
ansrd	Monitors active save and restore sessions.
asavegrp	Monitors the progress of individual save sets.
nsrck	Performs index consistency checking and repairs to maintain the integrity of the client file index.

Table 1. Services and Programs Managed by the NetWorker Server (Part 2 of 2)

Service/Program	Function
nsrd	Controls all NetWorker server activity: • Starts other services. • Authorizes and coordinates backup and restore services for the client. • Maintains the NetWorker configuration resource database. • Initiates queries to the database on behalf of other services. • Allocates media services. • Contacts clients for scheduled backups. • Monitors backup and restore sessions. • Maintains server statistics and message logs.
nsrim	Manages the NetWorker server's client file index.
nsrindexd	Provides the means for inserting entries into the NetWorker server's client file index.
nsrmmd	Provides device support during backup and restore by: • Generating mount requests. • Labeling devices. • Multiplexing during a multi-client backup. • Demultiplexing during a restore. • Generating requests for volume mounting and unmounting.
nsrmmdbd	Manages the NetWorker server's media database.
savegrp	Coordinates NetWorker clients during the save process.

The NetWorker master service (**nsrd**) calls the NetWorker client service (**nsrexecd**) and several client-side programs when a scheduled or manual backup request is received. A temporary server agent service (**ansrd**) monitors the progress of the backup session. Table 2 provides a description of the client-side services and programs.

Table 2. Services and Programs Managed by the NetWorker Client

Service/Program	Function
nsrexecd	Authenticates the NetWorker server's remote execution request, and executes the **save** and **savefs** backup commands on the client.
recover	Browses the NetWorker server's online client file index and restores the specified file(s) to primary disk storage.
save	Sends specified files, in a multiplexed data stream, to the NetWorker server for backup to media by **nsrmmd**. Creates an entry in the client file indexes and media database by invoking **nsrindexd**.
savefs	Sends backup information about a client's associated save sets to the NetWorker server. Identifies the save set data that was modified since the previous level save.

What Happens during a Scheduled NetWorker Backup

nsrd Service

When configuring a *backup group* on the NetWorker server, you schedule a start time for the backup group. The **nsrd** service begins the group's backup by invoking the **savegrp** program at the scheduled time.

savegrp Program

savegrp queries the client resources to determine:

- Which clients configured on the server are members of the backup group.
- What level of backup to perform.

- How many save sets to run concurrently.
- When the most recent backup of the group occurred.

If any of this information is not available on the NetWorker server, **savegrp** sends a request to the client-side service, **nsrexecd**, to run **savefs** on each client assigned to the backup group to gather the necessary details. The **savefs** program identifies the database files to back up for the specified client and sends this information to **savegrp**.

savegrp Worklist Preparation

After **savegrp** receives information about the objects to back up, **savegrp** prepares a work list for the server. NetWorker arranges the order of this work list based on the Client Priority attribute assigned to each client. The Client resource with the lowest value in the Priority attribute field is contacted first.

If problems were encountered with the client file index during the previous backup session, **nsrd** invokes the **nsrck** service to check the consistency and state of the NetWorker server's client file indexes and media database. Then **nsrd** begins the client file index insertion service, **nsrindexd**.

savegrp Contacts the First Client

The **savegrp** program contacts the first client on the server's work list. The client's **nsrexecd** program is invoked, and a backup session of the first save set begins. The **save** program passes all backup criteria, such as group and level of backup, to **nsrd**. From this information, **nsrd** determines the associated volume pool and forwards this information to the appropriate media service.

The **savegrp** program repeats this process for each item on the server's work list until all clients in the group are backed up.

nsrmmd Media Service

The media **nsrmmd** service performs the following functions:

- Sends a message to the NetWorker server, requesting a mount of the media assigned to the volume pool indicated by **nsrd**.
- Writes the data sent by **save** to storage media.
- Forwards storage information to **nsrmmdbd** to be recorded in the NetWorker server's media database.

Any time there is a lull in save set activity from the client, the NetWorker server queries for another save set within the group. To use the maximum potential of the backup devices, the **savegrp** program concurrently backs up the maximum number of save sets specified by the parallelism attribute.

Backup of NetWorker Server's Bootstrap

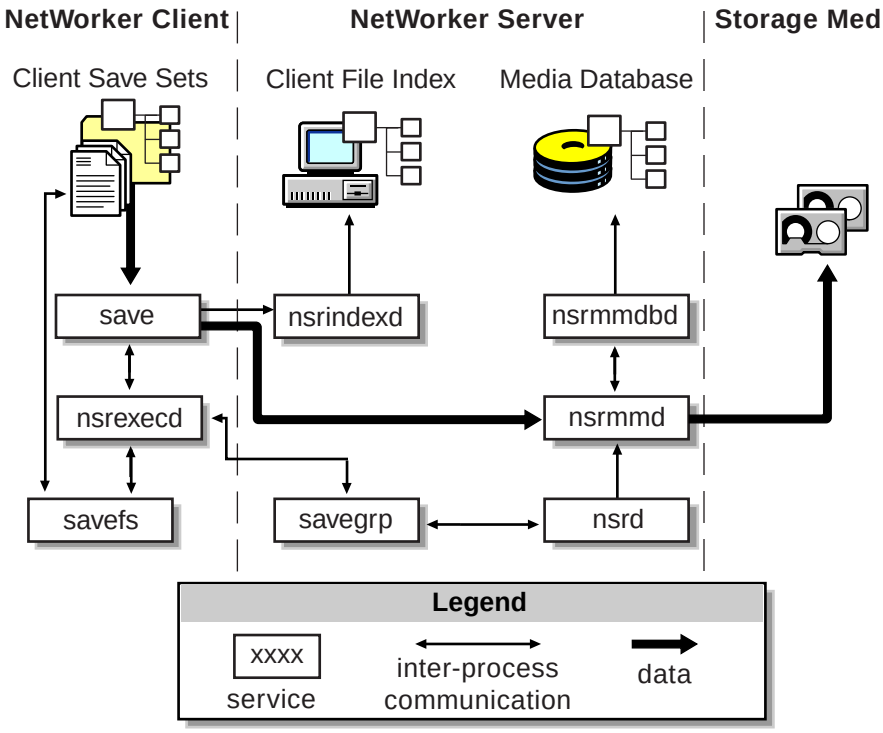
When the work list is complete, a backup of the NetWorker server's bootstrap file occurs if the server is either part of the group being backed up or is not part of an enabled group. When the backup of the bootstrap file is complete, a printout of the bootstrap file is sent to the default printer. This printout of the bootstrap file helps if the NetWorker server ever needs to be restored, as in a disaster recovery situation.

Final Results of savegrp Execution

The final results of the **savegrp** execution are sent to the server and are included in a *savegroup completion report*. This report is sent according to the notification setup for the savegroup event. Refer to the *Legato NetWorker Administrator's Guide* for details on using and customizing notifications.

Figure 1 shows how the services and programs managed by the NetWorker client and server interact during a scheduled backup.

Figure 1. How NetWorker Services, Processes, and Programs Interact during a Scheduled Backup



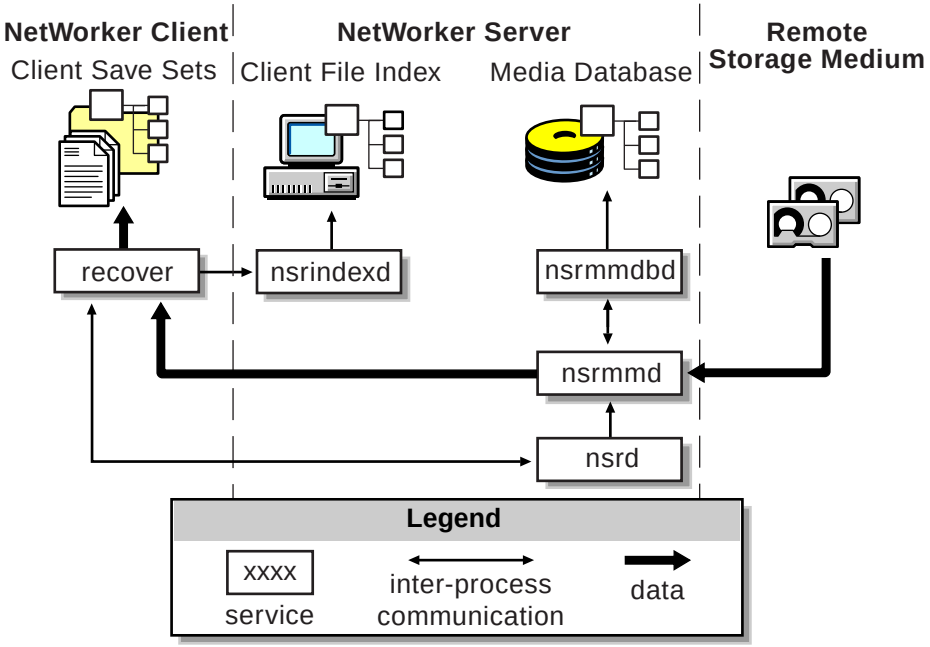
How NetWorker Restores Data

When NetWorker receives a request from a client to restore data, the server's **nsrd** service contacts the server's media database service, **nsrmmdbd**, to determine which media contains the requested save set. Once the save set's media location is obtained, **nsrmmd** issues a mount request. The media is positioned at the beginning of the save set, and the save set is passed to **nsrmmd**. The media service then forwards the save set to the client's **recover** program, which restores the data to the client's filesystem.

When the server's media database service, **nsrmmdbd**, is unable to locate the required volumes or when there are no enabled devices on the NetWorker server, the restore request fails.

Figure 2 shows how the services and programs managed by the NetWorker client and server interact while restoring data to a NetWorker client.

Figure 2. How NetWorker Services, Processes, and Programs Interact During a Restore



SAP R/3 on Oracle Backup and Recovery Systems

The NetWorker Module for SAP R/3 on Oracle and the NetWorker server function with the components of the standard SAP R/3 on Oracle backup and recovery subsystems to produce a comprehensive data storage management system. To implement a well-defined SAP R/3 on Oracle backup and recovery strategy, you need to understand how the NetWorker Module and the NetWorker server work together with the Oracle components.

The NetWorker Module and NetWorker server interact with the Oracle7, Oracle8 or Oracle8i backup and recovery subsystem during Oracle backup and restore operations. The Oracle backup and recovery subsystem comprises the following major components:

- Oracle Server
- SAP Server
- The **backint** backup/restore program
- Oracle's Recovery Manager (RMAN) (optional; available for Oracle8 and greater servers only)

Using backint

The NetWorker Module for SAP R/3 on Oracle and the NetWorker server interact with SAP's Brtools executables using **backint**, an interface to SAP developed by Legato Systems, Inc. The **backint** program allows you to back up all Oracle and SAP files. For more information, see *BC-BRI Backint Interface for ORACLE Databases*, available on the SAP website (www.sap.com).

Using RMAN

RMAN is the main Oracle8 or Oracle8i backup/restore utility for backing up, restoring, and recovering Oracle databases. It uses information from an Oracle database's control file to locate, back up, restore, and recover datafiles, control files, and archived logs.

The NetWorker Module for SAP R/3 on Oracle and the NetWorker server can also interact with Oracle's RMAN backup/restore utility. This option is only available for Oracle8 and greater servers. When this option is used, the SAP Database Administration (SAPDBA) program uses RMAN to back up the Oracle database and uses **backint** to back up SAP-specific configuration files, logs, and other files.

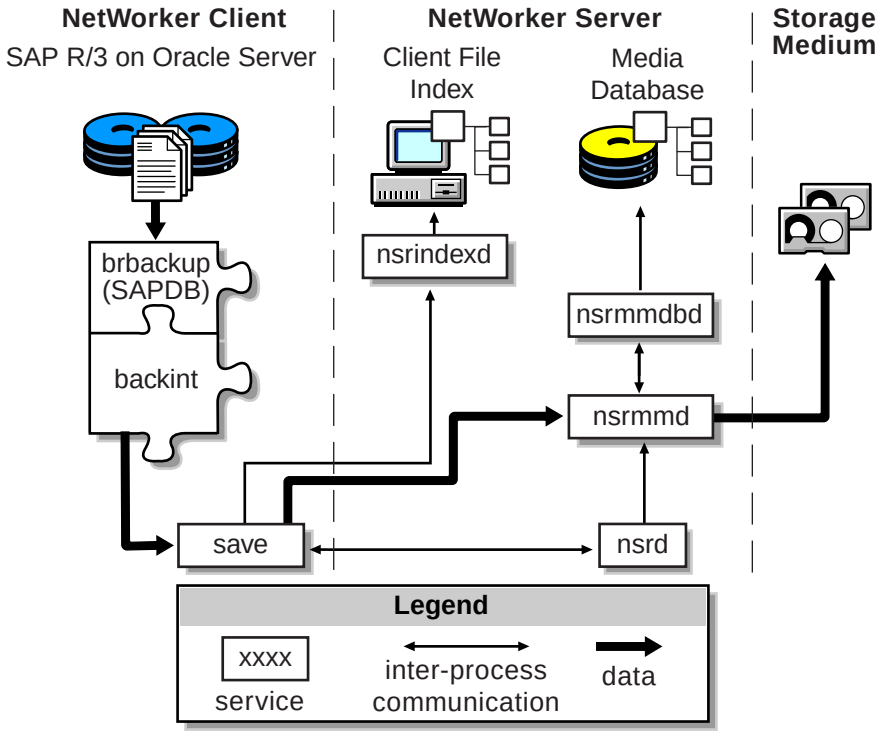
How NetWorker Module for SAP R/3 on Oracle Connects to NetWorker

NetWorker, combined with the NetWorker Module, provides storage management services for Oracle database servers with SAP R/3. The NetWorker Module provides services that connect NetWorker functionality to Oracle database servers with SAP R/3. NetWorker provides volume labels and NetWorker client resource files.

What Happens During a NetWorker Module for SAP R/3 on Oracle Backup

When an SAP R/3 on Oracle backup is triggered by **brbackup** on the SAP R/3 on Oracle server, the **brbackup** program sends a backup request to the **backint** program. The **backint** program backs up the requested Oracle data files, control files, online redo logs, and profiles. Also, **backint** sends the data in a parallel stream to the NetWorker server for backup to media or storage node, and creates an entry in the client file index and media database. Final results of the backup are included in a log file on the SAP R/3 on Oracle server.

Figure 3. How NetWorker Services, Processes, and Programs Interact During a Backup



When RMAN is Used to Back Up the Oracle Database

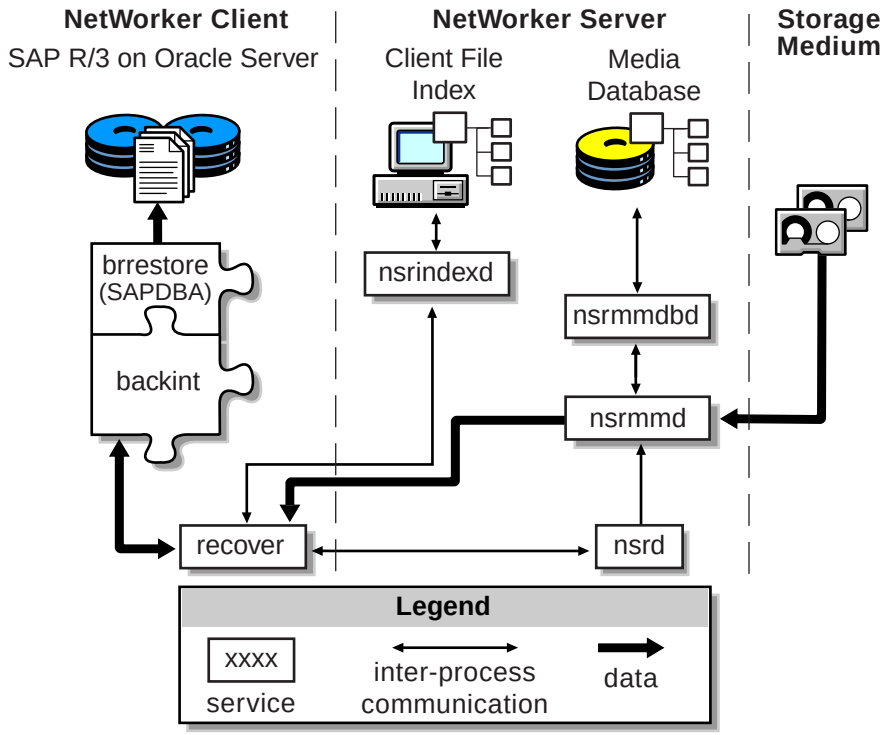
When the Oracle backup/restore utility, RMAN, is used to backup the Oracle database (available with Oracle8 or greater databases), the process is essentially the same as using **backint** alone, except that **brbackup** sends requests to both **backint** and RMAN. **backint** backs up the SAP-specific configuration files, logs, and other files, and RMAN backs up the Oracle data files.

2

What Happens During a NetWorker Module for SAP R/3 on Oracle Restore?

When an SAP R/3 on Oracle restore is triggered by **brrestore** on the SAP R/3 on Oracle server, the **brrestore** program sends a restore request to the **backint** program, which browses the NetWorker server's client file index and restores the specified files in a parallel stream from the NetWorker server to the SAP R/3 on Oracle server.

Figure 4. How NetWorker Services, Processes, and Programs Interact During a Restore



When RMAN is Used to Restore the Oracle Database

When the Oracle backup/restore utility, RMAN, is used to restore the Oracle database (available with Oracle8 or greater databases), the process is essentially the same except that **brrestore** sends requests to both **backint** and RMAN. **backint** restores the SAP-specific configuration files, logs, and other files, and RMAN restores the Oracle data files.

Chapter 3: Configuration on Windows NT and Windows 2000

This chapter provides procedures for configuring an Oracle server/cluster client with SAP R/3 as a NetWorker client on Windows NT and Windows 2000. For procedures for configuring an Oracle server/cluster client with SAP R/3 as a NetWorker client on UNIX, see "Configuration on UNIX" on page 73. The following information is addressed in this chapter:

- "Requirements" on page 36
- "Windows NetWorker Server Configuration for SAP R/3 on Oracle" on page 39
- "How to Configure the Server Resource on Windows" on page 39
- "Using Backup Groups" on page 40
- "Using NetWorker Policies" on page 42
- "NetWorker Backup Clients" on page 44
- "Configuring the Windows Client Resource for Scheduled Backups" on page 47
- "Using Storage Nodes" on page 56
- "How to Create Volume Pools for SAP R/3 on Oracle Database Backups" on page 59
- "Using Pools" on page 58
- "Configuring the SAP Initialization File on Windows" on page 62
- "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66
- "Coordinating Backup Processes for Windows Clients" on page 62

Requirements

To use the NetWorker Module for SAP R/3 on Oracle, each Oracle server/cluster client with SAP R/3 must be added to the NetWorker server's list of clients. Additionally, the SAP initialization profile, *init<oracle_sid>.sap*, and the NetWorker Module for SAP R/3 on Oracle *parameter file, init<oracle_sid>.utl,* must be configured. Also, the user who will administer the SAP backups must be added to the list of server administrators. In order to perform scheduled backups, the scheduled backup configuration file must be edited as well.

The NetWorker Module performs backup and restore processes according to the configuration specified in the *init<oracle_sid>.utl* file.

NetWorker Module for SAP R/3 on Oracle Configuration Options

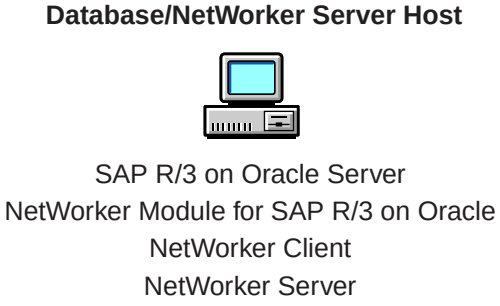
This section describes the supported options for setting up the NetWorker Module in a combined environment using SAP R/3, Oracle, and NetWorker. Each configuration consists of the following components:

- Oracle server/cluster client with SAP R/3
- NetWorker Module for SAP R/3 on Oracle
- NetWorker client
- NetWorker server

Option 1 - All Components on the Same System

In this first configuration, the Oracle server with SAP R/3 and NetWorker server are installed on the same system, as shown in Figure 5.

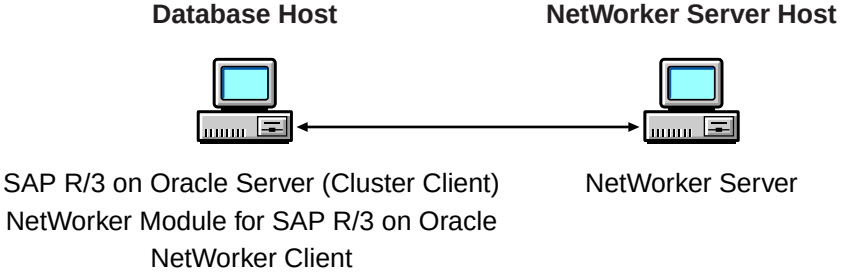
Figure 5. Configuration Option 1 - SAP R/3 on Oracle Server and NetWorker Server on the Same System



Option 2 - NetWorker Server on a Separate System

In this configuration, the Oracle server/cluster client with SAP R/3 and the NetWorker server are installed on separate systems, as shown in Figure 6. The Oracle server with SAP R/3 functions as a remote NetWorker client.

Figure 6. Configuration Option 2 - SAP R/3 on Oracle Server on a Different System from the NetWorker Server

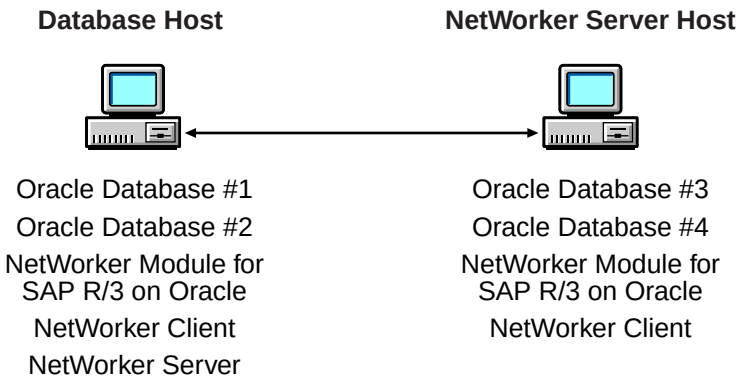


Installation Requirements for Multiple Database Backup

The NetWorker Module for SAP R/3 on Oracle supports concurrent backups of separate Oracle database instances on the same system or node. The NetWorker Module should be installed only once per system, regardless of the number of Oracle database instances to be backed up per system. All Oracle database files can then be backed up to the same NetWorker server, located locally or over the network.

With multiple licenses of the software, Oracle databases on separate systems can be backed up concurrently to the same NetWorker server. The NetWorker server can be located on any of the systems containing SAP R/3 and Oracle, or on a separate Windows or UNIX system. An example of a multiple database installation is detailed in Figure 7.

Figure 7. Multiple Database Backup



Windows NetWorker Server Configuration for SAP R/3 on Oracle

To use the NetWorker Module, each Oracle server/cluster client with SAP R/3 requiring backup and restore services must have an associated server resource and client resource configured on the NetWorker server.

Use the NetWorker Administrator program on the NetWorker server to define custom settings for Backup Groups and Volume Pools. Configure the *init<oracle_sid>.utl* parameter file on the Oracle server with SAP R/3 to specify the parameters the NetWorker Module should use during backup and restore sessions.

How to Configure the Server Resource on Windows

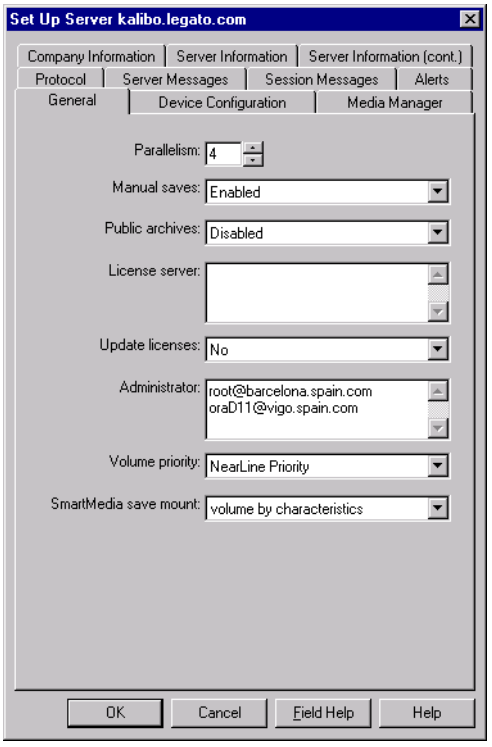
A NetWorker server resource resides on the NetWorker server and describes the specific administrator(s) that can access the NetWorker server and the number of save streams the server will accept from any of its clients. An example of a server resource configuration is illustrated in Figure 8 on page 40.

To configure a NetWorker server resource to accept data from an Oracle server/cluster client with SAP R/3, follow these steps:

1. Ensure that the Parallelism field is set equal to or greater than the number of save streams being sent to the NetWorker server by the Oracle server/cluster client. This is the parallelism setting found in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl.* The default setting in the parameter file is 8 and the maximum setting is 512. For further details on setting the parallelism attribute, see "Setting Parallelism" on page 67.
2. Ensure that the setting for Manual Saves is set to Enabled.
3. In the Administrator field, add each *Oracle user* in the format: *ora<oracle_sid>@ hostname*. This enables each indicated user on an Oracle server/cluster client with SAP R/3 to perform inquire functions and use the NetWorker reporting command, **nsrinfo**.

   For details on customizing the *init<oracle_sid>.utl* parameter file, see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66.

Figure 8. Server Setup on Windows NetWorker Server For NetWorker Module for SAP R/3 on Oracle



Using Backup Groups

NetWorker backup groups are used to specify the media pool to which a client's data belongs. The creation of a backup group for SAP R/3 on Oracle data is optional, but if you create one, you must also create an associated Pool.

About Backup Groups

A backup group is a set of NetWorker clients whose data can be written to a specific set of media or combined with backup data from other groups. One or more SAP R/3 on Oracle database clients can be assigned to a group.

NetWorker provides a preconfigured group named Default. To ensure that all data is backed up, NetWorker automatically adds all specified client resources to this default group.

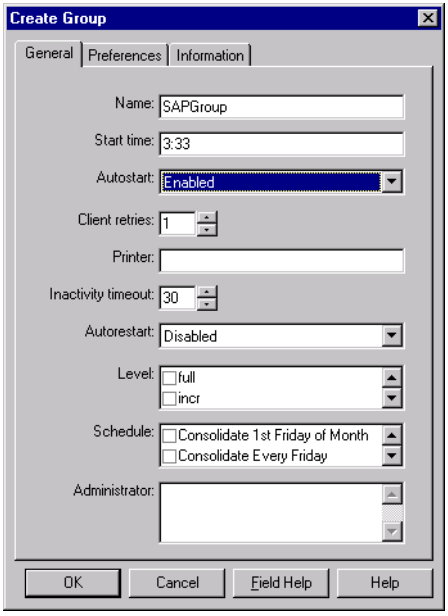
To assign Oracle data to a group with different attributes, a new group must be created using the NetWorker Administrator program.

How to Create a Group for SAP R/3 on Oracle Clients

To create a group specific for SAP R/3 on Oracle clients:

1. Create a new group with a valid group name, such as SAPGroup, as shown in Figure 9.

Figure 9. Backup Group setup on NetWorker Server For NetWorker Module for SAP R/3 on Oracle



2. To incorporate this group into your SAP R/3 on Oracle backups, uncomment the Group option in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*, and set it equal to the name of the SAP R/3 on Oracle backup group:

   `group = SAPGroup`

Important: NetWorker Module for SAP R/3 on Oracle does not support NetWorker scheduled backups, and the server's bootstrap notification report is not generated automatically after a NetWorker Module for SAP R/3 on Oracle backup.

Using NetWorker Policies

NetWorker software uses a Policies resource to create a life cycle for both the browse and retention policies associated with the backed up data. The client resource has a default browse policy of Month and a default retention policy of Year.

Browse Policy

The browse policy determines how long the client file index maintains a browsable entry. If the browse policy has not expired, you can view the data available for restore using **nwrecover**. After a browse policy expires, the **scanner** program can be used to rebuild the online indexes.

NetWorker software uses the client index entries in order to restore SAP R/3 on Oracle database files. Set the browse policy to a period long enough to retain client indexes as far back as required to restore them. To manage indexes manually, refer to "Manually Managing the Online Indexes" in the *Legato NetWorker Administrator's Guide.*

You should keep copies of archived system files until the associated database file save sets have exceeded their browse policy.

Retention Policy

The retention policy determines how long the save set information is stored in the media database and how long the files remain retrievable from the backup volume. After all the retention policies for the save sets on a volume and other dependent save sets expire, the volume is given a status of recyclable. Until the volume is relabeled, the **scanner** command can be used to extract a save set from a volume and rebuild the online indexes.

The preconfigured policies, shown in Table 3 on page 43, are provided with NetWorker; alternatively, you can create customized policies. Any policy can be used as either a browse or retention policy.

Table 3. Preconfigured NetWorker Policies

Policy Name	NetWorker Behavior
Decade	Available for ten years
Half Year	Available for six months
Month	Available for one month
Week	Available for one week
Year	Available for one year

Setting the Browse Policy

The browse policy for a client's Oracle data can be set using the Client Resource on the NetWorker server or in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*. To incorporate a different browse policy specifically for a client's Oracle database instances, uncomment the expiration option and set it equal to the browse policy you wish to incorporate in **nsr_getdate** format:

```
expiration = 2 weeks
```

Setting the Retention Policy

The retention policy for a client's SAP R/3 on Oracle data is set in the Client Resource on the NetWorker server.

Important: An entry for a save set must be removed from the file index before the save set can be removed or marked Recyclable in the media index.

NetWorker Backup Clients

NetWorker software uses a client/server model to provide storage management services. At least one system on the network is designated as the NetWorker server. Systems containing data to be backed up are configured as clients of the NetWorker server.

You configure NetWorker clients using the client resource provided by the NetWorker Administrator program.

Using a NetWorker Client Resource

A NetWorker client resource resides on the NetWorker server and describes the specific media management attributes assigned to the Oracle data resident on an Oracle server/cluster client with SAP R/3. This client resource provides the NetWorker server with the following instructions for handling the Oracle data on an Oracle server/cluster client with SAP R/3:

- The length of time to maintain entries in the online index for restore, unless specified in the *init<oracle_sid>.utl* file.
- The length of time to retain the volume entries in the media index.

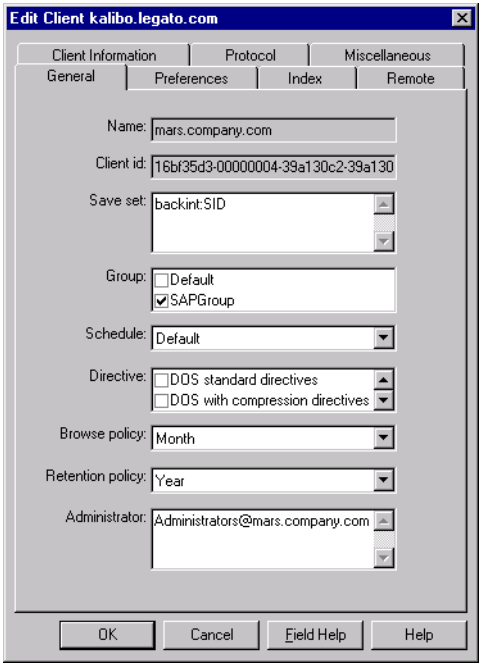
Other information regarding the client resource configuration is contained in NetWorker Module for SAP R/3 on Oracle parameter file (*init<oracle_sid>.utl*). Settings in this file will override any corresponding settings in the client resource definition.

Creating a NetWorker Client Resource on Windows

In order to perform scheduled backups, a client resource will have to be configured for the SAP R/3 on Oracle data. Depending on your backup configuration needs, you may want to create multiple clients to perform different tasks, such as one to perform full backups and another to perform incremental backups when full backups are not performed.

Many settings in the client resource have corresponding settings in the NetWorker Module for SAP R/3 on Oracle parameter file (*init<oracle_sid>.utl*). Settings in the parameter file will always override any setting in the client resource definition. An example of the general settings for a client resource configured for the NetWorker Module for SAP R/3 on Oracle is illustrated in Figure 10 on page 45.

Figure 10. Client Resource General Setup on Windows



The following items should be considered when configuring client resources:

- Save Set naming convention: Save set names are assigned automatically by the NetWorker Module, using the format `backint:`*`oracle_sid`*. However, the Save Set attribute in the Client Resource dialog is a required field, even though the value entered in this attribute will be ignored by the NetWorker Module. The only requirement is that the attribute begin with `backint:`, which is a keyword instructing NetWorker to use the NetWorker Module for SAP R/3 on Oracle to perform the backup.

  Therefore, in order to simplify tracking NetWorker Module save sets, you should enter `backint:`*`oracle_sid`* as the value for the client's Save Set attribute.

- For cluster clients, add the hostname or IP address for this cluster member's cluster interconnection to its Remote Access attribute list (for example, *`root@leon.spain.com`*). The Remote Access attribute list is found on the Remote tab (Figure 11 on page 47).
- For scheduled backups, the **nsrsapsv** command must be entered in the Backup command attribute, also found in the Remote tab. For more information, see "Configuring the Windows Client Resource for Scheduled Backups" on page 47.

Using the Existing Client Resource for File System Backup

When the NetWorker client was installed on the host computer running the SAP R/3 on Oracle database, a client resource was created to back up the host computer's filesystem. This client resource can continue to be used to backup the host's filesystem. Also, if you are performing non-scheduled backups rather than scheduled backups, this client can be used to configure certain settings that the NetWorker Module for SAP R/3 on Oracle uses during inquire and restore operations.

The following issues should be considered when configuring this client resource:

- Set the attribute for Directive to ignore all Oracle data on this client. NetWorker will then ignore all Oracle data on this client when the file system is backed up.
- If non-scheduled backups are used, settings in the client resource are used by NetWorker only for communication with the NetWorker Module for SAP R/3 on Oracle **backint** program during inquire and restore processes.
- Client resource settings specific for the NetWorker Module for SAP R/3 on Oracle backups are contained in the NetWorker Module parameter file, *init<oracle_sid>.utl*. Any settings entered in this client resource will be ignored when the NetWorker Module backs up SAP R/3 on Oracle data.

For more information about configuring a client resource for filesystem backups and restores, see the *Legato NetWorker Administrator's Guide*.

Configuring the Windows Client Resource for Scheduled Backups

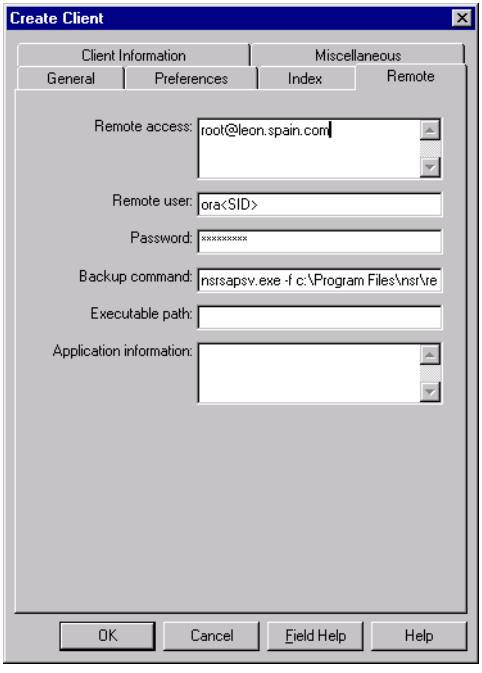
In order to perform scheduled backups, you must configure the client's remote access information, found in the Client Resource's Remote tab. Configuration is somewhat different depending on how your Oracle system is configured:

- If your Oracle system is configured to use *Database Authentication*, the Oracle administrator's system username and password, used to log onto the host computer running the Oracle database, must be entered in the Remote User and Password attributes of the Client Resource (see Figure 11 on page 47).

  The scheduled backup configuration file must also be configured to include the username and password required to log into the Oracle database. For more information, see "Customizing the Scheduled Backup Configuration File" on page 50.

- If your Oracle system is configured to use *External* or *Enterprise Authentication*, you must encrypt the username and password of the Oracle owner into the scheduled backup configuration file (see "How to Encrypt the Username and Password into the Configuration File" on page 50).

Figure 11. Client Resource Remote Setup on Windows



Use the information in Table 4 to complete the Client Resource remote setup. Enter the information in the Remote tab of the Create Client dialog box (see Table 11):

Table 4. Client Resource Remote Setup (Part 1 of 2)

Attribute	Description
Remote access	Used for cluster client configuration only. This field is not used for scheduled backup configuration. For more information, see "Creating a NetWorker Client Resource on Windows" on page 44.
Remote user	If your Oracle system is configured to use Database Authentication, enter the Oracle administrator's system username, used to log onto the host computer running the Oracle database. If your Oracle system uses External or Enterprise Authentication, you do not have to include the username here.
Password	If your Oracle system is configured to use Database Authentication, enter the Oracle administrator's password to log onto the host computer of the Oracle system. If your Oracle system uses External or Enterprise Authentication, you do not have to include the password here.

Table 4. Client Resource Remote Setup (Part 2 of 2)

Attribute	Description
Backup command	Used to enter the **nsrsapsv** command. The following syntax should be used to enter this command: **`nsrsapsv -f filename`** Where *filename* represents the full path and filename of the scheduled backup configuration file. For information about configuring the scheduled backup configuration file, see "Customizing the Scheduled Backup Configuration File". **Note:** The Backup command attribute is limited to a total of 64 characters. Therefore, the full path and filename for the scheduled backup configuration file cannot exceed 52 characters. As a result, it is recommended that scheduled backup configuration files should be stored in *c:\Program Files\nsr\res*.
Executable Path	Leave blank.
Application Information	Leave blank.

Customizing the Scheduled Backup Configuration File

The scheduled backup executable, **nsrsapsv**, requires certain parameters that are contained in a configuration file. The example scheduled backup configuration file, included with installation, is named *nsrsapsv.cfg*, but any name may used. The path and filename are passed to **nsrsapsv** when the scheduled back is configured in the NetWorker Administrator program (see "Backup command" described in Table 4).

How to Encrypt the Username and Password into the Configuration File

For Windows systems, the Oracle database administrator's username and password must be encrypted in the scheduled backup configuration file using the **-c** command line option for the **nsrsapsv** command.

To set the Oracle administrator's username and password in the configuration file:

1. Enter the following at the command line:

   `nsrsapsv -c filename`

   where *filename* represents the path and filename of the scheduled backup configuration file.

2. At the prompt, enter the Oracle administrator's username based on the following criteria:

   - If your Oracle system is configured to use Database Authentication, enter the username required to log into the Oracle database.
   - If your Oracle system is configured to use External or Enterprise Authentication, enter the username required to log onto the host machine running the Oracle database.

3. Next, enter the password following the criteria defined in step 2.

The username and password will now be included in encrypted format in the scheduled backup configuration file.

Setting Parameters in the Scheduled Backup Configuration File

The scheduled backup configuration file is a text file that contains a number of parameters required by the **nsrsapsv** executable.

Parameters are set as follows:

```
parameter = value
```

All environment variables that you want to use in your backup must be uncommented.

The following table lists each parameter and the allowed values:

Table 5. Parameters in the Schedule Backup Configuration File (Part 1 of 5)

Parameter	Value
BR_EXEC	The **brbackup** or **brarchive** command, along with any command line options, that **nsrsapsv** will execute. This is a required parameter. The **-u** command line option, which identifies the username and password of the Oracle database administrator, should not be used. Instead, the username and password should be encrypted using the **nsrsapsv -c *filename*** command (see "How to Encrypt the Username and Password into the Configuration File" on page 50). For example: `BR_EXEC=brbackup`
ORACLE_SID	ORACLE_SID is an environment variable that identifies the SID for the instance of Oracle that you wish to back up. If this parameter is specified, the indicated value will be used for the Oracle SID. If the parameter is not specified, the Oracle SID will be obtained from the save set name you entered in the NetWorker Administrator for this client (for example, if you entered in the save set name backint:SAP:online_backup and you did not specify ORACLE_SID in the scheduled backup configuration file, then SAP will be used for the Oracle SID. This is an optional parameter. Example: `ORACLE_SID=SAP`

Table 5. Parameters in the Schedule Backup Configuration File (Part 2 of 5)

Parameter	Value
ORACLE_HOME	This a a required environment variable and should be set to the installation path for the Oracle instance you specified for ORACLE_SID. Example: `ORACLE_HOME=/export/home/oracle/product/8.1.5`
NLS_LANG	This is a required environment variable. The format should be `LANGUAGE_TERRITORY.CHARACTERSET` Refer to your Oracle documentation for more information of this variable. Example: `NLS_LANG=AMERICAN_AMERICA.US7ASCII`
SAP_BIN	The path to the location of BrTools binary files. This should also be where the **backint** executable resides. This path will be added to the PATH environment variable so that the BrTools binaries and **backint** can be found. This is a required parameter. Example: `# SAP_BIN=/usr/sap/SAP/SYS/exe/run`
ORACLE_BIN	An environment variable that specifies where the Oracle binaries are. This path will be appended to the PATH environment variable so that all Oracle binaries can be found if needed. This parameter is only required if the Oracle binaries are not in default location of *ORACLE_HOME\bin*.

Table 5. Parameters in the Schedule Backup Configuration File (Part 3 of 5)

Parameter	Value
SAPBACKUP	An environment variable that indicates the temporary directory in which backup logs should be stored. BrTools and **backint** both use this directory to store temporary log files. For Windows systems, this is a required parameter. For UNIX systems, the default value is *ORACLE_HOME/sapbackup*.

SAP-specific environment variables	SAPARCH, SAPREORG, SAPTRACE, and SAPCHECK are SAP environment variables that are normally set in your SAP environment on Windows platforms. These environment variables are required for **brbackup** to run properly on Windows. If these variables are not set on your Windows system, or need to be overridden, they should be set here.
	
	Examples:
	
	`SAPARCH=d:\orant\CER\saparch`
	`SAPREORG=d:\orant\CER\sapreorg`
	`SAPTRACE=d:\orant\CER\saptrace`
	`SAPCHECK=d:\orant\CER\sapcheck`

Table 5. Parameters in the Schedule Backup Configuration File (Part 4 of 5)

Parameter	Value

PATH	This parameter can be used to add more search paths to the PATH environment variable. Anything specified here will be appended to the PATH environment variable. You may specify multiple search paths, using either one of the following methods:
	
	`PATH=d:\dir1;d:\dir2;d:\dir1\dir2\dir3`
	
	or
	
	`PATH=d:\dir1`
	`PATH=d:\dir2`
	`PATH=d:\dir1\dir2\dir3`
	
	This parameter is optional.

Any *name*`_path=`*value* pair	This parameter can be used to append values to an environment variable named *name*`_path` (for example, LD_LIBRARY_PATH). If an environment variable with this name already exists, then the value listed here will be appended to the existing value for this environment variable. If an environment variable with this name does not exist, it will be created. Example: `LD_LIBRARY_PATH=/export/home/oracle/product/8.1.5/lib:/usr/openwin/lib` This parameter is optional.

Table 5. Parameters in the Schedule Backup Configuration File (Part 5 of 5)

Parameter	Value
Any *name*=*value* pair	This parameter can be used to add any environment variable named *name*. You may specify any *name*=*value* pair. If the environment variable specified by *name* already exists, then it will be overwritten. For example: `BR_TRACE=1` will set BR_TRACE equal to `1` in your environment, which will instruct **brbackup** or **brarchive** to print out additional trace information. This parameter is optional.
ORACLE_USR_PASSWD	This parameter contains the encrypted username and password for the Oracle user. This parameter is created by the **nsrsapsv** command when it is executed with the -c command line option (see "How to Encrypt the Username and Password into the Configuration File" on page 50). This parameter should not be added or edited manually; use the **nsrsapsv** -c command instead.

Using Storage Nodes

A *storage node* is a system that is connected to a NetWorker server, with one or more of its devices distributed across multiple systems. Storage nodes are used in the NetWorker backup, archive, and Hierarchical Storage Management (HSM) operations. Devices attached to storage nodes are called *remote devices*. The storage node runs special NetWorker software that controls devices. The data stored on media in remote devices is tracked in the media database and online client file indexes on the controlling NetWorker server. If the data to be backed up resides on storage nodes, the data does not need to go over the network during backup and restore sessions.

Storage nodes added to the NetWorker configuration can increase the NetWorker server's performance, give more flexibility in designing the network, and centralize the control of data management activities to one or several NetWorker servers.

Storage Node Configuration

To create a storage node, install the storage node software from the NetWorker software distribution onto the storage node system. Define the storage node's devices, as described in "Remote Device Configuration" on page 57.

The storage node's hostname is automatically added to the Administrator list in the Server resource when you add a storage node device. For an autochanger or silo, define the devices in the **jb_config** program, and manually add them to the storage node's hostname in the Administrator list. After the storage node's hostname is added to the Administrator list, one instance of **nsrmmd** runs on the storage node for each device that it controls.

Important: To convert an existing NetWorker *server* to a storage node, you must merge its resource database, media database, and client file indexes with the corresponding databases and indexes on the system controlling the NetWorker server.

Storage Nodes and Remote Devices

You can control most operations on local and remote devices, including autochangers and silos, from the NetWorker Administrator program. For some remote autochanger operations, such as reset, you must use the **nsrjb** command or the **jb_config** program on the storage node system.

Important: NetWorker clients at release 4.2 and later are able to use remote devices for backup, archive, and HSM functions. Earlier NetWorker clients cannot back up data to remote devices.

Remote Device Configuration

You configure remote devices with the controlling NetWorker server the same way that you configure a stand-alone device that is connected to the NetWorker server. When you create each device, add a prefix to the device name that includes "rd=" and the storage node's hostname. For example, *rd=omega:c:\dev\tape01* creates a device called *c:\dev\tape01* on a storage node system called *omega*. For specific instructions on configuring devices, refer to the *Legato NetWorker Administrator's Guide*.

How to Configure a Remote Autochanger or Silo

There are two steps to configuring a remote autochanger or silo device:

1. Verify that the storage node is listed in the Administrator attribute in the Server resource of the controlling server, in the form *administrator@hostname*, where *hostname* is the hostname of the storage node.
2. Run the **jb_config** program on the storage node system to define each device in the autochanger or silo. For more information on the **jb_config** program, refer to the *Legato NetWorker Administrator's Guide*.

Using Pools

NetWorker software provides a means of directing backups to groups of media called pools. Pools allow you to establish a logical and systematic method for tracking, organizing, and sorting backed-up data.

About Pools

A pool is a specific collection of storage volumes that NetWorker software uses to sort and store data. The configuration settings for each pool act as a filter that informs the NetWorker software of the type of data each volume should receive for storage. The NetWorker software uses pools in conjunction with label templates to track data associated with a specific volume.

How NetWorker Uses Pools

The way a pool is configured determines which volumes receive data. Each pool configuration contains a list of criteria that the data must meet for it to be written to the associated volume.

When a NetWorker Module backup occurs, the NetWorker software sends the SAP R/3 on Oracle data to the pool defined in the associated *<oracle_sid>.utl* parameter file, where *init<oracle_sid>.utl* is the default.

The NetWorker software then checks whether a correctly labeled volume is mounted. If a correctly labeled volume is mounted, the NetWorker server writes the backed-up data to a volume from that pool. If the appropriate volume is not mounted, the NetWorker server sends a request for the appropriate volume to be mounted.

NetWorker Pool Types

Volume pools provide the ability to segregate backed-up data, such as archived log files and database files, to different sets of media. When you configure the NetWorker server to perform storage management services for the SAP R/3 on Oracle server/cluster client, you can create additional pools to sort data by pool type with any backup group. An example of a Pool resource configured for the NetWorker Module for SAP R/3 on Oracle is illustrated in Figure 12 on page 59 and Figure 13 on page 60.

For more information on using NetWorker volume pools, refer to “Managing Media and Backup Devices” in the *Legato NetWorker Administrator’s Guide*.

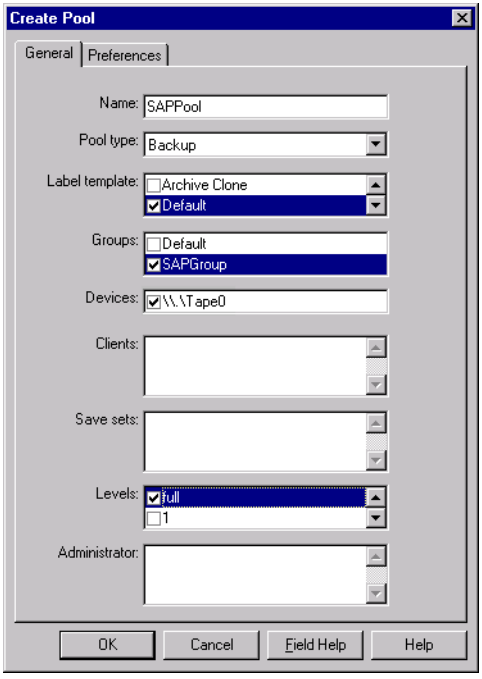
How to Create Volume Pools for SAP R/3 on Oracle Database Backups

When a pool is created, its name must be specified in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*. It can then be used by **backint** during backup and restore sessions.

To create volume pools and label templates for SAP R/3 on Oracle data:

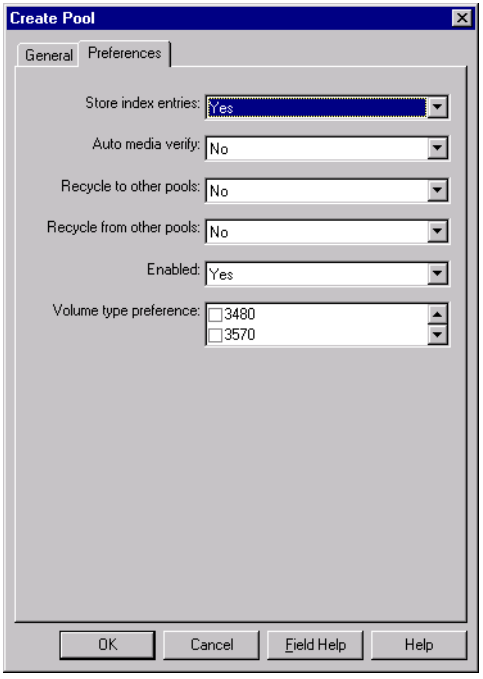
1. Use a valid pool name, such as SAPData, as the entry for Name.
2. Select a Pool Type.
3. Select a customized Label Template or accept the one NetWorker generates, for example, SAPData.
4. Select a backup group, if one was created, that is unique for SAP R/3 on Oracle as the choice for Groups.
5. Select a backup device from the Devices available.
6. Leave the attribute for Save Sets blank, because this is set by the **backint** program during each backup session.
7. Leave the attribute for Levels blank.

Figure 12. Pool General Setup for NetWorker Module for SAP R/3 on Oracle



8. Select Yes as the choice for Store Index Entries.
9. Select Yes for Enabled.
10. Save the Pool configuration.
11. Insert new media, or select another drive/slot with media loaded for labeling.

Figure 13. Pool Preferences Setup for NetWorker Module for SAP R/3 on Oracle



How to Create a Custom Label Template

The NetWorker software generates labels for volumes according to the label template rules configured on the NetWorker server.

To create a customized label template resource:

1. Create a name for the label template.
2. Specify the fields to use in the label.
3. Provide the alphabetic or numeric range for the volumes.
4. Select a separator to use between the fields.

The order in which you enter the fields determines the order of the fields in the label templates. The first field that is entered is the first field the NetWorker software uses in the label template.

The label template's name must contain only alphanumeric characters. NetWorker does not allow the following characters in a label template's name:

/ \ * [ ] $! ^ ';' ~ < > & | { }

Also, the NetWorker software displays an invalid character message if you attempt to save a configuration containing a field separator in the label template name. The following characters are reserved for field separators and should not be used in label template names:

- colon (:)
- dash (-)
- period (.)
- underscore (_)

When the configuration is applied, NetWorker displays the label to be applied to the next volume in the pool associated with the label. The label template is also added to the label template selections that are available for NetWorker volume pools.

If a volume pool is customized before a label template is created, the NetWorker software generates a label template using the pool name. For the NetWorker software to use a customized label template, a new label template must be created and associated with the appropriate volume pool in the pool resource.

Refer to the *Legato NetWorker Administrator's Guide* for complete instructions on using NetWorker label templates, and labeling and mounting backup volumes.

How to Modify the Pool Variables

To use a pool other than the NetWorker Default pool for backups of Oracle data, uncomment the Pool option in the **backint** parameter file, *init<oracle_sid>.utl*, and set it equal to the name of the pool, for example:

```
pool = SAPData
```

If you created two pools, one for the Oracle database files and the other for the archive logs, you must follow these steps:

1. Create an additional *<oracle_sid>.utl* parameter file.
2. Specify the name of the pool for the Pool attribute.

For information on setting variables in the *init<oracle_sid>.utl* parameter file, see "Coordinating Backup Processes for Windows Clients" on page 62.

3. Enter **brarchive** at the command line and specify the **-r** option along with the new *<oracle_sid>.utl* file created in step 1, for example:

   ```
   brarchive -r init2C11.utl
   ```

   For details on setting the parameters in the SAP Database Administration (SAPDBA) program, see "Configuring the SAP Initialization File on Windows" on page 62.

Coordinating Backup Processes for Windows Clients

3

Two parameter files have to be edited to complete the configuration. The first is the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*, which contains settings for the NetWorker/SAP interface. The second file is the SAP profile file, *init<oracle_sid>.sap*.

Configuring the SAP Initialization File on Windows

To perform a backup using the NetWorker Module for SAP R/3 on Oracle, the SAP initialization file, *init<oracle_sid>.sap*, located typically in the *%ORACLE_HOME%\DATABASE* directory, must point to the **backint** parameter file, *init<oracle_sid>.utl*, included with the NetWorker Module software.

- Instruct the SAPDBA program to use **backint** to back up the SAP R/3 on Oracle data file by setting the *backup_dev_type* parameter:

  ```
  # backup device type
  backup_dev_type = util_file
  ```

- Instruct the SAPDBA program to use the *init<oracle_sid>.utl* file for **backint** specific parameters by setting the *util_par_file* parameter:

  ```
  # backup utility parameter file
  util_par_file = ?/DATABASE/init<oracle_sid>.utl
  ```

Using RMAN

To instruct SAP to use Oracle's RMAN utility to backup the Oracle Database (available with Oracle8 or greater databases), you must set the *backup_dev_type* parameter in the *init<oracle_sid>.sap* file to **`rman_util`**.

rman_parms Parameter

The optional *rman_parms* parameter in the *init<oracle_sid>.sap* file is used to include NetWorker-specific environment variables that are used during an RMAN backup or restore. Use the following syntax:

```
rman_parms="ENV=(<var1>=<value>, <var2>=<value>, ...)"
```

For example:

```
rman_parms="ENV=(NSR_Server=<server_name>,
NSR_DATA_VOLUME_POOL=<pool_name>)"
```

The following table lists all the NetWorker-specific (NSR_) environment variables that can be set in the *rman_parms* parameter.

Table 6. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_CHECKSUM	• Value of TRUE specifies that NetWorker perform checksumming on the data • Value of FALSE specifies no checksumming	• FALSE (default) • TRUE
NSR_CLIENT	• NetWorker client resource to use for a backup or restore session • Recommended for backups or restores of Oracle running on a cluster or OPS system • Might be needed for disaster recovery	• Host from which the session is initiated (default) • Valid NetWorker client name

Table 6. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_COMPRESSION	• Value of TRUE specifies that NetWorker perform compression on the backup data • Value of FALSE specifies no compression	• FALSE (default) • TRUE
NSR_DATA_VOLUME_POOL	• Name of volume pool to use for Oracle backup, including a duplexed Oracle backup • **Note:** The NSR_DATA_VOLUME_POOL setting takes precedence over any pool associated with the scheduled backup group. For a scheduled Oracle backup, set either NSR_DATA_VOLUME_POOL or NSR_GROUP—but *not both*—in the RMAN backup script.	• "Default" pool (default) • Valid NetWorker pool name • Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable
NSR_DEBUG_FILE	• Only used for debugging purposes • Enables debugging by specifying the complete pathname of a file to receive debugging output • If undefined (by default), no debugging information is generated	• Undefined (default) • Valid pathname of the debug file

Table 6. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_ENCRYPTION	• Value of TRUE specifies that NetWorker perform encryption on the backup data • Value of FALSE specifies no encryption	• FALSE (default) • TRUE
NSR_GROUP	• Name of the NetWorker group to use for a scheduled backup • Setting NSR_GROUP causes the scheduled backup to automatically use a volume pool associated with the group (if NSR_DATA_VOLUME_POOL is *not* set in the same RMAN script)	• Undefined (default) • Valid NetWorker group name of 1024 characters or less
NSR_NO_BUSY	• Value of TRUE specifies that the scheduled backup fail immediately when the NetWorker server is busy • Value of FALSE specifies that the backup wait for the NetWorker server to accept the connection	• FALSE (default) • TRUE
NSR_SAVESET_EXPIRATION	• Date when the save set will expire • If 0 (default), save set will *never* expire	• 0 (default) • Valid date in **nsr_getdate(3)** format

Table 6. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_SERVER	• Mandatory if NetWorker server is different from Oracle host; otherwise, highly recommended • Hostname of the NetWorker server to perform the Oracle backup	• Most appropriate server (default) • Valid NetWorker server name

Configuring the NetWorker Module Parameter File for Windows Clients

NetWorker Module for SAP R/3 on Oracle performs backups based on the environment variable settings in its associated parameter file, *init<oracle_sid>.utl.*

This section contains a description of the valid settings for each of the NetWorker Module environment variables that can be included with the *init<oracle_sid>.utl* parameter file.

You set an environment variable in the *init<oracle_sid>.utl* parameter file as follows:

```
parameter = value
```

The following rules apply for setting parameters:

- Parameter values must be in lower case.
- All environment variables that you want to use in your backup must be uncommented.

Setting Data Compression

NetWorker client systems can compress data during backup before data is passed over the network or written to tape. Compressing data can speed up the backup process, as long as the system is able to send data to the NetWorker server fast enough to keep the tape drive streaming. Data compression will increase CPU usage on the SAP R/3 on Oracle server, but will reduce the amount of data sent to the NetWorker server.

To use data compression during a backup, before data is moved over the network or written to tape, set the compress parameter equal to **yes**:

```
compress = yes
```

Setting the Number of Save Sets

To specify the number of save sets the NetWorker Module should use for a save session, set the savesets parameter, for example:

```
savesets = 20
```

The default value for save sets is 20, and will be reduced by **backint** if the value exceeds the number of files within a backup request. To distribute the load, a client's files are distributed over several save sets.

When determining the number of save sets required for an average backup session, keep the following considerations in mind:

- The maximum size of any save set is 4 GB. If any one file is larger than 4 GB, the file will be assigned to multiple save sets.
- A single table space is backed up in a single backup session, and can consist of multiple data files.
- Files less than 2 GB in size should be assigned to a single saveset.
- The **backint** command will only use the number of save sets it requires for a particular backup session.
- Raw partitions will be assigned an individual save set, and filesystem data will be evenly distributed among the remaining save sets during the backup process by **backint**.
- The length of all the filenames should not exceed 1000 characters.

Important: You will receive an error message stating "the save command is too long" if the number of save sets indicated in the *init<oracle_sid>.utl* file is too low. To resolve this problem, increase the number of save sets used.

Setting Parallelism

The parallelism setting in the *init<oracle_sid>.utl* file indicates the number of parallel save streams to send simultaneously to the NetWorker server, for example:

```
parallelism = 8
```

The default setting for parallelism is 8 and the maximum setting is 512. The value for parallelism will be reduced by **backint** if it is greater than the value of the save sets parameter.

Important: If you change the parallelism setting, ensure that the NetWorker server can accept the number of streams being sent. For details on setting the parallelism value in the server resource on the NetWorker server, see "Configure the Server Resource on Windows" on page 39.

Setting the Backup Group

The specified backup group is used by the NetWorker **save** program to select a specific media pool that is unique for this group.

To assign the SAP R/3 on Oracle server to a backup group other than the NetWorker default, set the group parameter equal to a backup group specific for SAP R/3 on Oracle data, for example:

```
group = SAPBackup
```

Important: If you specify a value for Group, then an associated pool must be specified as well, as described in "Setting the Pool" in the following section.

Setting the Pool

The pool attribute sends data from the SAP R/3 on Oracle server to the specified NetWorker media pool.

To use a pool other than the NetWorker default pool for backup, it must be specified in the *init<oracle_sid>.utl* file. To indicate the volume pool to which the Oracle database objects should be backed up, uncomment the pool parameter and set it equal to the name of the pool, for example:

```
pool = SAPData
```

If you want to use multiple pools to separate data types, you need to create additional *<oracle_sid>.utl* parameter files and specify the filenames of the additional parameter files at the command line when **brbackup** or **brarchive** is used.

For example, during configuration a pool was created specifically for the archive logs called ARCHData. The pool attribute in the *archiveC11.utl* file is set equal to ARCHData. To use this pool to back up the archive logs, enter the following command at the command line:

brarchive -u *sysadmin* **-d** *util_file* **-r** *archiveC11.utl* **-m** *all* **-s** *save*

Setting the Browse Policy

The expiration parameter indicates, in **nsr_getdate** format, when the browse policy for a NetWorker client's save sets expire, for example:

```
expiration = 2 weeks
```

This setting overrides the browse policy setting for this client on the NetWorker server. For details on browse and retention policies, see "Using NetWorker Policies" on page 42.

Setting the Destination NetWorker Server

The server option indicates the hostname of the NetWorker server that the NetWorker Module will use for each save session, for example:

```
server = pocono
```

If the server option is not specified, the NetWorker Module backs up data to the default NetWorker server.

Setting the Client

For backups, the client option indicates the client name that will be used for the client file index for the current backup. Setting the client name will append the "-c <hostname>" to the save command that is built by **backint**. This option is not supported on AIX for backups.

When the NetWorker Module is used to back up clusters, you must set this option to the virtual node name.

During cluster restores, as well as directed recoveries, this option indicates the client name that was used for the client file index for the backup that you want to restore. For example, if you are restoring data to a host named saturn from one named mars, you would set this option to mars so that the client file indexes for mars will be used.

```
client = mars
```

Setting Notifications

Notifications are available on UNIX only. The NetWorker Module for SAP R/3 on Oracle for UNIX supports four types of notifications:

- The *notify_start* notification is executed at the beginning of a backup or restore session.
- The *notify_done* notification is executed at the completion of a backup or restore session.

- The *notify_success* notification is executed at the completion of a successful backup or restore session.
- The *notify_error* notification is executed at the completion of a failed backup or restore session.

When a notification is triggered, the uncommented notification command in the *init<oracle_sid>.utl* file is executed, resulting in a summary of the event.

To set a notification, uncomment the notification command to use and replace *mailx* with the name of the command line mail utility you want to use. The default notification commands are:

```
notify_start = mailx -s 'backint start' root
notify_done = mailx -s 'backint done' root
notify_success = mailx -s 'backint success' root
notify_error = mailx -s 'backint error' root
```


Setting the Index Query Option

The query_index option determines whether the index should be queried if the save set name doesn't match exactly. Allowed values are yes and no.

```
query_index=no
```

Setting the Save Set Name Format

The ssNameFormat option sets the naming convention for save sets. Allowed values are old and new. If old is used, the name for *all* save sets will be *backint:<oracle_sid>*. If new is used, the save set name for each session will differ according to the files being backed up and will use the format *backint:<oracle_sid>:<first filename in session>*.

```
ssNameFormat=old
```

Setting the Semaphore Timeout

The sem_timeout option sets the amount of time, in minutes, that **backint** will wait for **brbackup**/**brconnect** to remove the semaphore file. At the end of this timeout period, **backint** will exit with an error if the semaphore file was not deleted.

```
sem_timeout=30
```

Setting the Save Level to Full

The level_full option specifies whether the save should be done with the **`-level Full`** option. Allowed values are yes and no.

```
level_full=no
```

Setting the Backup Count

The retry_count option identifies the number of times that a failed backup should be retried. Allowed values are any integer greater than 0.

```
retry_count=0
```

Chapter 4: Configuration on UNIX

This chapter provides procedures for configuring an Oracle server/cluster client with SAP R/3 as a NetWorker Module client on UNIX. For procedures for configuring an Oracle server/cluster client with SAP R/3 as a NetWorker Module client on Windows, see "Configuration on Windows NT and Windows 2000" on page 35. The following procedures are provided in this chapter:

- "Requirements" on page 74
- "UNIX NetWorker Server Configuration for SAP R/3 on Oracle" on page 76
- "How to Configure the Server Resource on UNIX" on page 76
- "Using Backup Groups" on page 78
- "Using NetWorker Policies" on page 80
- "NetWorker Backup Clients" on page 81
- "Configuring the UNIX Client Resource for Scheduled Backups" on page 84
- "Using Storage Nodes" on page 93
- "How to Create Volume Pools for SAP R/3 on Oracle Database Backups" on page 96
- "Using Pools" on page 95
- "Configuring the SAP Initialization File on UNIX" on page 100
- "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104
- "Coordinating Backup Processes for UNIX Clients" on page 99

Requirements

To use the NetWorker Module for SAP R/3 on Oracle, each Oracle server/cluster client with SAP R/3 must be added to the NetWorker server's list of clients. Additionally, the SAP initialization profile, *init<oracle_sid>.sap*, and the NetWorker Module for SAP R/3 on Oracle *parameter file, init<oracle_sid>.utl*, must be configured. Also, the user who will administer the SAP backups must be added to the list of server administrators.

The NetWorker Module for SAP R/3 on Oracle performs backup and restore processes according to the configuration specified in the *init<oracle_sid>.utl* file.

NetWorker Module for SAP R/3 on Oracle Configuration Options

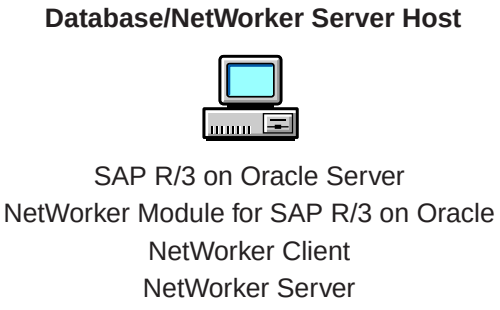
This section describes the supported options for setting up the NetWorker Module in a combined environment using SAP R/3, Oracle, and NetWorker. Each configuration consists of the following components:

- Oracle server/cluster client with SAP R/3
- NetWorker Module for SAP R/3 on Oracle
- NetWorker client
- NetWorker server

Option 1 - All Components on the Same System

In this first configuration, the Oracle server with SAP R/3 and NetWorker server are installed on the same system, as shown in Figure 14.

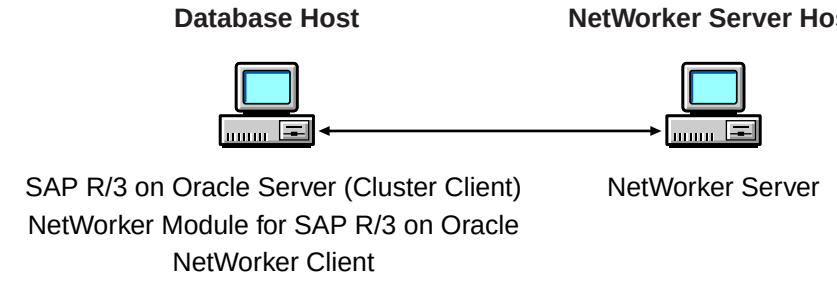
Figure 14. Configuration Option 1 - SAP R/3 on Oracle Server and NetWorker Server on the Same System



Option 2 - NetWorker Server on a Separate System

In this configuration, the Oracle server/cluster client with SAP R/3 and the NetWorker server are installed on separate systems, as shown in Figure 15. The Oracle server with SAP R/3 is a remote NetWorker client.

Figure 15. Configuration Option 2 - SAP R/3 on Oracle Server on a Different System from the NetWorker Server

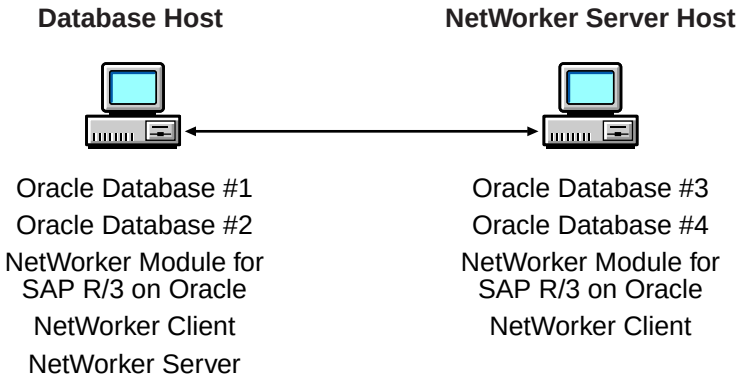


Installation Requirements for Multiple Database Backup

The NetWorker Module for SAP R/3 on Oracle supports concurrent backups of separate Oracle database instances on the same system or node. The NetWorker Module should be installed only once per system, regardless of the number of Oracle database instances to be backed up per system. All Oracle database files can then be backed up to the same NetWorker server, located locally or over the network.

With multiple licenses of the software, Oracle databases on separate systems can be backed up concurrently to the same NetWorker server. The NetWorker server can be located on any of the systems containing SAP R/3 and Oracle, or on a separate Windows or UNIX system. An example of a multiple database installation is detailed in Figure 16.

Figure 16. Multiple Database Backup



UNIX NetWorker Server Configuration for SAP R/3 on Oracle

To use NetWorker Module for SAP R/3 on Oracle, each Oracle server/ cluster client with SAP R/3 requiring backup and restore services must have an associated server resource and client resource configured on the NetWorker server.

Use the NetWorker Administrator program on the NetWorker server to define custom settings for Backup Groups and Volume Pools. Configure the *init<oracle_sid>.utl* parameter file on the Oracle server with SAP R/3 to specify the parameters the NetWorker Module should use during backup and restore sessions.

How to Configure the Server Resource on UNIX

A NetWorker server resource resides on the NetWorker server and describes the specific administrator(s) that can access the NetWorker server and the number of save streams the server will accept from any of its clients. An example of a server resource configuration is illustrated in Figure 17 on page 77.

To configure a NetWorker server resource to accept data from an Oracle server/cluster client with SAP R/3:

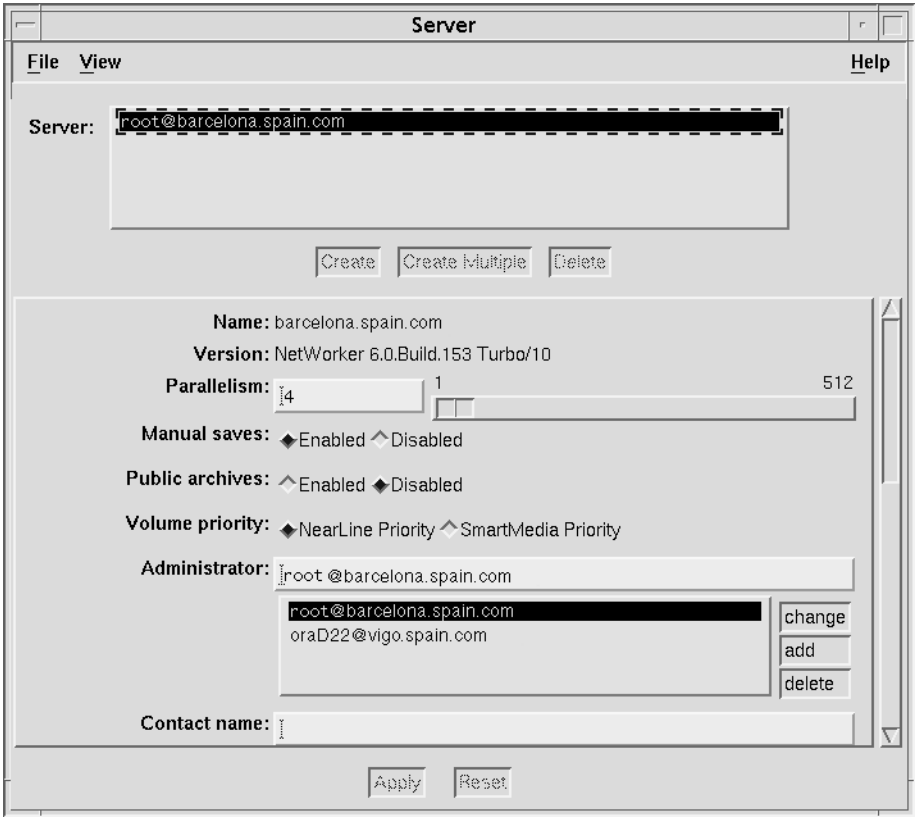
1. Ensure that the Parallelism field is set equal to or greater than the number of save streams being sent to the NetWorker server by the Oracle server/ cluster client. This is the parallelism setting found in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl.* The

default setting in the parameter file is 8 and the maximum setting is 512. For further details on setting the parallelism attribute, see "Setting Parallelism" on page 105.

2. Ensure that the setting for Manual Saves is set to Enabled.
3. In the Administrator field, add each *Oracle user* in the format: *ora<oracle_sid>@ hostname*. This enables each indicated user on an Oracle server/cluster client with SAP R/3 to perform inquire functions and use the NetWorker reporting command, **nsrinfo**.

   For details on customizing the *init<oracle_sid>.utl* parameter file, see "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.

Figure 17. Server setup on UNIX NetWorker Server



Using Backup Groups

NetWorker backup groups are used to specify the media pool to which a client's data belongs. The creation of a backup group for SAP R/3 on Oracle data is optional, but if you create one, you must also create an associated Pool.

About Backup Groups

A backup group is a set of NetWorker clients whose data can be written to a specific set of media or combined with backup data from other groups. One or more SAP R/3 on Oracle database clients can be assigned to a group.

NetWorker provides a preconfigured group named Default. To ensure that all data is backed up, NetWorker automatically adds all specified client resources to this default group.

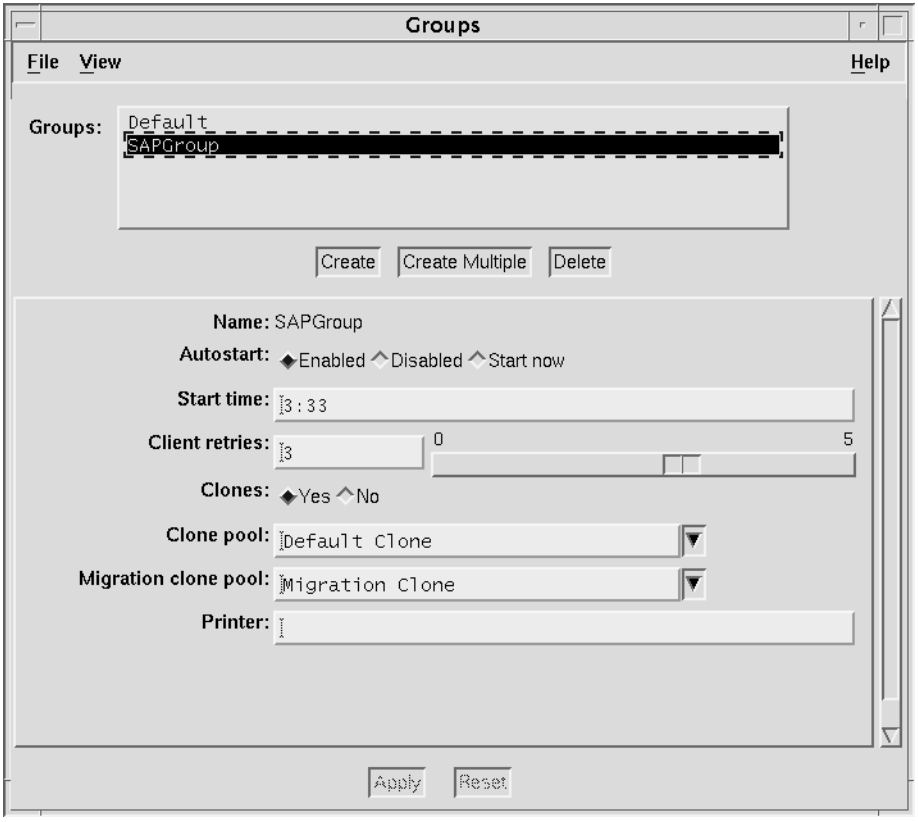
To assign Oracle data to another group with different attributes, a new group must be created using the NetWorker Administrator program.

How to Create a Group Specific for SAP R/3 on Oracle Clients

To create a group specific for SAP R/3 on Oracle clients:

1. Create a new group with a valid group name such as SAPGroup, as shown in Figure 18.

Figure 18. Backup Group setup on UNIX NetWorker Server for NetWorker Module for SAP R/3 on Oracle



2. To incorporate this group into your SAP R/3 on Oracle backups, uncomment the Group option in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*, and set it equal to the name of the SAP R/3 on Oracle backup group:

   `group = SAPGroup`

Important: NetWorker Module for SAP R/3 on Oracle does not support NetWorker scheduled backups, and the server's bootstrap notification report will not be generated automatically after a NetWorker Module backup.

Using NetWorker Policies

NetWorker software uses a Policies resource to create a life cycle for both the browse and retention policies associated with the backed-up data. The client resource has a default browse policy of Month and a default retention policy of Year.

Browse Policy

The browse policy determines how long the client file index maintains a browsable entry. If the browse policy has not expired, you can view the data available for restore using **nwrecover**. After a browse policy expires, the **scanner** program can be used to rebuild the online indexes.

NetWorker software uses the client index entries in order to restore SAP R/3 on Oracle database files. Set the browse policy to a period long enough to retain client indexes as far back as required to restore them. You should keep copies of archived system files until the associated database file save sets have exceeded their browse policy.

To manage indexes manually, refer to "Manually Managing the Online Indexes" in the *Legato NetWorker Administrator's Guide*.

Retention Policy

The retention policy determines how long the save set information is stored in the media database and how long the files remain retrievable from the backup volume. After all the retention policies for the save sets on a volume and other dependent save sets expire, the volume is given a status of recyclable. Until the volume is relabeled, the **scanner** command can be used to extract a save set from a volume and rebuild the online indexes.

The preconfigured policies shown in Table 7 are provided with NetWorker; alternatively, you can create customized policies. Any policy can be used as either a browse or retention policy.

Table 7. Preconfigured NetWorker Policies

Policy Name	NetWorker Behavior
Decade	Available for ten years.
Half Year	Available for six months.
Month	Available for one month.
Week	Available for one week.
Year	Available for one year.

Setting the Browse Policy

The browse policy for a client's SAP R/3 on Oracle data can be set using either the Client Resource on the NetWorker server, or in the parameter file for **backint**. To incorporate a different browse policy specifically for a client's SAP R/3 on Oracle data, uncomment the expiration option and set it equal to the browse policy you want to incorporate in **nsr_getdate** format, for example:

```
expiration = 2 weeks
```

Setting the Retention Policy

The retention policy for a client's SAP R/3 on Oracle data is set in the Client Resource on the NetWorker server.

Important: An entry for a save set must be removed from the file index before the save set can be removed or marked Recyclable in the media index.

NetWorker Backup Clients

NetWorker software uses a client/server model to provide storage management services. At least one system on the network is designated as the NetWorker server. Systems containing data to be backed up are configured as clients of the NetWorker server.

You configure NetWorker clients using the client resource provided by the NetWorker Administrator program.

Using a NetWorker Client Resource

A NetWorker client resource resides on the NetWorker server and describes the specific media management attributes assigned to the Oracle data resident on an Oracle server/cluster client with SAP R/3. This client resource provides the NetWorker server with the following instructions for handling the Oracle data on an Oracle server/cluster client with SAP R/3:

- The length of time to maintain entries in the online index for restore, unless specified in the *init<oracle_sid>.utl* file.
- The length of time to retain the volume entries in the media index.

Other information regarding the client resource configuration is contained in NetWorker Module for SAP R/3 on Oracle parameter file (*init<oracle_sid>.utl*). Settings in this file will override any corresponding settings in the client resource definition.

Creating a NetWorker Client Resource on UNIX

In order to perform scheduled backups, a client resource will have to be configured for the SAP R/3 on Oracle data. Depending on your backup configuration needs, you may want to create multiple clients to perform different tasks, such as one to perform full backups and another to perform incremental backups when full backups are not performed.

Many settings in the client resource have corresponding settings in the NetWorker Module for SAP R/3 on Oracle parameter file (*init<oracle_sid>.utl*). Settings in the parameter file will always override any setting in the client resource definition.

The following items should be considered when configuring client resources:

- Save Set naming convention: Save set names are assigned automatically by the NetWorker Module, using the format `backint:`*`oracle_sid`*. However, the Save Set attribute in the Client Resource dialog is a required field, even though the value entered in this attribute will be ignored by the NetWorker Module. The only requirement is that the attribute begin with `backint:`, which is a keyword instructing NetWorker to use the NetWorker Module for SAP R/3 on Oracle to perform the backup.

  Therefore, in order to simplify tracking NetWorker Module save sets, you should enter `backint:`*`oracle_sid`* as the value for the client's Save Set attribute.

- For cluster clients, add the hostname or IP address for this cluster member's cluster interconnection to its Remote Access attribute list (for example, `root@barcelona.spain.com`).
- For scheduled backups, the **nsrsapsv** command must be entered in the Backup command attribute. For more information, see "Configuring the UNIX Client Resource for Scheduled Backups" on page 84.

Using the Existing Client Resource for File System Backup

When the NetWorker client was installed on the host machine running the SAP R/3 on Oracle database, a client resource was created to back up the host computer's filesystem. This client resource can continue to be used to backup the host's filesystem. Also, if you are performing non-scheduled backups rather than scheduled backups, this client can be used to configure certain settings that the NetWorker Module for SAP R/3 on Oracle uses during inquire and restore operations.

The following issues should be considered when configuring this client resource:

- Set the attribute for Directive to ignore all Oracle data on this client. The NetWorker software will then ignore all Oracle data on this client when the file system is backed up.
- If non-scheduled backups are used, settings in the client resource are used by the NetWorker software only for communication with the NetWorker Module for SAP R/3 on Oracle **backint** program during inquire and restore processes.
- Client resource settings specific for the NetWorker Module for SAP R/3 on Oracle backups are contained in the NetWorker Module parameter file, *init<oracle_sid>.utl*. Any settings entered in this client resource will be ignored when the NetWorker Module backs up SAP R/3 on Oracle data.

For more information about configuring a client resource for filesystem backups and restores, see the *Legato NetWorker Administrator's Guide*.

Configuring the UNIX Client Resource for Scheduled Backups

In order to perform scheduled backups, you must configure the client's remote access information. Configuration is somewhat different depending on how your Oracle system is configured:

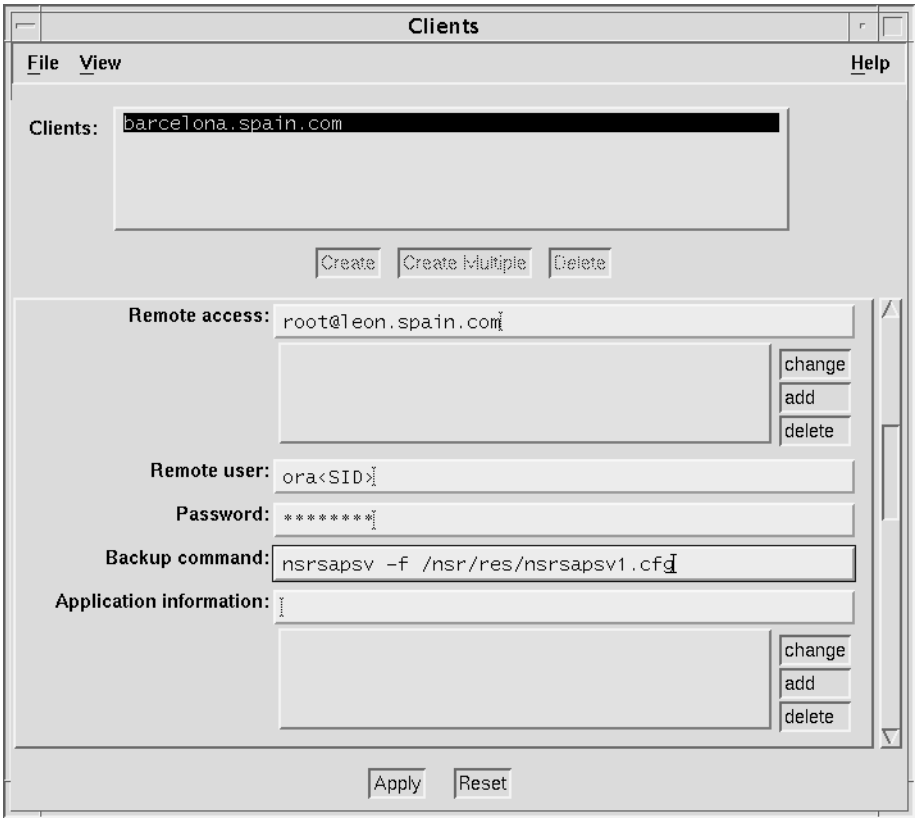
- If your Oracle system is configured to use *Database Authentication*, the Oracle administrator's system username and password, used to log onto the host machine running the Oracle database, must be entered in the Remote User and Password attributes of the Client Resource (see Figure 19 on page 85).

  The scheduled backup configuration file must also contain the username and password required to log into the Oracle database. For more information, see "How to Encrypt the Username and Password into the Configuration File" on page 87.

- If your Oracle system is configured to use *External* or *Enterprise Authentication*, then by default the username *ora<SID>* is used to log onto the host computer. The value for *SID* will be derived from the save set name entered in the client resource, or from the ORACLE_SID parameter in the scheduled backup configuration file (see "Customizing the Scheduled Backup Configuration File" on page 87).

  If *ora<SID>* cannot be derived, or if the NetWorker Module cannot log onto the host machine as this user, you must encrypt the username and password of the Oracle owner into the scheduled backup configuration file (see "How to Encrypt the Username and Password into the Configuration File" on page 87).

Figure 19. Client Resource Setup on UNIX



Use the information in Table 8 to complete the Client Resource remote setup. Enter the information in the Remote tab of the Create Client window (see Table 19)

Table 8. Client Resource Remote Setup (Part 1 of 2)

Attribute	Description
Remote access	Used for cluster client configuration only. This field is not used for scheduled backup configuration. For more information, see "Creating a NetWorker Client Resource on UNIX" on page 82.

Table 8. Client Resource Remote Setup (Part 2 of 2)

Attribute	Description
Remote user	If your Oracle system is configured to use Database Authentication, enter the Oracle administrator's system username, used to log onto the host machine running the Oracle database. If your Oracle system uses External or Enterprise Authentication, you do not have to include the username here.
Password	If your Oracle system is configured to use Database Authentication, enter the Oracle administrator's password to log onto the host machine of the Oracle system. If your Oracle system uses External or Enterprise Authentication, you do not have to include the password here.
Backup command	Used to enter the **nsrsapsv** command. The following syntax should be used to enter this command: **`nsrsapsv -f filename`** Where *filename* represents the full path and filename of the scheduled backup configuration file. For information about configuring the scheduled backup configuration file, see "Customizing the Scheduled Backup Configuration File". **Note:** The Backup command field is limited to a total of 64 characters. Therefore, the full path and filename for the scheduled backup configuration file cannot exceed 52 characters. As a result, it is recommended that scheduled backup configuration files should be stored in */nsr/res*.
Application information	Left blank.

Customizing the Scheduled Backup Configuration File

The scheduled backup executable, **nsrsapsv**, requires certain parameters that are contained in a configuration file. The example scheduled backup configuration file is named *nsrsapsv.cfg*, but any name may be used. The path and filename are passed to **nsrsapsv** when the scheduled back is configured in the NetWorker Administrator program (see "Backup command" described in Table 8).

Encrypting the Username and Password into the Configuration File

Depending on the configuration of your system, the Oracle database administrator's username and password may have to be encrypted in the scheduled backup configuration file.

- If your Oracle system is configured to use Database Authentication, you must encrypt the Oracle administrator's database username and password in the configuration file.
- If your Oracle system is configured to use External or Enterprise Authentication, you should encrypt the Oracle administrator's system username and password in the configuration file unless the NetWorker Module can derive *ora<SID>* from the save set name entered in the client resource, or from the ORACLE_SID parameter in the schedule backup configuration file. For more information, see "Configuring the UNIX Client Resource for Scheduled Backups" on page 84.

The **-c** command line option for the **nsrsapsv** command allows you to encrypt the username and password in the configuration file.

How to Encrypt the Username and Password into the Configuration File

To encrypt the username and password in the configuration file:

1. Enter the following at the command line:

   `nsrsapsv -c filename`

   where *filename* represents the path and filename of the scheduled backup configuration file.

2. At the prompt, enter the Oracle administrator's username based on the following criteria:

   - If your Oracle system is configured to use Database Authentication, enter the username required to log into the Oracle database.
   - If your Oracle system is configured to use External or Enterprise Authentication, enter the username required to log onto the host computer running the Oracle database.

3. Next, enter the password following the criteria defined in step 2.

The username and password will now be included in encrypted format in the scheduled backup configuration file.

Setting Parameters in the Scheduled Backup Configuration File

The scheduled backup configuration file is a text file that contains a number of parameters required by the **nsrsapsv** executable.

Parameters are set as follows:

```
parameter = value
```

All environment variables that you want to use in your backup must be uncommented.

The following table lists each parameter and the allowed values:

Table 9. Parameters in the Schedule Backup Configuration File (Part 1 of 5)

Parameter	Value
BR_EXEC	The **brbackup** or **brarchive** command, along with any command line options, that **nsrsapsv** will execute. This is a required parameter. The **-u** command line option, which identifies the username and password of the Oracle database administrator, should not be used. If required, the username and password should be encrypted using the **`nsrsapsv -c filename`** command. For more information, see "How to Encrypt the Username and Password into the Configuration File" on page 87. Example: `BR_EXEC=brbackup`

Table 9. Parameters in the Schedule Backup Configuration File (Part 2 of 5)

Parameter	Value
ORACLE_SID	ORACLE_SID is an environment variable that identifies the SID for the instance of Oracle that you wish to back up. If this parameter is specified, the indicated value will be used for the Oracle SID. If the parameter is not specified, the Oracle SID will be obtained from the save set name you entered in the NetWorker Administrator for this client (for example, if you entered in the save set name backint:SAP:online_backup and you did not specify ORACLE_SID in the scheduled backup configuration file, then SAP will be used for the Oracle SID. This is an optional parameter. Example: `ORACLE_SID=SAP`
ORACLE_HOME	This a a required environment variable and should be set to the installation path for the Oracle instance you specified for ORACLE_SID. Example: `ORACLE_HOME=/export/home/oracle/product/8.1.5`
NLS_LANG	This is a required environment variable. The format should be `LANGUAGE_TERRITORY.CHARACTERSET` Refer to your Oracle documentation for more information of this variable. Example: `NLS_LANG=AMERICAN_AMERICA.US7ASCII`

Table 9. Parameters in the Schedule Backup Configuration File (Part 3 of 5)

Parameter	Value
SAP_BIN	The path to the location of BrTools binary files. This should also be where the **backint** executable resides. This path will be added to the PATH environment variable so that the BrTools binaries and **backint** can be found. This is a required parameter. Example: `# SAP_BIN=/usr/sap/SAP/SYS/exe/run`
ORACLE_BIN	An environment variable that specifies where the Oracle binaries are. This path will be appended to the PATH environment variable so that all Oracle binaries can be found if needed. This parameter is only required if the Oracle binaries are not in default location of *ORACLE_HOME/bin*.
SAPBACKUP	An environment variable that indicates the temporary directory in which backup logs should be stored. BrTools and **backint** both use this directory to store temporary log files. For Windows systems, this is a required parameter. For UNIX systems, the default value is *ORACLE_HOME/sapbackup*.
SAP-specific environment variables	These parameters are used for Windows systems.

Table 9. Parameters in the Schedule Backup Configuration File (Part 4 of 5)

Parameter	Value

PATH	This parameter can be used to add more search paths to the PATH environment variable. Anything specified here will be appended to the PATH environment variable. You may specify multiple search paths, using either one of the following methods:
	
	`PATH=/export/home/dir1:/export/home/dir2:/home/dir1/dir2/dir3`
	
	or
	
	`PATH=/export/home/dir1`
	`PATH=/export/home/dir2`
	`PATH=/home/dir1/dir2/dir3`
	
	This parameter is optional.

Any *name*_`path`=*value* pair	This parameter can be used to create or append values to an environment variable named *name*_`path` (for example, $LD_LIBRARY_PATH). If an environment variable with this name already exists, then the value listed here will be appended to the existing value for this environment variable. Example: `LD_LIBRARY_PATH=/export/home/oracle/product/8.1.5/lib:/usr/openwin/lib` This parameter is optional.

Table 9. Parameters in the Schedule Backup Configuration File (Part 5 of 5)

Parameter	Value
Any *name=value* pair	This parameter can be used to add any environment variable named *name*. You may specify any *name=value* pair. If the environment variable specified by *name* already exists, then it will be overwritten. For example: `BR_TRACE=1` will set BR_TRACE equal to `1` in your environment, which will instruct **brbackup** or **brarchive** to print out additional trace information. This parameter is optional.
ORACLE_USR_PASSWD	This parameter contains the encrypted username and password for the Oracle user. This parameter is created by the **nsrsapsv** command when it is executed with the -c command line option (see "How to Encrypt the Username and Password into the Configuration File" on page 87). This parameter should not be added or edited manually; use the **nsrsapsv** -c command instead.

Using Storage Nodes

A *storage node* is a system that is connected to a NetWorker server, with one or more of its devices distributed across multiple systems. Storage nodes are used in the NetWorker backup, archive, and Hierarchical Storage Management (HSM) operations. Devices attached to storage nodes are called *remote devices.* The storage node runs special NetWorker software that controls devices. The data stored on media in remote devices is tracked in the media database and online client file indexes on the controlling NetWorker server. If the data to be backed up resides on storage nodes, the data does not need to go over the network during backup and restore sessions.

Storage nodes added to the NetWorker configuration can increase the NetWorker server's performance, give more flexibility in designing the network, and centralize the control of data management activities to one or several NetWorker servers.

Storage Node Configuration

To create a storage node, install the storage node software from the NetWorker software distribution on the storage node system. Define the storage node's devices, as described in "Remote Device Configuration" on page 94.

The storage node's hostname is automatically added to the Administrator list in the Server resource when you add a storage node device. For an autochanger or silo, define the devices in the **jb_config** program, and manually add them to the storage node's hostname in the Administrator list. After the storage node's hostname is added to the Administrator list, one instance of **nsrmmd** runs on the storage node for each device that it controls.

Important: To convert an existing NetWorker *server* to a storage node, you must merge its resource database, media database, and client file indexes with the corresponding databases and indexes on the system controlling the NetWorker server.

Storage Nodes and Remote Devices

You can control most operations on local and remote devices, including autochangers and silos, from the NetWorker Administration program. For some remote autochanger operations, such as reset, you must use the **nsrjb** command or the **jb_config** program on the storage node system.

Important: NetWorker clients at release 4.2 and later are able to use remote devices for backup, archive, and HSM functions. Earlier NetWorker clients cannot back up data to remote devices.

Remote Device Configuration

You configure remote devices with the controlling NetWorker server the same way that you configure a stand-alone device that is connected to the NetWorker server. When you create each device, add a prefix to the device name that includes "rd=" and the storage node's hostname. For example, *rd=omega:/dev/rmt/1mbn* creates a device called */dev/rmt/1mbn* on a storage node system called *omega*. For specific instructions on configuring devices, refer to the *Legato NetWorker Administrator's Guide*.

How to Configure a Remote Autochanger or Silo

1. Verify that the storage node is listed in the Administrator attribute in the Server resource of the controlling server, in the form *root@hostname*, where *hostname* is the hostname of the storage node.
2. Run the **jb_config** program on the storage node system to define each device in the autochanger or silo. For more information on the **jb_config** program, refer to the **jb_config** man page or the *Legato NetWorker Administrator's Guide*.

Using Pools

The NetWorker server provides a means of directing backups to groups of media called Pools. Pools allow you to establish a logical and systematic method for tracking, organizing, and sorting backed up data.

About Pools

A pool is a specific collection of storage volumes that NetWorker software uses to sort and store data. The configuration settings for each pool act as a filter that informs the NetWorker software of the type of data each volume should receive for storage. The NetWorker software uses pools in conjunction with label templates to track data associated with a specific volume.

How NetWorker Uses Pools

The way a pool is configured determines which volumes receive data. Each pool configuration contains a list of criteria that the data must meet for the data to be written to an associated volume.

When a NetWorker Module backup occurs, the NetWorker software sends the SAP R/3 on Oracle data to the pool defined in the associated *<oracle_sid>.utl* parameter file, where *init<oracle_sid>.ut*l is the default.

NetWorker then checks whether a correctly labeled volume is mounted. If a correctly labeled volume is mounted, the NetWorker software writes the backed-up data to a volume from that pool. If the appropriate volume is not mounted, NetWorker sends a request for the appropriate volume to be mounted.

NetWorker Pool Types

Volume pools provide the ability to segregate backed-up data, such as archived log files and database files, to different sets of media. When you configure the NetWorker server to perform storage management services for the SAP R/3 on Oracle server/cluster client, you can create additional pools to sort data by pool type with any backup group. An example of a Pool resource configured for the NetWorker Module for SAP R/3 on Oracle is illustrated in Figure 20 on page 97.

For more information on using NetWorker volume pools, refer to “Managing Media and Backup Devices” in the *Legato NetWorker Administrator’s Guide*.

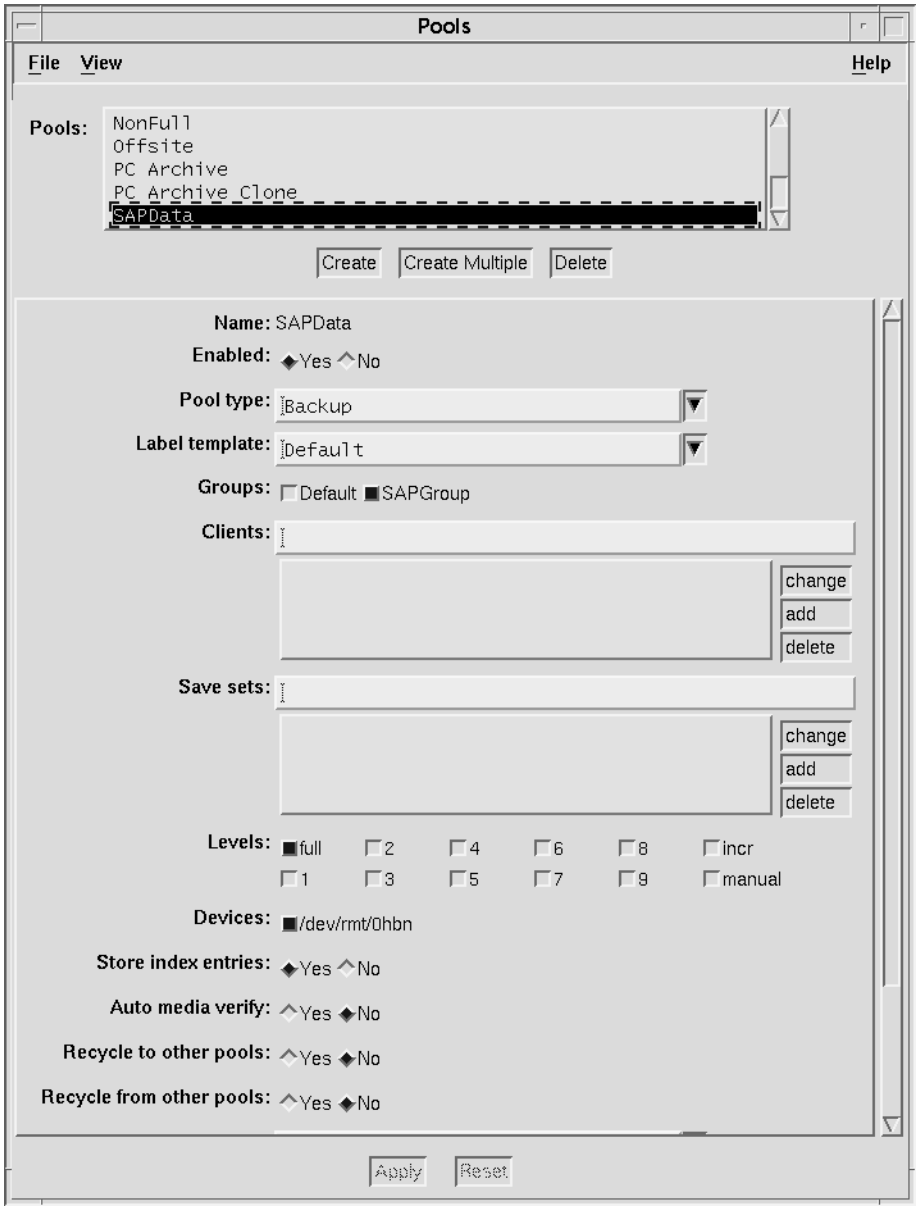
How to Create Volume Pools for SAP R/3 on Oracle Database Backups

When a pool is created, its name must be specified in the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*. It can then be used by **backint** during backup and restore sessions.

To create volume pools and label templates for SAP R/3 on Oracle data:

1. Use a valid pool name, such as SAPData, as the entry for Name.
2. Select Yes for Enabled.
3. Select a Pool Type.
4. Select a customized Label Template or accept the one NetWorker generates, for example, SAPData.
5. Select a backup group that is unique for SAP R/3 on Oracle as the choice for Groups.
6. Leave the attribute for Save Sets blank, because this is set by the **backint** program during each backup session.
7. Select a backup device from the Devices available.
8. Select Yes as the choice for Store Index Entries.
9. Save the Pool configuration.
10. Insert new media, or select another drive/slot with media loaded for labeling.

Figure 20. Pools Setup on NetWorker Server for SAP R/3 on Oracle Data



How to Create a Custom Label Template

The NetWorker software generates labels for volumes according to the rules of the label template configured on the NetWorker server. To create a customized label template resource, follow these steps:

1. Create a name for the label template.
2. Specify the fields to use in the label.
3. Provide the alphabetic or numeric range for the volumes.
4. Select a separator to use between the fields.

The order in which you enter the fields determines the order of the fields in the label templates. The first field that is entered is the first field the NetWorker software uses in the label template.

The label template's name must contain only alphanumeric characters. the NetWorker software does not allow the following characters in the label template's name:

/ \ * [ ] $! ^ ';' ~ < > & | { }

Also, NetWorker displays an invalid character message if you attempt to save a configuration containing a field separator in the label template name. The following characters are reserved for field separators and should not be used in label template names:

- colon (:)
- dash (-)
- period (.)
- underscore (_)

When the configuration is applied, NetWorker displays the label to be applied to the next volume in the pool associated with the label. The label template is also added to the label template selections that are available for NetWorker volume pools.

If a volume pool is customized before a label template is created, the NetWorker software generates a label template using the pool name. For NetWorker to use a customized label template, a new label template must be created and associated with the appropriate volume pool in the pool resource.

Refer to the *Legato NetWorker Administrator's Guide* for complete instructions on using NetWorker label templates, and labeling and mounting backup volumes.

How to Modify the Pool Variables

To use a pool other than the NetWorker Default pool for backups of Oracle data, uncomment the Pool option in the **backint** parameter file, *init<oracle_sid>.utl*, and set it equal to the name of the pool, for example:

```
pool=SAPData
```

If you created two pools, one for the Oracle database files and the other for the archive logs, follow these steps:

1. Create an additional *<oracle_sid>.utl* parameter file.
2. Specify the name of the pool for the Pool attribute.

   For information on setting variables in the *init<oracle_sid>.utl* parameter file, see "Coordinating Backup Processes for UNIX Clients" on page 99.
3. Enter **brarchive** at the command line and specify the **-r** option along with the new *<oracle_sid>.utl* file created in step 1, for example:

   ```
   brarchive -r init2C11.utl
   ```

   For details on setting the parameters in the SAP Database Administration (SAPDBA) program, see "Configuring the SAP Initialization File on UNIX".

Coordinating Backup Processes for UNIX Clients

Two parameter files have to be edited to complete the configuration. The first is the NetWorker Module for SAP R/3 on Oracle parameter file, *init<oracle_sid>.utl*, which contains settings for the NetWorker/SAP interface. The second file is the SAP profile file, *init<oracle_sid>.sap*.

Configuring the SAP Initialization File on UNIX

To perform a backup using the NetWorker Module for SAP R/3 on Oracle, the SAP initialization file, *init<oracle_sid>.sap*, located typically in the *$ORACLE_HOME/DATABASE* directory, must point to the **backint** parameter file, *init<oracle_sid>.utl*, included with the NetWorker Module software.

- Instruct the SAPDBA program to use **backint** to back up the SAP R/3 on Oracle data file by setting the *backup_dev_type* parameter:

  ```
  # backup device type
  backup_dev_type = util_file
  ```

- Instruct the SAPDBA program to use the *init<oracle_sid>.utl* file for **backint** specific parameters by setting the *util_par_file* parameter:

  ```
  # backup utility parameter file
  util_par_file = ?/DATABASE/init<oracle_sid>.utl
  ```

Using RMAN

To instruct SAP to use Oracle's RMAN utility to backup the Oracle Database (available with Oracle8 or greater databases), you must set the *backup_dev_type* parameter in the *init<oracle_sid>.sap* file to **`rman_util`**.

rman_parms Parameter

The optional *rman_parms* parameter in the *init<oracle_sid>.sap* file is used to include NetWorker-specific environment variables that are used during an RMAN backup or restore. Use the following syntax:

```
rman_parms="ENV=(<var1>=<value>, <var2>=<value>, ...)"
```

For example:

```
rman_parms="ENV=(NSR_Server=<server_name>,
NSR_DATA_VOLUME_POOL=<pool_name>)"
```

The following table lists all the NetWorker-specific (NSR_) environment variables that can be set in the *rman_parms* parameter.

Table 10. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_CHECKSUM	• Value of TRUE specifies that NetWorker perform checksumming on the data • Value of FALSE specifies no checksumming	• FALSE (default) • TRUE
NSR_CLIENT	• NetWorker client resource to use for a backup or restore session • Recommended for backups or restores of Oracle running on a cluster or OPS system • Might be needed for disaster recovery	• Host from which the session is initiated (default) • Valid NetWorker client name
NSR_COMPRESSION	• Value of TRUE specifies that NetWorker perform compression on the backup data • Value of FALSE specifies no compression	• FALSE (default) • TRUE

Table 10. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_DATA_VOLUME_POOL	• Name of volume pool to use for Oracle backup, including a duplexed Oracle backup • **Note:** The NSR_DATA_VOLUME_POOL setting takes precedence over any pool associated with the scheduled backup group. For a scheduled Oracle backup, set either NSR_DATA_VOLUME_POOL or NSR_GROUP—but *not both*—in the RMAN backup script.	• "Default" pool (default) • Valid NetWorker pool name • Name must be different from name used by another NSR_DATA_VOLUME_POOL* variable
NSR_DEBUG_FILE	• Only used for debugging purposes • Enables debugging by specifying the complete pathname of a file to receive debugging output • If undefined (by default), no debugging information is generated	• Undefined (default) • Valid pathname of the debug file
NSR_ENCRYPTION	• Value of TRUE specifies that NetWorker perform encryption on the backup data • Value of FALSE specifies no encryption	• FALSE (default) • TRUE

Table 10. Environment Variables in the rman_parms Parameter

Variable	Description	Default and Valid Values
NSR_GROUP	• Name of the NetWorker group to use for a scheduled backup • Setting NSR_GROUP causes the scheduled backup to automatically use a volume pool associated with the group (if NSR_DATA_VOLUME_POOL is *not* set in the same RMAN script)	• Undefined (default) • Valid NetWorker group name of 1024 characters or less
NSR_NO_BUSY	• Value of TRUE specifies that the scheduled backup fail immediately when the NetWorker server is busy • Value of FALSE specifies that the backup wait for the NetWorker server to accept the connection	• FALSE (default) • TRUE
NSR_SAVESET_EXPIRATION	• Date when the save set will expire • If 0 (default), save set will *never* expire	• 0 (default) • Valid date in **nsr_getdate(3)** format
NSR_SERVER	• Mandatory if NetWorker server is different from Oracle host; otherwise, highly recommended • Hostname of the NetWorker server to perform the Oracle backup	• Most appropriate server (default) • Valid NetWorker server name

Configuring the NetWorker Module Parameter File for UNIX Clients

NetWorker Module for SAP R/3 on Oracle performs backups based on the environment variable settings in its associated parameter file, *init<oracle_sid>.utl.*

This section contains a description of the valid settings for each of the NetWorker Module environment variables that can be included with the *init<oracle_sid>.utl* parameter file.

You set an environment variable in the *init<oracle_sid>.utl* parameter file as follows:

```
parameter = value
```

The following rules apply for setting parameters:

- Parameter values must be in lower case.
- All environment variables that you want to use in your backup must be uncommented.

Setting Data Compression

NetWorker client systems can compress data during backup before data is passed over the network or written to tape. Compressing data can speed up the backup process, as long as the system is able to send data to the NetWorker server fast enough to keep the tape drive streaming. Data compression will increase CPU usage on the SAP R/3 on Oracle server, but will reduce the amount of data sent to the NetWorker server.

To use data compression during a backup, before data is moved over the network or written to tape, set the compress parameter equal to **yes**:

```
compress = yes
```

Setting the Number of Save Sets

To specify the number of save sets the NetWorker Module should use for a save session, set the savesets parameter, for example:

```
savesets = 20
```

The default value for save sets is 20, and will be reduced by **backint** if the value exceeds the number of files within a backup request. To distribute the load, a client's files are distributed over several save sets.

When determining the number of save sets required for an average backup session, keep the following considerations in mind:

- The maximum size of any save set is 4 GB. If any one file is larger than 4 GB, the file will be assigned to multiple save sets.
- A single table space is backed up in a single backup session, and can consist of multiple data files.
- Files less than 2 GB in size should be assigned to a single saveset.
- The **backint** command will only use the number of save sets it requires for a particular backup session.
- Raw partitions will be assigned an individual save set, and filesystem data will be evenly distributed among the remaining save sets during the backup process by **backint**.
- The length of all the filenames should not exceed 1000 characters.

Important: You will receive an error message stating "the save command is too long" if the number of save sets indicated in the *init<oracle_sid>.utl* file is too low. To resolve this problem, increase the number of save sets used.

Setting Parallelism

The parallelism setting in the *init<oracle_sid>.utl* file indicates the number of parallel save streams to send simultaneously to the NetWorker server, for example:

parallelism = **8**

The default setting for parallelism is 8 and the maximum setting is 512. The value for parallelism will be reduced by **backint** if it is greater than the value of the save sets parameter.

Important: If you change the parallelism setting, ensure that the NetWorker server can accept the number of streams being sent. For details on setting the parallelism value in the server resource on the NetWorker server, see "Configure the Server Resource on UNIX" on page 76.

Setting the Backup Group

The specified backup group is used by the NetWorker **save** program to select a specific media pool that is unique for this group.

To assign the SAP R/3 on Oracle server to a backup group other than the NetWorker default, set the group parameter equal to a backup group specific for SAP R/3 on Oracle data, for example:

```
group = SAPBackup
```

Important: If you specify a value for Group, then an associated pool must be specified as well, as described in "Setting the Pool" in the following section.

Setting the Pool

The pool attribute sends data from the SAP R/3 on Oracle server to the specified NetWorker media pool.

To use a pool other than the NetWorker default pool for backup, it must be specified in the *init<oracle_sid>.utl* file. To indicate the volume pool to which the Oracle database objects should be backed up, uncomment the pool parameter and set it equal to the name of the pool, for example:

```
pool = SAPData
```

If you want to use multiple pools to separate data types, you need to create additional *<oracle_sid>.utl* parameter files and specify the filenames of the additional parameter files at the command line when **brbackup** or **brarchive** is used.

For example, during configuration a pool was created specifically for the archive logs called ARCHData. The pool attribute in the *archiveC11.utl* file is set equal to ARCHData. To use this pool to back up the archive logs, enter the following command at the command line:

brarchive -u *sysadmin* **-d** *util_file* **-r** *archiveC11.utl* **-m** *all* **-s** *save*

Setting the Browse Policy

The expiration parameter indicates, in **nsr_getdate** format, when the browse policy for a NetWorker client's save sets expire, for example:

```
expiration = 2 weeks
```

This setting overrides the browse policy setting for this client on the NetWorker server. For details on browse and retention policies, see "Using NetWorker Policies" on page 80.

Setting the Destination NetWorker Server

The server option indicates the hostname of the NetWorker server that the NetWorker Module will use for each save session, for example:

```
server = pocono
```

If the server option is not specified, the NetWorker Module backs up data to the default NetWorker server.

Setting the Client

For backups, the client option indicates the client name that will be used for the client file index for the current backup. Setting the client name will append the "-c <hostname>" to the save command that is built by **backint**. This option is not supported on AIX for backups.

When the NetWorker Module is used to back up clusters, you must set this option to the virtual node name.

During cluster restores, as well as directed recoveries, this option indicates the client name that was used for the client file index for the backup that you want to restore. For example, if you are restoring data to a host named saturn from one named mars, you would set this option to mars so that the client file indexes for mars will be used.

```
client = mars
```

Setting Notifications

Notifications are available on UNIX only. The NetWorker Module for SAP R/3 on Oracle for UNIX supports four types of notifications:

- The *notify_start* notification is executed at the beginning of a backup or restore session.
- The *notify_done* notification is executed at the completion of a backup or restore session.
- The *notify_success* notification is executed at the completion of a successful backup or restore session.
- The *notify_error* notification is executed at the completion of a failed backup or restore session.

When a notification is triggered, the uncommented notification command in the *init<oracle_sid>.utl* file is executed, resulting in a summary of the event.

To set a notification, uncomment the notification command to use and replace *mailx* with the name of the command line mail utility you want to use. The default notification commands are:

```
notify_start = mailx -s ‘backint start’ root
notify_done = mailx -s ‘backint done’ root
notify_success = mailx -s ‘backint success’ root
notify_error = mailx -s ‘backint error’ root
```


Setting the Index Query Option

The query_index option determines whether the index should be queried if the save set name doesn’t match exactly. Allowed values are yes and no.

```
query_index=no
```

Setting the Save Set Name Format

The ssNameFormat option sets the naming convention for save sets. Allowed values are old and new. If old is used, the name for *all* save sets will be *backint:<oracle_sid>*. If new is used, the save set name for each session will differ according to the files being backed up and will use the format *backint:<oracle_sid>:<first filename in session>*.

```
ssNameFormat=old
```

Setting the Semaphore Timeout

The sem_timeout option sets the amount of time, in minutes, that **backint** will wait for **brbackup**/**brconnect** to remove the semaphore file. At the end of this timeout period, **backint** will exit with an error if the semaphore file was not deleted.

```
sem_timeout=30
```

Setting the Save Level to Full

The level_full option specifies whether the save should be done with the **-level Full** option. Allowed values are yes and no.

```
level_full=no
```

Setting the Backup Count

The retry_count option identifies the number of times that a failed backup should be retried. Allowed values are any integer greater than 0.

```
retry_count=0
```

Chapter 5: Cloning

Cloning is a process of reproducing complete save sets from a storage volume to a clone volume. These cloned volumes are indistinguishable from the original, except that the volume labels are different.

Cloning SAP R/3 on Oracle Data

The **sapclone** command is available for cloning save sets created by the NetWorker Module for SAP R/3 on Oracle. The **sapclone** command can be executed from the SAP R/3 on Oracle server or from the NetWorker server. **sapclone** is used by the NetWorker server to clone save sets generated by the Oracle user, *ora<oracle_sid>*, to the default clone pool.

The cloning operation occurs in the following way:

1. The **sapclone** command is executed on the NetWorker server or the SAP R/3 on Oracle server.
2. The **sapclone** command selects and reports on the save sets to be cloned.
3. The **sapclone** command, in conjunction with **nsrclone**, initiates the cloning process.
4. NetWorker restores data from the source volume to a temporary space.
5. NetWorker writes the data from the temporary space to a clone volume whose pool type is “clone.”

If you want to perform cloning after the backup of a group has completed, enter the **sapclone** command at the command line. For details about the **sapclone** command, see “Save Set Cloning Command Utility” on page 112.

Save Set Cloning Command Utility

The synopsis below describes the rules and syntax for the NetWorker Module for SAP R/3 on Oracle command line clone utility:

`sapclone [-a] [-b` *pool*`] [-c` *client*`] [-n] [-s` *server*`] -u` *user*

Command options not residing in square brackets (**[ ]**) must always be present in the command. Command options in brackets are optional.

Table 11. sapclone Options

Option	Description	Example
-a	Clones all of a client's save sets. If this option is not specified, the NetWorker Module only clones those save sets that were created in the last 24 hours.	**sapclone -a -u mikeERC**
-b *pool*	Specifies the pool to which the cloned save sets should be sent. If this option is not specified, the save sets are sent to the Default Clone Pool.	**sapclone -b SAPClone -u mikeERC**
-c *client*	Identifies the name of client whose backed up data should be cloned. NetWorker will use the client file index for the specified client to find and clone the client's data. This option should be used for cloning data backed up from a cluster. For example, you may want to set this option to the name of the cluster's virtual node.	**sapclone -c saturn -s mars**
-n	Tests the cloning operation on a client's save set(s). When this option is specified, the cloning operation is not initiated. The example performs a trial cloning process on the save sets created by **backint** in the last 24 hours, with none of the data being stored onto volumes by a Clone Pool.	**sapclone -n -u mikeERC**

Table 11. sapclone Options

Option	Description	Example
-s *server*	Specify to which NetWorker server to clone. This option only needs to be specified if you either want to clone to a NetWorker server other than the default, or you are executing the **sapclone** command on a SAP R/3 on Oracle server.	**sapclone -s mars**
-u *user*	Specifies the associated Oracle user, in the format *ora<oracle_sid>*, whose save sets are to be cloned.	**sapclone -u oraSID**

Monitoring the Cloning Process

To monitor the cloning process, the NetWorker server displays messages in the NetWorker Administrator program for each save set that is cloned. Because the cloning process only clones complete save sets, additional volumes will be requested if a save set spans multiple volumes.

Messages generated during the cloning process are displayed in the NetWorker messages log file located in *c:\win32app\nsr\logs* (Windows NT) or */nsr/logs/messages* (UNIX).

If the NetWorker Module for SAP R/3 on Oracle is unable to write to the */nsr/logs* directory, then the report is written to the *c:\temp* directory on Windows NT or the */tmp* directory on UNIX.

See "Appendix A: Error Messages" for more information on the NetWorker Module for SAP R/3 on Oracle and NetWorker error messages.

Chapter 6: SAP R/3 on Oracle Backup

The NetWorker Module for SAP R/3 on Oracle provides a comprehensive storage management solution whereby both online and offline Oracle database instances residing on an Oracle server with SAP R/3 are securely backed up.

This chapter provides the following details on using the NetWorker Module to perform backups of Oracle database instances:

- "Backing Up SAP R/3 on Oracle Data"
- "Performing a Non-scheduled SAP R/3 on Oracle Backup" on page 119
- "Monitoring Backups" on page 127

Backing Up SAP R/3 on Oracle Data

The NetWorker Module for SAP R/3 on Oracle allows for scheduled and non-scheduled backups.

Scheduled Backups

Scheduled backups use the **nsrsapsv** command to execute the **backint** program, which backups up the Oracle databases as well as SAP data. Scheduled backups are configured in the client resource of the NetWorker Administrator graphical interface. For more information about configuring the client resource to perform scheduled backups, see "Configuring the Windows Client Resource for Scheduled Backups" on page 47 or "Configuring the UNIX Client Resource for Scheduled Backups" on page 84.

Non-scheduled Backups

There are two ways that you can perform non-scheduled backups with the NetWorker Module for SAP R/3 on Oracle:

- Using **backint** with Brtools to back up all SAP and Oracle data
- Using Oracle's RMAN to backup Oracle data along with **backint** to backup SAP-specific files. For information about performing a NetWorker Module for SAP R/3 on Oracle backup using RMAN, see "RMAN Interface" on page 117.

Both of these methods use the **brbackup** and **brarchive** programs to initiate backups.

backint Interface

Scheduled backups, along with the first method of non-scheduled backups, use the NetWorker Module for SAP R/3 on Oracle backup program, **backint,** with Brtools to backup SAP and Oracle data. For systems that use Oracle databases prior to Oracle version 8, this is the only method available. This method works as follows:

- For scheduled backups, **backint** is invoked by the **nsrsapsv** command which is configured in the client resource of the NetWorker Administrator graphical interface. For more information, see "Configuring the Windows Client Resource for Scheduled Backups" on page 47 or "Configuring the UNIX Client Resource for Scheduled Backups" on page 84.
- For non-scheduled backups, **backint** is invoked through the SAP Database Administration (SAPDBA) program on the Oracle server with SAP R/3. The SAPDBA program passes the request to **backint** to back up the Oracle data through the **brbackup** and **brarchive** programs.

Each Oracle data file, log file, or control file that **backint** backs up is encapsulated in a save stream. This stream is sent to the NetWorker server, which processes the data and updates the client file index for each file contained within the stream. The data is then directed to a volume or storage node by NetWorker. During the backup process, **backint** makes an entry into the log file, *backint<oracle_sid>.log*, on the Oracle server.

backint performs backups based on the parameter settings found in the *init<oracle_sid>.utl* file. For details about configuring the *init<oracle_sid>.utl* file, see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.

Using SAPDBA to Perform Backups

Non-scheduled backups using SAPDBA can be performed in one of two ways:

- Using the "Backup Database" option in SAPDBA. With this option, SAPDBA program passes the following types of data to **backint** for backup through the **brbackup** command:
  - Oracle data files
  - Offline redo logs
  - Control files
  - Any existent profiles
- Using the "Backup Offline Redo Logs" in SAPDBA. With this option, the SAPDBA program passes only the offline redo log files to **backint** for backup through the **brarchive** command.

RMAN Interface

The second method uses the Oracle Recovery Manager (RMAN) backup utility. Starting in BtTools 4.5 (which is supported under Oracle version 8 and greater), RMAN has been integrated with the SAPDBA program. Therefore, you can configure **brbackup** to call either **backint** (as described in the previous section) or Oracle's RMAN to back up the SAP data contained in the Oracle database.

However, when RMAN is used to back up the Oracle database, it does not back up SAP-specific profiles, logs, and other files. As a result, **brbackup** calls **backint** in a second phase to back up the SAP-specific profiles, logs, and control files.

This method works as follows:

Both RMAN and **backint** are invoked through the SAP Database Administration (SAPDBA) program on the Oracle server with SAP R/3.

The SAPDBA program passes a request to back up the Oracle data to both RMAN and **backint** through the **brbackup** and **brarchive** programs:

- When a "Backup Database" request is made, the SAPDBA program passes Oracle data files to RMAN through the **brbackup** command. Additionally, **backint** is used to backup the following files:
  - Online redo logs
  - Control files
  - Any existent profiles

The NetWorker Module program, **backint**, backs up these files to the NetWorker server according to the environment variable settings in the *init<oracle_sid>.utl* file.

- When a "Backup Archive Logs" request is made, the SAPDBA program passes only the archive log files to **backint** for backup through the **brarchive** command. The NetWorker Module backs up the archive log files to the NetWorker server according to the environment variable settings in the *init<oracle_sid>.utl* file.

Each Oracle data file, log file, or control file that RMAN or **backint** backs up is encapsulated in a save stream. This stream is sent to the NetWorker server, which processes the data and updates the client file index for each file contained within the stream. The data is then directed to a volume or storage node by NetWorker.

During the backup process, RMAN or **backint** makes an entry into the log file, *backint<oracle_sid>.log*, on the Oracle server.

For details on configuring the *init<oracle_sid>.utl* file, see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.

How to Backup SAP R/3 on Oracle Cluster Data

To backup SAP R/3 on Oracle Cluster Data:

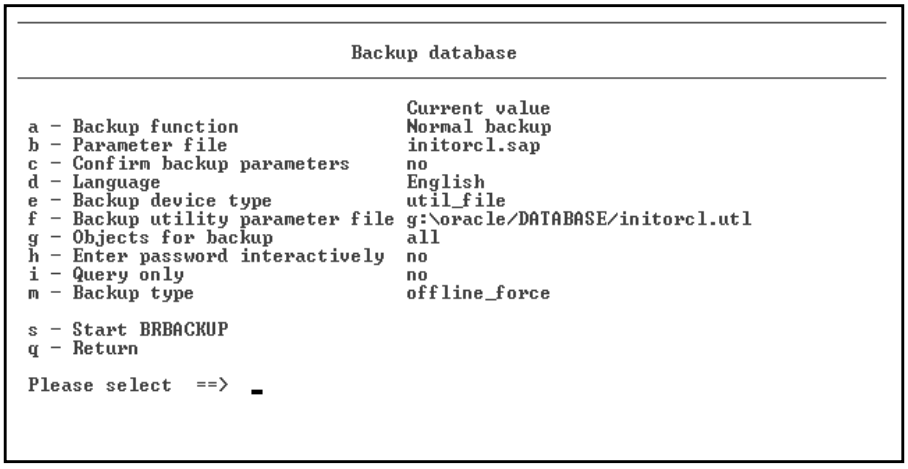
1. Install the NetWorker Module for SAP R/3 on Oracle on both physical nodes of the cluster. Use only the private disks of the nodes for the installation. For details on installing the NetWorker Module, refer to the *Legato NetWorker Module for SAP R/3 on Oracle Installation Guide*.
2. To back up Oracle data located on a private disk, use the physical node name as the client name. To back up Oracle data located on a shared disk that belongs to a virtual system, use the network name associated with this virtual system. For details on configuring the Client resource, see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.
3. Use Cluster Client Connections to back up a Tru64 cluster client.

The NetWorker Module for SAP R/3 on Oracle backs up only *shared* Oracle data that resides on a virtual client, and backs up *all* Oracle data that resides on private disks.

Performing a Non-scheduled SAP R/3 on Oracle Backup

A non-schedule backup of NetWorker Module for SAP R/3 on Oracle databases is performed using the SAPDBA Program or **brbackup**. Figure 21 on page 119 illustrates the Backup Database window of the SAPDBA program. Details on the supported options for both the Backup Database window and the command line version of **brbackup** are detailed in "SAPDBA Backup Command Utility" in the following section.

Figure 21. SAPDBA Backup Database Window



SAPDBA Backup Command Utility

To send data to the NetWorker Module's **backint** program for backup, the backup and archive options detailed in this section can be selected using the SAPDBA Program or included in the **brbackup** and **brarchive** commands. Any options that you incorporate into the **brbackup** or **brarchive** commands will overwrite settings in the SAP initialization file, *init<oracle_sid>.sap*. The **brbackup** and **brarchive** commands can be used from any DOS or UNIX command line.

The following synopsis describes the applicable options, for the **brbackup** and **brarchive** commands, that can be used in conjunction with the NetWorker Module:

brbackup [-c force][-d *util_file*][-m {all|table_space_name|file_ID|file_ID_range}][-p *profile*][-q check][-r *parameter_file*][-t {online|offline|offline_force|offline_standby}][-u *user/password*]

```
brarchive [-c force][-d util_file][-f stop][-m
delay_time][-p profile][-q check][-r parameter_file][-s
save][-u user/password]
```

Command options in square "[]" brackets are optional. Command options in curly "{}" brackets, must have one item in the command.

Table 12. brbackup and brarchive Command Line Options (Part 1 of 3)

Option	Description
-c force	Suppresses most of the confirmation messages that interrupt the backup process.
-d *util_file*	Specifies that the NetWorker Module is being used for this backup or archive process. The iteration of this option is not required, because this should have been set during configuration (see "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100).
-f stop	Instructs **brarchive** to wait for the next offline redo log file written by Oracle, and then send it to **backint** for archiving.
-m all	Sends the entire database to **backint** for backup.
-m *table_space_name*	Sends a single table space to **backint** for backup.
-m *file_ID*	Sends a data file with an associated Oracle file ID to **backint** for backup. The following file formats are acceptable: • Specify control files as ID 0 • Specify online redo log files as ID 0 *group_number*, where *group_number* is the group number associated with the redo log. • Specify all online redo log files as ID 00.
-m *file_ID_range*	Sends data files within a specified Oracle file ID range to **backint** for backup.

Table 12. brbackup and brarchive Command Line Options (Part 2 of 3)

Option	Description
-m *delay_time*	Specifies the delay time between when Oracle creates the offline redo log file and when data files are sent to the database in standby mode.
-p *profile*	Specifies a profile other than the default, *init<oracle_sid>.sap*. If a different profile is being used for the SAPDBA tools, then the settings outlined in "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100 must be specified in this additional profile.
-r *parameter_file*	Specifies the parameter file that the NetWorker Module uses during the backup or archive process. The iteration of this option is only required if you have created additional parameter files. The default parameter file, *init<oracle_sid>.utl*, should have been set during configuration; see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.
-s save	Instructs the NetWorker Module to archive the offline redo log files.
-t online	Instructs **brbackup** and the NetWorker Module to perform an online back up of the Oracle database. To reduce the number of redo logs that Oracle generates, use this option in conjunction with the -d *util_file_online* option.
-t offline	Specifies to **brbackup** and the NetWorker Module that the Oracle database is shut down.
-t offline_force	Instructs the SAP system to shut down the Oracle database immediately, and tell **brbackup** to send data to **backint** for backup.

Table 12. brbackup and brarchive Command Line Options (Part 3 of 3)

Option	Description
-t offline_standby	Instructs the SAP system the database in standby mode is ready for backup.
-u *user/password*	Specifies the Oracle database administrator's user name and password.

How to Perform an SAP R/3 on Oracle Offline Backup

Offline backups of each SAP R/3 on Oracle server within your network environment should be performed at a time when the network traffic is at its lowest, typically in the evenings or on weekends, because the SAP R/3 services and the Oracle database instance will not be available to users.

To perform an offline backup, follow these steps:

1. Ensure that the NetWorker server, the SAP R/3 on Oracle server, and the NetWorker Remote Exec services are running.
2. Shut down the SAP R/3 Service Manager.
3. From the SAPDBA Window, shut down the database instance.
4. Ensure that the `backup_type` (backup device type) and `util_par_file` (backup utility parameter file) parameters in the SAP utilities profile, *init<oracle_sid>.sap* are set appropriately. For details on configuring the *init<oracle_sid>.sap* file, see "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.
5. Determine the type of backup the NetWorker Module will perform by setting the variables in the appropriate *init<oracle_sid>.utl* file. For details on setting the variables in the *init<oracle_sid>.utl* file, see "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99.
6. Perform an offline backup following the instructions detailed in "How to Perform an Offline Backup from the SAPDBA Program" or "How to Perform Offline Backup from the Command Line" on page 123. You can also start an offline backup by setting the `backup_type` parameter in the SAP utilities profile, *init<oracle_sid>.sap* to `offline`.

How to Perform an Offline Backup from the SAPDBA Program

To perform an offline backup from the SAPDBA Program:

1. Select Backup Database from the main SAPDBA window.
2. Select Objects for Backup from the Backup Database window, and enter "all" to back up the entire Oracle database instance.
3. Select Offline as the Backup Type.
4. Begin the backup by selecting Start.

   The SAPDBA program, **brbackup**, passes the backup request to **backint**. The NetWorker Module program, **backint**, then backs up the entire Oracle database instance to the NetWorker server.
5. Backup the client indexes following the instructions in "Performing a Backup of the Client File Indexes and Bootstrap" on page 126.

How to Perform Offline Backup from the Command Line

To perform an offline backup using the command line version of **brbackup**:

1. Enter the following command at the command line:

   ```
   brbackup -m all -t offline
   ```

   – The -m all option specifies that **brbackup** backs up the entire Oracle database instance.

   – The -t offline option specifies to **brbackup** that the backup type is "offline."

   The SAPDBA program, **brbackup**, passes the backup request to **backint**. The NetWorker Module, **backint**, then backs up the entire Oracle database instance to the NetWorker server.
2. Back up the client indexes following the instructions in "Performing a Backup of the Client File Indexes and Bootstrap" on page 126.

How to Perform an SAP R/3 on Oracle Online Backup

With online backups, the SAP R/3 on Oracle server table spaces can be backed up while users are using the SAP R/3 services and the Oracle database instances.

To perform a SAP R/3 on Oracle online backup:

1. Ensure that the Oracle database instance is in ARCHIVELOG mode. To set an Oracle database instance to ARCHIVELOG mode:
   a. Mount the Oracle database instance.
   b. Set the database to ARCHIVELOG mode.
   c. Enable the automatic archiving services.
   d. Open the Oracle database instance.
2. Ensure that the NetWorker server, the SAP R/3 on Oracle server, and the NetWorker Remote Exec services are running.
3. Ensure the parameters for the backup device type and backup utility parameter file are set appropriately in the SAP utilities profile, *init<oracle_sid>.sap*. For details on configuring the *init<oracle_sid>.sap* file, see "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.
4. Determine the type of backup the NetWorker Module will perform by setting the variables in the appropriate *init<oracle_sid>.utl* file. For details on setting the variables in the *init<oracle_sid>.utl* file, see "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99.
5. Perform an online backup following the instructions detailed in "How to Perform an Online Backup from the SAPDBA Program" in the following section, or "How to Perform Online Backup from the Command Line" on page 125.

How to Perform an Online Backup from the SAPDBA Program

To perform an online backup from the SAPDBA program:

1. Select Backup Database from the main SAPDBA window.
2. Select objects to back up by selecting Objects for Backup from the Backup Database window, where the selection is either a table space, file ID, file ID range, or object list.
3. Set the Backup Type as Online.
4. Set the Backup Device Type as **util_file_online**.

5. Begin the backup process by selecting Start.

   The SAPDBA program, **brbackup**, passes the backup request to **backint**. The NetWorker Module, **backint**, then backs up the selected object(s) to the NetWorker server.

6. Back up the redo logs associated with the online backup, following the instructions provided in "Performing a SAP R/3 on Oracle Archive Log Backup" on page 125. Without the redo logs associated with an online backup, you will be unable to recover the associated files.

How to Perform Online Backup from the Command Line

To perform an online backup using the command line version of **brbackup**:

1. Select the object(s) to backup by including the -m *mode* option in the **brbackup** command, where the *mode* is either a table space, file ID, file ID range or object list.
2. Select the backup type as "online" by including option -t online in the **brbackup** command.
3. Begin the backup process.

   The SAPDBA program, **brbackup**, passes the backup request to **backint**. The NetWorker Module program, **backint**, then backs up the selected object(s) to the NetWorker server.

4. Back up the redo logs associated with the online backup, following the instructions provided in "Performing a SAP R/3 on Oracle Archive Log Backup" on page 125. If the redo logs are not associated with an online backup, you will be unable to recover the associated files.

Performing a SAP R/3 on Oracle Archive Log Backup

1. Select the archive function using one of the following methods:
   - Select Save Archive Logs from the Select Archive Function window of the SAPDBA program.
   - Include the -s save option in the **brarchive** command.
2. Begin the backup of the archive logs using one of the following methods:
   - Select Start from the Backup Archive Logs window of the SAPDBA program.
   - Invoke the **brarchive** command.

Backup of NetWorker Client Indexes

The client file indexes and the NetWorker server's bootstrap are vital for restoring data to SAP R/3 on Oracle database systems in the event of a disaster. When a non-scheduled backup of SAP R/3 on Oracle data is performed, the client file index and the NetWorker server's bootstrap are not backed up.

If you use non-scheduled backups on a regular basis, you should manually backup the client file indexes and the NetWorker server's bootstrap using the **savegrp** command.

For details on disaster recovery planning, see "Disaster Recovery Planning" on page 141.

Performing a Backup of the Client File Indexes and Bootstrap

After you perform a non-scheduled backup of SAP R/3 on Oracle data, invoke a backup of the client file indexes and the NetWorker server's bootstrap. On the NetWorker server, execute the following command:

```
# savegrp -O -c client_name
```

- The -O option specifies to **savegrp** to only back up the specified client's index and the associated NetWorker server's bootstrap.
- The -c *client_name* specifies the hostname of the SAP R/3 on Oracle server whose index is to be backed up.

Maintenance of NetWorker Client File Indexes

Because non-scheduled backups performed by the NetWorker Module for SAP R/3 on Oracle are executed by **brbackup** rather than using a NetWorker command, the browse and retention policies are not applied to the client file indexes when a backup is performed. Entries in the client file indexes will not expire until you perform a scheduled backup, restart your server, or perform one of the tasks listed below in "Managing the Client File Indexes".

Specific problems related to unenforcement of the browse and retention policies include extremely slow index queries and client file indexes that take up large amounts of hard drive space.

Managing the Client File Indexes

The client file indexes should be managed using one of the following methods:

- Include the client in a backup group. You can create a group for the single client and you can specify anything for the saveset, as long as the data in the saveset exists. The backup may be scheduled, manually started in the

NetWorker Administrator graphical interface, or manually started by running the **savegrp** program. For more information, see man page for **savegrp**.

When **savegrp** completes, it will run the **nsrim** program to update the file indexes. **nsrim** applies the browse and retention policies and will do file index database management operations as necessary.

- Manually run the **nsrim** program. In order to use **nsrim**, the user must either be logged in as root or must have the appropriate permissions to run the program. Execute **nsrim** using the following syntax

  `nsrim -c client name`

  For more information, see the man page for **nsrim**.

Monitoring Backups

When a backup session completes, the NetWorker Module appends to a backup session report on each SAP R/3 on Oracle server where the NetWorker Module resides. This report is located in the *c:\win32app\nsr\logs* for Windows NT, or */nsr/logs* directory on UNIX, and can be viewed in any text editor.

If the NetWorker Module is unable to write to the */nsr/logs* directory, then the report is written to the *c:\temp* directory on Windows NT or the */tmp* directory on UNIX.

The syntax for the backup report's log filename is as follows:

```
backint<sid>.log
```

The backup session report has the following attributes:

Table 13. Backup Session Report Attributes (Part 1 of 2)

Attribute	Description
Client Hostname	Indicates the SAP R/3 on Oracle server associated with this report.
User	Indicates the system ID, *ora<oracle_sid>*, associated with the database instance. The default setting for this attribute is C11. The **User** attribute is also referred to as the database instance system ID, *<oracle_dbsid>*.

Table 13. Backup Session Report Attributes (Part 2 of 2)

Attribute	Description
Params File	Indicates the parameter file being used by **backint** to back up the SAP R/3 on Oracle data.
Processing Parameter File	Indicates the environment variables being used by **backint** during the backup process. See "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99 for details on each of the NetWorker Module for SAP R/3 on Oracle environment variables.
Input File	Indicates the name of the input file that contains all the files that **backint** has been requested to back up. Following the message, "Reading Input File," each of the files contained in the input file are listed. For table spaces, the input file attribute represents a single table space, and the files listed are those database files contained within the table space.
Symlink	Specifies the location of a symbolic link associated with the file being backed up. The most common symbolic link is between the */oracle* and */mnt/oracle* directories. This line is backed up so that upon recovery, the link is resolved.
Number of Symlinks	Indicates the total number of symbolic links associated with a file.
Starting	Indicates the backup command, which is followed by the files that are being backed up.
Files	Indicates the number of files to be backed up in this backup session.
Savesets/Sessions	Indicates the number of save sets that are to be sent by **backint** to the NetWorker server.
Parallelism	Indicates the parallelism setting **backint** uses when passing save sets to the NetWorker server.

Chapter 7: SAP R/3 on Oracle Restore

In the event of data loss, data corruption, or a disk crash, the SAP Database Administration (SAPDBA) program can be used to restore the SAP R/3 on Oracle data backed up by the NetWorker Module for SAP R/3 on Oracle backup program, **backint**.

This chapter includes the following information:

- "NetWorker Module for SAP R/3 on Oracle Restore"
- "Determining the Scope of the Restore" on page 132
- "Performing an SAP R/3 on Oracle Restore" on page 134
- "Monitoring Restores" on page 138

NetWorker Module for SAP R/3 on Oracle Restore

During a backup, the NetWorker server makes an entry in an online client index and records the location of the data in an online media database. These entries provide restoration information required for every SAP R/3 on Oracle data file backed up. The information contained in the client and media indexes can be accessed using the SAPDBA interface located on an Oracle server with SAP R/3. The SAPDBA interface is used for restoring Oracle data that was backed up using the NetWorker Module for SAP R/3 on Oracle.

The client file index entry is maintained in the index 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. The expiration for the browse and retention policies is equal to the value set in the expiration attribute of the *init<oracle_sid>.utl* parameter file.

Once the browse and retention policies expire, the backup media is eligible for recycling and can be overwritten. Until the media is relabeled, the data from the media can be restored by using the **scanner** command on the NetWorker server.

Viewing Online Client File Index Entries

To view online client file index entries, select the Indexes button in the NetWorker Administrator program's main window and select an entry to view. The listing displayed for the entry selected shows the save set ID assigned during a backup session, the number and size of the file, and the date and level of the backup session.

Restoring SAP R/3 on Oracle Data

There are two ways that you can set up the NetWorker Module for SAP R/3 on Oracle: using **backint** with SAPDBA to restore both SAP and Oracle data, or using Oracle's RMAN with to restore Oracle data and **backint** to restore SAP-specific files. Both of these methods use the **brbackup** and **brarchive** programs to initiate backups.

backint Interface

The first method uses **backint** with the SAPDBA program to restore both SAP and Oracle data. For systems that use Oracle databases prior to Oracle version 8, this is the only method available. This method works as follows:

The NetWorker Module for SAP R/3 on Oracle restore program, **backint**, is invoked through the SAPDBA program.

The SAPDBA program passes the request to **backint** to restore data through the **brrestore** program:

- When a Full Restore request is made, **backint** restores the latest version of the Oracle database files, archived logs, and the control file that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.
- When a "Full Restore and Recovery" request is made, **backint** restores the latest version of the Oracle database files and the control file that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.
- When a Restore One Tablespace request is made, **backint** restores the latest version of the specified table space that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.
- When a Restore Individual Files request is made, **backint** restores the latest version of the specified file that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.

Each SAP R/3 on Oracle data file and log file is restored by **backint** to the SAP R/3 on Oracle server in parallel. This parallelism value is set in the parallelism attribute in the *init<oracle_sid>.utl* file. For details on setting the parallelism variable, see "Setting Parallelism" on page 133.

RMAN Interface

The second method uses Oracle's Recovery Manager (RMAN) utility. Starting in BrTools 4.5 (which is supported under Oracle version 8 and greater), RMAN has been integrated with the SAPDBA program. Therefore, you can configure **brbackup** to call either **backint** (as described in the previous section) or Oracle's RMAN to restore the SAP data contained in the Oracle database.

However, when RMAN is used to restore the Oracle database, it does not restore SAP-specific profiles, logs, and other files. As a result, **brbackup** calls **backint** in a second phase to restore the SAP-specific profiles, logs, and control files.

This method works as follows:

Both the Oracle RMAN and NetWorker Module restore program, **backint**, are invoked through the SAPDBA program.

The SAPDBA program passes the request to RMAN and **backint** to restore data through the **brrestore** program:

- When a Full Restore request is made, RMAN restores the latest version of the Oracle database and **backint** restores archived logs and the control file that were backed up to the NetWorker server. The restored files are forwarded to **brrestore** on the associated SAP R/3 on Oracle server.
- When a Full Restore and Recovery request is made, RMAN restores the latest version of the Oracle database files and **backint** restores the control file that were backed up to the NetWorker server. The restored files are forwarded to **brrestore** on the associated SAP R/3 on Oracle server.
- When a Restore One Tablespace request is made, RMAN restores the latest version of the specified table space that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.
- When a Restore Individual Files request is made, RMAN restores the latest version of the specified file that was backed up to the NetWorker server to **brrestore**, on the associated SAP R/3 on Oracle server.

Restoring SAP R/3 on Oracle Cluster Data

Restoring data backed up from private disks in a cluster node is similar to restoring data on a system that is not part of a cluster. See "Performing an SAP R/3 on Oracle Restore" on page 134 for instructions on restoring the SAP R/3 on Oracle data.

To restore data from a shared disk of a virtual client, follow the instructions provided in "How to Restore Files from a Different Client" on page 133. To restore Tru64 UNIX cluster data, use Cluster Client Connections in conjunction with the NetWorker Module.

Determining the Scope of the Restore

The **backint** program included with the NetWorker Module performs a restore based on the environment variable settings in its associated parameter file, *init<oracle_sid>.utl*.

This section contains a description of the valid settings for each of the NetWorker Module for SAP R/3 on Oracle environment variables that can be included with the *init<oracle_sid>.utl* parameter file.

You set an environment variable in the *init<oracle_sid>.utl* parameter file as follows:

```
parameter = value
```

The rules for setting the environment variables are as follows:

- Parameter values must be in lower case.
- Parameter values containing spaces must be contained in quotes.
- All environment variables that you want to use in your backup must be uncommented.

Changing the NetWorker Server from which to Restore

To restore files from a NetWorker server other than the server setting found in the *init<oracle_sid>.utl* file, set the server parameter equal to the hostname of the NetWorker server from which you want to restore files, for example:

```
server = spain
```

If the server option is not specified, the NetWorker Module will attempt to restore files from the default NetWorker server.

How to Restore Files from a Different Client

The client option indicates the hostname of the client from which the NetWorker Module will restore files.

To restore files from a different client than the one where the files originated, follow these steps:

1. Ensure that the client has the same organization name, site name, domain name, and configuration as the original client.
2. Ensure that the client where the original Oracle database instance files are located is offline.
3. Uncomment the client parameter in the *init<oracle_sid>.utl* parameter file and set it equal to the hostname of the client whose files you want to restore, for example:

   ```
   client = madrid
   ```

   If the version of the *init<oracle_sid>.utl* file you are using does not include the client parameter, you can include it.

Setting Parallelism

The parallelism setting in the *init<oracle_sid>.utl* file indicates the number of files that are to be restored simultaneously by **backint** to the SAP R/3 on Oracle server, for example:

```
parallelism = 8
```

The default setting for parallelism is 8 and the maximum setting is 512. The value for parallelism will be reduced by **backint** if it is greater than the value of the save sets parameter.

Setting the Backup and Recovery Retry Count

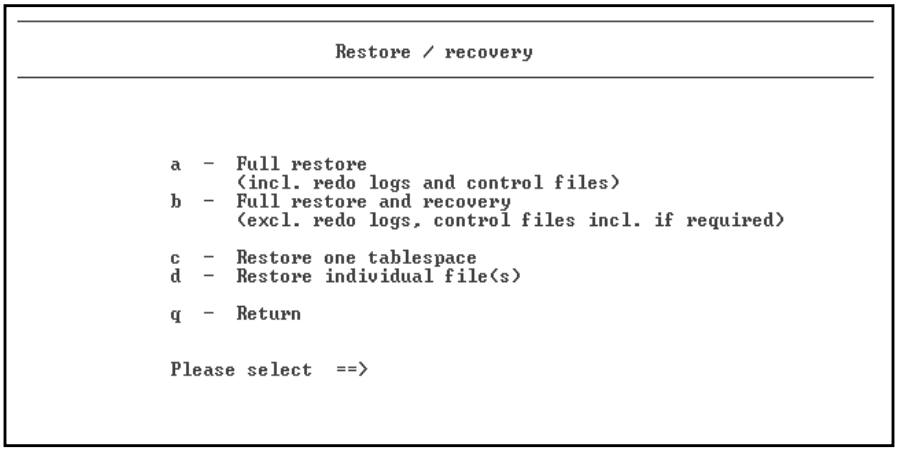
The retry_count option identifies the number of times that a failed backup or recovery should be retried. Allowed values are any integer greater than 0.

```
retry_count=0
```

Performing an SAP R/3 on Oracle Restore

You perform NetWorker Module restores using the SAPDBA Program or **brrestore**. Figure 22 illustrates the Backup Database window of the SAPDBA program. For details on the supported options for both the Backup Database window and the command line version of **brrestore**, see "SAPDBA Restore Command Utility" in the following section.

Figure 22. SAPDBA Restore/ Recovery Database Window



SAPDBA Restore Command Utility

The restore options detailed in this section can be selected in the SAPDBA program or included in the **brrestore** command to retrieve data from the NetWorker Module program, **backint**. Any options that you incorporate into the **brrestore** command will overwrite any settings in the SAP initialization file, *init<oracle_sid>.sap* file. The **brrestore** command can be used at any DOS or UNIX command line shell.

The following synopsis below describes the applicable options for the **brrestore** command that can be used in conjunction with the NetWorker Module. The conventions presented in the command line are as follows:

```
brrestore [-c force][-d {util_file|util_file_online}]
[-m {all|table_space_name|file_ID|file_ID_range}]
[-p profile][-q check][-r parameter_file]
```

Command options in square "[]" brackets are optional. For the command options in curly "{}" brackets, one of the items must exist in the command.

Table 14. brrestore Command Line Options (Part 1 of 2)

Option	Description
-c force	Suppresses most of the confirmation messages that interrupt the restore process.
-d *util_file*	Specifies that the NetWorker Module is being used for this restore process. The iteration of this is not required, because the setting should have been made during configuration. See "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.
-m all	Requests the restore of all table spaces and associated files from **backint**.
-m full	Requests a restore of the entire database instance from **backint**.
-m *table_space_name*	Requests the restore of a single table space from **backint**.
-m *file_ID*	Requests the restore of a data file with an associated Oracle file ID from **backint**. The following file formats are acceptable: Specify control files as ID 0. Specify online redo log files as ID 0 *group_number*, where *group_number* is the group number associated with the redo log. Specify all online redo log files as ID 00.
-m *file_ID_range*	Requests the restore of data files within a specified Oracle file ID range from **backint**.

Table 14. brrestore Command Line Options (Part 2 of 2)

Option	Description
-p *profile*	Specifies a profile other than the default, *init<oracle_sid>.sap*. If a different profile is being used for the SAPDBA tools, then the settings outlined in "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100 must be specified in this additional profile.
-r *parameter_file*	Specifies the parameter file that the NetWorker Module uses during the restore process. The iteration of this option is only required if you have created additional parameter files. The default parameter file, *init<oracle_sid>.utl*, should have been set during configuration; see "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.

How to Perform a Restore of an Entire Oracle Database Instance

Performing a full restore enables you to restore an entire Oracle database instance from the last offline backup. To perform a full restore, follow these steps:

1. Ensure that the NetWorker server, the SAP R/3 on Oracle server, and the NetWorker Remote Exec services are running.
2. Ensure that you are logged into the SAPDBA program in Expert Mode.
3. Shut down the SAP R/3 Service Manager.
4. Shut down the Oracle database instance.
5. Ensure that parameters for *backup_device_type* and *backup_utility_parameter_file* are set appropriately in the SAP initialization file, *init<oracle_sid>.sap*. For details on configuring the *init<oracle_sid>.sap* file, see "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.

6. Determine the type of restore that the NetWorker Module will perform by setting the variables in the appropriate *init<oracle_sid>.utl* file. For details on setting the variables in the *init<oracle_sid>.utl* file, see "Determining the Scope of the Restore" on page 132.
7. Select the restore type by doing one of the following:
   - Select Full Restore from the Restore/Recovery window of the SAPDBA program.
   - Include the -m full option in the **brrestore** command.
8. Begin the restore from within the SAPDBA graphical program, or by executing **brrestore** at the command line.

The SAPDBA program, **brrestore**, sends the request for a full restore to the NetWorker Module restore command, **backint**. The NetWorker Module restores the database files, redo logs, and control files to the SAP R/3 on Oracle server from the last offline backup.

For recovery of the database, refer to the related SAP R/3 and Oracle documentation.

How to Perform a Restore of a Single Oracle Database Object

When performing a restore of a single database object, you can use the SAP R/3 services and the remainder of the Oracle database. To perform a restore of a single Oracle database object, follow these steps:

1. Ensure that the NetWorker server, the SAP R/3 on Oracle server, and the NetWorker Remote Exec services are running.
2. Ensure that you are logged into the SAPDBA program in Expert Mode.
3. Take the database object(s) you are restoring offline.
4. Ensure *the* parameters for *backup_device_type* and *backup_utility_parameter_file* are set appropriately in the SAP initialization file, *init<oracle_sid>.sap*. For details on configuring the *init<oracle_sid>.sap* file, see "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.
5. Determine the type of restore that the NetWorker Module will perform by setting the variables in the appropriate *<oracle_sid>.utl* file. For details on setting the variables in the *<oracle_sid>.utl* file, see "Determining the Scope of the Restore" on page 132.

6. Select the restore type by doing one of the following:
   - Select Restore One Tablespace or Restore Individual Files from the Restore/Recovery window of the SAPDBA program.
   - Include the -m ***mode*** option in the **brrestore** command, where *mode* is either a table space, file ID, or file ID range.
7. Begin the restore from within the SAPDBA graphical program, or by executing **brrestore** at the command line.

The SAPDBA program, **brrestore**, sends the request for the selected object(s) to be restored to the NetWorker Module's restore command, **backint**. The NetWorker Module restores from the latest version of the object that was backed up to the SAP R/3 on Oracle server.

For details on the recovery of the objects into the Oracle database instance, refer to the related SAP R/3 and Oracle documentation.

Monitoring Restores

When a restore session completes, the NetWorker Module appends to a restore session report on each SAP R/3 on Oracle server where the NetWorker Module resides. This report is located in the *c:\Program Files\nsr\logs* directory on Windows or */nsr/logs* directory on UNIX, and can be viewed in any text editor. If the NetWorker Module is unable to write to the */nsr/logs* directory, then the report will be written to the *c:\temp* directory on Windows or the */tmp* directory on UNIX. The syntax for the restore report's log filename is:

```
backint<sid>.log
```

The restore session report has the following attributes:

Table 15. Restore Session Report Attributes (Part 1 of 2)

Attribute	Description
Client Hostname	Indicates the SAP R/3 on Oracle server associated with the report.
User	Indicates the system ID, *ora<oracle_sid>*, associated with the database instance. The default setting for this attribute is C11. The **User** attribute is also referred to as the database instance system ID, *<oracle_dbsid>*.

Table 15. Restore Session Report Attributes (Part 2 of 2)

Attribute	Description
Params File	Indicates the parameter file being used by **backint** to restore the SAP R/3 on Oracle data.
Processing Parameter File	Indicates the environment variables being used by **backint** during the backup process. For details on each of the NetWorker Module for SAP R/3 on Oracle environment variables, see "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99.
Input File	Indicates the file where the data to restore is being sent, usually *out*. This attribute is followed by the directory of each particular input file to be restored by **backint**.
Symlink	Specifies the location of a symbolic link associated with the file being backed up. The most common symbolic link is between the */oracle* and */mnt/oracle* directories. This link is backed up so that, upon recovery, the link is resolved.
Number of Symlinks	Indicates the total number of symbolic links associated with a file.
Starting	Indicates the recover command used, followed by the directory or file that is being backed up.
Files	Indicates the number of files to be restored in this restore session.
Savesets/Sessions	Indicates the number of save sets that are to be sent by **backint** to the SAP R/3 on Oracle server.
Parallelism	Indicates the parallelism setting **backint** uses when passing save sets from the NetWorker server to the SAP R/3 on Oracle server.

Chapter 8: Disaster Recovery Planning

This chapter provides guidelines to follow to prepare for a disaster and some procedures to follow in case of a disaster. The guidelines included in this chapter are designed to give you *general principles* on how to recover critical data and to help you understand the procedures.

This chapter includes information on the following:

- "Creating a Disaster Recovery Plan"
- "How to Perform a Disaster Recovery" on page 149

Creating a Disaster Recovery Plan

It is important to develop a plan for recovering from a disaster on your Oracle server. Not only do you need to back up important data on a daily basis, but you need to develop and test a plan for recovering your data should you experience a disk crash or loss of data. The more time and effort you invest in creating and testing your disaster recovery plan, the better prepared you will be should a disaster strike.

When you create a disaster recovery plan, consider the following strategies for an ideal backup solution:

- Operate each Oracle database instance in ARCHIVELOG mode.
- Perform offline backups of the entire Oracle database instance at least once a week.

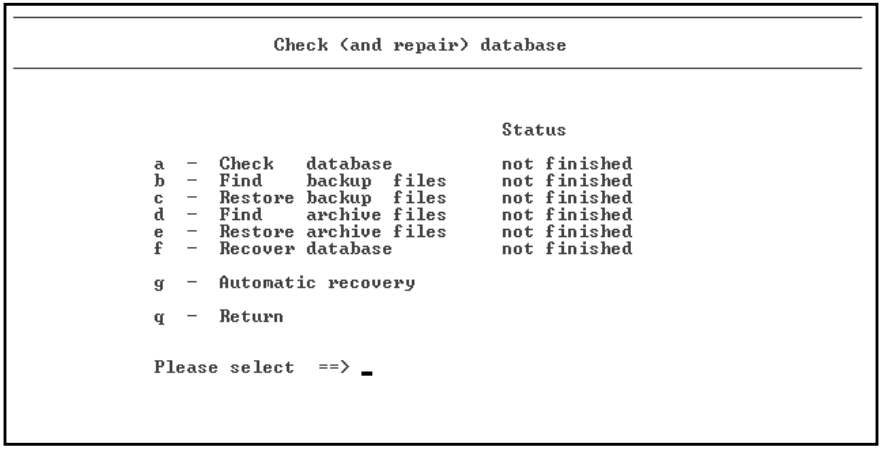
  In situations where the Oracle database instances can never be taken offline, increase the number of online backups and archived redo log backups that are performed.
- Perform offline backups after any structural change has been made to the database instance to ensure that you always have a copy of the most recent control files.

- Perform online backups on a daily basis.
- Perform a backup of the archive redo logs at least twice a day.
- Institute mirroring of the online redo logs.
- Perform a backup of the NetWorker server's bootstrap at least once a week.
- Perform database checks at least once a week to determine the condition of the control files, datafiles, table spaces, and online redo logs.
- Test your backup, restore, and recover procedures at least once a month.
- Keep accurate records of your network and system configurations and maintain all your original software in a safe location, including the following items:
  - Original operating system media and patches
  - Original NetWorker media
  - Device drivers and media device names
  - Filesystem configuration
  - IP addresses and hostnames
  - Bootstrap information
  - Disk information
- Keep an extra disk on hand as a "hot spare," in case a disk failure occurs. Format it and verify that it works. If a disk failure does occur, it is much faster to use a spare disk than it is to rename database files and update the control file accordingly.

Checking and Repairing an Oracle Database Instance

The following steps might be required to check and repair an Oracle database from the SAP Database Administration (SAPDBA) program. Steps that are not required appear in the Check <and repair > Database window with a status of Not Needed, as illustrated in Figure 23 on page 143.

Figure 23. SAPDBA Check <and repair> Database Window



How to Check and Repair an Oracle Database Instance

To check and repair an Oracle Database instance, follow these steps:

1. Select Check Database from the Check <and repair> Database window.

   The SAPDBA program checks the condition of the Oracle data files, table spaces, and control files. If the database is open when you perform the check and data files are missing, the SAPDBA program will close the database and perform a safe check of the Oracle database instance. If the safe check is unable to locate any errors, then the database is reopened. If there are errors in the files, then you need to determine which files are damaged and recover them.

2. Select Find Backup Files from the Check <and repair> Database window to determine which database objects require recovery.

   The SAPDBA program sends an inquire request to the NetWorker Module program, **backint**. The **backint** program passes the log sequence number associated with the most recent backup of this database object back to the SAPDBA program.

3. Select Restore Backup Files from the Check <and repair> Database window to restore the required database objects.

   a. Select Specify Restore Parameters to ensure that the attribute for Device Type is set to *util_file*, and the attribute for Backup Utility Parameter File is set equal to *init<oracle_sid>.utl*.

   b. Begin the restore process by selecting Start Restore of Backup Files.

The SAPDBA program, **brrestore**, sends the restore request to the NetWorker Module restore command, **backint**. The NetWorker Module restores the last version of the database objects that were backed up to the SAP R/3 on Oracle server.

4. Select Find Archive Files from the Check <and repair> Database window, and select Start Finding Archive Files to determine which archived redo logs are required for the recovery of the database objects.

   The SAPDBA program sends an inquire request to the NetWorker Module program, **backint**. The **backint** program passes the log sequence number associated with the most recent backup of the archive redo log back to the SAPDBA program.

5. Select Restore Archive Files from the Check <and repair> Database window to restore the required archived redo logs.

   a. Select Specify Restore Parameters to ensure that the attribute for Device Type is set to *util_file* and the attribute for Backup Utility Parameter File is set equal to *init<oracle_sid>.utl*. If you created an additional parameter file for the backup of the archived redo logs, specify the name of that parameter file instead, for example: *arch<oracle_sid>.utl*.

   b. Begin the restore process by selecting Start Restore of Archive Files.

      The SAPDBA program, **brrestore**, sends the restore request to the NetWorker Module restore command, **backint**. The NetWorker Module restores the database object's associated redo logs to the SAP R/3 on Oracle server.

6. Select Recover Database from the Check <and repair> Database window to recover the database.

Disk Information

As an additional precautionary step to help you recover from loss of critical data, you should print and save partition and formatting information about each disk on your Oracle Server with SAP R/3. If a disk is damaged or destroyed during a disaster, this information can be used to re-create the disk exactly as it was prior to the disk crash. For details regarding how to determine partition and formatting information, see "Disk Information on UNIX" or "Disk Information on Windows NT and Windows 2000".

Important: When you re-create your disk configuration, you must have partitions large enough to hold all the recovered data. Make the partitions at least as big as they were prior to the crash.

Disk Information on UNIX

Use the **df** command to find out how the NetWorker server and the SAP R/3 on Oracle server disks are partitioned and mounted. Use the appropriate operating system command to print the disk partitioning information:

- For Solaris, use the **df** and **prtvtoc** command.

  The **prtvtoc** command provides information about how each disk is partitioned for a Solaris system. The device name is the "raw" device corresponding to the device name used for the output from the **df** command.

- For AIX, use the **df** and **lslv** commands or the Logical Volume Manager in the System Management Interface Tool (SMIT).

  The **lslv** command provides information about the logical volumes on an AIX system.

- For HP-UX and Tru64, use the **df** command.

If a disk was damaged, you will be able to restore it and recover the filesystems to their original state using the hardcopy information from these disk information commands.

Disk Information on Windows NT and Windows 2000

As a precaution, copy the information that appears in the Windows Disk Administrator window, including the size of the partitions, the formatting methods, and the drive letters to which the partitions have been assigned.

8

Types of Disaster Recovery

You can use the NetWorker software to recover from different types of disasters on your SAP R/3 on Oracle 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 you need to perform to recover the data on your Oracle Server.

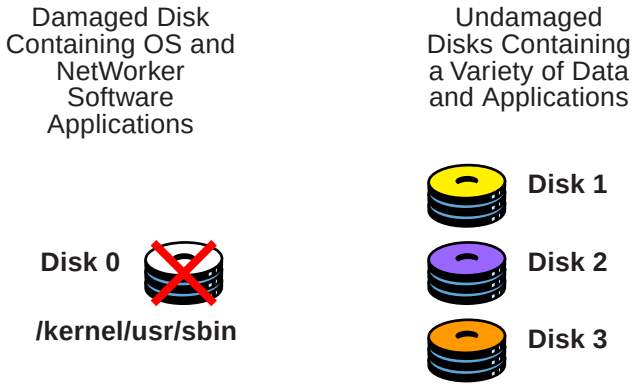
The information in this chapter explains how to recover from four different types of disasters on your Oracle Server:

- NetWorker server disk crash or data corruption
- NetWorker and SAP R/3 on Oracle server data corruption
- SAP R/3 on Oracle server disk crash or data corruption
- NetWorker server beyond repair

Case 1: NetWorker Server Data Corruption

Figure 24 illustrates how the operating system and NetWorker software can be damaged or destroyed. In this case, an Oracle server with SAP R/3 on UNIX has several physical disks. A power outage has corrupted the filesystem on Disk 0, and the operating system and NetWorker software residing on Disk 0 have been lost. To recover from a disaster of this type, you need to replace the disk, reinstall the operating system and NetWorker software, and use NetWorker to recover the lost server configuration and any data that was lost when the filesystem was corrupted.

Figure 24. Damaged Disk Containing Operating System and NetWorker Software

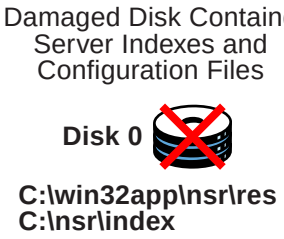


Important: In a situation where the primary disk containing both the operating system and the NetWorker binaries has been destroyed, you must always reinstall the operating system, reinstall the NetWorker software and applicable NetWorker patches, and then use the NetWorker software to recover the remainder of your data. You cannot recover data backed up by the NetWorker application without reinstalling the operating system and NetWorker software first.

Case 2: NetWorker Server and SAP R/3 on Oracle Server Data Corruption

Figure 25 shows how the directory containing the NetWorker online indexes and resource configuration files can be damaged or destroyed. In this case, a disaster has corrupted the disk on the Windows-based Oracle server with SAP R/3 that contains the NetWorker indexes and configuration files. To recover from a disaster of this type, you need to recover the contents of the bootstrap save set.

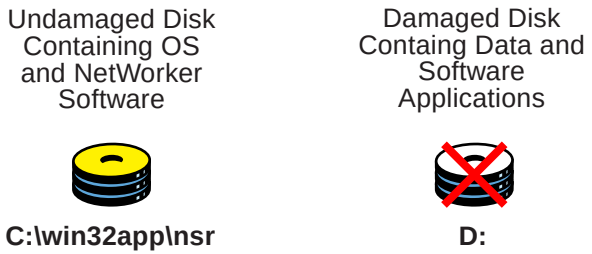
Figure 25. Damaged Disk Containing NetWorker Indexes



Case 3: SAP R/3 on Oracle Data Corruption

Figure 26 illustrates how Oracle data can be damaged or destroyed. In this example, a Windows-based Oracle server has two disks. The second disk containing the Oracle data has been destroyed by a disk crash. However, the disk containing the operating system and NetWorker software is still operational. To recover from a disaster of this type, use the SAPDBA program in conjunction with the NetWorker Module for SAP R/3 on Oracle to restore the data onto the disk that crashed.

Figure 26. Damaged disk containing Oracle data



Case 4: NetWorker Server Is Unrecoverable

The case shown in Figure 27 illustrates the situation where the NetWorker server has been destroyed. To recover from this disaster, you need to recover all the data to a new system *with the same name*.

Figure 27. Destroyed NetWorker server

How to Perform a Disaster Recovery

The remainder of this chapter details the order to follow to perform a disaster recovery when both the NetWorker server and the SAP R/3 on Oracle server have been damaged. The following is an outline of the tasks involved in the disaster recovery process.

1. "Task 1: Meeting Requirements" on page 150.

   To begin the disaster recovery process, ensure that you meet all the hardware, software, and operating system requirements. Guidelines for meeting these requirements are detailed in the following sections:

   - "Hardware Requirements" on page 150
   - "Operating System Requirements" on page 151
   - "Software Requirements" on page 151

2. "Task 2: Recover the Operating System" on page 151.

   Recover the operating system and software following the guidelines detailed in one of the following sections:

   - "How to Recover a UNIX Operating System and Software" on page 151
   - "How to Recover a Windows Operating System and Software" on page 153

3. "Task 3: Retrieve the Most Recent Bootstrap's Save Set ID" on page 154

   Retrieve the save set ID associated with the most recent NetWorker server's bootstrap, following the instructions detailed in "How to Locate the Latest Bootstrap" on page 154.

4. "Task 4: Recover NetWorker Indexes and Configuration Files" on page 155

   Recover the NetWorker indexes and configuration files, following the instructions detailed in "How to Recover the Indexes and Configuration Files" on page 157.

5. "Task 5: Renaming the Configuration Files Directory" on page 160

   Rename the NetWorker configuration files directory, following the instructions detailed in "How to Rename the Configuration Files Directory" on page 160.

6. "Task 6: Recovering the Filesystem Data" on page 161

   Recover the filesystem data associated with the NetWorker server and the SAP R/3 on Oracle server, following the instructions detailed in "How to Recover the Filesystem Data" on page 161.

7. "Task 7: Recovering NetWorker to a Different Server" on page 161

   If necessary, recover the NetWorker server to a different server if the original is beyond repair, following the instructions detailed in "Task 7: Recovering NetWorker to a Different Server" on page 161.

8. "Task 8: Restoring SAP R/3 on Oracle Data" on page 163

   Restore the damaged Oracle data to the SAP R/3 on Oracle server, following the instructions detailed in "How to Recover from a Crash with Damaged Oracle Database Files" on page 163.

9. "Task 9: Recovering Oracle Data" on page 164

   Recover the Oracle data, following the guidelines detailed in "Task 9: Recovering Oracle Data" on page 164. Also refer to the SAP R/3 and Oracle documentation.

Task 1: Meeting Requirements

While performing any of the disaster recovery procedures on your Windows or UNIX system, keep in mind the following hardware, operating system, and NetWorker requirements. Fulfill the requirements that are pertinent to your situation.

This section outlines the following requirements:

- "Hardware Requirements"
- "Operating System Requirements"
- "Software Requirements" on page 151

Hardware Requirements

Use the following list to install and configure your system hardware correctly:

- Replace a damaged disk with a disk of the same size or larger.
- Re-create the disk partitions on the new system to be the same size or larger.
- Format the disk partitions using the same formats as the original disk (for example, File Allocation Table (FAT) or NTFS).

Operating System Requirements

Adhere to the following list when you reinstall the operating system:

- Reinstall the same version of the operating system.
- Reinstall the operating system in the same directory where it was located prior to the disaster.
- Use the same server name, TCP/IP hostname, and DNS domain name.
- Reinstall any service packs or patches that existed before the disaster.
- Reinstall the device and SCSI drivers.
- Ensure that all network protocols are configured and working properly.

Software Requirements

Fulfill the following software requirements to ensure that you reinstall the SAP R/3, Oracle, the NetWorker Module for SAP R/3 on Oracle, and NetWorker components successfully. Refer to the corresponding installation guide(s) for each software component that needs to be reinstalled.

- Reinstall the same versions of the NetWorker Module, NetWorker, SAP R/3, and Oracle software.
- Reinstall the NetWorker Module, NetWorker, SAP R/3, and Oracle software into the same directory they were located in prior to the disaster.
- Reinstall any patches that were installed prior to the disaster.

Task 2: Recover the Operating System

This section contains the following procedures:

- "How to Recover a UNIX Operating System and Software"
- "How to Recover a Windows Operating System and Software" on page 153

How to Recover a UNIX Operating System and Software

When a disk with operating system and software binaries has been damaged or completely destroyed, you need to replace the damaged disk and reinstall both the operating system and the software. If the disk was not completely destroyed and the operating system or software is still operational, use only those steps in this section that apply to your situation.

Important: When you recover the operating system, you must do so in single user mode from the system console, not from an X Windows system.

To recover the operating system and software:

1. Replace the damaged disk if necessary. Make sure that the replacement disk is as large or larger than the original disk.
2. Use the saved disk partition information to re-create the disk partitions with the same structure as the original disk. See "Disk Information on UNIX" on page 145.
3. Use the output from the **disk information** command to make a filesystem for each raw partition that you plan to recover, and then mount the block partition. (The NetWorker Module does not initialize or create filesystems; it recovers data into existing filesystems.)
4. Reinstall the operating system, using the original software and documentation. The attached storage devices are automatically configured when you install the operating system. After you reinstall the operating system, run the **tar** command to verify that the storage device is functioning properly. You need to fully configure the operating system by re-creating any unique configurations that existed before you lost data or experienced a disk crash.
5. If you use a device with a default configuration that is not directly supported by the operating system, you also need to modify the appropriate device configuration files:
   - On Solaris systems, you might need to modify the */kernel/drv/st.conf* file to support a DLT tape drive.
   - On AIX, use SMIT to configure the devices.
   - On Tru64 UNIX and HP-UX systems, you must reconfigure the control port for the device robotics. Enter **lsdev -d spt** to get the major number for the driver. Then enter **ioscan -f** to view a list of devices and **mknod** */path/of/device* **c s***pt-major-number* **0xIITL00**. Then enter **jbinfo** to verify the configuration.
6. If you had a link to another disk that contains the NetWorker indexes and configuration files (*/nsr/res*) or any other NetWorker directories located on another disk, re-create it now. By default, */nsr* is a link to */usr/nsr*.

7. Reinstall the software using the original software and accompanying documentation.

If you lost the NetWorker indexes and resource configuration files that reside in the */nsr/res* directory, follow the instructions in "Task 4: Recover NetWorker Indexes and Configuration Files" on page 155.

How to Recover a Windows Operating System and Software

When a disk with the operating system and software binaries has been damaged or completely destroyed, you need to replace the damaged disk and reinstall both the operating system and the software. If the disk was not completely destroyed and the operating system or software is still operational, use only those steps in this section that apply to your situation.

To recover the operating system and software:

1. Replace the damaged disk, if necessary. Make sure that the replacement disk is as large or larger than the original disk.
2. Use the saved disk partition information to recreate the disk partitions with the same structure as the original disk. Format each partition on the disk with the same file systems as before (either FAT or NTFS). See "Disk Information on Windows NT and Windows 2000" on page 145 for more information.
3. Reinstall the operating system into the same directory where the operating system originally resided, using the original software and accompanying documentation. Be sure that you use the same TCP/IP hostname and DNS domain name you used prior to losing the operating system.

Important: Install the Windows operating system into a workgroup. Do not install the server in a domain. When you recover the Registry later in this procedure, the server will be returned to its original domain after the recovery is complete and you restart the system.

You need to fully configure the operating system by recreating any unique configurations that existed before you lost data or experienced a disk crash.

4. Install and configure the correct SCSI controller and tape device drivers.
5. If the system had a Microsoft Service Pack installed prior to the disk crash, reinstall it now.

6. Reboot the system and log on as Administrator.
7. Reinstall the software in the location it was prior to the disaster. Also, reinstall any patches you had installed prior to the disaster.

If you lost the NetWorker indexes and resource configuration files that reside in the *c:\win32app\nsr\res* directory, follow the instructions in "Task 4: Recover NetWorker Indexes and Configuration Files" on page 155.

Task 3: Retrieve the Most Recent Bootstrap's Save Set ID

The most efficient way to recover the bootstrap is to ensure that you save the bootstrap information prior to a disaster. However, if you do *not* have the information, you must scan the most recent backup volume to find the save set ID of the most recent bootstrap. Use the **scanner -B** command to find a valid bootstrap.

How to Locate the Latest Bootstrap

To find the save set ID of the most recent bootstrap, follow these steps:

1. Place the most recent media used for backups in the NetWorker server device.
2. At the system or command prompt, change to the directory where the NetWorker binaries and executables are located, typically *c:\Program Files\nsr\bin on Windows or /usr/sbin* on UNIX.
3. Use the **scanner -B** command to locate the most recent bootstrap on the media. For example:
   - For Windows systems:
     ```
     scanner -B \\.\Tape0
     ```
   - For AIX systems:
     ```
     scanner -B /dev/rmt0.1
     ```
   - For Tru64 UNIX systems:
     ```
     scanner -B /dev/rmt/0mbh
     ```
   - For Solaris systems:
     ```
     scanner -B /dev/rmt/0hbn
     ```
   - For HP-UX 10.x systems:
     ```
     scanner -B /dev/rmt/0mnb
     ```

The **scanner -B** command displays the latest bootstrap save set information found on the backup volume, as illustrated in the following example:

```
scanner: scanning 8mm tape spain.001 /dev/rmt/0hbn
scanner: Bootstrap 1148869870 of 8/21/96 7:45:15
located on volume spain.001, file 88
```

After you locate the bootstrap with the most recent date, you can run the **mmrecov** command on a UNIX system to recover the NetWorker Module for SAP R/3 on Oracle server indexes and resource configuration. For more information, see "Task 4: Recover NetWorker Indexes and Configuration Files" in the next section.

Task 4: Recover NetWorker Indexes and Configuration Files

To recover the NetWorker server indexes and configuration files that are typically located in the *c:\Program Files\nsr\res* directory on Windows or */nsr/res directory on UNIX*, use the **mmrecov** command.

Important: If the operating system and the NetWorker Module software were also destroyed, they must be reinstalled prior to recovering the contents of the *c:\Program Files\nsr\res* directory on Windows or the */nsr/res* directory on UNIX. For details on reinstalling the operating system, refer to "Recover a Windows Operating System and Software" on page 153, or "Recover a UNIX Operating System and Software" on page 151.

Before recovering the indexes and configuration files, read the following sections:

- "Directories"
- "Using the mmrecov Command" on page 156
- "How to Recover the Indexes and Configuration Files" on page 157
- "Using nsrwatch and nwadmin Commands" on page 159

8

Directories

When you use the **mmrecov** command to recover the *c:\Program Files\nsr* directory on Windows or the */nsr* directory on UNIX, you recover the contents of three important directories:

- *Media Manager directory, typically c:\Program Files\nsr\mm* on Windows or the */nsr/mm* on UNIX, which contains the NetWorker Module media index that tracks all of the NetWorker Module backup volumes.
- *c:\Program Files\nsr\index\server-name directory* on Windows or */nsr/index/server-name* directory on UNIX, which contains the NetWorker Module client index, and details on each of the client's files that were backed up prior to the disaster.
- *c:\Program Files\nsr\res directory* on Windows or the */nsr/res* directory on UNIX, which contains special NetWorker Module resource configuration files. The *nsr.res* file contains the NetWorker Module server configurations, including device information. Unlike the indexes, the contents of this directory cannot be reliably overwritten while the NetWorker Module is running. Therefore, **mmrecov** recovers the *c:\Program Files\nsr\res* directory on Windows as *c:\Program Files\nsr\res.r* and the */nsr/res* directory on UNIX as */nsr/res.R*. Later, you must change the directory name to *c:\Program Files\nsr\res* on Windows or */nsr/res* on UNIX.

Using the mmrecov Command

The **mmrecov** command asks you for the bootstrap save set identification number (ssid). If you followed the recommended procedures to prepare for loss of critical data, you have a copy of the bootstrap file as a hardcopy printout with the name of the backup media you need and the bootstrap save set ID.

In the following example, ssid "17851237" is the most recent bootstrap backup:

```
Jun 17  22:21 1997 mars's NetWorker bootstrap information

date    time    level       ssid  file  record   volume

6/14/92 23:46:13   full   17826163    48       0   mars.1

6/15/92 22:45:15      9   17836325    87       0   mars.2

6/16/92 22:50:34      9   17846505   134       0   mars.2

mars.3

6/17/92 22:20:25      9   17851237    52       0   mars.3
```

If you do not have this information, you can still recover the indexes by finding the ssid using the **scanner -B** command. See "Task 3: Retrieve the Most Recent Bootstrap's Save Set ID" on page 154.

After you locate the bootstrap with the most recent date on your system, you can run the **mmrecov** command, supplying the save set ID and file number displayed by the **scanner** command, to recover the NetWorker Module server indexes and resource configuration.

How to Recover the Indexes and Configuration Files

With the operating system and the NetWorker Module software in place, recover the indexes and configuration files from the backup media by following these steps:

1. Find the bootstrap information (required for the next two steps).
2. Mount the backup media that contains the most recent backup named "bootstrap" in a storage device.
3. Enter the **mmrecov** command at the command shell to extract the contents of the bootstrap backup. An example of the resulting output is shown below:

```
Doing mmrecov operation on the server !!!

mmrecov: Using mars as server

rd=mars:/space1/DISKDEV1 rd=mars:/space1/DISKDEV2
/space1/DISKDEV1 /space1/DISKDEV2

What is the name of the device you plan on using
[rd=mars:/space1/DISKDEV1]? /space1/DISKDEV1

Enter the latest bootstrap save set id []: 17851237

Enter starting file number (if known) [0]: 52

Enter starting record number (if known) [0]: 0

Please insert the volume on which save set id 17851237
started into /space1/DISKDEV1.  When you have done this,
press <RETURN>: [Return]

Scanning /space1/DISKDEV1 for save set 17851237; this
may take a while...

scanner: scanning optical disk TestBackup.199 on
/space1/DISKDEV1

/nsr/res/nsr.res

/nsr/res/nsrjb.res
```

```
scanner: ssid 17851237: scan complete
scanner: ssid 17851237: 44 KB, 11 file(s)
/nsr/res/nsrla.res
/nsr/res/
/nsr/mm/
/nsr/index/mars/
/nsr/index/
/nsr/
nsrmmd -r /nsr/mm/mmvolume/
/space1/DISKDEV1: mount operation in progress
/space1/DISKDEV1: mounted optical disk TestBackup.199
(write protected)
The bootstrap entry in the on-line index for mars has
been recovered. The complete index is now being
reconstructed from the various partial indexes which
were saved during the normal save for this server.


If your resource files were lost, they are now recovered
in the ‘res.R’directory.  Copy or move them to the ‘res’
directory, after the index has been reconstructed and
you have shut down the daemons.  Then restart the
daemons.
Otherwise, just restart the daemons after the index has
been reconstructed.
     7 records recovered, 0 discarded.
nsrindexasm: Pursuing index pieces of
/nsr/index/mars/db from mars.
Recovering files into their original locations.
nsrindexasm -r ./mars/db/
merging with existing mars index
mars: 2035 records recovered, 0 discarded.
Received 1 matching file(s) from NSR server `mars’
Recover completion time: Tue Jun 24 16:46:38 1997
Cross checking index for client mars to remove duplicate
```

```
records


The index for 'mars' is now fully recovered.
```

Using nsrwatch and nwadmin Commands

You can use NetWorker commands such as **nsrwatch** or **nwadmin** to watch the progress of the NetWorker server during the recovery of the index and configuration files. Open a new MSDOS or UNIX command shell window to monitor the recovery. An example of the output is shown below:

```
mars# nsrwatch

Tue 16:36:11 server notice: started

Tue 16:36:30 index notice: The client index is missing,
recover the index or run nsrck -c

Tue 16:36:30 index notice: completed checking 2 client(s)

Tue 16:36:34 /space1/DISKDEV1 volume TestBackup.199 not
found in media index

Tue 16:45:21 /space1/DISKDEV1 mount operation in progress

Tue 16:45:30 /space1/DISKDEV1 mounted optical disk
TestBackup.199 (write protected)

Tue 16:45:33 index notice: nsrim has finished cross
checking the media db

Tue 16:46:24 index notice: cross-checking index for mars

Tue 16:46:30 /space1/DISKDEV1 mounted optical disk
TestBackup.199 (write protected)

Tue 16:46:31 mars:/nsr/index/mars (6/24/97) starting read
from TestBackup.199 of     397

Tue 16:46:35 mars:/nsr/index/mars (6/24/97) done reading
397 KB

Tue 16:46:38 index notice: cross-checking index for mars
```

Task 5: Renaming the Configuration Files Directory

Unlike the *c:\Program Files\nsr\indexes* directory on Windows or the */nsr/indexes* directory on UNIX, the *c:\Program Files\nsr\res* directory on Windows or the */nsr/res* directory on UNIX contains configuration files that cannot be reliably overwritten while the NetWorker services are running. Therefore, **mmrecov** recovers the *c:\Program Files\nsr\res* directory on Windows as *c:\Program Files\nsr\res.r* and the */nsr/res* directory on UNIX as */nsr/res.R*.

How to Rename the Configuration Files Directory

To complete the recovery of the NetWorker configuration files:

1. Shut down NetWorker server.
2. Rename the existing *c:\Program Files\nsr\res* directory on Windows to *c:\Program Files\nsr\res.orig*, or rename the existing */nsr/res* directory on UNIX to *nsr/res.orig*.
3. Rename the recovered *c:\Program Files\nsr\res.r* directory on Windows to *c:\Program Files\nsr\res*, or rename the recovered */nsr/res.R* directory on UNIX to */nsr/res*.
4. Restart the NetWorker server.
5. After **mmrecov** has finished, this final message appears:

   ```
   The on-line index for 'server' is now fully recovered.
   ```

   Shut down the NetWorker server using the **nsr_shutdown** command.
6. Save the original *c:\Program Files\nsr\res* directory on Windows as *c:\Program Files\nsr\res.orig* or save the original */nsr/res* directory on UNIX as */nsr/res.orig*. Rename the recovered file (*res.R*) to *res*, as described below.
7. Restart the NetWorker server. When it restarts, the server uses the recovered configuration data residing in the recovered *c:\Program Files\nsr\res* directory on Windows or */nsr/res* directory on UNIX.
8. Verify that the NetWorker server configuration files are correct, and remove the *res.orig* directory.

Task 6: Recovering the Filesystem Data

Once you recover the NetWorker server's indexes and configuration files, you can recover the remainder of the NetWorker server's data and the Oracle server with SAP R/3 filesystem data by using either the NetWorker User program or **nwrecover**.

For information about how to use the NetWorker User program or **nwrecover**, refer to the *Legato NetWorker Administrator's Guide.*

How to Recover the Filesystem Data

To recover the remainder of the data on your NetWorker Module server:

1. Start the NetWorker User program or enter **nwrecover** at the shell prompt.
2. For Windows, recover the Registry.
3. Reboot your computer once the recover is completed.
4. Log on as Administrator or *root*.
5. Recover the system's remaining data, with the following exceptions:
   - Any data that was backed up using the NetWorker Modulemust be recovered back to the system using the NetWorker Module.
   - *c:\Program Files\nsr\index\server_name*, *c:\Program Files\nsr\res*, and *c:\Program Files\nsr\mm* on Windows or */nsr/index/server_name*, */nsr/res*, and */nsr/mm* on UNIX directories. These directories were already recovered when you ran the **mmrecov** command.
   - *The %SystemDrive%\system32\smss.exe* file may have been installed during disaster recovery on Windows.
6. Click the Start speedbar button to begin the recovery.
7. After the NetWorker Module completes the recovery, reboot the system.

The system should be restored to its status prior to the disk crash.

Task 7: Recovering NetWorker to a Different Server

This section describes the situation in which your original NetWorker server is damaged beyond repair, so you want to move the NetWorker software to a different server. This procedure assumes that you are not updating the operating system or the NetWorker software.

Important: Do not make any changes to the operating system or NetWorker software at the same time that you move to a different server.

If you want to make changes to the operating system or the NetWorker software, you should configure the new system exactly like the original, using the same version of the operating system and NetWorker software. After configuring the new server, ensure that the system is operational and perform a couple of successful backups; then, update or upgrade the operating system or the NetWorker software.

To move NetWorker to a different server, use the same steps for recovering a primary disk and the NetWorker Module indexes and configuration files, see:

- "How to Recover a UNIX Operating System and Software" on page 151
- "Recover the Indexes and Configuration Files" on page 157

You should be aware of the following requirements for configuring the software when recovering NetWorker to a different server:

- Use the original *hostname* for the new NetWorker server, because the NetWorker server indexes were created under the original NetWorker server's hostname.
- Ensure the original server name is listed as an alias for the server in the Client window of the NetWorker Administrator program.

After NetWorker has been moved to another machine, you must recover the NetWorker resource database (*nsr.res* file) with the same resource and attribute settings on the new system as you had on the previous one.

After you successfully moved your server, check the following:

- Verify the NetWorker server resource configurations using the NetWorker Administrator program.
- Use the **savegrp** command to perform a bootstrap backup as soon as possible. See "Performing a Backup of the Client File Indexes and Bootstrap" on page 126.
- Check the Recover window to ensure that all the client indexes can be recovered.

Task 8: Restoring SAP R/3 on Oracle Data

This section describes how to recover from a crash in which one or more files of an Oracle database were damaged on your SAP R/3 on Oracle server.

The first sign of a disk crash is usually an I/O error. Oracle usually documents the I/O error in the trace file and in the alert log.

If only one database file is affected, your database may have encountered a bad spot on the disk. This can be circumvented by reformatting the disk to make a new list of bad blocks. However, this can be time-consuming, so it is prudent to have a spare disk available to use while you reformat.

If several database files are affected, all on the same disk, you could have a disk controller problem or a disk head crash. A bad controller can be replaced, while data on the disk often remains in perfect shape. After a head crash, you will need to use a spare disk as a replacement.

How to Recover from a Crash with Damaged Oracle Database Files

To recover from a crash in which one or more Oracle database files were damaged:

1. Perform a check on the Oracle database from the SAPDBA program to determine which Oracle database objects have been damaged, following the instructions in "Checking and Repairing an Oracle Database Instance" on page 142.
2. Restore the Oracle database files using either the Restore/Recovery option from the SAPDBA program or the command line utility, **brrestore**. To restore the entire Oracle database instance, see "How to Perform a Restore of an Entire Oracle Database Instance" on page 136. To restore only a single Oracle database object, see "How to Perform a Restore of a Single Oracle Database Object" on page 137.

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Task 9: Recovering Oracle Data

After you have finished restoring the required Oracle files, you need to apply the redo logs to bring your database up to date.

Perform a complete media recovery after a datafile is lost or the SYSTEM table is corrupted (see "How to Perform an Offline Complete Media Recovery"). Perform an incomplete media recovery after a user error occurs, such as a dropped table (see "How to Perform an Offline Incomplete Media Recovery" on page 165).

Your database is easier to recover when it is closed, because there is less contention for system resources. You need to close the database in any case if the SYSTEM table was corrupted. However, if only a few datafiles were affected and the database must remain available for business reasons, leave it open. Perform an open database recovery with the affected table spaces offline. In this case, it might be helpful to *remap* restored files to a neutral location (see "How to Perform an Online Partial Media Recovery" on page 165).

How to Perform an Offline Complete Media Recovery

To perform a closed database recovery:

1. Connect to the database as INTERNAL.
2. Determine which datafiles are corrupted by looking at the message logs or by issuing the following SQL command:

   ```
   SELECT file#, online, error FROM v$recover_file
   ```

3. Issue a SHUTDOWN.
4. Correct the hardware problem. For example, replace the disk.
5. Restore the damaged datafiles using the SAPDBA program, **brrestore**, following the instructions detailed in "Checking and Repairing an Oracle Database Instance" on page 142, or "How to Perform a Restore of a Single Oracle Database Object" on page 137.
6. Start the Server Manager and connect as INTERNAL, and then issue a STARTUP MOUNT.
7. Issue a RECOVER {DATABASE,TABLE_SPACE,DATAFILE}.
8. Supply archived redo logs as requested. When the recovery is complete, the following message appears:

   ```
   Media recovery complete.
   ```

9. Issue an ALTER DATABASE OPEN.

How to Perform an Online Partial Media Recovery

To perform an open database recovery:

1. Connect to the database as INTERNAL.
2. With an open database, remap or take the table space with damaged datafiles offline by issuing the following SQL command:

   ```
   ALTER TABLESPACE tblsp-name OFFLINE
   ```

3. Correct the hardware problem. For example, replace the disk.
4. Restore the damaged datafiles using the SAPDBA program, **brrestore**, following the instructions detailed in "Checking and Repairing an Oracle Database Instance" on page 142 or "How to Perform a Restore of a Single Oracle Database Object" on page 137.
5. Issue a RECOVER {DATABASE,TABLE_SPACE,DATAFILE}.
6. Supply archived redo logs as requested. When the recovery is complete, the following message appears:

   ```
   Media recovery complete.
   ```

7. Bring the affected table space online with the following command:

   ```
   ALTER TABLESPACE tblsp-name ONLINE
   ```

How to Perform an Offline Incomplete Media Recovery

An incomplete media recovery is performed when not using all available media, for example, after a user drops (deletes) a table by mistake. To perform an incomplete media recovery:

1. Connect to the database as INTERNAL.
2. Perform a database check to determine which datafiles are corrupted, following the instructions detailed in "Checking and Repairing an Oracle Database Instance" on page 142.
3. Issue a SHUTDOWN ABORT.
4. If the control files do not match the desired database structure, restore old control files as needed.
5. Restore datafiles from backups taken at appropriate times. For example, if a user error occurred during redo log #112, restore data files from backups taken before #112. Restore damaged datafiles with the SAPDBA program, **brrestore**, following the instructions detailed in "How to Perform a Restore of a Single Oracle Database Object" on page 137.

6. Start the Server Manager and connect as INTERNAL, then issue a STARTUP MOUNT.
7. Issue a RECOVER DATABASE UNTIL {CANCEL,TIME,CHANGE}.
8. Supply archived redo logs as requested.

   If you chose the CANCEL option, stop applying redo logs at the desired point and type CANCEL.

   When the recovery is complete, the following messages appear:

   ```
   Incomplete recovery done UNTIL CHANGE scn.
   Media recovery complete.
   ```

9. Issue ALTER DATABASE OPEN {RESETLOGS,NORESETLOGS}.

   Refer to the appropriate Oracle guide to determine if you should use the RESETLOGS option. If you do use RESETLOGS, shut down the database and perform another full backup.

Appendix A: Error Messages

This appendix lists error messages you might encounter while using the NetWorker Module for SAP R/3 on Oracle, and provides suggestions to resolve the problems described. The information in this appendix details the following:

- Table 16 indicates possible error messages that might appear in the *backint<oracle_sid>.log* file.
- Table 17 indicates any error messages that begin with the line "Backint exiting at *time_stamp* with fatal error."

Regular Session Error Messages

The error messages detailed in Table 16 are errors that may occur during a backup, restore, or inquire session, but do not prevent the session from continuing.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 1 of 8)

Error Message	Description	Solution
Couldn't open notify command: *notify_command*	NetWorker Module for SAP R/3 on Oracle could not write a notification to the command line mail utility specified in the error message.	Check the usage of the Notification parameter in the *init<oracle_sid>.utl* file. See "Setting Notifications" on page 69 (Windows) or "Setting Notifications" on page 108 (UNIX).

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Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 2 of 8)

Error Message	Description	Solution
Ignoring, use format param=value	There is uncommented text in the *init<oracle_sid>.utl* parameter file that does not conform to "param = value" and it will be ignored.	See "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99 and "Determining the Scope of the Restore" on page 132 for information on setting the parameters appropriately in the *init<oracle_sid>.utl* file.
Warning: Unknown parameter, *parameter_name*	The parameter indicated is not a valid NetWorker Module for SAP R/3 on Oracle environment variable.	See "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99 and "Determining the Scope of the Restore" on page 132 for valid environment variables.
Parallelism setting ignored: must be an integer	The value specified for the parallelism parameter in the *init<oracle_sid>.utl* file is not an integer and will not be used during this session.	See "Setting Parallelism" on page 67 (Windows) or "Setting Parallelism" on page 105 (UNIX) for instructions on setting parallelism.
Sessions setting ignored: must be an integer	The value specified for the save sets parameter in the *init<oracle_sid>.utl* file is not an integer and will not be used during this session.	See "Setting the Number of Save Sets" on page 67 (Windows) or "Setting the Number of Save Sets" on page 104 (UNIX) for instructions on setting the number of save sets.
Warning: This is an EVALUATION version, your data will expire in 5 days	NetWorker Module for SAP R/3 on Oracle has not been enabled with a permanent enabler code.	Contact Legato Customer service to get a permanent enabler. Enter the enabler code according to the "Enabling and Registering" section of the NetWorker Module for SAP R/3 on Oracle *Installation Guide*.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 3 of 8)

Error Message	Description	Solution
Couldn't open command: *command*	The specified command could not be opened.	Ensure that NetWorker Module for SAP R/3 on Oracle **save** and **recover** are not being used by another process.
Warning: save symlinks had errors	During the process of saving symbolic links, backint ran out of memory and could no longer add symbolic links to its list.	This situation is unlikely to occur. Your machine may below on memory, or there may be a logic error in the program. If this situation recurs, contact Legato technical support.
Warning: Too many symlinks	There are too many symbolic links to be saved (more than100).	The backup will continue, but not all of the symbolic links may be saved. If there are more than 100 symbolic links in the list of database files to be backed up, you may want to consider restructuring your directories to eliminate the extra symbolic links.
backint.c:317 (and elsewhere) Unable to build command line.	Backint was unable to build a command line for a subprocess because the program ran out of memory.	This situation is unlikely to occur. Your computer may be low on memory, or there may be a logic error in the program. If this situation recurs, contact Legato technical support.
Warning: Too many symlinks, no space in command buffer. Will need to do another pass for symlink save.	There were too many symbolic links to be saved at one time.	The program will automatically try to save the rest of the symbolic links in the next pass. No user action is required.
Warning: save of symlinks may have had errors	There may have been some problems saving the symbolic links. The error(s) should probably be listed above this message in the log file.	Check for any errors listed with the symbolic links. If necessary, resolve the situations that caused the save to fail.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 4 of 8)

Error Message	Description	Solution
Switch log <line_number>	When doing an online backup, the switch log file had some text in it other than the line #SUCCESS or #ERROR for a filename.	Most of the time these messages are no cause for concern. If you are getting errors, you may want to check your SAP installation.
Unable to build command line for dir.	**backint** was unable to build a command line for a subprocess because the program ran out of memory.	This situation is unlikely to occur. Your machine may be low on memory, or there may be a logic error in the program. If this situation recurs, contact Legato technical support.
Unable to find pid <process ID> in list of files?	**backint** is checking the status of a subprocess that was spawned to save individual files. However, the subprocess ID does not match any of the expected process ID's.	Check the rest of the messages from the backup process to ensure that everything was saved. In particular, check for the message "x of y files saved at <time>." If not all of the files were saved, retry the backup.
Unable to open save output file <filename>	The subprocesses started by backint write out files to indicate the results of the attempt to save the files. However, in this case, the parent process could not read the output file from the child process.	Check the permissions on the directory where the file is being created, so the child process can write out the output file. You will probably need to restart your backup.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 5 of 8)

Error Message	Description	Solution
Error: unexpected inquire case.	The files requested in the input file do not match the SAP backint specification. Valid file specifications include: #NULL specified for backup ID and no file name specified File name specified with or without a backup ID Backup ID specified with no file name	Check the backup input file generated by BRBACKUP. If the input file generated appears to be the wrong format, contact SAP support.
Error: unable to print summary. One or more parameters are not set.	The backup finished, but the summary of results could not be printed because either the server name or the client name is unknown.	This is a rare situation, because **backint** tries to get the local host name in case the client and/or server names aren't set. If this situation continues, you may specify the client and/or server names explicitly in the parameter file.
Ignoring, use format of param=value	One of the lines in the *init<SID>.utl* file has an incorrect format. **backint** expects a parameter line to have a parameter, followed by an equal sign, followed by its value.	Check the parameter file to make sure it has the correct format.
Warning: Unknown parameter <parameter>	There is an invalid parameter specified in the *init<SID>.utl* file. This parameter is being ignored.	Check the spelling of the parameter and make sure that it matches one of the specified parameters "Configuring the NetWorker Module Parameter File for Windows Clients" on page 66 or "Configuring the NetWorker Module Parameter File for UNIX Clients" on page 104.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 6 of 8)

Error Message	Description	Solution
parallelism setting ignored, must be an integer	The value specified for parallelism is not a numeric value. The parallelism setting is ignored, and the default value will be used.	Make sure the parallelism setting is a valid, integer value.
sessions setting ignored, must be an integer	The value specified for sessions is not a numeric value. The sessions setting is ignored, and the default value will be used.	Make sure the sessions setting is a valid, integer value.
sem_timeout setting ignored, must be an integer	The value specified for sem_timeout is not a numeric value. The sem_timeout setting is ignored, and the default value will be used.	Make sure the sem_timeout setting is a valid, integer value.
retry count setting ignored, must be an integer	The value specified for retry_count is not a numeric value. The retry_count setting is ignored, and the default value will be used.	Make sure the retry_count setting is a valid, integer value.
Couldn't popen() notify command<error>	A command used for notifying on a saveset start, completion, or error message could not be executed because of the error listed in the message. The backup will continue, but the notification will not happen.	Make sure the command specified can be executed and that any program(s) specified are in the path.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 7 of 8)

Error Message	Description	Solution
Unable to query with savetime and filename both absent	Backint was trying to find a file in the index, but neither the save time nor the filename were provided.	Check the input file to see if any file information is specified incorrectly. If this situation persists, there may be a logic error in the program.
<path name>Nothing found in index	The specified file was not found in the NetWorker index.	Make sure the file was actually backed up in a previous run of backint. If BRBACKUP specifies filenames that were never backed up, check your SAP installation.
lookup failed on <filename>(<backup ID>)	Backint was trying to look up a file name and/or backup ID in the index, but the attempt to query the index failed. The next message should explain why the index query failed.	Check the error message to determine why the attempt to query the index failed. If this message does not explain the problem, and future inquire or restore requests fail, contact Legato support.
Unable to search with savetime or filename both absent	**backint** was trying to find a file in the index, but neither the save time nor the filename were provided.	Check the input file to see if any file information is specified incorrectly. If this situation persists, there may be a logic error in the program.
<process ID>File <filename> not found in index, no attempt to recover will be made	The file name specified for recovery was not saved by NetWorker and does not appear in the index.	Check the filename specified to see if the name is correct.Check previous backup runs to determine whether the file was actually savedin a previous backup.
Unable to lock output file.	The backint program needs exclusive access to the output file to record its log information (i.e. success or failure of the attempt to recover the file). Backint was unable to get exclusive access.	Check to see if any other programs have the output file open. Also check to see if there are two backups running at the same time.

Table 16. NetWorker Module for SAP R/3 on Oracle Error Messages (Part 8 of 8)

Error Message	Description	Solution
Retry save<number> of <maximum> retry.	The attempt to save a file failed, so backint is trying again to save the file. This will be retried until the maximum number of save attempts is reached.	If there are errors saving a file, they should be listed elsewhere in the log file.
Warning: <filename> is not a regular file, raw partition, or directory.	**backint** is trying to determine the size of a file, but the file is a special file (such as a symbolic link or a named pipe).	Check the filename to see what type of file this is. If BRBACKUP is requesting backup of special files, you may need to contact SAPsupport.

Fatal Error Messages

The error messages detailed in Table 17 give you guidelines as to why a particular backup, restore, or inquire session has ended.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 1 of 8)

Error Message	Description	Solution
Backint interrupted	The NetWorker Module for SAP R/3 on Oracle **backint** program was interrupted during a backup, restore, or inquire session.	N/A
Usage error	An unsupported option was included in the **backint** command.	NetWorker Module for SAP R/3 on Oracle backup and restore sessions can only be invoked through the SAPDBA (SAPDBA) program. The command options supported by the **brbackup** and **brrestore** commands are outlined in "SAPDBA Backup Command Utility" on page 119 and "SAPDBA Restore Command Utility" on page 134.
Opening parameter file	Unable to open the **backint** parameter file, *init<oracle_sid>.utl*.	Attempt to open the parameter file for **backint** in any text editor. If you are unable to open the parameter file, replace it with the original from the NetWorker Module CD.
This eval copy has expired	The evaluation version of NetWorker Module for SAP R/3 on Oracle has expired.	Contact Legato Customer service to get a permanent enabler. Enter the enabler code according to the "Enabling and Registering" section of the *NetWorker Module for SAP R/3 on Oracle Installation Guide*.

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Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 2 of 8)

Error Message	Description	Solution
Bad function on input line, *function*	The function indicated cannot be performed as it is either not a valid function or you are attempting to use unsupported options.	The NetWorker Module for SAP R/3 on Oracle can only be invoked through the SAPDBA program or associated commands and only supports the options outlined in "SAPDBA Backup Command Utility" on page 119, and "SAPDBA Restore Command Utility" on page 134.
Number of input files exceeds limit	The total size of the files to be backed up exceeds the size limit set by the total number of save sets, where no one save set can accept more than 4 GB of data.	Increase the number of save sets used during the backup session, following the details in "Setting the Number of Save Sets" on page 67 (Windows) or "Setting the Number of Save Sets" on page 104 (UNIX).
Warning, Empty input file	The input file that contains the files to be backed up or restored is empty.	Ensure that you have selected database objects for backup or restore.
Nonrecursive directory backup is not supported at this time	You have attempted to back up a directory and the backup of directories is not supported.	Select specific database objects to back up from the SAPDBA program and restart the backup process.
Save set too large, must increase session setting	The number of files assigned to a save set exceeds 4 GB.	Increase the number of save sets using the guidelines in "Setting the Number of Save Sets" on page 67 (Windows) or "Setting the Number of Save Sets" on page 104 (UNIX).

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 3 of 8)

Error Message	Description	Solution
Save command too long	The number of save sets indicated in the NetWorker Module for SAP R/3 on Oracle parameter file *init<oracle_sid>.utl* is too small.	Increase the number of save sets using the guidelines in "Setting the Number of Save Sets" on page 67 (Windows) or "Setting the Number of Save Sets" on page 104 (UNIX).
lstat'ing file: <error>, file was <name>	Description: The SAP module tried to determine the size of a symbolic link that does not exist or that the SAP module cannot access because permission is denied.	Check the file to see that it exists and is a valid symbolic link.
opening switch list file for online backup: <error>	Description: When doing an online backup, **backint** tries to open a file to communicate with BRBACKUP. This file could not be opened for the reason given.	Check to see if the *.switch.lis* file exists in the SAPBACKUP directory. If so, check the permissions on this file. Normally, the SAP module deletes and recreates this file for every tablespace to be switched into backup mode.
opening switch semaphore file for online backup: <error>	Description: When doing an online backup, **backint** tries to open a file to communicate with BRBACKUP. This file could not be opened for the reason given.	Check to see if the *.switch.sem* file exists in the SAPBACKUP directory. If so, check the permissions on this file. Normally, the SAP module deletes and recreates this file for every tablespace to be switched into backup mode.
Semaphore file not deleted in <time> seconds	Description: When doing an online backup, the SAP module was waiting for the switch semaphore file to be deleted. After waiting some number of seconds, the switch semaphore file still was not deleted.	If BRBACKUP appears to be running properly but just slowly, you can increase the sem_timeout setting in *init<SID>.utl*.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 4 of 8)

Error Message	Description	Solution
Checking for deletion of semaphore file: <error>	Description: The existence of the semaphore file could not be confirmed because of a system error.	Check to see if the *.switch.sem* file is still in the SAPBACKUP directory. If so, delete it before running the SAP backup again.
Opening switch log file for online backup: <error>	Description: When doing an online backup, **backint** expects BRBACKUP to provide a log file of the tablespaces that were switched into or out of backup mode.	Check to see if the *.switch.log* file is still in the SAPBACKUP directory. If so, delete it before running the SAP backup again.
Switch log file indicates an error.	Description: BRCONNECT indicated in the switch log file that there was an error switching one of the tablespaces into or out of backup status. This is considered a fatal error in the **backint** specification.	Investigate the error messages from the switch log file to determine what the problem was. Check your SAP installation or the SAP documentation to determine what went wrong.
Unable to get temp directory.	Description: **backint** was unable to find a temporary directory path on an Windows machine.	Create a temporary directory and set the %TMP% environment variable to point to this directory. Otherwise, make sure the Windows system directory is writeable.
Creating directive file: <error>	Description: The directive file for NetWorker's use cannot be created. This directive file is created so NetWorker can process files with the correct attributes.	Check the directory where the directive file is being created (usually the /tmp directory on UNIX systems or the directory specified by the %TMP% environment variable on Windows) to make sure files can be written to it.
Unable to allocate memory: <error>	Description: **backint** was unable to allocate memory.	Check the memory usage on your machine. It may be necessary to reboot if your computer is running low on memory.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 5 of 8)

Error Message	Description	Solution
Unable to create LGTO_SAP_PPID environment variable.	Description: **backint** was unable to allocate memory for the environment variables.	Check the memory usage on your machine. It may be necessary to reboot if your computer is running low on memory.
Unable to open output file: <error>	Description: The output file could not be opened for the reason specified.	Check the permissions on the output file and directory, and check to see there is sufficient disk space to create a new file.
Waitchild failed: <error>	Description: The program could not properly receive the exit code from a child process. It's possible that the child process did not start correctly.	Check any prior error messages to determine whether a child process failed, and if so, why.
Could not execute child backint process.	Description: The parent **backint** process could not execute a child process (used to store an individual saveset) for some reason.	Make sure you have the backint binary installed in the directory from which SAPDBA, BRBACKUP, or BRRESTORE is run. Check the log file for any other messages which may help pinpoint the problem.
Unable to change to root: <error>	Description: In a cluster environment, the program was unable to change its real and effective user ID's to root.	Make sure the user running SAPDBA, BRBACKUP, or BRRESTORE is the root user, or someone with permission to “su” to the root user.
Opening input file: <error>	Description: The input file could not be opened. It may be nonexistent, or it may exist but not allow anyone read permission.	Check to make sure that the input file is present and that it is readable.
Opening output file: <error>	Description: The output file could not be opened for the reason specified.	Check the permissions on the output file and directory, and check to see there is sufficient disk space to create a new file.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 6 of 8)

Error Message	Description	Solution
SAPBACKUP must be set for online backups.	Description: The SAPBACKUP environment variable must be set for an online backup. This directory is used to hold the switch log and switch list files on Windows.	Set the SAPBACKUP environment variable to a valid directory (such as *%ORACLE_HOME%\<**oracle_sid**>\database* on Windows.)
ORACLE_HOME must be set for online backups.	Description: The $ORACLE_HOME environment variable must be set for an online backup. The $ORACLE_HOME/sapbackup directory is used to hold the switch log and switch list files on UNIX.	Set the $ORACLE_HOME environment variable to the correct directory.
Unable to allocate memory for 1000 files	Description: **backint** ran out of room when it tried to allocate memory for a block of file information.	Check the memory usage on your machine. It may be necessary to reboot if your computer is running low on memory. If the input file is excessively large, check to make sure SAPDBA is providing a valid list of files.
BACKUP: Bad input line: <line>	Description: One of the lines in the input file had a bad format. There should be exactly one or two fields on each input line (filename and optional size for a special file.)	Check the input file generated by BRBACKUP to make sure it has the correct format. If not, and this error keeps occurring, contact SAP technical support.
RESTORE: Bad input line: <line>	Description: One of the lines in the input file had a bad format. There should be exactly two or three fields on each input line (backup ID, file name, and optional destination directory).	Check the input file generated by BRRESTORE to make sure it has the correct format. If not, and this error keeps occurring, contact SAP technical support.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 7 of 8)

Error Message	Description	Solution
INQUIRE: Bad input line: <line>	Description: One of the lines in the input file had a bad format. There should be exactly one or two fields on each input line (backup ID or #NULL and optional filename).	Check the input file generated by BRRESTORE to make sure it has the correct format. If not, and this error keeps occurring, contact SAP technical support.
Improperly formatted backup id: <backup ID>	Description: The backup ID is incorrect. It should be either a number or the word #NULL.	Check the input file generated by BRRESTORE to make sure it has the correct format. If not, and this error keeps occurring, contact SAP technical support.
Use absolute path name for: <filename>	Description: The filename given in the input file was not an absolute path name. The file cannot be restored or inquired without having the full path name.	Check the input file generated by BRRESTORE to make sure it has the correct format. If not, and this error keeps occurring, contact SAP technical support.
stat'ing file: <error>	Description: The filename given in the input file does not exist, or it may be inaccessible.	Check the file to see if it exists and has read permission.
Open log file: <error>	Description: **backint** was unable to open a log file for writing because of the reason indicated.	Check the permissions on the file listed in the message, as well as the directory.
Unable to get server parallelism.	Description: **backint** was unable to connect to the NetWorker server to determine the parallelism (number of simultaneous save streams).	Check the NetWorker server to make sure it is running, and that it can be contacted over the network.
recover_start: cannot connect to server <server name>	Description: **backint** was unable to connect to the NetWorker server to start the recovery process.	Check to make sure the correct NetWorker server is specified. Check the log file to see if there are any other messages that refer to this problem.

Table 17. NetWorker Module for SAP R/3 on Oracle Fatal Error Messages (Part 8 of 8)

Error Message	Description	Solution
cannot connect to server: <error>	Description: **backint** was unable to connect to the NetWorker server to start reading the media index.	Check to make sure the correct NetWorker server is specified. Check the log file to see if there are any other messages that refer to this problem.
cannot start session with server: <error>	Description: **backint** was unable to start reading the media index on the NetWorker server.	Check to make sure the correct NetWorker server is specified. Check the log file to see if there are any other messages that refer to this problem.

Appendix B: Troubleshooting

If you have a problem with the NetWorker Module for SAP R/3 on Oracle during backup and restore sessions, use the information in this appendix to diagnose and fix your problem.

Backup and Restore Problems

Table gives guidelines for solving possible problems that can occur during a NetWorker Module for SAP R/3 on Oracle backup or restore process.

Table 18. NetWorker Module for SAP R/3 on Oracle Backup or Restore (Part 1 of 3)

Problem	Possible Solution(s)
Data is not being backed up to the NetWorker Module for SAP R/3 on Oracle server.	Ensure that the SAP initialization file, *init<oracle_sid>.sap*, is configured to use the NetWorker Module for SAP R/3 on Oracle. See "Configuring the SAP Initialization File on Windows" on page 62 or "Configuring the SAP Initialization File on UNIX" on page 100.

Table 18. NetWorker Module for SAP R/3 on Oracle Backup or Restore (Part 2 of 3)

Problem	Possible Solution(s)
Data is not being backed using the specifications made in the Client resource on the NetWorker Module for SAP R/3 on Oracle server.	NetWorker Module for SAP R/3 on Oracle does not use the settings in the Client resource during backup. To tell the NetWorker Module how to perform a backup, it must be specified in the *init<oracle_sid>.utl* file on the Oracle server with SAP R/3. See "Coordinating Backup Processes for Windows Clients" on page 62 or "Coordinating Backup Processes for UNIX Clients" on page 99.
The bootstrap notification report was not printed to the designated printer specified in the Group resource on the NetWorker Module for SAP R/3 on Oracle server.	Bootstrap notification reports are not generated after a NetWorker Module for SAP R/3 on Oracle backup. To generate a bootstrap notification report, follow the instructions detailed in "Performing a Backup of the Client File Indexes and Bootstrap" on page 126.
Online backup of an Oracle table space is taking a long time.	Oracle creates more online redo logs during an online backup than during an offline backup.
The parallelism setting in the *backint<oracle_sid>.log* is different from the setting in the parameter file *init<oracle_sid>.utl*.	The number of files within the backup session was lower than the parallelism setting and was adjusted by **backint** during the backup session.
You specified an Oracle directory to be backed up, and the backup failed.	The NetWorker Module does not support backing up directories. Specify each database object within the directory to back up and then perform the backup.

Table 18. NetWorker Module for SAP R/3 on Oracle Backup or Restore (Part 3 of 3)

Problem	Possible Solution(s)
You are unable to view the files backed up to the NetWorker Module for SAP R/3 on Oracle server from the SAP Database Administration (SAPDBA) program on the Oracle server.	Ensure that the Oracle user associated with the data files is specified in the Administrator field of the NetWorker Module for SAP R/3 on Oracle server resource. For further details, see "Configure the Server Resource on Windows" on page 39 or "Configure the Server Resource on UNIX" on page 76.
You are unable to restore the most recent version of the file that was backed up.	When a restore is initiated within a certain time frame that is not available, **brrestore** will restore files from previous backups. Ensure that the Oracle user associated with the data files is specified in the Administrator field of the NetWorker Module for SAP R/3 on Oracle server resource. For further details, see "Configure the Server Resource on Windows" on page 39 or "Configure the Server Resource on UNIX" on page 76. Ensure that the PATH environment variable is pointing to the location of **nsrinfo**.

B

Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to NetWorker Module for SAP R/3 on Oracle products.

?	The Oracle placeholder for the main directory of the Oracle database instance identified as $ORACLE_HOME.
ARCHIVELOG mode	Setting your Oracle database in this mode enables the performance of online backups of an Oracle database instance.
attribute	A feature of a resource. It is a service that the resource provides.
autochanger	A mechanism that uses a robotic arm to move media among various components located in a device including slots, media drives, media access ports, and transports. Autochangers automate media loading and mounting functions during backups and restores.
auto media management	A feature that enables NetWorker to automatically label, mount, and overwrite a volume it considers unlabeled or recyclable.
backint	The NetWorker Module for SAP R/3 on Oracle program that performs backups and restores of Oracle data requested from the SAP Database Administration (SAPDBA) program.
backup	The writing of saved data to a volume.

backup device type	The backup device to which the SAP Database Administration (SAPDBA) program sends data. By setting this attribute equal to util_file, you tell the SAPDBA program to use the utility file provided by the NetWorker Module for SAP R/3 on Oracle.
backup group	A group of NetWorker clients whose data can be written to a specific set of media or combined with backup data from other groups.
backup volume	A tape or other storage medium used to store NetWorker backup data, as opposed to an archive volume or migration store.
bootstrap	A save set that is essential for NetWorker disaster recovery procedures. It is composed of three components that reside on the NetWorker server: the media database, the resource database, and the server's index.
brarchive	The SAP Database Administration (SAPDBA) program that sends requests to NetWorker Module for SAP R/3 on Oracle to back up archive logs.
brbackup	The SAP Database Administration (SAPDBA) program that sends requests to NetWorker Module for SAP R/3 on Oracle to back up Oracle data files, control files, redo logs, and table spaces.
browse policy	A policy that determines how long entries for your backup data remain in the online file index.
brrestore	The SAP Database Administration (SAPDBA) program that sends requests to NetWorker Module for SAP R/3 on Oracle to restore Oracle data to the Oracle server.
client	A system that accesses the NetWorker Module for SAP R/3 on Oracle server to back up or restore files. Clients may be workstations, PCs, or fileservers.

client file index	A database of information maintained by the NetWorker server that tracks every file or filesystem backed up. The NetWorker server maintains a single client file index for each client system.
clone	The process the NetWorker Module for SAP R/3 on Oracle uses to make an exact copy of saved data (save sets). The NetWorker Module for SAP R/3 on Oracle can clone individual save sets or the entire contents of a backup volume.
command line	The shell prompt where you enter commands.
device	The unit (tape drive, optical drive, or autochanger) connected to the NetWorker server or Storage Node—either as a stand-alone computer or in an autochanger—that stores data on media.
directed recover	A restore method that restores data that originated on one client system and recreates it on another client system.
enabler codes	Special codes provided by Legato that activate the NetWorker Module for SAP R/3 on Oracle software product.
file index	A database of information maintained by NetWorker Module for SAP R/3 on Oracle that tracks every file or filesystem backed up.
fileserver	A system that provides services to other systems on a network.
filesystem	• A file tree that is on a specific disk partition or other mount point. • The entire set of all files. • A method of storing files.
group	A group of NetWorker clients whose data can be written to a specific set of media or combined with backup data from other groups.

heterogeneous network	Networks with systems of different platforms that interact across the same network.
Hierarchical Storage Management	A data management strategy that moves data from one storage medium to another.
inactivity timeout	An attribute that indicates the number of minutes the NetWorker Module for SAP R/3 on Oracle waits before determining that a client is unavailable for backup.
init<oracle_sid>.sap	The SAP initialization file used to set the parameters used by the SAP Database Administration (SAPDBA) program during backup, restore, and archive sessions.
init<oracle_sid>.utl	The NetWorker Module for SAP R/3 on Oracle parameter file that specifies the parameters used by the **backint** command during backup, restore, and archive sessions.
interoperability	The capability of software and hardware on multiple machines from multiple vendors to communicate meaningfully.
label	The identifying name given to a volume.
media	The physical storage medium to which backup data is written.
media database	A database that contains information about each storage volume location and the life cycle status of all data and volumes managed by NetWorker.
media manager	The NetWorker Module for SAP R/3 on Oracle component that tracks save sets to backup volumes.
multiplexing	A NetWorker feature that permits data from more than one save set to be written to multiple storage volumes on the same or different storage devices.

NetWorker Module for SAP R/3 on Oracle	A Legato network-based software product to back up and recover filesystems.
NetWorker Module for SAP R/3 on Oracle client	A system that can access the backup and restore services from a NetWorker Module for SAP R/3 on Oracle server.
NetWorker Module for SAP R/3 on Oracle server	The system on a network running the NetWorker Module for SAP R/3 on Oracle software, containing the online indexes, and providing backup and restore services to the clients on the same network.
notification	A message generated to the NetWorker Administrator program about important NetWorker events.
nsrclone	The command used to make an exact copy of Oracle data that was backed up using the NetWorker Module for SAP R/3 on Oracle.
offline backup	A backup performed when an Oracle database instance has been shut down and is not available to users.
online backup	A backup performed when an Oracle database instance is available to users.
online indexes	The databases located on the server that contain all the information pertaining to a client's backup and backup volumes.
oracle_sid	The system ID of the Oracle database instance.
oracle user	The owner of a database file within an Oracle database instance.
parallelism	A feature that enables the NetWorker Module for SAP R/3 on Oracle to back up save sets from several clients, or multiple save sets from a single client, at the same time.

parameter	A variable used to identify the specific variables and options to be used by commands associated with a parameter file.
pathname	A set of instructions to the operating system for accessing a file. An *absolute pathname* tells you how to find a file beginning at the root directory and working down the directory tree. A *relative pathname* tells you how to find the file starting from the current location.
pool	A feature that enables you to sort backup data to selected volumes. A volume pool contains a collection of backup volumes to which specific data has been backed up.
preconfigured	Existing selections or configurations for different NetWorker Module for SAP R/3 on Oracle features.
recover	The NetWorker Module for SAP R/3 on Oracle command used to browse the server index and restore files from a backup volume to a client's disk.
recycled volume	A volume whose data has passed both its browse and retention policies and is available for relabeling.
redo log	A log file created by Oracle when any type of interaction occurs involving an Oracle database instance.
remote device	A storage device that is attached to a NetWorker storage node.
resource	Anything that you may need to manage or locate, such as a client, storage device, backup schedule, or event notification.
retention policy	A policy that determines how long entries will be retained in the media index and thus be recoverable.

retrieve	The process of locating and copying files and directories that NetWorker Module for SAP R/3 on Oracle has archived.
root	The UNIX superuser account. By convention, the privileged system maintenance login on any operating system.
sapclone	The NetWorker Module for SAP R/3 on Oracle command used to create a duplicate copy of the Oracle data backed up using the NetWorker Module for SAP R/3 on Oracle.
SAP Database Administration (SAPDBA) Program	The SAP utility provided with SAP R/3 that simplifies the administration tasks related to Oracle databases.
save	The NetWorker Module for SAP R/3 on Oracle command that backs up client filesystem data to backup volumes and makes data entries in the online index.
save set	A group of files or a filesystem from a single client system backed up onto storage media.
save set ID	An internal identification number that the NetWorker Module for SAP R/3 on Oracle assigns to a save set.
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 Module for SAP R/3 on Oracle command used to read a backup volume when the online indexes are no longer available.
server	The server that the NetWorker Module for SAP R/3 on Oracle uses to back up and restore data.
shell prompt	A cue for input in a shell window where you enter a command.

stand-alone device	A backup device that contains a single drive for backing up data. Stand-alone devices cannot store or automatically load backup volumes.
storage node	A storage device attached to a server whose backup operations are administered from the controlling NetWorker server.
versions	The date-stamped collection of available backups for any single file.
volume	A physical unit of media, such as magnetic tape, optical disk, or disk file. With the advent of optical media, it is possible to place two volumes on a single piece of media.
volume ID	The internal identification assigned to a backup volume by the NetWorker Module for SAP R/3 on Oracle.
volume pool	A feature that enables you to sort backup data to selected volumes. A volume pool contains a collection of backup volumes to which specific data has been backed up.

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