EMC® NetWorker® Module for SAP with Oracle

Release 4.5

Administration Guide

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EMC²

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Glossary

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PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

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Note: This document was accurate at publication time. Go to EMC Online Support (https://support.emc.com) to ensure that you are using the latest version of this document.

Purpose

This document describes how to configure and use the EMC NetWorker Module for SAP with Oracle (NMSAP) release 4.5.

Audience

This document is intended for system administrators who are responsible for configuring NMSAP and maintaining backup and recovery systems.

Users of this guide must be familiar with these topics:

- SAP terminology and concepts, especially those related to Oracle database backup and recovery
- Backup and recovery procedures
- Disaster recovery procedures

Related documentation

You can find additional EMC publications for this product release and related NetWorker products at EMC Online Support.

The *EMC NetWorker Software Compatibility Guide* at EMC Online Support provides a full list of supported environments and platforms.

Conventions used in this document

EMC uses the following conventions for special notices:

NOTICE

NOTICE is used to address practices not related to personal injury.

Note: A note presents information that is important, but not hazard-related.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (non-procedural) text for: • Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus • Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, functions, and utilities • URLs, pathnames, file names, directory names, computer names, links, groups, service keys, file systems, and notifications
Bold	Used in running (non-procedural) text for names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system calls, and man pages Used in procedures for: • Names of interface elements, such as names of windows, dialog boxes, buttons, fields, and menus • What the user specifically selects, clicks, presses, or types
Italic	Used in all text (including procedures) for: • Full titles of publications referenced in text • Emphasis, for example, a new term • Variables
`Courier`	Used for: • System output, such as an error message or script • URLs, complete paths, file names, prompts, and syntax when shown outside of running text
`Courier bold`	Used for specific user input, such as commands
`Courier italic`	Used in procedures for: • Variables on the command line • User input variables
< >	Angle brackets enclose parameter or variable values supplied by the user
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections—the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate non-essential information omitted from the example

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REVISION HISTORY

The following table presents the revision history of this document.

Revision	Date	Description
02	October 7, 2013	Updated the information in "Oracle ASM and Exadata support" on page 21.
01	July 25, 2013	Directed availability release of NMSAP 4.5.

CHAPTER 1
Overview of NMSAP Features

This chapter includes the following topics:

- Importance of backups 16
- NMSAP software features 16
- Internationalization 23
- NMSAP and associated software 25
- NMSAP software components 26

Importance of backups

For the complete protection of a database system or application system, a viable backup strategy must include regular backups of the following data:

- Database or application data
- Transaction (or archived) logs
- Configuration and control files for a database or application

These backups are important for the following reasons:

- Without backups, you cannot restore a database at all.
- Without transaction logs, you can restore a database only to the time of its last consistent backup.
- Without the configuration files and control files, you cannot re-create the database setup or application setup.

The EMC® NetWorker® server maintains an online client file index and online media database, which together comprise the online indexes. During a backup, the NetWorker server makes an entry in the online client file index. The server also records the location of the data in the online media database. These entries provide recovery information required for all backed-up data.

During a scheduled backup, the NetWorker server backs up the client index and other server configuration information (called bootstrap), such as the resource database. The client index and bootstrap information is mandatory for performing disaster recovery of the NetWorker server.

If you do not run scheduled backups with NetWorker Module for SAP with Oracle (NMSAP), you must back up the bootstrap information manually to prepare for a NetWorker server disaster. The *EMC NetWorker Disaster Recovery Guide* describes how to back up the bootstrap information and how to prepare for NetWorker server disaster recovery.

"Glossary" on page 137 describes the terms used in this guide.

NMSAP software features

NMSAP is an add-on module for the NetWorker client software. NMSAP provides a backup and restore interface between SAP BR*Tools, the NetWorker server, and the NetWorker Management Console (NMC). The main component of NMSAP is the **backint** program, which provides backup, inquiry, and restore processes for all Oracle files and SAP files.

NMSAP scheduled backups

You can configure a scheduled backup to use a calendar time or to use probe settings that detect when the system meets specific conditions.

Scheduled backups include the backup of the NetWorker bootstrap record, which is essential for disaster recovery.

NMSAP manual backups

You can perform a manual backup at any time, on demand. You initiate a manual backup from the NMSAP client host.

The NetWorker bootstrap record required for disaster recovery is not included in a manual backup. You must back up these items separately.

RMAN backups and restores with NMSAP

You can use the Oracle Recovery Manager (RMAN) program integrated with NMSAP and SAP BR*Tools for backup, restore, and inquiry operations. RMAN does not back up the configuration files, logs, and other files that the NMSAP **backint** program backs up. The BR*Tools documentation describes RMAN.

Restores of Fujitsu NetWorker Module for SAP R/3 backups

NMSAP can restore backups performed with Fujitsu NetWorker Module for SAP R/3 version 3.0 on an operating system that this NMSAP release supports. The *EMC NetWorker Software Compatibility Guide* at EMC Online Support provides details.

If the backup with Fujitsu NetWorker Module for SAP R/3 used advanced backup compression with GZIP or BZIP2, NMSAP automatically uncompresses the backup during the restore.

If you convert from using Fujitsu NetWorker Module for SAP R/3 to using NMSAP, you must configure backups of SAP Oracle according to the NMSAP documentation. For example, NMSAP operations ignore the following options if they are set:

- Fujitsu-specific compression options GZIP and BZIP2
- Other Fujitsu-specific parameters, such as files_per_save and device_server

NMSAP deduplication backups and restores with EMC Avamar

A deduplication backup with an EMC Avamar® server is an optional feature that deduplicates backup data before sending the data to the backup server. After an initial backup to a supported Avamar server configured as a deduplication node, deduplication backups include only unique blocks of data that contain changes. Deduplication supports manual, scheduled, snapshot, and probe-based backups.

Deduplication does not support the following features:

- Backup of raw devices or volumes
- Use of data compression, checksum, or NSR_AES_ENCRYPTION parameters

You must configure an Avamar deduplication backup according to "Configuring Avamar deduplication backups" on page 40.

NMSAP deduplication backups and restores with EMC Data Domain

NMSAP supports deduplication backups and restores with an EMC Data Domain® system. You can configure the Data Domain system as NetWorker advanced file type devices (AFTDs), virtual tape library (VTL) devices, or DD Boost devices.

A Data Domain deduplication backup to an AFTD, VTL, or DD Boost device can be a manual backup or a scheduled backup, including a probe-based backup.

The first Data Domain backup backs up all the specified data and achieves the least amount of data deduplication, referred to as compression or global compression in Data Domain documentation. Subsequent Data Domain backups achieve improved deduplication rates as the backups identify more and more redundant data blocks.

Do not use database or NMSAP encryption or compression for backups to a Data Domain system. The encryption or compression decreases the data deduplication ratio.

NMSAP backups to VTL or AFTD devices on Data Domain

An NMSAP backup to a Data Domain system configured as a NetWorker VTL or NetWorker AFTD device sends all the data to the Data Domain system where the deduplication occurs. During a restore, the Data Domain system converts the stored data to its original non-deduplicated format before sending the data over the network.

NMSAP backups to DD Boost devices

An NMSAP backup to a Data Domain system configured as a DD Boost device can take advantage of the DD Boost feature, which consists of two components:

- The DD Boost library API enables the NetWorker software to communicate with the Data Domain system.
- The distributed segment processing (DSP) component reviews the data that is already stored on the Data Domain system and sends only unique data for storage.

DSP enables deduplication of the backup data on the NetWorker storage node or the NMSAP client directly. Deduplication on the NetWorker storage node can be used when the NMSAP client does not have direct access to the Data Domain system or when DD Boost does not support the NMSAP client's operating system. With deduplication on the storage node, all the data is sent from the NMSAP client to the storage node and only the unique blocks are sent from the storage node to the target device.

To reduce the amount of transferred data, NMSAP can use the DD Boost components to deduplicate the data locally and send only the unique blocks directly to the target device through direct file access (DFA) technology (Client Direct feature). A Client Direct backup uses the storage node only to coordinate the backup and manage the device.

By default, NMSAP tries to perform a Client Direct backup. If the NMSAP client does not have direct access to the DD Boost device on the Data Domain system, then the backup is automatically routed through the storage node.

During a restore, if the NMSAP client has direct access to the DD Boost device, then the client restores data directly from the device, regardless of whether the backup was done directly from the NMSAP client or through the storage node. If the NMSAP client cannot access the data directly, then the restore process reverts to the traditional method that uses the storage node. Regardless of the restore method used, the Data Domain system converts the stored data to its original non-deduplicated state before sending the data over the network.

You must configure a deduplication backup with a Data Domain system according to "Configuring Data Domain Boost backups" on page 43.

NMSAP Client Direct backups to an AFTD

Traditionally, an NMSAP backup to an AFTD on either a Data Domain system or another type of system includes the following steps:

1. The NMSAP client sends all the backup data to the storage node.
2. The storage node sends the data to the attached AFTD device.

The Client Direct feature enables the NMSAP client to bypass the storage node and write the data directly to the AFTD by using DFA, which can improve the backup performance. A Client Direct backup uses the storage node only to coordinate the backup and manage the device. If an NMSAP backup cannot use the Client Direct method due to the permissions or accessibility to the AFTD, the backup uses the storage node instead.

The *EMC NetWorker Module for SAP with Oracle Release Notes* describes the software requirements of an NMSAP Client Direct backup to an AFTD.

You must configure a Client Direct backup to an AFTD according to "Configuring NMSAP backups to AFTD storage on Windows" on page 46.

NMSAP probe-based (event-based) backups

You can configure NMSAP probe-based (event-based) backups to be triggered when the system meets specific conditions within a scheduled backup window. You can specify the conditions by the number of transaction (archived) logs generated, or by the time elapsed since the previous probe-based backup. NMSAP also supports user-defined probes.

You must configure a probe-based backup according to "Configuring probe-based backups" on page 47.

Snapshot backups and restores with NMSAP

Snapshot technology provides enhanced protection and improved availability of data and nearly eliminates the use of resources on the production host to perform backups.

A snapshot is a point-in-time (PIT), read-only copy of production data located on a primary storage platform, such as EMC Symmetrix® or EMC CLARiiON®. You can either restore snapshots back to the production host or mount the snapshots onto a data mover host. You can then back up the snapshots to conventional storage with NMSAP.

NMSAP supports EMC NetWorker PowerSnap™ Module, the EMC NetWorker Snapshot Management (NSM) feature, and EMC Replication Manager software for snapshot backups.

The following chapters provide more details:

- Chapter 7, "Snapshot Backups and Restores"
- Chapter 8, "Split-Mirror Backups and Restores"

Restartable backups

NMSAP supports restartable backups through the NetWorker checkpoint restart feature and SAP **brbackup - fillup** *bkup_log* option. This option enables you to restart an NMSAP client backup from a known good point called a checkpoint. During the restarted backup, NMSAP does not back up files that were successfully backed up during the failed backup.

For NMSAP restartable backups, the checkpoint granularity is at the save set level. When you restart a backup, a successfully completed save set from the prior failed backup is not backed up, but a failed save set is backed up.

Note: An NMSAP restarted backup does not generate partial save sets for a prior failed backup.

NMSAP restartable backups support both scheduled backups and manual backups. "Configuring restartable backups" on page 39 provides configuration details.

Cluster and Oracle RAC backups and restores

NMSAP supports backups and restores of operating system cluster and Oracle Real Application Cluster (RAC) systems.

Directory backups and restores

NMSAP supports backups and restores of non-database files and directories.

Note: The restore granularity of a directory backup performed with the **brbackup** command is the entire directory. You cannot restore a subset of files from a directory backup.

NMSAP supports the following four directory backup modes, provided by the SAP BR*Tools suite:

- sap_dir—This mode backs up SAP-related directories, including the following directories:
  - /sapmnt/*DBSID*
  - /usr/sap/*DBSID*
  - /usr/sap/trans
- ora_dir—This mode backs up $ORACLE_HOME with the exception of the following subdirectories, if they exist:
  - $ORACLE_HOME/sapdata*n*
  - $ORACLE_HOME/origlog
  - $ORACLE_HOME/mirrlog
- all_dir—This mode combines the sap_dir and ora_dir modes.
- *full_directory_path*—This mode backs up the user-specified directory.

You can perform a directory backup as either of the following types of backups:

- Manual backup as described in "Performing manual backups" on page 56
- Scheduled backup configured through the non-wizard method as described in "Configuring scheduled backups without the wizard" on page 35

  Note: NMSAP does not support a scheduled directory backup configured with the wizard method.

Back up non-database files and directories only after a SAP upgrade or Oracle upgrade. Directory backups with NMSAP are not a replacement for file system backups. To fully protect the file system environment, use the NetWorker file system interface.

Run backups of non-database files and directories separately from database backups. You must create a separate Client resource for the backup of non-database files and directories.

Oracle ASM and Exadata support

NMSAP supports Oracle Automatic Storage Management (ASM) and Oracle Exadata through the BR*Tools RMAN interface only.

NMSAP supports Oracle Exadata in both of the following configurations:

- Exadata Database Machine
- Exadata Storage Server, attached to an external database server

NMSAP supports the same environment for Oracle Exadata (including the Oracle database versions, operating system versions, BR*Tools versions, and NetWorker versions) that NMSAP supports for Oracle RAC, as described in the *EMC NetWorker Software Compatibility Guide*.

You must install and configure NMSAP on each Exadata database server in the same way that you install and configure NMSAP for Oracle RAC. The installation and configuration procedures are described in the *EMC NetWorker Module for SAP with Oracle Installation Guide* and in this administration guide.

To perform backups and restores of Exadata, you must follow the instructions for Oracle RAC environments in this administration guide.

If the Oracle Exadata database servers are connected to a NetWorker remote storage node, then the following requirements apply to the connection:

- The only supported protocol is IP, over InfiniBand or other networks like Ethernet. Native InfiniBand or any protocol other than IP is not supported.
- There could be multiple network interfaces on the Oracle Exadata database servers to the storage node, such as one for an InfiniBand connection and one for an Ethernet connection. In such a case, you must configure the network settings and the NetWorker Client resource to send the backup data from the Oracle Exadata server to the remote storage node over the preferred network, such as InfiniBand. The configuration details are available in the NetWorker documentation.

Configuration wizard

NMSAP supports the scheduled backup configuration wizard, integrated with NMC.

If the configuration wizard supports your environment, use the wizard when possible to create a backup configuration. "Wizard limitations" on page 32 describes the types of backups and environments that the wizard does not support.

Configurations made with the wizard are not saved as client-side parameters and configuration files, but are saved as client attributes on the NetWorker server. The wizard can use the NMSAP parameters and configuration files used with earlier NMSAP releases as input templates to generate a new wizard configuration.

You can optionally save the backup settings created with the wizard to an NMSAP parameter file (init*DBSID*.utl) and configuration file (nsrsapsv.cfg) on the NMSAP client host. You can use these files for diagnostic or reference purposes.

Configuration conversion

NMSAP supports the conversion of an NMSAP client-side configuration to a wizard configuration.

"Converting client-side configurations to wizard configurations" on page 34 describes how to use the the **nsrsapadm -W** command to convert an NMSAP client-side configuration to a wizard configuration.

Simplified scheduled backup configuration of multiple databases

NMSAP supports the scheduled backup of multiple databases on the same client host by using a single NetWorker Client resource.

When you configure a scheduled backup without the wizard, you can specify multiple databases in the Save Set attribute of a single Client resource as described in "Save Set" on page 38. You do not need to configure a separate Client resource for each database.

When you use a single Client resource for multiple databases, you also use a single NMSAP configuration file, nsrsapsv.cfg, and specify unique parameter settings for each database. You can still use multiple init*DBSID*.utl files for the backup.

The Parallelism attribute in the NetWorker Client resource or Group resource determines whether NMSAP backs up the multiple databases simultaneously or sequentially. The *EMC NetWorker Administration Guide* provides details about the NetWorker client and savegrp parallelism.

Virtualization support

NMSAP supports several types of virtualization software, such as VMware, Solaris zones, Microsoft Hyper-V, and so on. The *EMC NetWorker Software Compatibility Guide* at EMC Online Support provides a full list of supported environments and platforms.

Note: You must install NMSAP in a guest operating system.

VMware support

NMSAP supports regular backups and restores of SAP Oracle databases on a VMware virtual machine (VM) on an ESX server.

NMSAP also supports the following advanced features of a VMware ESX server:

- VMotion—The VMotion feature enables migration of virtual machines from one ESX server to another while the servers are on. The migration is seamless to the applications that run on the virtual machines so users do not experience disconnections. The backup or restore remains uninterrupted if a migration occurs during an NMSAP backup or restore. VMware documentation describes the virtual machine requirements for VMotion.

- Distributed Resource Scheduler (DRS)—The DRS feature enables dynamic balancing and allocation of resources across multiple ESX servers. Depending on the DRS policies set by the user, the DRS can migrate a virtual machine or recommend that users migrate a virtual machine to a different ESX server by using VMotion. DRS can also start (at boot-up) a virtual machine on a different ESX server. If a migration occurs during an NMSAP backup or restore, the backup or restore remains uninterrupted because this feature uses VMotion.
- High Availability (HA)—The HA feature enables the restart of VMware on the same ESX server, on a different ESX server, or on a physical machine, depending on the type of VMware cluster configured. During a restart, users are disconnected and must reconnect.

  If a restart occurs during an NMSAP backup or restore, the backup or restore fails.

  - You must manually restart a manual backup or restore when the guest operating system restarts.
  - For a scheduled backup, the NetWorker server retries the backup if the Client Retries attribute in the Group resource is set to a non-zero value.

Solaris zones support

NMSAP supports Solaris global zones, whole root zones, and sparse root zones. The *EMC NetWorker Module for SAP with Oracle Installation Guide* provides installation details for sparse root zone environments.

Internationalization

NMSAP provides internationalization (I18N) support that enables you to monitor, back up, and restore non-ASCII data from NMSAP clients. For example, a NetWorker server with an ASCII locale can view and manage backups from an NMSAP client with a Chinese locale. Also, a NetWorker server with a Chinese locale can view and manage backups from an NMSAP client with an ASCII locale.

Note: I18N support is distinguished from localization (L10N) support, in which the software user interface and operational messages are translated into localized languages. This NMSAP release does not provide L10N support.

I18N support assumes the use of NMSAP with the following I18N products:

- Internationalized operating system
- Unicode version of BR*Tools
- NetWorker server and client that support I18N

Note: NMSAP support of non-ASCII environments is limited by the I18N support provided by Oracle, BR*Tools, the NetWorker client, and the underlying operating system.

You must configure I18N support according to "Configuring I18N support" on page 29.

Support of non-ASCII characters

The NMSAP client supports non-ASCII characters for the following items:

- Full pathnames of the parameter file and configuration file, for example, init*DBSID*. utl.
- Full pathnames of the operational log files, for example, SAPBACKUP and SAPTRACE.
- Full pathnames of variables set in the nsrsapsv.cfg file, for example, PATH, SAP_BIN, SAPTRACE, and SAPSWITCH.
- Most strings passed as command-line options to the NMSAP programs **nsrsapadm**, **nsrsapsv**, **sapclone**, and **backint**. Exceptions are the Oracle username and password, which is an Oracle limitation, and the full pathname of the NMSAP scheduled backup configuration file (nsrsapsv.cfg), which is a NetWorker server limitation. "ASCII-only characters" on page 24 provides details.
- All NetWorker parameters that the NetWorker software supports.
- Environments configured by the scheduled backup wizard.

Note: The NLS_LANG=AMERICAN.AMERICA.US7ASCII parameter value is an example value or default value. This parameter setting occurs in the sample backup configuration file (nsrsapsv.cfg) shipped with the product or generated by the NMSAP wizard. You can change this setting to another value. The SAP documentation describes how to set the NLS_LANG parameter.

ASCII-only characters

Some Oracle, BR*Tools, and NetWorker software configuration settings that are used with the NMSAP client do not support I18N and must use ASCII characters. Read the appropriate product documentation for complete details. Examples include:

- Oracle requires ASCII characters for the following items:
  - ORACLE_HOME environment variable
  - Oracle database instance name *DBSID*
- BR*Tools requires ASCII characters for the following items:
  - Connection strings (database username and password) to the SAP Oracle database
  - Oracle datafiles, log files, control files, parameter file names
  - Oracle tablespace names
  - SAPARCH, SAPBACKUP, SAPCHECK, and SAPREORG variable settings in the nsrsapsv.cfg file
- NetWorker software and NMSAP require ASCII characters for the following items:
  - NetWorker client, server, pool, group, expiration policy, and email notification parameters, which are set in the NMSAP parameter file (init*DBSID*.utl)
  - NMSAP scheduled backup configuration file (nsrsapsv.cfg) pathname, which is passed to the Backup Command attribute in the NetWorker Client resource

NMSAP and associated software

NMSAP works with different types of software in an NMSAP environment: NetWorker, NetWorker PowerSnap Module, EMC Replication Manager, SAP server, Oracle server.

NetWorker software

The NetWorker software provides services to protect an enterprise against data loss. The basic NetWorker products include the NetWorker server, client, storage node, and the NetWorker Management Console (NMC).

NetWorker client release 8.1 or later includes the NetWorker Snapshot Management (NSM) feature that integrates and replaces the previous stand-alone NetWorker PowerSnap Module. NMSAP can use PowerSnap or NSM to create a snapshot (point-in-time) copy of SAP Oracle data on a client host, which serves as an instant backup. NMSAP can then back up the snapshot to a conventional storage medium.

NetWorker PowerSnap Module software

With NetWorker client release 8.0.*x* or earlier, NMSAP can work with the NetWorker PowerSnap Module software to provide a high-availability storage environment as described in the preceding section.

Note: After an upgrade to NetWorker client release 8.1 or later, you can use NMSAP with NSM to recover NMSAP backups performed with the PowerSnap Module.

EMC Replication Manager software

NMSAP can work with EMC Replication Manager (RM) to provide support for BR*Tools split-mirror backups. RM creates a replica of production data stored on an EMC storage array, such as Symmetrix or CLARiiON, which NMSAP can back up to conventional storage.

SAP server software

The SAP server software includes the BR*Tools utilities, used by NMSAP for the backup, restore, and inquiry of the SAP Oracle databases. BR*Tools consist of **brbackup**, **brarchive**, **brrecover**, **brrestore**, and other utilities.

Oracle server software

The Oracle software includes the RMAN utilities for backup, restore, and inquiry operations. The use of RMAN with NMSAP and BR*Tools software is optional because you can use the NMSAP **backint** program as the sole backup and restore software.

If you configure RMAN to back up SAP Oracle databases, the **backint** program will additionally back up the SAP configuration files, logs, and other files that RMAN does not back up. "Choosing either backint or RMAN as the backup and restore utility" on page 29 provides details.

NMSAP software components

Table 1 on page 26 lists the NMSAP software components referred in this guide. On Microsoft Windows systems, most of these files are in the directory *NetWorker_install_directory*\nsr\bin.

Table 1 NMSAP and associated software components

Component	Description
backint[**.exe**]	NMSAP program interface to SAP BR*Tools, which provides backup, restore, and inquire functionality.
init.utl	Configuration file template that specifies the variables used by the **backint** program for manual backups and restores, and for scheduled backups that are not configured through the wizard. Copy this template file and name it init*DBSID*.utl, where *DBSID* is the name of the SAP Oracle database instance to be backed up.
libnworasap.*xx* (UNIX) orasbt.dll, **nsrsbtcnsap.exe** (Windows)	RMAN media management utilities.
nsrsapsv[**.exe**]	Scheduled backup program that invokes the appropriate BR*Tools executables.
nsrsapsv.cfg	Configuration file template for the **nsrsapsv** scheduled backup program for backups that are not configured through the wizard. Copy this template file and save the original file with its default settings. On UNIX, this file is in the /etc directory.
nsrsapadm[**.exe**]	Binary or executable program that converts an old-style configuration of a scheduled backup to a new-style configuration, which you can modify with the wizard. You can also use this program to encrypt login information in the nsrsapsv.cfg file for the user who performs a scheduled backup.
nsrsapprobe[**.exe**]	Program that probes for the number of generated archived logs as a condition that triggers a probe-based backup.
sapclone[**.exe**]	Save set cloning program that provides an interface to the NetWorker **nsrclone** program.
nsrsapra[**.exe**] **nsrsaprachild**[**.exe**] sapra.jar sapra_res.jar	NMSAP scheduled backup configuration wizard files.
nwsldreg.xml	SAP Solution Manager registration file.
man pages (UNIX only)	Reference for NMSAP commands.

CHAPTER 2
Software Configuration

This chapter includes the following topics:

- Verifying the NMSAP software requirements 28
- Configuring I18N support 29
- Choosing either backint or RMAN as the backup and restore utility 29
- Configuring scheduled backups with the wizard 31
- Converting client-side configurations to wizard configurations 34
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- Configuring manual backups 38
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- Configuring Data Domain Boost backups 43
- Configuring NMSAP backups to AFTD storage on Windows 46
- Configuring probe-based backups 47
- Configuring backup email notifications 50

Verifying the NMSAP software requirements

You must verify that the NMSAP software environment meets the basic requirements.

1. You have correctly installed and configured the Oracle software and SAP software before you configure the NMSAP environment.

   The appropriate Oracle and SAP documentation provides instructions.

   Note: You can recover only datafiles for which you had read permission on the operating system when you backed up the datafiles.
   Grant read access to the datafiles to a DBA operating system group. Granting the read access enables the restore of the data by a different user or to a different host.

2. You have installed and enabled the NetWorker client software and NMSAP on each SAP Oracle server requiring backup and recovery services.

   The platform-specific NetWorker installation guide and the *EMC NetWorker Module for SAP with Oracle Installation Guide* provide instructions.

3. You have correctly linked the NMSAP RMAN management library/utility if you use the BR*Tools RMAN feature on UNIX.

   The *EMC NetWorker Module for SAP with Oracle Installation Guide* provides details.

4. The NMSAP **backint** executable is in the same directory as BR*Tools, or you have set util_path=*full path to directory containing **backint*** in the BR*Tools initialization profile init*DBSID*.sap with BR*Tools 7.10 or later.

   You have set the owner of **backint** to root on UNIX.

5. You have set the uid bit for the **backint** program if you will restore to raw device files on UNIX. You can set the uid bit for **backint** by typing the following command:

   ```
   chmod 4755 backint
   ```

   Note: In rare cases, you must set the uid bit to enable restores to file systems on UNIX.

6. You have granted the NetWorker server User Group resource privileges to the SAP user who performs the NMSAP operations. You can set the User Group resource with NMC or the **nsradmin** program.

   The SAP user requires specific privileges:

   - To run backups and restores requires only the following default privileges:
     - Monitor NetWorker
     - Back Up Local Data
     - Recover Local Data
   - To review backup information in NetWorker indexes, for example, with the **nsrinfo** and **mminfo** commands requires the Operate NetWorker privilege.
   - To configure a backup or to convert a backup configuration with **nsrsapadm** requires the Configure NetWorker privilege.

7. You have ensured NMSAP connectivity if you use a firewall. You must configure the corresponding ports for the NetWorker server as required.

   The *EMC NetWorker Administration Guide* provides details.

The *EMC NetWorker Software Compatibility Guide* describes the compatibility of NMSAP with other products.

Configuring I18N support

"Internationalization" on page 23 describes the internationalization (I18N) features that NMSAP supports. You must meet the I18N requirements and complete any configuration steps to enable NMSAP I18N support.

Requirements for I18N support

NMSAP I18N support requires the following I18N products:

- Internationalized operating system
- Unicode version of BR*Tools
- NetWorker server and client that support I18N

The NetWorker documentation describes the NetWorker I18N requirements.

Note: The I18N support provided by Oracle, BR*Tools, the NetWorker client, and the underlying operating system limits the NMSAP support of non-ASCII environments.

"Internationalization" on page 23 and the *EMC NetWorker Module for SAP with Oracle Release Notes* provide more information.

Configuring I18N support on UNIX

To configure I18N support of the NMSAP client host on UNIX only:

1. Log in as the root user.
2. Shut down the NetWorker services.
3. Set the LC_ALL environment variable to the appropriate locale.

   For example, in a Japanese locale on Solaris, set LC_ALL as follows:

   ```
   # nsr_shutdown
   # export LC_ALL=ja_JP.eucJP
   # /etc/init.d/networker start
   ```

4. Restart the NetWorker services.

Choosing either backint or RMAN as the backup and restore utility

The SAP BR*Tools software coordinates all the backup, restore, and inquiry operations of SAP Oracle data. You can configure the BR*Tools software to use either the NMSAP **backint** program or the Oracle RMAN program with the NMSAP RMAN media management library to perform these operations. The following examples describe how you can specify the program to use.

In addition to backing up Oracle data, the **brbackup** and **brarchive** programs back up the BR*Tools profiles, log files, and backup catalogs required for disaster recovery. NMSAP operations always use **backint** to back up and restore these files, regardless of the method selected for Oracle data backups and restores. Therefore, even if you use RMAN for an Oracle backup, you must configure the same backup for **backint** operations to ensure that the backup succeeds.

Specifying backint as the backup and restore utility

If you want to use the NMSAP **backint** program for backup, restore, and inquiry operations for your Oracle database, you must create a BR*Tools initialization profile with the required settings.

1. With a text editor, open the BR*Tools initialization profile init*DBSID*.sap, usually located in the following directory:
   - On UNIX or Linux: $ORACLE_HOME/dbs
   - On Microsoft Windows: %ORACLE_HOME%*DATABASE*
2. Set the backup device type parameter to use the **backint** program by specifying one of the following settings:

   ```
   backup_dev_type = util_file
   ```
   or
   ```
   backup_dev_type = util_file_online
   ```

   Note: You must set backup_dev_type = util_file_online for online backups to decrease the amount of time each tablespace remains in hot backup mode, resulting in a smaller number of generated transaction logs.

3. Set the util_par_file parameter to use the NMSAP parameter file, init*DBSID*.utl:
   - On UNIX or Linux:

     util_par_file = ?/dbs/init*DBSID*.utl

     where ? is $ORACLE_HOME
   - On Microsoft Windows:

     util_par_file = ?\database\init*DBSID*.utl

     where ? is %ORACLE_HOME%

"Configuring the backint parameter file" on page 110 describes how to configure the parameter file. The appropriate SAP documentation describes how to use the **backint** program.

Specifying RMAN as the backup and restore utility

If you want to use the Oracle RMAN utility with the NMSAP media management library for backup, restore, and inquiry operations for your Oracle database, you must create a BR*Tools initialization profile with the following settings.

1. With a text editor, open the BR*Tools initialization profile init*DBSID*.sap, usually located in the following directory:
   - On UNIX or Linux: $ORACLE_HOME/dbs
   - On Microsoft Windows: %ORACLE_HOME%\D*ATABASE*
2. Set the backup device type parameter to use the RMAN program:

   ```
   backup_dev_type = rman_util
   ```

   The rman_util value ensures that the NMSAP RMAN interface backs up the Oracle database data and the NMSAP **backint** interface backs up the BR*Tools metadata (configuration files, backup catalog, and so on).

   Note: Do not use the rman_disk or rman_stage value because these values cause BR*Tools to back up the metadata without using NMSAP and NetWorker.

3. Uncomment the line for the rman_send parameter and set the parameter to include each NetWorker (NSR_*) parameter that is appropriate for the backup, restore, and inquiry sessions.

   "NMSAP parameters for RMAN backups and restores" on page 124 describes these parameters. Use the following syntax:

   ```
   rman_send="NSR_ENV=(var1=value1, var2=value2, ...)"
   ```

   For example, this setting sends the same value to all the allocated channels:

   ```
   rman_send="NSR_ENV=(NSR_DEBUG_LEVEL=9, NSR_SERVER=bu-libra)"
   ```

   This setting sends the channel-specific values:

   ```
   rman_channels=2
   rman_send=("channel sbt_1
   'NSR_ENV=(NSR_DATA_VOLUME_POOL=pool_name_1)'",
   "channel sbt_2 'NSR_ENV=(NSR_DATA_VOLUME_POOL=pool_name_2)'")
   ```

The SAP documentation describes how to use the BR*Tools with RMAN program for backup and restore operations.

Configuring scheduled backups with the wizard

The wizard is a Java application that runs from the NetWorker Management Console (NMC). The configurations for scheduled backups created with the wizard are stored on the NetWorker server.

"Configuring scheduled backups without the wizard" on page 35 describes the non-wizard method of configuring a scheduled backup.

Wizard workflows

The wizard provides the option of a typical configuration or a custom configuration, depending on the amount of detail needed for specific scheduled backup configurations.

The typical workflow enables you to configure a backup with fewer clicks by using default backup settings. The typical configuration configures a full offline back up of the whole database.

The custom configuration enables you to perform the following tasks:

- Use an existing NMSAP parameter file, init*DBSID*.utl, and configuration file, nsrsapsv.cfg, as initial input to the wizard configuration.
- Customize the backup options, for example, to configure these settings:
  - Number of NMSAP backup sessions to use
  - Specific database objects to back up
  - Online backup to run
  - Backup level
  - Additional backup parameters
- Extract the created wizard configuration to a client-side parameter file (init*DBSID*.utl) and configuration file (nsrsapsv.cfg).

Wizard limitations

The wizard has the following limitations:

- You must configure some NetWorker resources and settings outside of the wizard with the NMC program, for example:
  - Device resources
  - Media Pool resources
  - Deduplication Node resource
  - NetWorker user privileges

  "Configuring scheduled backups without the wizard" on page 35 provides details.
- The wizard does not support the configuration of these backups:
  - RMAN backups
  - Snapshot backups (with PowerSnap or NSM)
  - Split-mirror backups (with EMC Replication Manager software)
  - Probe-based (event-based) backups

Wizard requirements

Before you use the wizard, ensure that you meet all the following requirements:

- You have installed the required NetWorker releases on the NMC server, NetWorker server, and NMSAP client hosts as described in the *EMC NetWorker Module for SAP with Oracle Release Notes* and the *EMC NetWorker Software Compatibility Guide*.
- On the NetWorker server where the configuration exists, the NMC user that starts the wizard (the wizard user) has the Configure NetWorker privilege and all its prerequisite privileges.

- Communication between the NMC server, NetWorker server, and NMSAP client uses **nsrauth** authentication. The NetWorker documentation provides the requirements for **nsrauth** authentication.

Configuring a scheduled backup with the wizard

You can create or modify a scheduled backup configuration with the NMSAP wizard.

1. Correctly configure the NMSAP software environment as described in "Verifying the NMSAP software requirements" on page 28.
2. In the NMC **Enterprise** view, select the NetWorker server name and double-click the **NetWorker** application to launch the application.
3. In the **Configuration** view under the NetWorker server name, select **Clients**:
   - To create a NetWorker Client resource for NMSAP, right-click **Clients** and select **Client Backup Configuration** › **New**.
   - To modify a NetWorker Client resource previously created with the wizard for NMSAP, right-click the client name and select **Client Backup Configuration** › **Modify**.
4. On each wizard page that appears, specify the options and values required for the backup configuration.

   You can click a link in the wizard steps panel to go directly to the page you want to modify. The number of steps shown in the steps panel varies according to the chosen configuration type.
5. If you use the wizard to modify a configuration and you select to change a database user's password or OS user's password, the wizard enables you to apply that password change to other backup configurations with the same credentials. The feature facilitates easy password changes across different server-side configurations as follows:
   - If you use database authentication on the client host and you select to change the password for a specific database (Net service name) and database username, the password change is applied to all the backup configurations that use the same database and username on the host.

     Note: If you use the same username for different databases on the same host, you can select an option to apply the same password change to all the backup configurations of all the databases with that username.
   - If you select to change the password for a specific OS username, the password change is applied to all the NMSAP backup configurations that use the same OS username on the host.
6. On the last wizard page named **Review and Accept the Client Configuration**, click **Create** or **Modify** to create or modify the configuration, and click **Finish** to exit the wizard.

Converting client-side configurations to wizard configurations

NMSAP with the supported NetWorker server and client software enables the conversion of scheduled backup settings from NMSAP client-side files, init*DBSID*.utl and nsrsapsv.cfg, to attributes on the NetWorker server that are used by the NMSAP wizard. After a conversion, you can only modify and update the configuration by using the wizard.

NMSAP can run scheduled backups by using either the wizard configurations or the client-side parameter file and configuration file.

Note: Manual backups performed with NMSAP require the use of the client-side parameter file and configuration file.

The conversion method uses the **nsrsapadm** utility to convert NMSAP 3.0.2 or later scheduled backup settings to the new wizard settings. This utility reads the backup parameter file and configuration file on the NMSAP client host. The utility then stores the converted settings on the NetWorker server. The utility changes the scheduled backup command specified in the NetWorker Client resource from **nsrsapsv -f** *file_name* to **nsrsapsv**.

To convert a configuration with the **nsrsapadm** utility, perform the following steps on each SAP Oracle client to be backed up by the NetWorker server:

1. Log in to the SAP Oracle client as the user with the Configure NetWorker privilege on the NetWorker server.
2. Ensure that you have installed the NetWorker client software and NMSAP on the SAP Oracle client, and specified the client as a NetWorker Client resource on the NetWorker server.
3. On the SAP Oracle client operating system command line (UNIX or Linux) or command prompt window (Windows), run the following command:

   ```
   nsrsapadm -W -s server_name [-c client_name] [-g group_name]
   [-N save_set_name]
   ```

   where:

   - **-W** specifies the conversion mode.
   - **-s** *server_name* specifies the NetWorker server on which the configuration will be saved and run.
   - **-c** *client_name* specifies the NetWorker Client resource that has the backup settings to be converted. If not specified, the default value is the hostname of the physical host where the **nsrsapadm** command runs. You must set this option to the virtual client name for cluster environments.
   - **-g** *group_name* specifies the NetWorker Group resource of the client being converted. If used, the group must already exist.
   - **-N** *save_set_name* specifies the save set name used in the Client resource.

   For example, the following command converts all the Client resources for the NMSAP physical host, located on the NetWorker server my.server.com, which have the Save Set attribute set to backint:SAP1:

   ```
   nsrsapadm -W -s my.server.com -N backint:SAP1
   ```

Configuring scheduled backups without the wizard

As an alternative to the wizard configuration, you can create or modify a scheduled backup configuration by performing these tasks:

- Manually creating the NMSAP parameter file and configuration file
- Setting the NetWorker Client resources directly in the NMC program

The NMC interface also provides NetWorker Group, Device, Media Pool, and other resource settings that are not available in the wizard.

Configuring the NMSAP parameters without the wizard

1. Ensure that you have correctly configured the NMSAP software environment as described in "Verifying the NMSAP software requirements" on page 28.
2. On the NMSAP client, copy the init.utl and nsrsapsv.cfg template files (supplied with the NMSAP installation) with new names for the database instance, and configure the files for the backup.

   Appendix A, "NMSAP Parameter Files and Configuration Files," provides configuration details.
3. Encrypt the SAP operating system username and the password, and if required, the Oracle database username and password:

   a. On the NMSAP client, log in as root or administrator and type the following NMSAP command:

   ```
   nsrsapadm -P -z file_name
   ```

   where *file_name* is the full pathname of the NMSAP backup configuration file (nsrsapsv.cfg) used for the backup.

   b. Follow the prompt instructions for the encryption.

   The configuration file is updated with the encrypted password authorizations.

   Note: You must set the Oracle database username and the password for probe-based backups. "Configuring a probe-based backup" on page 47 provides details.

4. On the NMSAP client, configure the BR*Tools initialization profile init*DBSID*.sap with the following parameters:

   - Backup device type (backup_dev_type)
   - Backup utility configuration file (util_par_file)

   "Choosing either backint or RMAN as the backup and restore utility" on page 29 provides details.

Configuring the scheduled backup resources without the wizard

On the NetWorker server, you can configure a NetWorker Client resource and other scheduled backup resources in the NMC program, without using the wizard.

1. In the NMC **Enterprise** view, select the NetWorker server name, and double-click the **NetWorker** application to launch it.
2. In the **Configuration** view under the NetWorker server name, select the appropriate backup resources to configure, such as **Groups**, **Schedules**, **Clients**, and so on. For example:
   - To create client, right-click **Clients** and select **New**.
   - To modify an existing NMSAP client, double-click the client name to open its **Properties** window.

   On each of the properties tabs, specify the appropriate options and values for the backup configuration.
3. Configure the NetWorker Group, Schedule, and other NMC resource settings for scheduled NMSAP backups. The *EMC NetWorker Administration Guide* and online help provide details about the NetWorker resources.
   - Schedule resource—Create or select a Schedule resource to specify the days of the week when the scheduled backup runs.
   - Group resource—Create or select a Group resource to apply to a group of NetWorker clients that will start to back up data at a scheduled time. Set **Autostart** to **Enabled**. You can apply a Group resource as an attribute to a NetWorker Client resource and a NetWorker Media Pool resource.

     Note: In the Group resource, if you enable the Clones attribute and set the Clone Mode to “Start on each save set completion” (a new option with the NetWorker 8.1 server), then NMSAP backups ignore the Clone Mode setting. The clone operation does not start until after the group completion for the NMSAP backups.

   - Device resources—Configure a NetWorker Device resource for each supported storage device used for backup and restore operations.
   - Media Pool resources—Configure the volumes in each NetWorker Media Pool resource to receive specific types of backup data, such as tablespaces or archived logs. When configuring the Media Pool resources, leave the **Save Sets** attribute blank. The NMSAP program sets the **Save Sets** during each backup session.
   - Client resource—Specify a NetWorker Client resource for each SAP Oracle server (NMSAP client) that requires backup, restore, and inquiry services.

     Table 2 on page 37 describes the Client resource attributes that are applicable to NMSAP operations.

Table 2 NetWorker Client resource attributes for NMSAP scheduled backups (page 1 of 2)

Attribute	NMC tab	Description
Aliases	Globals	Specifies all known aliases for the NMSAP host.
Backup Command	Apps & Modules	Specifies the name of the command to be used for an NMSAP scheduled backup, either: **nsrsapsv** which is configured by the wizard only and cannot be manually set or **nsrsapsv -f** *file_pathname* which uses the settings of the NMSAP configuration file (nsrsapsv.cfg), where *file_pathname* is the full pathname of the NMSAP configuration file created on the NMSAP client host as described in "Configuring the NMSAP parameters without the wizard" on page 35. The pathname can contain only ASCII characters and can be no longer than 64 characters. Following is the default pathname: • On Microsoft Windows: *NetWorker_install_directory*\nsr\res\nsrsapsv*DBSID*.cfg • On UNIX: /nsr/res/nsrsapsv*DBSID*.cfg If the pathname contains spaces, you might need to add quotes around the pathname and add an extra backslash after each backslash, for example, "C:\\Program Files\\dir\\file".
Browse Policy	General	Specifies the length of time that the NetWorker server retains an entry for the backup in the online client file index.
Checkpoint enabled	General	When selected, enables a restartable backup.
Checkpoint granularity	General	This attribute is ignored by all NMSAP operations.
Client Direct	General	When selected, enables the Client Direct feature for a scheduled backup to a DD Boost device or AFTD. If a Client Direct backup is not possible, the backup routes the data through the storage node instead of sending the data directly from the client to the storage device. **Note:** This attribute is only available with NetWorker server release 8.0 or later.
(Avamar) Deduplication Backup	Apps & Modules	When selected, enables a deduplication backup to Avamar. **Note:** You cannot select this attribute together with the Data Domain Backup attribute.
(Avamar) Deduplication Node	Apps & Modules	Specifies the hostname of the Avamar server that will store the deduplicated backup.
Data Domain Backup	Apps & Modules	When optionally selected, ensures that the deduplication backup is always stored on a DD Boost device when the backup pool contains a mixture of DD Boost devices and other types of devices. **Note:** You cannot select this attribute together with the (Avamar) Deduplication Backup attribute.
Data Domain Interface	Apps & Modules	Specifies the interface over which the backup will occur to a Data Domain device. This option is used only when you enable Data Domain Backup for the client. NMSAP supports the IP interface only. If you select **IP** or **Any**, then the backup will occur over the IP interface. If you select **Fiber Channel**, then the backup will fail. **Note:** This attribute is only available with NetWorker server release 8.1 or later.
Directive	General	Leave blank. NMSAP does not support global directives.

Table 2 NetWorker Client resource attributes for NMSAP scheduled backups (page 2 of 2)

Attribute	NMC tab	Description
Group	General	Specifies the NetWorker Group resource to use for an NMSAP scheduled backup.
Name	General	Specifies the hostname of the SAP server host where the NMSAP software is installed.
Parallelism	Globals	Specifies the maximum number of concurrent backup and restore sessions to use for a backup operation. You can use this Client resource attribute instead of the parallelism setting in the parameter file or the wizard configuration.
Pool	Globals	Specifies the pool to use for a backup. When selected, this attribute overrides the pool associated with the backup group.
Remote Access	Globals	Specifies the SAP user and fully qualified hostname (IP) of a remote host, used to enable backups in a cluster environment and restores of the backups to that remote system. • For a cluster backup, specifies *sap_user@physical_host* for each physical host in the cluster. • For restore of a backup from this host to a different destination host, specifies *sap_user@different_host*.
Remote User, Password	Apps & Modules	Recommended for backups on Microsoft Windows systems. Not required on UNIX systems. These attributes specify the SAP user's operating system username and password.
Retention Policy	General	Specifies the minimum length of time that must elapse before backed-up data is eligible to be overwritten on the backup media.
Save Set	General	Specifies the database to be backed up. Use the following format for the save set name: backint:*DBSID* For a client-side scheduled backup that you configured without the wizard, you can optionally specify multiple database instances on separate lines: backint:*DBSID1* backint:*DBSID2* where *DBSID1* and *DBSID2* are different database instances on the same SAP Oracle client. You can specify unique parameter settings for each database instance by grouping the parameter settings within braces in the nsrsapsv configuration file as described in "Configuring the nsrsapsv configuration file" on page 118.
Schedule	General	Specifies the NetWorker Schedule resource to use for an NMSAP scheduled backup.

Configuring manual backups

1. Complete all the steps described in "Verifying the NMSAP software requirements" on page 28.
2. Configure the NMSAP parameter file, init*DBSID*.utl, with the settings for the appropriate NetWorker server and the other backup parameters.

   "Configuring the backint parameter file" on page 110 provides details.
3. Set these parameters in the BR*Tools initialization profile init*DBSID*.sap:

   - Backup device type (backup_dev_type)
   - Backup utility configuration file (util_par_file)

   "Choosing either backint or RMAN as the backup and restore utility" on page 29 provides details.

Configuring restartable backups

You can configure a scheduled restartable backup or a manual restartable backup for an NMSAP client.

You can configure a scheduled restartable backup either with the wizard or without the wizard. If you do not use the wizard, you must use individual settings in the NMC program.

Configuring scheduled restartable backups with the wizard

To configure a scheduled restartable backup with the wizard, follow the instructions in "Configuring scheduled backups with the wizard" on page 31 and perform the following additional steps:

1. On the **Specify Backup Type and Data Options** page, select the **Checkpoint enabled** checkbox.
2. On the **Specify Performance and Other Options** page:
   a. Set the parallelism to the required value for the backup, which should be less than the number of files to be backed up.
   b. Set the **Number of Save Sets** field to a value greater than the parallelism.
3. To enable the automatic restart of a failed backup, use the NMC program to set the Client Retries attribute in the Group resource to a value greater than zero.

   Note: If you do not enable automatic restart of a failed backup, you must restart the backup manually through the group restart option.

Configuring scheduled restartable backups without the wizard

To configure a scheduled restartable backup without the wizard, follow the instructions in "Configuring scheduled backups without the wizard" on page 35 and perform the following additional steps:

1. On the **General** tab in the Client resource, select the **Checkpoint enabled** checkbox.

   Note: NMSAP ignores the Checkpoint Granularity attribute during a checkpoint restartable backup. Changing the attribute setting has no impact on the NMSAP backup.

2. In the **backint** configuration file init*DBSID*.utl, set the following parameters:
   - Set **parallelism** to the required value for the backup, which should be less than the number of files to be backed up.
   - Set **savesets** to a value greater than the parallelism.
   - Set **ss_group_by_fs** to FALSE.

   "NMSAP backint parameters" on page 110 describes these **backint** parameters and how to set them.

3. To enable the automatic restart of a failed backup, set the Client Retries attribute in the Group resource to a value greater than zero.

   Note: If you do not enable automatic restart of a failed backup, you must restart the backup manually through the group restart option.

Configuring manual restartable backups

To configure a manual restartable backup, set the required parameters in the **backint** configuration file init*DBSID*.utl as described in step 2of the "Configuring scheduled restartable backups without the wizard" on page 39.

"Restarting failed manual backups" on page 57 describes how to restart a failed manual backup.

Configuring Avamar deduplication backups

You must follow the requirements, best practices, and configuration procedures for a deduplication NMSAP backup with Avamar.

Chapter 6, "Cluster and Oracle RAC Configurations," describes additional steps for deduplication backup configuration in cluster and RAC environments.

Requirements for Avamar deduplication backups

You must meet the following requirements for an Avamar deduplication backup:

- The NetWorker client and server releases support deduplication. The *EMC NetWorker Software Compatibility Guide* at EMC Online Support provides details.
- Install and configure the Avamar server as a NetWorker deduplication node. The *EMC NetWorker Administration Guide* provides details.
- Configure the NetWorker backup device, which receives only the backup metadata during the NMSAP deduplication backup, as an advanced file type device (AFTD). The *EMC NetWorker Administration Guide* and release notes provide details.

Best practices for Avamar deduplication backups

The benefits of deduplication depend on the environment. Deduplication can be beneficial in a data warehouse environment where the data does not change frequently. Deduplication can also be beneficial for databases where only a small percentage of data is updated repeatedly, or where new data is added to a database but the old data does not change much.

The following practices can improve the deduplication backup performance:

- After you select an Avamar server as the deduplication node for an initial full backup of a client, continue to use that same node for all backups of the client. This practice takes advantage of the client deduplication information stored on the node.
- Do not use deduplication for RMAN incremental backups. Because only data blocks that have changed are backed up, incremental backups result in a low rate of duplication and the benefit is likely to be insignificant.

- Do not include a deduplication client in the same Group resource as non-deduplication clients.
- Depending on computer resources, avoid setting backup parallelism to more than four.
- Schedule deduplication backups to avoid the Avamar server read-only periods. An Avamar server spends periods of time in maintenance mode, where the server might be unavailable for backup or have limited bandwidth.

  Note: A deduplication NMSAP backup that runs during a maintenance period might become suspended until the Avamar server resources become available.

- For RMAN backups only:
  - For database full backups, you can improve the deduplication ratio by not using RMAN multiplexing and by ensuring that the Oracle software does not concatenate data from different files in the same backup piece. To disable multiplexing and prevent concatenation, ensure that **rman_filesperset** is set to 1 in the BR*Tools initialization profile init*DBSID*.sap. The Oracle documentation describes RMAN multiplexing and the number of files in each backup set.
  - If you perform database incremental backups or archived log backups to Avamar, the Oracle software sends only the changed blocks. As a result, the deduplication ratio is typically low. To increase the backup throughput for these backups, set **rman_filesperset** to a larger value or do not set **rman_filesperset**. If you do not set **rman_filesperset**, then the Oracle software uses the default setting. The Oracle documentation provides more details about **rman_filesperset**.

The Avamar and NetWorker documentation describes the Avamar server and NetWorker requirements for deduplication backups.

Configuring scheduled Avamar deduplication backups with the wizard

You can configure a scheduled Avamar deduplication backup either with or without the wizard. This section describes the configuration procedure with the wizard.

1. Create a NetWorker Deduplication Node resource for the Avamar server.
2. Follow the instructions in "Configuring scheduled backups with the wizard" on page 31 and perform the following additional steps:
   a. On the wizard page for deduplication options, select the Avamar deduplication backup and the deduplication node (Avamar server).
   b. On the **Specify Log Files Locations and Additional Options** wizard page, in the table, set the NSR_NWPATH parameter to the location of the NetWorker client.
   c. For typical operations, use the default settings for cache usage and chunk size. However, if non-default settings are required, set the following parameters in the table on the **Specify Log Files Locations and Additional Options** wizard page:
      - NSR_DEDUP_CACHE_ENABLED
      - NSR_DEDUP_CHUNK_SIZE
      - NSR_DEDUP_CACHE_TAG

Appendix A, "NMSAP Parameter Files and Configuration Files," describes these parameters.

Configuring scheduled Avamar deduplication backups without wizard

You can configure a scheduled Avamar deduplication backup either with or without the wizard. The configuration procedure without the wizard uses individual settings in the NMC program.

1. Create a NetWorker Deduplication Node resource for the Avamar server.
2. Follow the instructions in "Configuring scheduled backups without the wizard" on page 35 and perform the following additional steps:
   a. In the Client resource for the NMSAP client host, set the Avamar deduplication backup flag and select the deduplication node (Avamar server).
   b. In the NMSAP parameter file init*DBSID*.utl set the NSR_NWPATH parameter to the location of the NetWorker client.
   c. For typical operations, use the default settings for cache usage and chunk size. However, if non-default settings are required, set the following parameters in the NMSAP parameter file init*DBSID*.utl:
      – NSR_DEDUP_CACHE_ENABLED
      – NSR_DEDUP_CHUNK_SIZE
      – NSR_DEDUP_CACHE_TAG

      Appendix A, "NMSAP Parameter Files and Configuration Files," describes these parameters.

Configuring manual Avamar deduplication backups

You can include deduplication in a manual backup that uses the NMSAP **backint** program.

1. Create a NetWorker Deduplication Node resource for the Avamar server.
2. Create a NetWorker Client resource for the SAP Oracle host, set the Avamar deduplication backup flag, and select the deduplication node (Avamar server).
3. Edit the NMSAP parameter file init*DBSID*.utl with the following settings:
   - NSR_DEDUP_BACKUP = TRUE
   - NSR_DEDUP_NODE = *NetWorker_deduplication_node*
     This name must exactly match the Deduplication Node name selected in the Client resource.

Configuring deduplication backups with Avamar and Oracle RMAN

You can include deduplication in a scheduled backup or manual backup that uses the Oracle RMAN utility.

1. Create a NetWorker Deduplication Node resource for the Avamar server.
2. Create a NetWorker Client resource for the SAP Oracle host, set the Avamar deduplication backup flag, and select the deduplication node (Avamar server).

3. On the SAP Oracle server, edit the BR*Tools initialization profile init*DBSID*.sap and configure the rman_send parameter with the following settings.
   - NSR_DEDUP_BACKUP—Mandatory for manual backups only.
   - NSR_DEDUP_NODE—Mandatory for manual backups only.
   - NSR_DEDUP_CACHE_TAG—Mandatory for backup with more than one RMAN channel. Set this parameter to a different value for each channel.

   The following example shows an rman_send parameter configured for a manual deduplication backup:

```
rman_channels=2

rman_send=(
"'NSR_ENV=(NSR_DEDUP_BACKUP=TRUE,
    NSR_DEDUP_NODE=test.emc.com)'",
"channel sbt_1 'NSR_ENV=(NSR_DEDUP_CACHE_TAG=orcl10g_1)'",
"channel sbt_2 'NSR_ENV=(NSR_DEDUP_CACHE_TAG=orcl10g_2)'")
```

Appendix A, "NMSAP Parameter Files and Configuration Files," describes the parameters.

Configuring Data Domain Boost backups

You must follow the requirements, best practices, and configuration procedures in this section for a deduplication backup that uses only DD Boost devices. The content in this section does not apply to a deduplication backup that uses AFTD or VTL devices.

The NetWorker documentation describes how to configure a Data Domain backup to AFTD or VTL devices. "Configuring NMSAP backups to AFTD storage on Windows" on page 46 also describes how to configure a Client Direct backup to AFTD devices.

Requirements for DD Boost backups

Before you configure a Data Domain deduplication backup with a DD Boost device, ensure that the NetWorker client and server releases support the DD Boost device. The *EMC NetWorker Module for SAP with Oracle Release Notes* provides details.

NMSAP supports three types of configurations for Data Domain deduplication backups:

- Deduplication using Client Direct—This configuration eliminates the sending of data over the network between the NMSAP client and the storage node. The deduplicated data is sent directly from the NMSAP client to the DD Boost device.
- Deduplication on a remote storage node—This configuration decreases the amount of network traffic between the storage node and Data Domain system by sending only the unique blocks over the network. However, deduplication requires all the data to be sent over the network between the NMSAP client and the storage node.
- Deduplication on a local storage node (located on the NMSAP client)—This configuration has similar performance to deduplication using Client Direct. However, this configuration requires a storage node on the NMSAP client and additional memory resources.

Best practices for DD Boost backups

Deduplication backups and restores with a Data Domain system are preferable to those with an Avamar server for large databases with high data change rates. A daily change rate of more than 5 percent is a high change rate.

During planning and configuration of a deduplication backup, keep in mind these best practices that can improve the backup performance:

- Do not use database backup encryption or NMSAP backup encryption because the encryption decreases the data deduplication ratio.
- Do not use database backup compression or NMSAP backup compression because the compression decreases the data deduplication ratio.
- Use Client Direct access to a Data Domain device for backups and restores to eliminate data transfer between the NMSAP client and NetWorker storage node. However, using this feature requires an additional 24 MB of memory per data stream on the NMSAP client and also increases the NMSAP CPU usage.
- For RMAN backups only:
  - For database full backups, you can improve the deduplication ratio by not using RMAN multiplexing and by ensuring that the Oracle software does not concatenate data from different files in the same backup piece. To disable multiplexing and prevent concatenation, ensure that **rman_filesperset** is set to 1 in the BR*Tools initialization profile init*DBSID*.sap. The Oracle documentation describes RMAN multiplexing and the number of files in each backup set.
  - For database incremental backups or archived log backups, the Oracle software sends only the changed blocks. As a result, the deduplication ratio is typically low. To increase the backup throughput for these backups, set **rman_filesperset** to a larger value or do not set **rman_filesperset**. If you do not set **rman_filesperset**, then the Oracle software uses the default setting. The Oracle documentation provides more details about **rman_filesperset**.

Data Domain and NetWorker documentation describes the requirements for deduplication backups.

Configuring Client Direct with DD Boost backups

You can configure a scheduled backup or manual backup to a DD Boost device that deduplicates data on the NMSAP host and passes only unique data blocks directly to the device, bypassing the storage node.

1. Review "Best practices for DD Boost backups" on page 44.
2. Configure the DD Boost device and enable the Data Domain system for NetWorker operations. The *EMC NetWorker and EMC Data Domain Deduplication Devices Integration Guide* provides details.

3. Associate the backup with a pool that contains the DD Boost device configured in step 2:
   - For a scheduled backup, associate the required media pool with the NMSAP Group resource or Client resource by using the NMC program. The *EMC NetWorker Administration Guide* and NMC online help provide details about using the NMC program.
   - For a manual backup, set the pool parameter (for **backint** backups) or the NSR_DATA_VOLUME_POOL parameter (for RMAN backups) to the required pool. "Configuring manual backups" on page 38 provides details about configuring a **backint** backup. "NSR_DATA_VOLUME_POOL" on page 124 provides details about the parameter for RMAN backups.
4. Follow the configuration instructions in Table 3 on page 45, similar to the instructions for configuring a non-deduplication backup.
5. For a Client Direct backup, use the default configuration settings. The Client Direct feature is enabled by default.

   With Client Direct enabled, NMSAP tries to perform a Client Direct backup. If a Client Direct backup is not possible, NMSAP reverts to a backup through the storage node.

   Note: If you upgrade from NetWorker server release 7.6.*x* to 8.0 or later, and you want to disable Client Direct for scheduled backups, you must clear the Client Direct checkbox in the wizard or disable the Client Direct attribute in the Client resource. With NetWorker server 8.0 or later, the Client Direct setting in the wizard field or Client resource takes precedence over the NSR_DIRECT_ACCESS setting in the init*DBSID*.utl parameter file.

Table 3 Configuring a Data Domain backup

Type of Data Domain deduplication backup	Configuration instructions	Additional instructions if the pool contains Data Domain and other types of devices
Scheduled backup configured with the wizard	"Configuring scheduled backups with the wizard" on page 31	Select the Data Domain backup for the type of deduplication on the wizard page of deduplication options.
Scheduled backup configured without the wizard	"Configuring scheduled backups without the wizard" on page 35	Select the attribute to enable a Data Domain backup in the Client resource of the NMSAP client.
Manual backup	"Configuring manual backups" on page 38	Set NSR_DEVICE_INTERFACE=DATA_DOMAIN in the init*DBSID*.utl parameter file. "NSR_DEVICE_INTERFACE" on page 114 provides details.

Configuring storage node with DD Boost backups

You can configure a scheduled backup or manual backup to a DD Boost device, where the backup does not try to use the Client Direct method but instead deduplicates data on a storage node.

1. Follow step 1 to step 4 in "Configuring Client Direct with DD Boost backups" on page 44.
2. Ensure that the Client Direct feature is disabled by following the appropriate procedure:
   - For a manual backup with any NetWorker server release or for a scheduled backup with a NetWorker server release earlier than 8.0, set NSR_DIRECT_ACCESS=No in the advanced option table in the wizard or in the init*DBSID*.utl parameter file. "NSR_DIRECT_ACCESS" on page 114 provides details.
   - For a scheduled backup with NetWorker server release 8.0 or later, clear the Client Direct checkbox in the wizard or disable the Client Direct attribute in the NetWorker Client resource.

Configuring NMSAP backups to AFTD storage on Windows

You must follow the configuration procedures in this section for NMSAP backups to AFTD devices on Windows systems.

Configuring Client Direct to AFTD backups on Windows

You can configure a scheduled backup or manual backup that uses Client Direct to an AFTD device on Windows by performing the following steps.

1. Configure an AFTD by using either the Device Wizard or the NMC device properties window on the Windows system.

   The *EMC NetWorker Administration Guide* provides complete details about AFTD configurations, including considerations for Client Direct clients.
2. Ensure that the NMSAP client has the required access to the AFTD through CIFS. The *EMC NetWorker Administration Guide* provides details.
3. Associate the backup with a pool that contains the AFTD configured in step 1.
4. Follow the appropriate configuration instructions:
   - "Configuring scheduled backups with the wizard" on page 31
   - "Configuring scheduled backups without the wizard" on page 35
   - "Configuring manual backups" on page 38
5. For a Client Direct backup, use the default configuration settings. The Client Direct feature is enabled by default.

   With Client Direct enabled, NMSAP tries to perform a Client Direct backup. If a Client Direct backup is not possible, NMSAP reverts to a traditional backup through the storage node.

Configuring storage node to AFTD backups on Windows

You can configure a scheduled backup or manual backup to an AFTD device on Windows, where the backup does not try to use the Client Direct method but instead sends data through a storage node.

1. Follow step 1 to step 4 in "Configuring Client Direct to AFTD backups on Windows" on page 46.
2. Ensure that the Client Direct feature is disabled by following the appropriate procedure:
   - For a manual backup, set NSR_DIRECT_ACCESS=No in the init*DBSID*.utl parameter file. "NSR_DIRECT_ACCESS" on page 114 provides details.
   - For a scheduled backup, clear the Client Direct checkbox in the wizard or disable the Client Direct attribute in the NetWorker Client resource.

Configuring probe-based backups

The NetWorker Probe resource is an optional feature that triggers backups when the system meets user-specified conditions. A probe-based backup is also referred to as an event-based backup.

Note: Unless the system meets the probe conditions, a scheduled backup group enabled for a probe will not run.

The system must meet the following conditions for a probe-based backup to be triggered:

- The current time is within a specified window of time. The backup window is defined by the probe start time and end time in the probe-enabled backup Group resource.
- The system meets one of the following conditions:
  - A specified amount of time has elapsed since the previous probe-based backup.
  - One probe or all the probes associated with the backup are successful, depending on the probe success criteria specified in the backup configuration.

    You can set the probe success criteria in the NetWorker Group resource to the value of Any or All.

Configuring a probe-based backup

A probe-based NMSAP backup requires settings in three NetWorker resources: Probe, Group, and Client.

1. Create a separate NetWorker Probe resource for the supplied NMSAP **nsrsapprobe** program and any other program or script that checks for a user-defined condition. The Probe resource defines the conditions that trigger the probe-based backup.

   NOTICE

   Because a NetWorker Probe resource stores information on the state of database redo logs, the Probe resource must be associated with a single NetWorker Client resource only. Multiple databases configured through multiple Client resources require a

separate Probe resource for each client.

You can associate a script written for a user-defined probe with more than one NetWorker Client resource.

Table 4 on page 48 describes Probe resource attributes for NMSAP backups.

Table 4 NetWorker Probe resource attributes for NMSAP backups

Attribute	Description
Name	A unique name that identifies the Probe resource.
Probe Command	Name of the program or script that triggers a probe-based backup. For example, the **nsrsapprobe** program supplied with NMSAP triggers a backup when the number of Oracle transaction (archived redo) logs generated since the last probe-based backup meets or exceeds the value of the LOG_THRESHOLD parameter. The Probe Command can be a user-defined program or script. "User-defined probes" on page 49 provides details.
Command Options	Required for the **nsrsapprobe** program only. A comma-separated list of parameters with their settings as follows: • LOG_THRESHOLD—Mandatory. Specifies the number of Oracle transaction (archived redo) logs generated since the last probe-based backup, which will trigger a new probe-based backup. • ORACLE_SERVICE—Mandatory. Specifies the Net service name for the Oracle database that is to be probed. **Note:** If this Probe resource is associated with a Client resource that is configured with the wizard and contains the ORACLE_SERVICE parameter, then the values for ORACLE_SERVICE must match in both resources. • NSR_DEBUG_DIR—Optional. Specifies a valid directory pathname where debug information for probe operations is recorded in a nsrsapprobe_*pid*.log file. **Note:** When you set NSR_DEBUG_DIR, you enable debugging of probe operations. • TNS_ADMIN—Mandatory if Oracle Net services files are installed in a non-default location. Specifies the pathname of the non-default location of the Oracle Net services files. For example: ORACLE_SERVICE=SAP.world,LOG_THRESHOLD=10

2. Create a NetWorker Group resource for the probe-based backup. Configure the Group resource to enable probe-based backups and set the probe timing options.

   The *EMC NetWorker Administration Guide* provides details.

3. Associate the NetWorker Probe resource with a Client resource. You must do this setting with the individual NMC resource settings and not with the wizard. Table 5 on page 49 describes the required Client resource attributes for NMSAP probe-based backups.

NOTICE

Probe-based backups use Oracle database authentication. You must set the Oracle database username and the password in the backup configuration, either through the wizard or encrypted in the nsrsapsv.cfg file.

Table 5 NetWorker Client resource attributes for probe-based NMSAP backups

Attribute	Description
Probe Resource Name	Specify the name of the Probe resource from step 1. **Note:** You can associate a Client resource with only one probe.
Group	Specify the name of the probe-enabled Group resource from step 2.

The *EMC NetWorker Administration Guide* provides details.

User-defined probes

The user-defined script or program for probe-based backups must meet the following requirements:

- Name starts with “nsr” or “save.”
- Location is in the same directory that contains the NetWorker client binaries.
- Permissions of the script or program file include the “execute” permission.
- Returns one of the following code values when the script or program finishes running its probe:
  - 0—Signifies that the backup condition has been met.
  - 1—Signifies that the backup condition has not been met.
  - Other than 0 or 1—Signifies that an error occurred during the probe.

Example probe-based backup with multiple probes

You can configure a probe-based backup with multiple probes. Depending on the Probe Success Criteria setting in the Group resource, a backup will start when the conditions for any or all of the probes are met.

For example, a probe-based backup is triggered when both of the following conditions are true:

- At least 25 Oracle transaction log files are generated on an SAP Oracle client named, for example, oraprod_host. A Probe resource for this condition will use the supplied **nsrsapprobe** program.
- More than two tape drives are idle in a tape library attached to a NetWorker storage node, named for example libstore_host, where the probe-based backup will be sent for storage. A second Probe resource for this condition will use a user-defined script named **nsrjukeboxprobe**.

To configure an example probe-based backup with these two conditions:

1. Create the NetWorker Probe resource for the supplied **nsrsapprobe** program with the following attributes:
   - Name: myxlogs
   - Probe Command: nsrsapprobe
   - Command Options: LOG_THRESHOLD=25

2. Create a user-defined script, **nsrjukeboxprobe,** with “execute” permissions and store the script in the same directory as the NetWorker binaries on libstore_host. When the script runs, it checks for the number of idle tape drives in the library, and returns one of the following values:
   - 0—If more than two tape drives are idle in the library.
   - 1—If two or fewer tape drives are idle in the library.
   - Other than 0 or 1—An error occurred during the probe and no backup will be performed.
3. Create a second NetWorker Probe resource for the user-defined probe with the following attributes:
   - Name: myxdrives
   - Probe Command: nsrjukeboxprobe
   - Command Options: (blank)
4. Create a NetWorker Group resource, named for example probe_group, and configure the required probe attributes, with the **Probe Success Criteria** attribute set to **All**.
5. Create a NetWorker Client resource for the NMSAP backup of oraprod_host with the following attributes:
   - Name: oraprod_host
   - Backup Command: nsrsapsv -f
   - Group: probe_group
   - Probe: myxlogs
   - Save Set: backint:*DBSID*
6. Create a NetWorker Schedule resource named “skip_all” and set the level to skip for each day in the schedule. This will enable a probe to run without running a backup.
7. Create a dummy Client resource for the libstore_host storage node with the “skip-all” schedule and the following attributes:
   - Name: libstore_host
   - Backup Command: (blank)
   - Group: probe_group
   - Probe: myxdrives
   - Save Set: my_skip_set
   - Schedule: skip_all

Configuring backup email notifications

NMSAP enables you to obtain email notifications for when an NMSAP backup starts, ends, completes with errors, or completes successfully. You must specify the email utility that NMSAP will run for the email notifications, for example, the **mailx** utility on UNIX or a supported utility on Windows. This email utility must be installed on the NMSAP client.

To enable the email notifications, you must set the appropriate parameters to the command-line options of the email utility:

- If you use the wizard to configure a backup, set the following parameters in the Advanced Options table: notify_done, notify_error, notify_start, notify_success.
- If you use an NMSAP parameter file, init*DBSID*.utl, for the backup, set the notify_done, notify_error, notify_start, and notify_success parameters in that parameter file.

Table 14 on page 111 describes the required settings of these parameters.

CHAPTER 3
Backup Procedures

This chapter includes the following topics:

- Performing scheduled backups 54
- Performing manual backups 56
- Reviewing backup and restore session reports 58
- Verifying backup information in the NetWorker indexes 58
- Cloning backups 60

Performing scheduled backups

You can use the following procedures to test, monitor, and cancel scheduled NMSAP backups, not including snapshot backups.

The *EMC NetWorker Administration Guide* provides information about restarting checkpoint enabled backups.

Chapter 7, "Snapshot Backups and Restores," and Chapter 8, "Split-Mirror Backups and Restores," describe how to perform snapshot backups.

Testing scheduled backups

You can configure scheduled NMSAP backups to run automatically according to the backup schedules. After you configure a scheduled backup, you can manually test the backup.

Before you test a scheduled backup, ensure that you meet the following requirements:

- You have correctly set up the software environment. You have provided read and write access to a common parent directory for all the files associated with the backup. "Verifying the NMSAP software requirements" on page 28 provides details.
- You have created the NetWorker Client resource with a correctly configured save set and backup command.
- You have assigned the Client resource to a backup group.

You can test a scheduled backup with the NetWorker Management Console (NMC).

1. Start the NMC program.
2. Select the appropriate NetWorker server to perform the backup.
3. Select the group to monitor for the test.
4. Start the scheduled backup for the specified group.

Monitoring scheduled backups

The NMC program provides a centralized view of all the backup and recovery activity throughout an entire enterprise, the operations related to devices and libraries, and the managed events that require user intervention.

You can monitor scheduled NMSAP backups with the NMC program.

1. Run the NMC program.
2. Select the backup group in the monitor view.

   The Details window appears details of backups that are running, successfully completed, or failed.

Note: For a deduplication backup, the NMC display shows the total size of the data before deduplication, not the size of the deduplicated data. The display also does not indicate that the data is for a deduplication backup.

Appendix C, "Troubleshooting and Error Messages," describes how to review diagnostic messages and error messages.

Canceling scheduled backups

You can cancel a scheduled backup in progress from the NMC program.

1. Run the NMC program.
2. Select the backup group in the monitor view.
3. Right-click the group to stop and select **Stop**.

Note: If you cancel a backup before completion, none of the backed-up data might be recoverable. To manually start a canceled backup process from the beginning, right-click the group to start and select **Start**. Ensure that the backup successfully completes without interruption.

To cancel the scheduled backup from the NMSAP client host, you can use the following command:

```
brbackup | brarchive -g abort | stop | term | kill
```

The SAP Note 1129197 provides details.

Restarting failed scheduled backups

If you set the Client Retries attribute in the Client resource to a value greater than zero, the NetWorker group mechanism retries the backup automatically.

Alternatively, you can manually retry the backup from NMC.

1. Run the NMC program.
2. Select the backup group in the monitor view.
3. Right-click the group to rerun and select **Restart**.

To ensure that only the data that was not backed up in the failed backup is backed up again, configure the backup to take advantage of the checkpoint restart option, as described in "Configuring restartable backups" on page 39.

Note: If the restart does not occur within the NetWorker restart window that can be set on the NMC group properties Advanced tab, the next checkpoint-restart backup backs up all the data.

Performing manual backups

You can use the following procedures to perform manual NMSAP backups and NetWorker bootstrap backups, and also monitor and cancel manual NMSAP backups.

NOTICE

The NetWorker server bootstrap and client indexes are not automatically backed up at the end of a manual backup, as they are for a scheduled backup. After running a manual backup, perform a backup of the NetWorker server bootstrap and client indexes to prepare for disaster recovery of the NetWorker server by following the instructions in the *EMC NetWorker Administration Guide*.

Running manual backups

Before you run a manual backup, ensure that you meet the following requirements:

- You have correctly set up the software environment. You have provided read and write access to a common parent directory for all the files associated with the backup. "Verifying the NMSAP software requirements" on page 28 provides details.
- You have set the **server** parameter in the NMSAP parameter file, init*DBSID*.utl, for the appropriate NetWorker server. "Configuring the backint parameter file" on page 110 provides details.
- You have set the BR*Tools initialization profile init*DBSID*.sap with parameters for the following items:
  - Backup device type (backup_dev_type)
  - Backup the utility configuration file (util_par_file)

  "Choosing either backint or RMAN as the backup and restore utility" on page 29 provides details.

You can perform a manual backup as illustrated by the following examples.

1. Type the SAP backup command with the appropriate parameters to back up the SAP Oracle database or the selected objects to the NetWorker server. For example:
   - Offline backup:

     ```
     brbackup -m all -t offline [-d util_file]
     ```

   - Online backup:

     ```
     brbackup -m backup_objects -t online [-d util_file_online]
     ```

   Appendix B, "Examples of SAP Command Options," describes the available **brbackup** command options.

2. If you perform an online backup, back up the archived redo logs by typing this additional command:

   ```
   brarchive
   ```

   Note: Without the redo logs, you can recover a database that was backed up online only to the time of its last full backup.

3. Back up the client file indexes and bootstrap. The *EMC NetWorker Administration Guide* provides instructions.
4. Run the following command to back up non-database files or directories:

   brbackup -m {**sap_dir** | **ora_dir** | **all_dir** | *full_directory_path* | *non-database_file_path*}

   "Directory backups and restores" on page 20 provides details.

Monitoring manual backups

Operational messages about the status of manual NMSAP backups are displayed at the command line or GUI where the backup is started. Also, the NMC program provides a centralized view of the following activity:

- All the NetWorker server backup and restore activity
- Device and library operations and managed events that require user intervention

The *EMC NetWorker Administration Guide* describes how to review NMC progress and completion messages.

Appendix C, "Troubleshooting and Error Messages," describes how to review diagnostic messages and error messages.

Canceling manual backups

You can cancel a running manual backup by using one of the following procedures:

- Press **Ctrl-c** or the equivalent "attention" keyboard shortcut on the system.
- Type the following command:

  brbackup | **brarchive -g abort** | **stop** | **term** | **kill**

  The SAP Note 1129197 provides details.

Restarting failed manual backups

When a backup session fails, you can restart the backup operation from the beginning by rerunning the **brbackup** command.

Alternatively, you can restart the backup of only the files that failed to be backed up:

1. On the NMSAP host, inspect the backup session log and troubleshoot the error messages. "Reviewing backup and restore session reports" on page 58 provides details.
2. Complete the backup by running the following command at the command line:

   brbackup -f *brbackup_log_name1*[**,***brbackup_log_name2***,...**] | *yyyy-mm-ddhh.mi.ss* | *number_of_days* | **last**

Examples

- To back up the files that failed to be backed up during the last two backup sessions:
  a. Find the backup logs for these two sessions in the SAPBACKUP directory, for example, beemhgkr.anf and beemhzwi.anf.
  b. Run the following command for these logs:

```
brbackup -f beemhgkr.anf,beemhzwi.anf
```

- To back up the files that were not backed up during the last backup session, run the following command:

```
brbackup -f last
```

- To back up the files that failed to be backed up in all the backup sessions that were run in the last three days, run the following command:

```
brbackup -f 3
```

Reviewing backup and restore session reports

During backup sessions or restore sessions, the NMSAP **backint** program appends a report to a sessions log file on each NMSAP host. The default location for the log is as follows:

- On Microsoft Windows: *NetWorker_install_directory*\nsr\applogs
- On UNIX or Linux: /nsr/applogs

The default format for the log file name is backint*DBSID*.log.raw.

You can specify a different location for this backup sessions log by using a different name with the **backint_log** and **arch_backint_log** parameters.

This sessions log is in I18N format. You must run the log through the NetWorker **nsr_render_log** utility to make the log readable.

Verifying backup information in the NetWorker indexes

The *EMC NetWorker Administration Guide* provides details about the NetWorker online indexes.

You can use the **mminfo** command and **nsrinfo** command to review information about NMSAP scheduled backups and manual backups in the NetWorker online indexes.

- Query the backup information in the media database by using the **mminfo** command. For example:

```
mminfo -v -s NetWorker_server_hostname -c NMSAP_client_hostname
```

Note: The deduplication save set size (**size** field) reported by the **mminfo** command includes only the size of the NetWorker save set metadata.

  - To view only save sets created as part of an Avamar deduplication backup, use the **mminfo** command with the **-q dedupe** option.
  - To view only save sets created as part of a Data Domain deduplication backup, use the **mminfo** command with the **-q DataDomain** option.

- To list the extended attributes for the deduplication backups, add the **-S** option, which provides information about the total size of data protected and the amount of new data passed during backup.

  The following example shows the result for an Avamar deduplication backup:

```
# mminfo -S -q dedupe -c oak

ssid=3413300047 savetime=03/23/2013 03:48:22 PM (1282592902)
oak:backint:SAP level=full   sflags=vF       size=3860
files=5          insert=03/23/2013 create=03/23/2013
complete=03/23/2013 browse=04/23/2013 11:59:59 PM
retent=03/23/2014 11:59:59 PM
  clientid=0b211897-00000004-4c72caf4-4c72caf3-00035000-8e6d9956
                *ACTUAL_HOST: oak;
               *Client path: /NetWorker/bu-maple.legato.com/oak;
             *Data set size: 251666432;
          *De-Dup session id: 4;
         *De-Dup snapup time: 2013-03-23;
            *De-duplication: Yes;
        *De-duplication host: bu-sonic.lss.emc.com;
                    *Domain: /NetWorker/bu-maple.legato.com;
    *New data on De-Dup Node: 701967.00;
                 *New files: 1;
        *Size on De-Dup Node: 251666432.00;
                       group: NMSAP;
  Clone #1: cloneid=1282592903  time=03/23/2013 03:48:23 PM
retent=03/23/2014 flags=F frag@         0 volid=4268935984
file/rec=3413300047/0     rn=0 last=03/23/2013
```

Note: For Avamar deduplication backups, the save set size in the **size** field reported by the **mminfo** command includes only the size of the NetWorker save set metadata, usually stored on the AFTD device. The **size** field does not include the size of the backed-up data stored in Avamar. The ***Size on De-Dup Node** field provides the size of the backed-up data.

  The following example shows the result for a Data Domain deduplication backup:

```
# mminfo -S -q DataDomain -c oak

ssid=3138980225 savetime=02/11/2013 07:29:31 AM (1360585771)
bu-staples:backint:SAP level=full  sflags=vF     size=52440380
files=8          insert=02/11/2013
  create=02/11/2013 complete=02/11/2013 browse=03/11/2013
11:59:59 PM retent=02/11/2014 11:59:59 PM
  clientid=e78e210a-00000004-511148be-5119091d-00491100-7523d243
                *ACTUAL_HOST: bu-staples;
          *backup start time: 1360585771;
*ss data domain backup cloneid: 1360585772;
*ss data domain dedup statistics:
"v1:1360585772:52648196:52640041:904993";
                       group: sapdd;
  Clone #1: cloneid=1360585772  time=02/11/2013 07:29:32 AM
retent=02/11/2014  flags=F
    frag@        0 volid=3155757360 file/rec=       0/0     rn=0
last=02/11/2013
```

- Query the information about the backed-up files in the client file index by using the **nsrinfo** command. For example:

  ```
  nsrinfo -s NetWorker_server_hostname NMSAP_client_hostname
  ```

  The **nsrinfo** command can produce very verbose output.

  Note: For Avamar deduplication backups, the save file size (**size** field) recorded in the NetWorker index contains only the NetWorker save file metadata. The **size** field does not include the size of the backed-up data.

The *EMC NetWorker Command Reference Guide* and *EMC NetWorker Administration Guide* describe the **nsrinfo** command and **mminfo** command.

Deletion and expiration of Avamar deduplication backups

When a user or the NetWorker server deletes a deduplication backup, the backup information is deleted immediately from the NetWorker indexes and a request is queued for deletion of the backup from the Avamar server.

Once a deduplication save set exceeds the retention time and the data chunks are deleted from the Avamar server, the save sets are no longer recoverable with the **scanner** program.

The *EMC NetWorker Administration Guide* describes the deletion of deduplication backups.

Cloning backups

The NetWorker software can create clone copies of completed backup save sets for addtional protection and recovery options. You can use a special clone command with NMSAP, although the regular **nsrclone** command is also available.

The NMSAP clone process, which uses the **sapclone** command, makes an exact copy of data in a storage volume and saves the data in a clone volume. You can clone individual save sets or the entire contents of a storage volume. Because the process clones only complete save sets that can span multiple volumes, the process requests additional clone volumes when needed.

A clone volume is indistinguishable from the original volume, except that the volume labels are different. NetWorker software indexes and tracks save set clones in both the client file index and the media database.

Note: If you clone Avamar deduplication backups, only the metadata stored on the NetWorker storage device is cloned, not the data stored by the Avamar server.

Using the sapclone command and options

You can clone NMSAP backups of SAP Oracle databases by running the **sapclone** command from the NMSAP host. You can use the **sapclone** command with the NetWorker **nsrclone** command to write the cloned data to the default clone pool or to a specified clone volume whose pool type is "clone."

Note: The **sapclone** command can clone only save sets that were generated with the NMSAP **backint** program. The names of these save sets start with "backint." You can clone RMAN backups with the **nsrclone** command.

You can also use the **sapclone** command to create clones of deduplicated NMSAP save sets stored on Data Domain systems by specifying the **-b** option with a Data Domain clone pool. If you configure both the source device and target device for the clone copy as Data Domain devices (not as AFTD or VTL devices), then the clone copy is optimized in the deduplication format, also known as "clone-controlled replication." If the target device is for traditional disk or tape storage, then the clone copy reverts to the non-deduplicated native format. The *EMC NetWorker and EMC Data Domain Deduplication Devices Integration Guide* describes clone-controlled replication.

Use the following syntax for the **sapclone** command:

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

Command options in brackets ([ ]) are optional. Only the **-u** option is mandatory.

Table 6 on page 61 lists the options to use with the **sapclone** command.

Table 6 The **sapclone** command options

Option	Description
-a	Specifies to clone all the save sets of a client. If you do not use this option, the NMSAP program clones only the save sets created in the last 24 hours. Example: **sapclone -a -u SAP1**
-b *pool*	Specifies the pool to which the cloned save sets are sent. If you do not use this option, the save sets are sent to the Default clone pool. Example: **sapclone -b SAPClone -u SAP1**
-c *client*	Specifies the name of the client whose backed-up data should be cloned. NetWorker software uses the client file index for the specified client to find and clone the client data. Use this option for cloning data backed up from a cluster. For example, you can set this option to the name of the cluster's virtual node. Example: **sapclone -c saturn -u SAP1**
-n	Specifes to test the cloning operation on the save sets for a client. When you use this option, 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 stored onto volumes of a clone pool. Example: **sapclone -n -u SAP1**
-s *server*	Specifies the destination NetWorker server. You must use this option only if one of the following conditions is true: • You clone to a NetWorker server other than the default server. • You run the **sapclone** command on a SAP Oracle server. Example: **sapclone -s mars -u SAP1**
-u *SID*	Mandatory. Specifies the Oracle database for which the save sets will be cloned. Example: **sapclone -u SAP1**

CHAPTER 4
Data Restore and Recovery

This chapter includes the following topics:

- Restore and recovery terminology 64
- Performing data restore and recovery 64

Restore and recovery terminology

Unlike the NetWorker software that uses the term *recover* for all backup retrieval activities, NMSAP distinguishes between the restore and recovery of a database:

- *Restore* means to retrieve datafiles from a backup and store the files on a disk.
- *Recover* means to apply the database transaction logs to update the database to a specific point-in-time and to make the database consistent.

The backup lifecycle

NetWorker software manages the backup lifecycle of data through the browse policy and retention policy. You must specify these policies for each file and NetWorker save set respectively before the backup time. You can specify the policies by setting the NetWorker Client resource browse and retention attributes or the NMSAP NSR_SAVESET_BROWSE and NSR_SAVESET_RETENTION parameters:

- The browse policy determines how long backed-up files are maintained in the client file index on the NetWorker server.
- The retention policy determines how long save set entries are maintained in the media database on the NetWorker server.

When a backup file entry expires from the NetWorker client index, NMSAP is unable to restore the specified file. You can use the NetWorker **scanner** program to re-create the missing entry if the volume of the NetWorker save set containing the save file is not recycled. You cannot recover a backup after a save set's retention policy expires and the volume that contains the save set is recycled.

- Set the browse policy to be at least as long as the Recovery Point Objective (RPO).
- Set the retention policy to be at least as long as or longer than the browse policy.

The *EMC NetWorker Administration Guide* describes browse policies and retention policies.

Performing data restore and recovery

You can perform all NMSAP restore and recovery operations on a SAP Oracle host by using the SAP BrGui interface or the **brrestore** or **brrecover** command.

NMSAP can restore and recover only the data that you backed up with NMSAP or with the Fujitsu NetWorker Module for SAP R/3 version 3.0.

NOTICE

You can restore only the files for which you have read permission, based on the files' operating system permissions at the time that the files were backed up.

On a UNIX or Linux system, the read permission is associated with the numeric user ID (UID) and group ID (GID), not the username or group name. The UID or GID of the user performing the restore must match the ID associated with the files at backup time.

You can use the following procedure to recover an entire database or a subset of database objects, such as a tablespace or a datafile.

1. (Optional) To restore the data to a different SAP Oracle host (destination host) than the one that was backed up:
   - On a UNIX or Linux system, ensure that the SAP user on the destination host has read permission to the backed-up files as described in the preceding NOTICE.
   - Follow the disaster recovery steps to re-create the environment and restore the configuration files and BR*Tools logs.
   - Perform the following steps on the destination host.
2. Ensure that you have configured the NMSAP environment with all the requirements. "Verifying the NMSAP software requirements" on page 28 provides details.
3. Ensure that you have configured the BR*Tools initialization profile init*DBSID*.sap for either **util_file** or **rman_util** as the backup device type. Otherwise, use the required **brrestore** options or **brrecover** options.

   "Choosing either backint or RMAN as the backup and restore utility" on page 29 provides details.
4. Ensure that you have configured the NMSAP parameter file, init*DBSID*.utl, for the appropriate parameters:
   - The **server** parameter specifies the hostname of the NetWorker server that contains the backup to be restored.
   - The **client** parameter specifies the hostname of the NMSAP host that was backed up if that host is different than the destination host.
   - The **parallelism** setting is the same as used to create the backup. Typically, you set the parallelism to the number of target sessions accepted by the devices, which must be equal to or less than the NetWorker parallelism.
   - If you restore the SAP Oracle data to a new location and only the top common data directory changes but the subdirectory structure remains the same as it was at backup time, then NSR_RELOCATION_DEST can specify the new top data directory to improve the restore performance.

     The BR*Tools programs determine the new destination directory, for example, **brrestore -m** *object=new_destination*.

     If the common directory for files being restored, as determined by **brrestore**, does not match the path set with NSR_RELOCATION_DEST, then the restore ignores the NSR_RELOCATION_DEST setting.
   - Optionally, NSR_RECOVER_POOL can specify the pool from which to restore the backup when multiple backup copies (clones) are available. "NSR_RECOVER_POOL" on page 115 provides details.

   "Configuring the backint parameter file" on page 110 and "Examples of brrestore command syntax and options" on page 129 describe these configurations.

5. Ensure that the backup to be restored exists by using an inquire function before you perform a restore operation. For example, to inquire for the latest backup, type the following command:

   ```
   brrestore -verify [use_dbv | only_conf]
   ```

   The files are read from the backup media but are not restored.

6. Prepare for the restore operation:

   - For a full restore, shut down the Oracle database instance.
   - For the restore of a single database object, take the database object offline.

7. Perform the restore operation by using the BR*Tools interfaces.

   NOTICE

   The **brrestore** program used for a restore operation, whether run directly from the command line or indirectly from the **brrecover** command or BrGui interface, first deletes all the original files to be restored before the program runs **backint** to restore the backed-up files. You will lose the original files if **brrestore** or **backint** fails.

   Perform one of the following actions to prevent these issues:
   - Restore the files to a different location that does not include any files by using the **-m** option and specifying the restore destination, for example:
     brrestore -m *tablespace_name*=*restore_directory*
   - Use the **brrestore -NFD** option to prevent deletion of the original files by **brrestore**.

   To restore a restarted backup, specify each BR*Tools log produced by the initial backup and subsequent restart attempts for the **brrestore** command or **brrecover** command. For example, if you started the NMSAP backup and the backup required two restart attempts before completion, you must run the **brrestore -b** *backup_log* command three times and use the proper log name each time. The list of BR*Tools catalog files is logged in both of the following locations:

   - **backint** logs in the nsr/applogs directory
   - BR*Tools SAPBACKUP location

   To restore data from a directory (non-database) backup, use the **brrestore -m non_db** command. When you restore the SAP directory data, prevent deletion of the BR*Tools and **backint** binaries during the restore by performing a relocated restore. For example, use the following command:

   ```
   brrestore -m non_db=restore_directory
   ```

   Appendix B, "Examples of SAP Command Options," contains examples of the **brrestore** and **brrecover** commands and options. The appropriate SAP documentation provides details about these commands and other SAP commands.

8. To apply redo logs to recover a database, refer to the appropriate SAP and Oracle documentation.

"Reviewing backup and restore session reports" on page 58 provides details about backup and restore log information.

Restarting a restore for files that failed a restore

During a restore operation, NMSAP attempts to restore all the requested files even if some files fail to restore. When a restore session is complete, you can use the following procedure to restart the restore operation for files that failed to restore.

1. On the NMSAP host, inspect the restore session log and troubleshoot the error messages for files that failed to restore. "Reviewing backup and restore session reports" on page 58 provides details.
2. Complete the restore by applying the **brrestore -f** command to the appropriate **brrestore** logs.

   Examples:

   - To restore the files that failed to restore during the last two restore sessions:

     a. Find the restore logs for these two sessions in the SAPBACKUP directory, for example, reaxdwie.rsb and reasdwap.rsb.

     b. Type the following command for these logs:

     ```
     brrestore -f reaxdwie.rsb, reasdwap.rsb
     ```

   - To restore the files not restored during the last restore session, type the following command:

     ```
     brrestore -f last
     ```

   - To restore files that failed to restore in all the restore sessions that ran in the last three days, type the following command:

     ```
     brrestore -f 3
     ```

CHAPTER 5
Disaster Recovery

This chapter includes the following topics:

- Requirements for disaster recovery 70
- Recovering from a disaster 70

Requirements for disaster recovery

For a comprehensive disaster recovery plan, you must fully reconstruct the computing environment and all the SAP Oracle server (NMSAP host) files associated with maintaining data. "Importance of backups" on page 16 describes the impacts of incomplete protection.

Maintain accurate and complete records of the network and system configurations. Keep all the original software media and the following items in a safe location:

- Original operating system media and patches
- Original NetWorker media
- Device drivers and device names
- File system configuration
- IP addresses and hostnames
- NetWorker bootstrap and client index information

You need the NetWorker server bootstrap and client index information to perform disaster recovery of the NetWorker server, a separate procedure not covered in this chapter.

NOTICE

The NetWorker server bootstrap and client indexes are not automatically backed up at the end of a manual backup, as they are for a scheduled backup. After running a manual backup, perform a backup of the NetWorker server bootstrap and client indexes to prepare for disaster recovery of the NetWorker server by following the instructions in the *EMC NetWorker Administration Guide*.

The *EMC NetWorker Disaster Recovery Guide* describes how to recover the NetWorker server and a NetWorker client or storage node from various types of disasters.

Recovering from a disaster

To recover from a disaster, first restore lost Oracle and SAP configuration files and lost BR*Tools backup log files according to the following instructions. After you restore these files, you can perform a database point-in-time recovery or a whole database reset according to the instructions in Chapter 4, "Data Restore and Recovery."

Restoring the required Oracle and SAP BR*Tools files

The following procedure is a concise version of the disaster recovery steps described in the SAP documentation, modified for the specific requirements of NMSAP. You can perform this procedure on the original host or a new host, both referred to as the destination host.

NOTICE

You can restore only the files for which you have read permission, based on the files' operating system permissions at the time that the files were backed up.

On a UNIX or Linux system, the read permission is associated with the numeric user ID (UID) and group ID (GID), not the username or group name. The UID or GID of the user performing the restore must match the ID associated with the files at backup time.

1. (Optional) To restore the data to a different SAP Oracle host (destination host) than the one backed up:
   a. On the NetWorker server that contains the backup to be restored:
      – Create a generic Client resource for the destination host if one does not yet exist.
      – Set the Remote Access attribute in the Client resource of the backed-up NMSAP host to *sap_user@destination_host*.
   b. Perform the following steps on the new destination host.
2. If the entire SAP Oracle system is lost:
   a. Reinstall all the required software components described in "NMSAP and associated software" on page 25.
   b. Reconfigure the SAP data layout, such as the SAPDATA_HOME directory and its subdirectories, to the same state as before the disaster.
3. Load the storage volumes with the required Oracle and SAP configuration files and the BR*Tools backup log files on the NetWorker storage node.
4. Configure the BR*Tools profile file, init*DBSID*-dr.sap, and NMSAP parameter file, init*DBSID*-dr.utl, for recovery on the destination host.

   Ensure that the NMSAP configuration file contains at least the following parameters:
   - The **server** parameter specifies the hostname of the NetWorker server that contains the backup to be restored.
   - The **client** parameter specifies the hostname of the NMSAP host that was backed up, if that host is different than the destination host.
5. On the destination host, start BR*Tools or BrGui and follow the onscreen instructions to perform a disaster recovery of profiles and logs.

For example, the following steps show how to use BR*Tools for disaster recovery of profiles and logs:

a. In the **brtools** menu, select **Restore and Recovery** and then **Disaster recovery**.

b. On the page **BRRECOVER options for disaster recovery**, set the location of the BR*Tools profile file and the NMSAP configuration file for use by **brrecover**.

Note: If you are restoring the original BR*Tools profile or NMSAP configuration file, ensure that the files used for the disaster recovery have different names or are stored in a different location than the original files to be restored.

c. On the page **Device type for restoring profiles and log files from BRBACKUP | BRARCHIVE backup**, select **Backup utility**.

d. On the page **Parameters for restoring profiles and log files from BRBACKUP backup utility**, specify the files to restore as they appear in the NetWorker client index.

e. On the page **Restore of profiles and log files from BRBACKUP backup**, select the components that you want to restore.

The SAP documentation provides more details about disaster recovery.

Recovering a SAP Oracle database after disaster

After you restore the correct SAP BR*Tools profiles and logs on the NMSAP host, follow the normal BR*Tools recovery procedure to perform database point-in-time recovery or database reset.

"Performing data restore and recovery" on page 64 provides the procedure to recover a SAP Oracle database.

The SAP documentation provides more details about database recovery.

CHAPTER 6
Cluster and Oracle RAC Configurations

This chapter includes the following topics:

- Cluster systems 74
- Oracle RAC systems 77

Cluster systems

A cluster environment consists of two or more linked hosts with shared storage, called cluster nodes, which work together to provide a resilient database processing platform.

In an active-passive cluster, some nodes are active and others are standby, waiting to take over the processing when an active node fails. A user can connect to the cluster by using a virtual cluster name or IP address, regardless of which nodes are active. You normally implement active-passive clusters for high availability solutions or to improve computer performance.

An Oracle Real Application Cluster (RAC) system provides a single database that can be accessed by multiple Oracle instances simultaneously as an active-active application cluster configuration.

This section describes the procedures for active-passive cluster configurations. "Oracle RAC systems" on page 77 describes the procedures for Oracle RAC configurations.

Client parameter setting for cluster systems

During an NMSAP backup, the NetWorker server creates entries about the backed-up data in the online client file index. During an NMSAP restore, you can retrieve the data by first searching the client file index.

The **client** parameter provides the following information to the NetWorker server:

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

If you do not set the **client** parameter, NMSAP uses the name of the local host (cluster node), not the virtual cluster host, for the operations during cluster backups and restores. Because the local host name can change over time and cause confusion and errors, use the virtual cluster name for the **client** parameter.

The value of the **client** parameter (either the default value or an explicitly defined value) used for a backup must be the same as the value of the **client** parameter used for the restore of that backup.

Set the **client** parameter to the virtual cluster hostname in a cluster environment to enable the restore of backup data no matter which cluster node was used during the backup.

NSR_PHYSICAL_HOST_LICENSE setting for cluster systems

By default, NMSAP is licensed per virtual cluster host and you require a license for each virtual cluster hostname that is backed up. You cannot change this default behavior when you back up to NetWorker server 7.6 or earlier.

When you back up to NetWorker server 7.6 SP1 or later, set the parameter NSR_PHYSICAL_HOST_LICENSE=TRUE to enforce that NMSAP is licensed per cluster node, not per virtual cluster hostname.

"NSR_PHYSICAL_HOST_LICENSE" on page 115 describes the parameter.

Configuring scheduled backups in a cluster with the wizard

You can configure a scheduled backup in a cluster either with or without the wizard. This section describes the configuration procedure with the wizard.

1. Ensure that the NetWorker server is remote and not a part of the cluster environment.
2. Ensure that you have installed NMSAP on a local disk on all the physical nodes of the cluster designated to perform a backup.
3. Follow the procedure for "Configuring a scheduled backup with the wizard" on page 33, keeping in mind the following cluster-specific requirements:
   - On the **Specify the Client Name** page, type the name of the virtual host for the cluster and select the **Virtual Client** checkbox.
   - On the **Specify Log File Locations and Additional Options** page, in the **Advanced Options** table:
     - Set the **client** parameter to the virtual hostname. "Client parameter setting for cluster systems" on page 74 provides details.
     - Set the NSR_PHYSICAL_HOST_LICENSE parameter to specify the correct NMSAP licensing, if required. "NSR_PHYSICAL_HOST_LICENSE setting for cluster systems" on page 74 provides details.
   - On the **Select the NetWorker Client Properties** page, add *sap_user@physical_host* to the **Remote Access** field for each physical host in the cluster.

With the previous settings, the wizard performs the following actions:

- Creates a NetWorker Client resource for the virtual host with the usual settings for scheduled backups and the following additional settings:
  - The Backup Command attribute contains **-c** *virtual_client_name*.
  - The Remote Access attribute contains the *sap_user@physical_host* entries.
- Creates a generic NetWorker Client resource (with the Save Set attribute set to All and not assigned to a group) for each physical node if the resource does not already exist.
- Grants access (ACL rights) to the Lockbox resource for the virtual host to system/root user and *sap_user* on each physical host.

  Note: If additional users need ACL rights to the Lockbox, you can add the users to the Lockbox resource directly in NMC.

Configuring scheduled backups in a cluster without the wizard

You can configure a scheduled backup in a cluster either with or without the wizard. This section describes the configuration procedure without the wizard.

1. Ensure that the NetWorker server is remote and not a part of the cluster environment.
2. Ensure that you have installed NMSAP on a local disk on all the physical nodes of the cluster designated to perform a backup.
3. Ensure that the configuration file and parameter file are stored in the same location on each physical node or on a shared disk.

4. Follow the procedure for "Configuring scheduled backups without the wizard" on page 35 to create the configuration for the virtual host, keeping in mind the following cluster-specific requirements:
   - Create a generic NetWorker Client resource (with the Save Set attribute set to All and not assigned to a group) for each physical node if the resource does not already exist.
   - In the Remote Access attribute of the Client resource that you create for the virtual cluster host, add *sap_user@physical_host* for each node that requires access to the backup.

     Note: You do not need to add **-c** *virtual_client_name* to the Backup Command attribute.

   - In the init*DBSID*.utl file, set the **client** parameter to the virtual client hostname. "Client parameter setting for cluster systems" on page 74 provides details.
   - On the NMSAP client, set the NSR_PHYSICAL_HOST_LICENSE parameter to specify the correct NMSAP licensing, if required. "NSR_PHYSICAL_HOST_LICENSE setting for cluster systems" on page 74 provides details.

Configuring manual backups in a cluster

To configure an NMSAP manual backup in a cluster, follow the instructions for configuring a scheduled backup without the wizard as described in "Configuring scheduled backups in a cluster without the wizard" on page 75.

The only difference in the manual backup configuration procedure is that you may configure a generic NetWorker Client resource for the virtual host.

Configuring Avamar deduplication backups in a cluster

1. Follow these procedures:
   - "Configuring scheduled Avamar deduplication backups with the wizard" on page 41 or "Configuring scheduled Avamar deduplication backups without wizard" on page 42 or "Configuring manual Avamar deduplication backups" on page 42 for the virtual cluster host
   - "Configuring scheduled backups in a cluster with the wizard" on page 75 or "Configuring scheduled backups in a cluster without the wizard" on page 75 or "Configuring manual backups in a cluster" on page 76
2. Ensure that there is at least one NetWorker Client resource enabled for deduplication backups, which corresponds to the client host that is set either on the **Specify the Client Name** wizard page or in the **client** parameter in the init*DBSID*.utl file.
3. For scheduled backups, ensure that the NetWorker Client resource for the virtual host is part of the NetWorker backup group and is enabled for deduplication.

Configuring Data Domain deduplication backups in a cluster

Follow these procedures:

- "Configuring scheduled backups in a cluster with the wizard" on page 75 or "Configuring scheduled backups in a cluster without the wizard" on page 75 or "Configuring manual backups in a cluster" on page 76
- "Configuring Client Direct with DD Boost backups" on page 44 or "Configuring storage node with DD Boost backups" on page 46 for the virtual cluster host

Configuring probe-based backups in a cluster

Follow these procedures:

- Configure a scheduled backup in the cluster according to "Configuring scheduled backups in a cluster with the wizard" on page 75 or "Configuring scheduled backups in a cluster without the wizard" on page 75.
- Configure the probe-based backup according to "Configuring a probe-based backup" on page 47. Associate the Probe resource with the Client resource for the virtual client host.

Converting client-side configurations to wizard settings in a cluster

To convert a scheduled backup configuration that uses configuration files to the wizard configuration in a cluster:

1. Follow the instructions for "Converting client-side configurations to wizard configurations" on page 34. You can run the **nsrsapadm** conversion utility from any of the physical nodes configured for backup.
2. During the conversion, when **nsrsapdm** prompts for names of users to add to the Lockbox resource, specify the names of SAP operating system users on each physical node that will be used for the backup.

   Note: If you do not grant the Lockbox ACL rights during the conversion, you can add the user later by using NMC to edit the Lockbox resource for the cluster virtual host.

Restoring data in a cluster

To restore data backed up from a shared disk of a virtual client:

1. Set the **client** parameter in the NMSAP parameter file, init*DBSID*.utl, to the virtual client that holds the NetWorker index entries for the backup to be restored.
2. Follow the instructions for "Performing data restore and recovery" on page 64.

Oracle RAC systems

An Oracle Real Application Cluster (RAC) is an active-active application cluster environment for parallelism and high availability. A node in an Oracle RAC system is a physical host or virtual host. An Oracle instance is a memory structure and a group of Oracle Server processes running on a node.

An Oracle database comprises datafiles used by the Oracle instances. The datafiles can be shared between the nodes. All the instances share the same datafiles and control file. Each instance must have its own redo log files and its own archived redo logs.

A RAC system enables multiple Oracle instances across multiples nodes to access the same Oracle database simultaneously. Oracle RAC is based on a cluster software infrastructure that provides concurrent access to the same storage and the same datafiles from all the nodes in the cluster. All the database files reside on shared disks.

Configuring Oracle RAC backups

The SAP documentation provides details about RAC setup. Specific requirements for Oracle RAC backups with BR*Tools and NMSAP are as follows:

- One of the Oracle RAC instances, set as the dedicated database (DDB) instance, is used to perform all the database administration tasks. You must be able to administer all the RAC instances from the DDB instance.
- You must install BR*Tools and NMSAP on the DDB instance host.
- You must create the BR*Tools log directories, such as SAPBACKUP and SAPARCH, on a shared file system.
- You must correctly configure Oracle SQL Net.
- You must set the required parameters, such as **parallel_instances** and **db_services**, in the SAP initialization file, init*DBSID*.sap, located on the DDB instance.
- For a probe-based backup, you must configure a RAC backup as usual. Complete the probe-based backup configuration according to "Configuring a probe-based backup" on page 47. Associate the Probe resource with the Client resource configured for the scheduled backup.

  Note: In a RAC environment, the LOG_THRESHOLD parameter setting in the Probe resource must specify the total number of logs generated by all the RAC nodes in a cluster since the last probe-based backup.

All the Oracle RAC backups performed with BR*Tools and NMSAP run on the DDB instance. The backup configuration of the DDB instance is the same as for a stand-alone system. Chapter 2, "Software Configuration," provides details.

The archived redo logs from all the instances are stored in a common shared location. These logs are backed up by the **brarchive** program, which is started on only one RAC instance, usually the DDB instance.

Restoring Oracle RAC data

To restore Oracle RAC data, run the BR*Tools commands, such as **brrestore** or **brrecover**, on the DDB instance.

You can restore all the required archived redo logs with a single **brrestore** command. You can specify the instance name and which logs must be restored with the **brrestore -a** command.

For example, the following command restores the archived logs with sequence numbers from 40 to 50 that belong to the instance ORA2:

```
brrestore -a 40-50,ORA2
```

CHAPTER 7
Snapshot Backups and Restores

This chapter includes the following topics:

- Snapshot backups and restores with PowerSnap or NSM 82
- Types of PowerSnap or NSM backups 84
- Types of PowerSnap or NSM restores..... 85
- Backup and restore data flows with PowerSnap or NSM..... 86
- Configuring NMSAP snapshot backups with PowerSnap or NSM 87
- Testing NMSAP backups and restores with PowerSnap or NSM 93
- Example parameter settings for PowerSnap or NSM backups..... 94
- Reviewing the NMSAP PowerSnap or NSM backup records..... 95

Snapshot backups and restores with PowerSnap or NSM

PowerSnap or NetWorker Snapshot Management (NSM) backups and restores provide snapshot-based protection and availability of data on supported types of primary storage, for example, EMC CLARiiON or EMC Symmetrix. NMSAP works with the NetWorker PowerSnap Module or NSM to provide this protection for SAP Oracle data.

The *EMC NetWorker Software Compatibility Guide* at EMC Online Support describes the supported PowerSnap Modules or NSM and the primary storage platforms.

PowerSnap Modules and NSM support scheduled backups only. Manual (client-initiated) backups are not supported. The PowerSnap Module or NSM documentation provides details.

Note: NMSAP snapshot backups with PowerSnap or NSM do not use the SAP disk-volume backup interface introduced in BR*Tools 7.10.

Figure 1 on page 83 shows the basic NMSAP environment for PowerSnap or NSM snapshot backups and restores. Table 7 on page 82 lists the required software components.

Table 7 Typical configuration for NMSAP snapshot operations with PowerSnap or NSM

Computer or device	Required software or configuration
Oracle production server host	Oracle server, SAP BR*Tools, NetWorker client, NMSAP, PowerSnap Module (only if NetWorker client 8.0.*x* or earlier is installed)
Proxy client host (data mover host)	NetWorker client, NetWorker storage node, PowerSnap Module (only if NetWorker client 8.0.*x* or earlier is installed)
Storage array	Storage array that PowerSnap or NSM supports, for example, Symmetrix or CLARiiON
NetWorker server host	NetWorker server, NetWorker storage node, NetWorker client

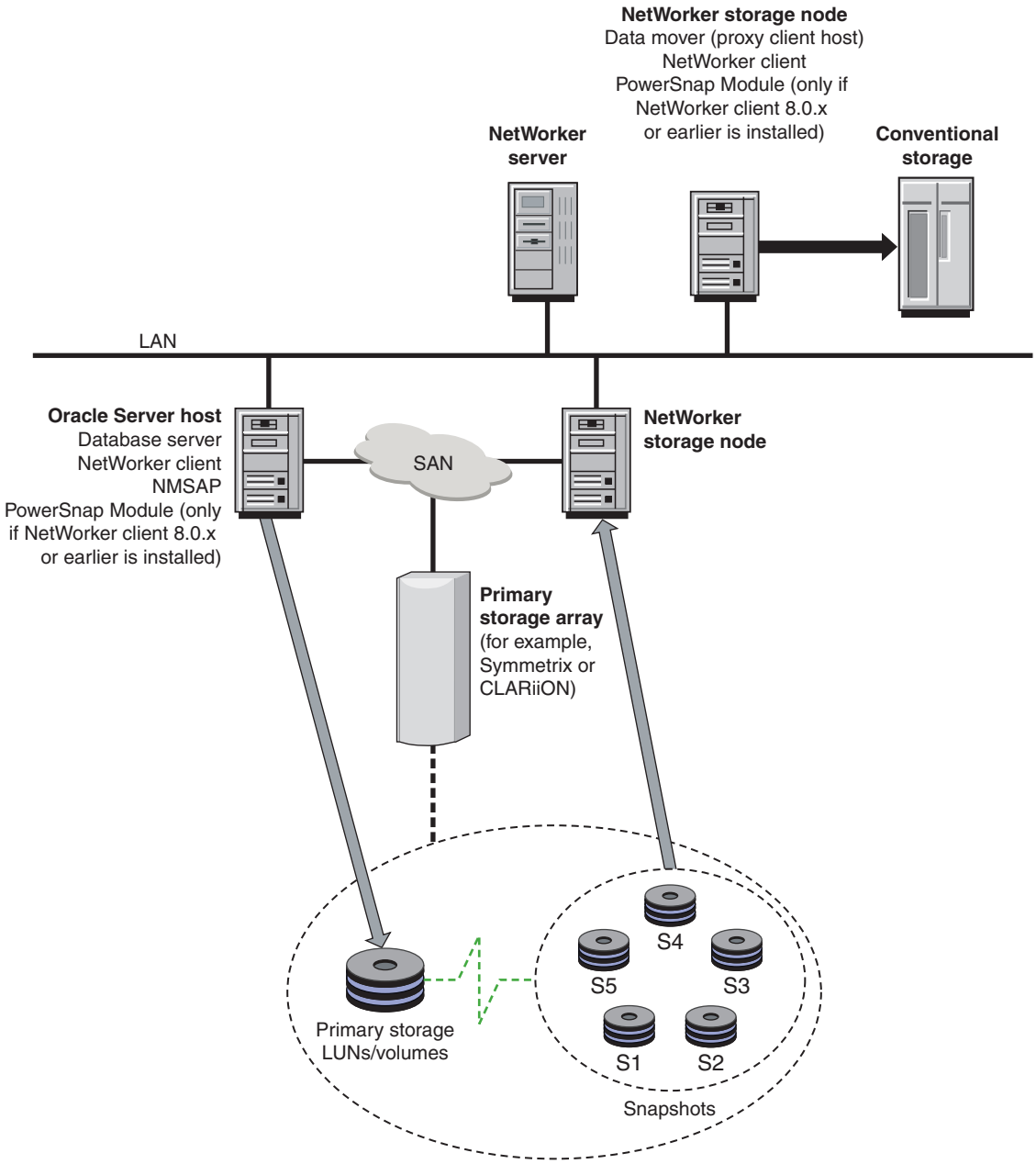

Figure 1 Software used in the NMSAP environment for PowerSnap or NSM backups and restores

Types of PowerSnap or NSM backups

NMSAP with the PowerSnap Module or NSM supports the types of snapshot backups described in Table 8 on page 84.

Table 8 Supported types of PowerSnap or NSM backups

Backup type	Snapshot retention	Location of stored data
"Instant backup (snapshot backup)" on page 84	Permanent	Snapshot on primary storage
"Immediate live backup (rollover-only backup)" on page 85	Temporary	Conventional backup media only
"Deferred live backup (snapshot and rollover backup)" on page 85	Permanent	Both primary and conventional storage

The Snapshot Policy attribute in the NetWorker Group resource specifies the PowerSnap or NSM backup type. "Configuring a Group resource for PowerSnap or NSM backups" on page 89 provides details.

Instant backup (snapshot backup)

An instant backup creates a permanent point-in-time (PIT) copy or snapshot of SAP Oracle data. The instant backup stores the snapshot on the primary storage system where it is available to NMSAP for performing instant restores or rollbacks. You can schedule an instant backup to occur many times in a single day with minimal impact to the SAP Oracle server or network.

A group of SAP Oracle datafiles in the snapshot is referred to as a snap set. You must configure the snapshot policy to control the lifecycle of the snap set. This policy specifies the frequency of instant backups and how long snapshots are retained before being recycled. "Configuring a Snapshot Policy resource" on page 88 provides details.

Live backup

A live backup, also known as a snapshot rollover or rollover to conventional storage, is a backup of a snapshot to conventional (secondary) storage.

A proxy client host, also called the data mover host, is separate from the Oracle server host and is used by the PowerSnap Module or NSM to move the snapshot data to conventional storage. The use of a proxy client as a secondary host reduces the demand on the Oracle server host. The proxy client and data mover is typically a NetWorker storage node.

Note: You must configure the group snapshot policy to enable live backups. "Configuring a Snapshot Policy resource" on page 88 provides details.

NMSAP supports two types of live backup, immediate live backup (rollover-over backup) and deferred live backup (snapshot and rollover backup):

Immediate live backup (rollover-only backup) — Also known as a serverless snapshot backup or snapshot-based backup, this type of live backup creates a temporary snapshot and uses the PowerSnap Module or NSM to immediately back up the snapshot to conventional storage. The snapshot is then automatically deleted from the primary storage and is not available to NMSAP for performing instant restores or rollbacks.

Deferred live backup (snapshot and rollover backup) — This type of live backup creates a permanent snapshot and uses the PowerSnap Module or NSM to back up the snapshot to conventional storage. The permanent snapshot is retained on the primary storage and is available to NMSAP for performing instant restores or rollbacks for the period specified by either of the following policies:

- Snapshot expiration policy
- Retain Snapshots attribute of the snapshot policy

Types of PowerSnap or NSM restores

NMSAP with the PowerSnap Module or NSM supports the types of restores described in Table 9 on page 85.

Table 9 Supported types of PowerSnap or NSM restores

Restore type	Data retrieved from
"Instant restore" on page 85	Mounted snapshot
"Rollback" on page 85	Unmounted snapshot, entirely restored to source location
"Restore from conventional storage" on page 86	Conventional storage

The RESTORE_TYPE_ORDER parameter in the user-defined PowerSnap or NSM configuration file specifies the type of PowerSnap or NSM restore. "Configuring the PowerSnap or NSM parameters" on page 91 provides details.

Instant restore

An instant restore mounts a snapshot that was created by an instant backup. This process enables NMSAP to retrieve the saved data or a subset of the saved data. This type of restore require a minimal amount of time.

Rollback

A rollback restores the entire snapshot to the source location by using the hardware's particular capabilities. The PowerSnap Module or NSM does not support relocation during rollbacks. To determine if a rollback is supported on a specific type of hardware, refer to the PowerSnap Module or NSM documentation.

NOTICE

Rollbacks are destructive because rollbacks overwrite the entire contents of a snapshot unit, such as a volume or disk.

Restore from conventional storage

A restore from conventional storage restores snapshot data (saved to the conventional storage system) from the storage system to the SAP Oracle server.

Note: The restore of snapshot data from the conventional storage requires the use of the PowerSnap Module or NSM.

Backup and restore data flows with PowerSnap or NSM

During a PowerSnap or NSM backup, the NMSAP **backint** process interacts with the PowerSnap Module or NSM processes to create the PIT snapshot and backs up the snapshot to the NetWorker server.

A snapshot backup with PowerSnap or NSM includes the following processes:

1. At the time of a scheduled snapshot backup, the NetWorker server starts the NMSAP **nsrsapsv** process, which runs the SAP **brbackup** command.
2. The SAP **brbackup** program runs the NMSAP **backint** program, which then communicates with the PowerSnap Module or NSM.
3. On the SAP Oracle server host, the PowerSnap Module or NSM takes a point-in-time snapshot of the Oracle data on the primary storage, which then becomes available to the PowerSnap or NSM data mover host.
4. If you perform a live backup, the PowerSnap Module or NSM on the data mover host moves the SAP Oracle data from the snapshot on the primary storage to the NetWorker storage node, which stores the data on conventional storage. If required, PowerSnap or NSM deletes the snapshot.
5. At the end of the PowerSnap or NSM backup, the NetWorker server updates the online client index and media database with information about the backup.

The *EMC NetWorker Administration Guide* describes the NetWorker server and client services.

Figure 2 on page 87 illustrates the data flow of PowerSnap backups and restores in an NMSAP environment with NetWorker client release 8.0.*x* or earlier. If you install NetWorker client release 8.1 or later, the backup and restore workflow does not include the PowerSnap Module. PowerSnap functionality is replaced by the NSM feature in the NetWorker client release 8.1 and later.

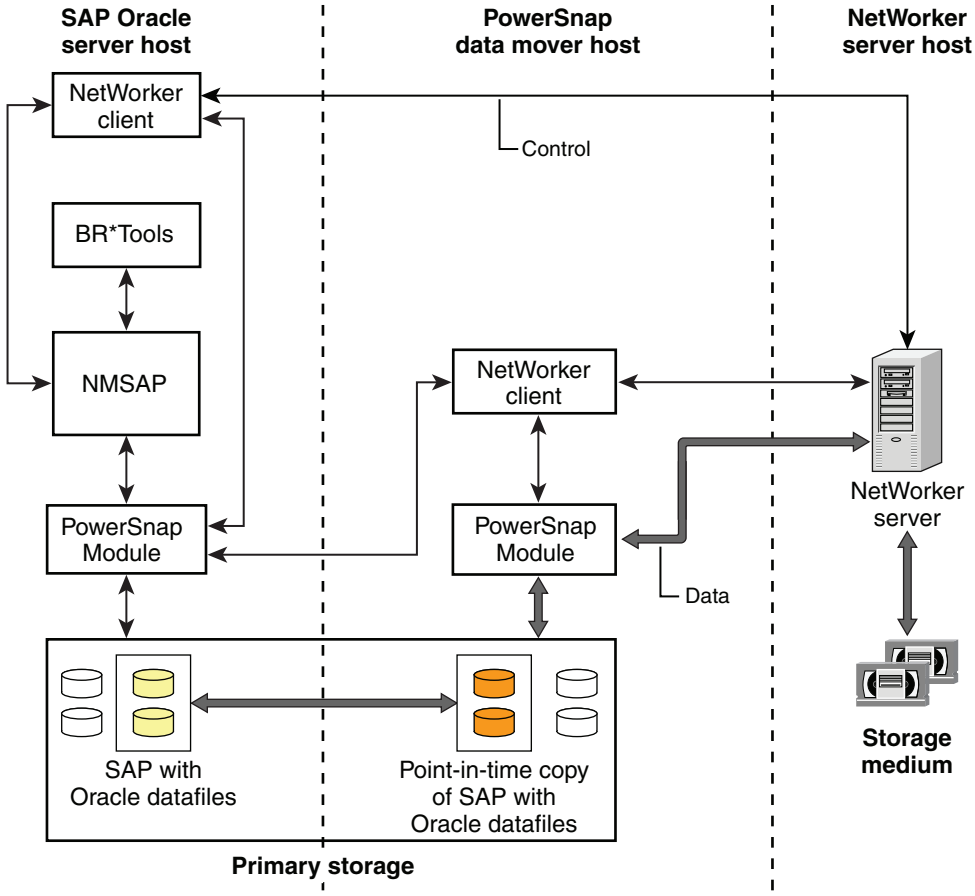

Figure 2 PowerSnap backup and restore data flow with NMSAP

Configuring NMSAP snapshot backups with PowerSnap or NSM

You must configure the required NetWorker resources and parameters for NMSAP snapshot backups with PowerSnap or NSM.

The PowerSnap Module or NSM documentation describes the PowerSnap or NSM configuration procedures.

1. Configure the SAP Oracle database layout to position the datafiles on the primary storage that the specific PowerSnap Module or NSM supports.

   Note: Do not locate the Oracle database control file or any SAP directories, except sapdata*n*, on the same volume (snapshot unit) as the datafiles that will be backed up through PowerSnap or NSM backups. You cannot back up specific types of Oracle files, such as control files, through a PowerSnap or NSM backup. This is an Oracle constraint. The Oracle documentation for the particular Oracle server version describes the Oracle file types that do not support snapshot backups.

2. Ensure that you have installed both NMSAP and the required PowerSnap Module or NetWorker client (including the NSM feature) according to the instructions in the following documentation:
   - *EMC NetWorker Module for SAP with Oracle Installation Guide*
   - NetWorker PowerSnap Module or NetWorker documentation
3. For online database backups, perform one of the following actions:
   - In the init*DBSID*.sap file, set backup_device_type=util_file_online
   - In the nsrsapsv.cfg file, set the BR_EXEC parameter's CLI option to -d util_file_online.

   Note: If you set backup_device_type to util_file, the database stays in backup mode for the duration of the backup and generates a larger number of transaction logs.

4. Complete these procedures to configure the required NetWorker resources:
   - "Configuring a Snapshot Pool resource" on page 88
   - "Configuring a Snapshot Policy resource" on page 88
   - "Configuring a Group resource for PowerSnap or NSM backups" on page 89
   - "Configuring Device resources for PowerSnap or NSM backups" on page 89
   - "Configuring Client resources for PowerSnap or NSM backups" on page 89
5. Complete these procedures to configure the required parameters:
   - "Configuring the NMSAP parameters for PowerSnap or NSM operations" on page 90
   - "Configuring the PowerSnap or NSM parameters" on page 91

Configuring a Snapshot Pool resource

Configure a separate NetWorker Snapshot Pool resource to support NMSAP snapshot backups with the PowerSnap Module or NSM. The PowerSnap Module or NSM stores the metadata from the snapshot in this pool:

- Use the same configuration method as for a regular (non-snapshot) NMSAP backup, except the specified backup device must be a file or advanced file type.
- Specify the pool name in the Snapshot Pool attribute of the NetWorker Group resource as described in "Configuring a Group resource for PowerSnap or NSM backups" on page 89.

Configuring a Snapshot Policy resource

Configure a NetWorker Snapshot Policy resource to perform either instant backups or live backups with NMSAP and the PowerSnap Module or NSM. Specify a preconfigured policy or create a policy.

Configuring a Group resource for PowerSnap or NSM backups

Configure a NetWorker Group resource for NMSAP snapshot backups with the PowerSnap Module or NSM. Table 10 on page 89 provides typical settings.

Note: The NetWorker scheduled backup group must start a PowerSnap or NSM backup. You cannot schedule a PowerSnap or NSM backup through the SAP Computing Center Management System (CCMS).

Table 10 Group resource attributes for PowerSnap or NSM backups

Attribute name	Attribute setting
Snapshot	True.
Snapshot Policy	Daily or other customized policy.
Snapshot Pool	A Pool resource dedicated to the storage of snapshot operation metadata. Use file-type volume devices instead of tape.
Start Time	Set the start time in relation to the Number of Snapshots attribute for the snapshot policy: (Interval x Number of Snapshots) must be less than or equal to (24:00 h - Start Time).
Interval	Set the interval in relation to the Number of Snapshots attribute for the snapshot policy.

Configuring Device resources for PowerSnap or NSM backups

Configure a Device resource for each conventional storage device to be used during live SAP Oracle backups. You must mount the devices.

Configuring Client resources for PowerSnap or NSM backups

Configure the NetWorker Client resource for the NMSAP snapshot operations with the PowerSnap Module or NSM as described in "Configuring the scheduled backup resources without the wizard" on page 36. Associate the Client resource with the snapshot Group resource.

The snapshot browse policy and retention policy (of the Group resource specified for the Client resource) define the lifecycle of a snapshot.

The Browse Policy attribute in the Client resource applies only to the NetWorker client file index entries for PowerSnap or NSM backups that reside on conventional storage (live backups).

The Retention Policy attribute in the Client resource applies only to the NetWorker media database entries for live backups.

Note: NMSAP appends ":PS:" to the save set name during a PowerSnap or NSM backup to identify PowerSnap or NSM save sets.

Configuring the NMSAP parameters for PowerSnap or NSM operations

Table 11 on page 90 describes the NMSAP parameters set in the parameter file init*DBSID*.utl for PowerSnap or NSM backups or restores. Example 1 on page 94 provides a basic example configuration for PowerSnap or NSM backups.

Table 11 NMSAP PowerSnap or NSM parameters in parameter file init*DBSID*.utl (page 1 of 2)

NMSAP PowerSnap or NSM parameter	Description	Default and valid values
ps_backup_mode ps_archive_mode ps_restore_mode ps_inquire_mode	Each of these PowerSnap or NSM functional modes is enabled if set to TRUE. Normally, all the modes are set together to either all TRUE or all FALSE, except ps_archive_mode=FALSE and all others =TRUE. Do not use any other settings except for diagnostic purposes.	• FALSE (default) • TRUE
ps_opaque_pfilename	Full pathname of a configuration file that contains PowerSnap or NSM specific parameters. "Configuring the PowerSnap or NSM parameters" on page 91 describes how to set the parameters.	• Undefined (default) • Full pathname of the PowerSnap or NSM configuration file

ps_exclude_backup_bi_run_nums
ps_exclude_archive_bi_run_nums
	Specifies which **backint** runs to exclude from PowerSnap or NSM processing, typically run number 2. Each **brbackup** or **brarchive** session invokes the **backint** process to run twice in sequence.
	• Run 1 backs up the Oracle data.
	• Run 2 backs up the Oracle database initialization file init*DBSID*.ora, and the BR*Tools initialization profile init*DBSID*.sap and catalog files.
	Files backed up during run 2 do not require PowerSnap or NSM processing and can be backed up by conventional processing without PowerSnap or NSM, thereby saving valuable snapshot disk resources.
	Note: Use the following starting values:
	`ps_exclude_backup_bi_run_nums=2`
	`ps_exclude_archive_bi_run_nums=1;2`
		• Undefined (default)
		• Numeric value of one or more valid **backint** run numbers to exclude, each separated by a semicolon (;)

ps_exclude_backup_paths ps_exclude_archive_paths	Specifies individual PowerSnap or NSM files to exclude from PowerSnap or NSM processing and back up with conventional non-snapshot processing instead. PowerSnap or NSM files are those on a snapshot-capable file system that NetWorker is aware of. Whenever possible, set the ps_exclude_*xxx*_bi_run_nums parameters instead of the ps_exclude_*xxx*_paths parameters. **Note:** - On Microsoft Windows systems, support of wildcard characters is limited, and a single trailing * denotes simple case-insensitive prefix matching. If you set the parameter to a value of: X:*, or X:\db*, or X:\DB01*, then X:\DB01\FOO.DBF is excluded from PowerSnap or NSM backups. - On UNIX systems, wildcard support follows the standard shell support for full file pathnames. For example, if you set the parameter to a value of: /db01/foo.*, or /db??/*.dbf, the file /db01/foo.dbf is excluded. However, if you set the parameter to /db*, the file is not excluded.	• Undefined (default) • Full pathnames of the files to be excluded, each separated by a semicolon (;). You can use wildcard characters as described in the Note. Use values based on the actual file name that BR*Tools passes to **backint**.

Table 11 NMSAP PowerSnap or NSM parameters in parameter file init*DBSID*.utl (page 2 of 2)

NMSAP PowerSnap or NSM parameter	Description	Default and valid values
ps_ps_before_nonps	Specifies whether to perform all PowerSnap or NSM processing before conventional processing without PowerSnap or NSM. This helps prevent potential resource conflicts. Setting this parameter to FALSE enables concurrent processing of all files set for backup, archive, or restore. **Note:** Use the FALSE value at your discretion.	• TRUE (default) • FALSE
ps_group_objs	Specifies whether to group all session files for each PowerSnap or NSM operation, such as prepare or sync, snapshot or split, save or restore, or cleanup. Setting this parameter to TRUE improves NMSAP performance for certain database disk or file system configurations, particularly if large numbers of files are processed by BR*Tools and PowerSnap or NSM with util_file_online. However, grouping files also reduces the potential parallelism for certain backup and restore suboperations, which in turn can reduce performance.	• TRUE (default) • FALSE

Configuring the PowerSnap or NSM parameters

You can set the PowerSnap or NSM parameters in the PowerSnap or NSM configuration file for backups or restores, or in the Application Info attribute of the NetWorker Client resource for backups only.

You must specify the PowerSnap or NSM configuration file by its complete file pathname, for example, /nsr/res/nmsapps.cfg, in the ps_opaque_pfilename parameter in the NMSAP parameter file, init*DBSID*.utl.

Some parameters in the PowerSnap or NSM configuration file have corresponding parameters in the NMSAP parameter file, init*DBSID*.utl, from which they inherit their values. Normally, you should not specify values for these parameters in the PowerSnap or NSM configuration file. If you set a corresponding parameter in the PowerSnap or NSM configuration file, it overrides the equivalent parameter in the NMSAP parameter file. Table 14 on page 111 lists the parameters in the NMSAP parameter file.

You must list each parameter in the configuration file or the Application Info attribute on a separate line, in the following format:

```
parameter_name=parameter_value
```

where:

- *parameter_name* is the parameter name, such as NSR_SNAP_TYPE.
- *parameter_value* is the parameter value, such as emcclar.

Table 12 on page 92 lists some common PowerSnap or NSM parameters. The appropriate PowerSnap Module or NSM documentation provides a complete list of PowerSnap or NSM parameters.

Table 12 Common parameters in PowerSnap or NSM configuration file, nmsapps.cfg (page 1 of 2)

PowerSnap or NSM parameter	Description	Default and valid values
NSR_CHECKSUM	Corresponds to the checksum parameter in Table 14 on page 111.	Setting of NMSAP checksum parameter (default).
NSR_CLIENT	Corresponds to the client parameter in Table 14 on page 111. **Note:** If set, the NSR_CLIENT parameter value must match the client parameter value.	Setting of NMSAP client parameter (default).
NSR_COMPRESSION	Corresponds to the compress parameter in Table 14 on page 111.	Setting of NMSAP compress parameter (default).
NSR_DATA_MOVER	Mandatory if the PowerSnap or NSM backup uses a data mover host that is different from the PowerSnap or NSM client host (NSR_CLIENT). Specifies the hostname or IP address of the PowerSnap or NSM data mover host.	• Local host (default). • Valid hostname or IP address.
NSR_DATA_VOLUME_POOL	Corresponds to the pool parameter in Table 14 on page 111.	Setting of NMSAP pool parameter (default).
NSR_MAX_STREAMS	Optional. Specifies the maximum number of restore streams.	• Setting of the NMSAP pallelism parameter (default). • An integer value.
NSR_PS_DEBUG_LEVEL	Optional. PowerSnap or NSM debug level.	• 0 (default, no debugging). • 0 to 9.
NSR_PS_SAVE_PARALLELISM	Optional. Specifies the maximum number of concurrent backup save streams on the PowerSnap or NSM client host.	• Setting of the NMSAP pallelism parameter (default). • An integer value.
NSR_SAVESET_BROWSE	Corresponds to NSR_SAVESET_BROWSE in Table 14 on page 111. **Note:** Applies only to data stored on conventional storage as described in "Configuring Client resources for PowerSnap or NSM backups" on page 89.	Setting of NMSAP NSR_SAVESET_BROWSE parameter (default).
NSR_SAVESET_RETENTION	Corresponds to NSR_SAVESET_RETENTION in Table 14 on page 111. **Note:** Applies only to data stored on conventional storage as described in "Configuring Client resources for PowerSnap or NSM backups" on page 89.	Setting of NMSAP NSR_SAVESET_RETENTION parameter (default).
NSR_SNAP_TYPE	Optional. Specifies snapshot platforms. If the value is unspecified, PowerSnap or NSM inquires the BRC service to choose the most appropriate value.	The value must be lowercase, for example: • symm-dmx for Symmetrix DMX • emcclar for CLARiiON • emcrp for RecoverPoint

Table 12 Common parameters in PowerSnap or NSM configuration file, nmsapps.cfg (page 2 of 2)

PowerSnap or NSM parameter	Description	Default and valid values
RESTORE_TYPE_ORDER	Optional. Specifies the type of restore to perform. If you specify multiple values, the system attempts each type of restore in the order specified until a restore operation is successful. **Note:** For NMSAP, a rollback operation terminates if one of the following conditions is true: - You have specified **brrestore** file relocation. - Non-requested files exist in the **brrestore**-requested file systems. These files could become corrupted after a rollback.	• pit:conventional (default) One or more of the following values is supported, with each value delimited from the others by a colon (:): • pit—Specifies an instant (PIT) restore. • conventional—Specifies a restore from conventional storage media. • rollback—Specifies a rollback restore from a PIT copy.

Testing NMSAP backups and restores with PowerSnap or NSM

You can test NMSAP backups and restores with PowerSnap or NSM by running the appropriate commands.

Before you test NMSAP backups and restores with PowerSnap or NSM, ensure that you have configured the required NetWorker resources and NMSAP configuration files as described in "Configuring NMSAP snapshot backups with PowerSnap or NSM" on page 87.

1. Test the NMSAP PowerSnap or NSM backups by running the **savegrp** command either from the NMC GUI program or from the command line on the NetWorker server host:

   ```
   savegrp -c client_name group_name
   ```

   The backup test is successful if the **backint** log reports the following message:

   n of *n* PS files reported

   where *n* is the number of files requested that reside on a PowerSnap or NSM disk.

   If you encounter a problem, check the NMSAP **backint** log and PowerSnap or NSM log. The following problems are common:

   - The PowerSnap Module or NSM does not manage the target file.
   - The PowerSnap Module or NSM daemon or service, **nsrpsd**, is not running.
   - The PowerSnap or NSM configuration file, powersnap.res, needs to be modified.
   - The ps_*xxx*_mode or ps_exclude_*xxx* parameter is set to exclude a file from PowerSnap or NSM processing, where *xxx* is described in Table 11 on page 90.
   - The ps_opaque_pfilename file needs to be modified.

   For additional troubleshooting, set the following parameters in the init*DBSID*.utl file to generate diagnostic logs for EMC Customer Support:

   ```
   debug_level = 9
   nsr_debug_msg = TRUE
   ```

   To obtain PowerSnap or NSM debug logs, set the following parameter in the ps_opaque_pfilename file:

   ```
   NSR_PS_DEBUG_LEVEL=9
   ```

2. Run a pre-restore inquiry with the following command:

   brrestore -verify

3. Test a restore with the following command:

   brrestore

   The restore test is successful if a **backint** log reports the following message:

   n of *n* PS files reported

   where *n* is the number of files requested that reside on the primary storage that PowerSnap or NSM supports.

Example parameter settings for PowerSnap or NSM backups

The following examples include settings in the NMSAP parameter file, init*DBSID*.utl, and the PowerSnap or NSM configuration file, nmsapps.cfg, for NMSAP backups and restores with the PowerSnap Module or NSM.

Example 1 Typical settings in the backint parameter file init*DBSID*.utl

```
ps_backup_mode = TRUE
ps_archive_mode = FALSE
ps_restore_mode = TRUE
ps_inquire_mode = TRUE
ps_exclude_backup_bi_run_nums = 2
ps_exclude_archive_bi_run_nums = 1;2
ps_exclude_backup_paths = (left blank)
ps_exclude_archive_paths = (left blank)
ps_ps_before_nonps = TRUE
ps_group_objs = TRUE
ps_opaque_pfilename = /nsr/res/nmsapps_backup.cfg
```

Example 2 Typical settings in the PowerSnap or NSM configuration file

In the following examples, the PowerSnap or NSM parameters for specific primary storage are set in the /nsr/res/nmsapps_backup.cfg file, which is specified with the ps_opaque_pfilename parameter in the NMSAP parameter file:

- For CLARiiON:

  ```
  NSR_DATA_MOVER=datamover.emc.com
  NSR_SNAP_TYPE=emcclar
  EMCCLAR_SNAP_SUBTYPE=CoW
  FRAME_IP=10.5.167.17:10.5.167.18
  ```

- For Symmetrix:

  ```
  NSR_DATA_MOVER=datamover.emc.com
  NSR_SNAP_TYPE=symm_dmx
  ```

Reviewing the NMSAP PowerSnap or NSM backup records

The NetWorker server records information about each NMSAP PowerSnap or NSM backup in the online client file index and media database. The NetWorker client file index for NMSAP PowerSnap or NSM backups is stored under the "saporacle" namespace. The “backup” namespace is used for regular (non-snapshot) NMSAP backups.

Use the **nsrinfo** and **mminfo** commands to query the online NetWorker indexes:

- To query the NetWorker client file index, type the **nsrinfo** command. For example:

  ```
  nsrinfo [-v] -n saporacle -s NetWorker_server client
  ```

  where *client* is the SAP Oracle server hostname.

- To query the NetWorker media database, type the **mminfo** command. For example:

  ```
  mminfo [-v] [-N backint:DBSID:PS:] -s NetWorker_server -c client
  ```

  where *client* is the SAP Oracle server hostname.

The *EMC NetWorker Command Reference Guide* and the UNIX man pages describe these NetWorker commands.

CHAPTER 8
Split-Mirror Backups and Restores

This chapter includes the following topics:

- Split-mirror backups and restores 98
- Basic split-mirror backup and restore data flows 98
- Configuring the production host for split-mirror backups 100
- Configuring the mount host for split-mirror backups 101
- Configuring the snapshot software for split-mirror backups 103
- Configuring the NetWorker server for split-mirror backups 104
- Configuring a cluster environment for split-mirror backups 104
- Examples of parameters for split-mirror backups 105
- Examples of RM scripts for split-mirror backups 106

Split-mirror backups and restores

NMSAP in cooperation with EMC Replication Manager (RM) software or any other snapshot technology software supports BR*Tools split-mirror backups with a split-command interface.

NMSAP supports split-mirror backups of SAP Oracle data stored on an EMC storage array, such as EMC Symmetrix or EMC CLARiiON, through the use of RM software on all NMSAP platforms (UNIX, Linux, Windows).

NMSAP also supports other types of storage arrays, such as EMC, HP, Hitachi, and IBM, without the use of RM software. This support is available on the UNIX and Linux platforms that NMSAP supports.

Note: The NMSAP with RM split-mirror backup implementation does not support the SAP **splitint** interface.

Split-mirror backups created with NMSAP, BR*Tools, and RM require the software components described in Table 13 on page 98. If you do not use RM software, you must install the snapshot technology software components that are required.

Table 13 Hosts required for split-mirror backups with RM and NMSAP

Computer or device	Required software or configuration
Oracle production server host	Oracle server, SAP BR*Tools, RM agent. Optionally, NetWorker client, NMSAP.
Mount host **Note:** Mount host is also known as the data mover, mirror host, or backup host.	At least Oracle client software and SQL Plus, SAP BR*Tools, RM agent, NetWorker client, and NMSAP.
Replication Manager server host	RM server.
NetWorker server host	NetWorker client and NetWorker server.

Basic split-mirror backup and restore data flows

A split-mirror backup involves the following basic processes:

- Snapshot technology software “splits” the disks on the primary storage array, which creates a snapshot copy or replica of the database.
- Snapshot technology mounts the replica onto the backup host or data mover, enabling the NMSAP **backint** program to access the files to be backed up. The software can optionally synchronize the disks at a later time, if required.
- The NMSAP **backint** program backs up the snapshot data from the mount host to conventional storage.

Note: The SAP split-mirror backup framework does not support the backup of archived redo logs. To fully protect the SAP environment, configure NMSAP on the production host to back up the archived logs at least once a day.

Manual split-mirror backup data flow

You start a manual split-mirror backup on the mount host by running the SAP **brbackup** command.

During a manual split-mirror backup, the following process occurs:

1. The **brbackup** program contacts the production database to determine the location of objects to be backed up. For an online backup, the program also creates a copy of the control file on the mount host.
2. The **brbackup** program prepares the production database for the backup:
   - For an online backup, the program puts the required tablespaces into backup mode.
   - For an offline backup, the program shuts down the database, if required.
3. The **brbackup** program runs the script specified by the split_cmd parameter in the init*DBSID*.sap file.
4. The split script runs the proper command for the specified snapshot technology software, for example, an RM job that creates a database replica and mounts the replica on the mount host.
5. The script returns control to **brbackup**.
6. The **brbackup** program completes the operations with the production database:
   - For an online backup, the program takes the tablespaces out of backup mode.
   - For an offline backup, the program restarts the database, if required.
7. The **brbackup** program runs the NMSAP **backint** program on the mount host.
8. The **backint** program establishes a connection with the NetWorker server, backs up the data to conventional storage, and records the backups in the NetWorker server catalog.
9. The **brbackup** program records the backup in its own catalog on the mount host and makes a copy of the catalog on the production host.
10. Optionally, the **brbackup** program runs the script specified by the resync_cmd parameter in the init*DBSID*.sap file to resynchronize the mirror disks.

By default, NMSAP stores backup entries in the NetWorker client file index under the name of the client that NMSAP backs up, in this case the mount host. The backup entries can be recorded under the Oracle production host by setting the NMSAP client parameter to the production host.

Note: To simplify the restore, store the data backed up through the split-mirror framework and the archived logs backed up outside of the framework under the same NetWorker client name, either the production host or the mount host.

Scheduled split-mirror backup data flow

Scheduled split-mirror backups are scheduled through the NetWorker server.

At the scheduled backup start time, the following process occurs:

1. The NetWorker server contacts the NetWorker client on the mount host.
2. The NetWorker client calls the NMSAP **nsrsapsv** scheduled backup program.
3. The **nsrsapsv** program sets the environment required to run the **brbackup** program and runs the **brbackup** program, as configured in the NMSAP nsrsapsv.cfg configuration file.
4. The backup then follows the same steps as a manual split-mirror backup.

Restore of split-mirror backup data flow

The restore and recover operations for split-mirror backups are the same as for normal NMSAP backups and do not use the snapshot technology software.

You can restore the backup data to either the mount host or the production host by running the **brrestore** command on the destination host.

Configuring the production host for split-mirror backups

Table 13 on page 98 lists the required and optional software components to be installed on the production host.

Configuration of the production host for split-mirror backups requires the configuration of the Oracle, BR*Tools, and NMSAP software on the production host.

Configuring Oracle software on the production host

Follow the SAP documentation for details about how to create an Oracle database on the production host.

The following configurations apply specifically to split-mirror backups:

1. Preferably, use the same ORACLE_HOME and user operating system account on both the production host and mount host.
2. Ensure that the database is in archived log mode.
3. Ensure that the following database files are located on the storage array:
   - Database files
   - Control file
   - Parameter file (init*DBSID*.ora)
   - Redo log files
   - Archived logs
   - Dump files
4. Configure and start the Oracle Net services. This step enables the mount host to connect to the production database.
5. Grant sysoper and sysdba privileges to the SAP database user for BR*Tools operations.

Configuring BR*Tools on the production host

Follow the SAP documentation for details about how to configure BR*Tools on the production host.

The following configurations apply specifically to split-mirror backups:

1. Preferably, use the same paths and values for SAP-specific parameters, such as SAPBACKUP and SAPARCH, on both the production host and mount host.
2. On Windows, use NFS to share the %SAPBACKUP% directory located on the production host with the mount host.

   Ensure that the Oracle and SAP user and services on the mount host have read and write permissions on the %SAPBACKUP% directory. The permissions are required to copy the control file to the %SAPBACKUP% directory during a split-mirror backup.

Note: On Windows, the **brrestore** command might fail to restore the Oracle database control file, generated during an online split-mirror backup, and the BR*Tools backup catalogs. Split-mirror backups on Windows use NFS sharing, which enables these files to be backed up from their location in the %SAPBACKUP% directory. However, the NFS sharing does not enable NMSAP to find the expected request file in the NetWorker index. Restore these files by using NetWorker file system tools, such as the **recover** command or the client graphical user interface.

Configuring NMSAP on the production host

Optionally, install NMSAP on the production host. This installation enables the following operations:

- Backup of Oracle archived logs, which must be performed outside of the split-mirror backup framework.
- Recovery of the backups directly to the production host instead of the mount host.

Configuring the mount host for split-mirror backups

Table 13 on page 98 lists the required software components to be installed on the mount host.

Configuration of the mount host for split-mirror backups requires the configuration of the Oracle, BR*Tools, and NMSAP software on the mount host.

Configuring Oracle software on the mount host

Follow the Oracle documentation for details about how to configure the Oracle software on the mount host.

The following configurations apply specifically to split-mirror backups:

1. Preferably, use the same ORACLE_HOME and user operating system account on both the production host and mount host.
2. Configure and start the Oracle Net services. This step enables the mount host to connect to the production database.

3. Either copy the init*DBSID*.ora parameter file from the production host to the mount host, or create a dummy init*DBSID*.ora file that contains the following parameters:
   - db_name=*SID of the production database*
   - control_files=(*location of the control file on the production host*, *location2*)

Configuring BR*Tools on the mount host

Follow the SAP documentation for details about how to configure BR*Tools on the mount host.

The following configurations apply specifically to split-mirror backups:

1. Preferably, use the same paths and values for SAP-specific parameters, such as SAPBACKUP and SAPARCH, on both the production host and mount host.
2. Create the **split** command script by following the appropriate RM documentation.
3. Set the following parameters in the init*DBSID*.sap initialization profile:
   - split_cmd = *location of the snapshot technology software split command script*
   - primary_db = *SID of the production database*

     Note: For a single-host configuration where the mount host is the same as the production host, you must set this parameter to the LOCAL keyword:
     primary_db = LOCAL

   - orig_db_home = *$SAPDATA_HOME on the production host*

     Note: This parameter is required when the replica is mounted onto a different directory than the production database, for example, in a single-host environment.

4. In a two-host UNIX environment, set the following parameters in the init*DBSID*.sap file:
   - remote_host = *production database host*
   - stage_copy_cmd = rcp | ftp | scp

     Set only one of these values.

     Note: Ensure that the SAP user on the mount host is allowed to perform the specified command on the production host.

5. In a Windows environment, mount the shared %SAPBACKUP% directory under the same path as on the production host.

   Note: The %SAPBACKUP% directory must be shared because SAP split-mirror backups do not support FTP or RCP on Windows.

6. Set the following parameters in the init*DBSID*.sap file, or specify them as command-line options of the **brbackup** command:

   Note: The command-line options take precedence over the corresponding parameters set in the init*DBSID*.sap file.

   - backup_type = online_split | offline_split
   - backup_dev_type = util_file
   - util_par_file = *location of the NMSAP config utl file*

7. Set the required SAP environment variables:

   - $SAPDATA_HOME = *location of the replica*
   - Set other required variables, for example, $SAPBACKUP, as described in the BR*Tools documentation.

Configuring NMSAP on the mount host

Chapter 2, "Software Configuration," describes how to configure NMSAP.

For scheduled backups, ensure that the nsrsapsv.cfg file on the mount host contains the following setting:

PATH = *location of the snapshot technology software binaries to be run as part of the split command*

Note: The NMSAP wizard does not support the configuration of split-mirror backups. You must manually configure scheduled backups.

Configuring the snapshot software for split-mirror backups

Follow the proper software documentation for details about how to configure the software to perform a consistent split and mount the replica on a mount host so that the replica is accessible to the NMSAP **backint** program.

When you use the RM software, follow the documentation for that software. The following requirements apply specifically to split-mirror backups:

1. Add the array devices to the RM storage pool. The devices must be visible to both the production host and mount host.
2. Create an application set and an RM job for the SAP Oracle database instance. In the RM job properties, select the **Consistent split replication** option.
3. In the RM job properties, unselect **Unmount the replica on job completion**. The replica must remain mounted after the RM job completes. Also, the job must fail if the replica mount attempt fails.

Configuring the NetWorker server for split-mirror backups

Table 13 on page 98 lists the required software components to be installed on the NetWorker server host.

Chapter 2, "Software Configuration," describes how to configure the NetWorker server for NMSAP manual backups and scheduled backups.

The following requirements apply specifically to split-mirror backups:

1. Configure the NetWorker Client resource for the production host with the following settings:
   - Scheduled backup group: None, unless this resource is configured for archived log backups
   - Remote access: *SAP_user@mount_host*
2. Configure the NetWorker Client resource for the mount host with the following settings:
   - Save set: backint:*DBSID*
   - Group: *NMSAP group*
   - Backup command: nsrsapsv -f *location of nsrsapsv.cfg file*
   - Remote access: *SAP_user@production_host*

Configuring a cluster environment for split-mirror backups

Chapter 6, "Cluster and Oracle RAC Configurations," describes how to configure a cluster environment for scheduled backups.

The following requirements apply specifically to split-mirror backups:

1. Configure the required production host software on each physical node of the cluster.
2. Configure the required mount host software on a computer that is located outside of the cluster.

   Note: Only a production host can be in a cluster environment. The mount host must be a stand-alone host.

3. Store the parameter file, init*DBSID*.utl, and the configuration file, nsrsapsv.cfg, in the same location on each physical node or on a shared drive.
4. Use the virtual node name for the production hostname.
5. On the NetWorker server, create, and configure the NetWorker Client resource for each physical node with the following settings:
   - Generic NetWorker resource (not specific to NMSAP)
   - Group: None

6. On the NetWorker server, create, and configure the NetWorker Client resource for the virtual node with the following settings:
   - Group: None, unless this resource is configured for archived log backups
   - Remote access:
     - *SAP user@physical node #1*
     - *SAP user@physical node #2*
     - *SAP user@mount host*
7. Configure the NetWorker Client resource for the mount host with the following settings:
   - Save set: backint:*DBSID*
   - Group: *NMSAP group*
   - Backup command: nsrsapsv -f *location of nsrsapsv.cfg file*
   - Remote access: *SAP_user@virtual_node*

Examples of parameters for split-mirror backups

The following examples show parameters that must be set in the Oracle, BR*Tools, and NMSAP configuration files on the production host and mount host for split-mirror backups and restores.

Parameter settings on the production host

You must modify the following Oracle configuration files on the production host according to the requirements of the environment. In these examples, the production host is named bu-erie.

initSAP.ora

```
control_files = (H:\oradata\SAP\sapdata1\cntrl\ctrlSAP.ctl,
   H:\oradata\SAP\sapdata2\cntrl\ctrlSAP.ctl,
   H:\oradata\SAP\saparch\cntrl\ctrlSAP.ctl)
background_dump_dest = H:\oradata\SAP\saptrace\background
user_dump_dest = H:\oradata\SAP\saptrace\usertrace
log_archive_dest = H:\oradata\SAP\saparch
log_archive_format = SAParch%t_%s_%r
```

listener.ora

```
SID_LIST_LISTENER =
     (SID_LIST =
         (SID_DESC =
               (SID_NAME = SAP)
               (ORACLE_HOME = C:\oracle\product\10.2.0\db_1)
          )
     )
```

Parameter settings on the mount host

You must modify the following Oracle and BR*Tools configuration files on the mount host according to the requirements of the environment. In these examples, the production host is named bu-erie.

initSAP.ora

```
db_name=SAP
control_files = (H:\oradata\SAP\sapdata1\cntrl\ctrlSAP.ctl,
   H:\oradata\SAP\sapdata2\cntrl\ctrlSAP.ctl,
   H:\oradata\SAP\saparch\cntrl\ctrlSAP.ctl)
```

tnsnames.ora

```
SAP =
     (DESCRIPTION =
          (ADDRESS = (PROTOCOL = TCP)(HOST = bu-erie)(PORT = 1521))
          (CONNECT_DATA =
               (SERVER = DEDICATED)
               (SERVICE_NAME = SAP)
          )
     )
```

initSAP.sap

```
split_cmd = F:\oracle\product\brtools\7.00\online_split.cmd
backup_type = online_split
primary_db = SAP
backup_dev_type = util_file
util_par_file = initSAP.utl
orig_db_home = H:\oradata\SAP
```

Note: If the mount host is the same as the production host, then set primary_db = LOCAL.

nsrsapsv.cfg

```
BR_EXEC=brbackup -m all -d util_file -r
F:\oracle\product\10.2.0\db_1\database\initSAP.utl -p
F:\oracle\product\10.2.0\db_1\database\initSAP.sap
ORACLE_HOME=F:\oracle\product\10.2.0\db_1
DBSID=SAP
NLS_LANG = AMERICAN_AMERICA.US7ASCII
SAPBACKUP=\\bu-erie\I\oradata\SAP\sapbackup
SAPDATA_HOME=H:\oradata\SAP
SAP_BIN=F:\oracle\product\brtools\7.00
Path=C:\Program Files\EMC\rm\client\bin
```

Examples of RM scripts for split-mirror backups

The following examples show RM scripts that you can modify as required for specific environments and configurations. Different scripts are used on UNIX and Windows systems.

Note: The following scripts have no error handling and do not consider possible use cases where the operations might fail.

sap_online_split script for RM on UNIX

```
# SAP_ONLINE_SPLIT
# File to launch into ermcli and read the commands to execute
WDIR=/space10/home/ora101/nmsap/nas
RMDIR=/opt/emc/rm/gui
LOG=/opt/emc/rm/logs/cli
DATE=`date '+DATE %m_%d_%y_'|awk '{print $2}'`
echo "Date $DATE" >>
   /db/app/oracle/product/10.1.0/db_1/SAP/sapbackup/echo.log 2>&1
TIME=`date '+TIME %H:%M'|awk '{print $2}'`
echo "Time $TIME" >>
   /db/app/oracle/product/10.1.0/db_1/SAP/sapbackup/echo.log 2>&1
$RMDIR/rmcli host=cdendobread1c port=65432
   file=$WDIR/erm_brbackup_online_split.sh >> $LOG/brbackup_online_spl
it$DATE$TIME.log 2 >&1
echo "End of the RM split command" >>
   /db/app/oracle/product/10.1.0/db_1/SAP/sapbackup/echo.log 2>&1
```

erm_brbackup_online_split.sh script for RM on UNIX

```
login user=Administrator password=emc
run-activity name=sap_brbk_j infoset=sap_brbk
exit
```

sap_online_split.cmd script for RM on Windows

```
@echo off
REM EMC_SAP_ONLINE_SPLIT
REM File to launch into ermcli and read the commands to execute
set WDIR=C:\oracle\product\brtools\7.00
set RMDIR=C:\Program Files\EMC\rm\gui
set LOG=C:\Program Files\EMC\rm\logs\client
"%RMDIR%/\rmcli.bat" file=%WDIR%\erm_online_split.cmd >>
   %LOG%\rmjob_output.txt

echo #INFO Success
```

erm_online_split.cmd script for RM on Windows

```
connect host=cdendobread1c port=65432
if-not login user=Administrator password=emc then exit 1
if-not run-job name=sap_buhuron appset=clar_buerie then exit 1
```

APPENDIX A
NMSAP Parameter Files and Configuration Files

This appendix includes the following topics:

- NMSAP parameters for backups and restores 110
- NMSAP backint parameters 110
- NMSAP nsrsapsv parameters 118
- NMSAP parameters for RMAN backups and restores 124

NMSAP parameters for backups and restores

For all NMSAP operations except scheduled backups configured with the wizard, you must set NMSAP parameters in the **backint** parameter file as described in "NMSAP backint parameters" on page 110. RMAN backups use the **backint** program to back up metadata.

In addition, for RMAN backups and restores, you must also set NMSAP parameters in the init*DBSID*.sap file with either the rman_send option or the rman_parms option as described in "NMSAP parameters for RMAN backups and restores" on page 124.

For NMSAP scheduled backups configured without the wizard, you must also set the required **nsrsapsv** parameters in the NMSAP configuration file as described in "NMSAP nsrsapsv parameters" on page 118.

You must also set certain SAP parameters in the init*DBSID*.sap file, as described in the relevant sections of this guide.

Note: For scheduled backups configured with the wizard, you do not need to set any parameters. The configuration wizard sets all the required parameters in the NetWorker Client resource attributes.

NMSAP backint parameters

The **backint** parameters provide the client, server, pool, deduplication, parallelism, and other values to the NMSAP **backint** program.

Configuring the backint parameter file

Make a copy, such as init*DBSID*.utl, for your own use of the original parameter file template, init.utl, supplied with NMSAP.

Note: When you uninstall NMSAP or upgrade NMSAP to a new release, the system deletes the original template file and any settings you made in the file.

The template file is located in the following directory:

- On Linux and UNIX: /etc/init.utl
- On Windows: *NetWorker_install_directory*\nsr\bin\init.utl

NOTICE

If you use this file for scheduled backups, you do not need to set the server parameter or the group parameter in the file. However, if you do set the parameters, the parameter settings must match the corresponding attributes on the NetWorker server or an error occurs.
Any other settings specified in this file, such as the pool name, take precedence over the corresponding setting on the NetWorker server.

To set parameters in the NMSAP parameter file, init*DBSID*.utl, use the following format and guidelines:

```
parameter=value
```

- To use parameters in a backup, restore, or inquire operation, you must uncomment and modify the parameters as required.
- Parameter names and values are case-sensitive.

Supported backint parameters

Table 14 on page 111 describes the NMSAP parameters that the **backint** program supports.

Table 14 Supported **backint** parameters (page 1 of 8)

Parameter	Description	Default and valid values
arch_backint_log	Specifies the full pathname of the **backint** log file when running the **brarchive** command.	• Default location on UNIX: /nsr/applogs/arch_backint*DBSID*.log.raw • Default location on Windows: *NetWorker_install_path*\nsr\applogs\arch_backint*DBSID*.log.raw • Valid full pathname of the log file. The directory pathname must exist. If the file does not exist, the operation creates the file.
backint_log	Specifies the full pathname of the backint log file when running the **brbackup** command or **brrestore** command. To specify a separate log file to use specifically for restores, modify this parameter before you run **brrestore**. Alternatively, you can specify the **backint_log** parameter in an init*DBSID*_restore.utl file, which you can specify as a command-line argument to the **brrestore** program. For example: **brrestore -r init*DBSID*_restore.utl**	• Default location on UNIX: /nsr/applogs/backint*DBSID*.log.raw • Default location on Windows: *NetWorker_install_path*\nsr\applogs\backint*DBSID*.log.raw • Valid full pathname of the log file. The directory pathname must exist. If the file does not exist, the operation creates the file.
backint_tmpdir	Specifies the directory of the **backint** temporary files.	• Default location on UNIX: /nsr/applogs/ • Default location on Windows: *NetWorker_install_path*\nsr\applogs\ • Valid full pathname. The directory pathname must exist.
checksum	Specifies whether to perform a cyclic redundancy check (CRC) on the backup data. Setting this parameter to TRUE excludes the use of the compress and NSR_AES_ENCRYPTION parameters, which you must set to FALSE. If you set more than one of these parameters to TRUE, the priority order is: compress, checksum, NSR_AES_ENCRYPTION.	• FALSE (default). • TRUE.
client	Specifies the NetWorker client hostname to use for the client file index for the current backup or restore. If you use NMSAP to back up or restore a virtual cluster client, set this value to the virtual node name.	• Local physical host (default). • Valid NetWorker client hostname.

Table 14 Supported **backint** parameters (page 2 of 8)

Parameter	Description	Default and valid values
compress	Specifies whether to compress the data during a backup before the data passes over the network or is written to the backup device. The compression can speed up the backup process. Compression increases CPU usage on the SAP Oracle server, but reduces the amount of data sent to the NetWorker storage node. NMSAP supports only the default NetWorker encryption algorithm. NMSAP does not support backup compression with GZIP or BZIP2. Setting this parameter to TRUE excludes the use of the checksum and NSR_AES_ENCRYPTION parameters, which you must set to FALSE. If you set more than one of these parameters to TRUE, the priority order is: compress, checksum, NSR_AES_ENCRYPTION.	• FALSE (default). • TRUE.
debug_level	Specifies the level of debug messages that **backint** writes to the debug log file.	• 0 (default, no debugging). • 0 to 9.
max_logs	Specifies the maximum number of the **backint** session logs saved in the **backint** log file, specified by the **backint_log** parameter. If you set the value to 0, all the backup logs are saved in the log file.	• 0 (default). • Any positive integer.
notify_done	Alerts when the **backint** program completes its activity. Uncomment the option and replace *mailx* with the name of the command-line email utility to be used. For example: notify_done = *mailx* -s 'backint done' root	• Undefined (default). • Valid email string.
notify_error	Alerts if the **backint** program encounters any errors during its activity. Uncomment the option and replace *mailx* with the name of the command-line email utility to be used. For example: notify_error = *mailx* -s 'backint error' root	• Undefined (default). • Valid email string.
notify_start	Alerts when the **backint** program begins its activity. Uncomment the option and replace *mailx* with the name of the command-line email utility to be used. For example: notify_start = *mailx* -s 'backint start' root	• Undefined (default). • Valid email string.
notify_success	Alerts when the **backint** program successfully completes its activity. Uncomment the option and replace *mailx* with the name of the command-line email utility to be used. For example: notify_success = *mailx* -s 'backint success' root	• Undefined (default). • Valid email string.

Table 14 Supported **backint** parameters (page 3 of 8)

Parameter	Description	Default and valid values
NSR_AES_ENCRYPTION	Specifies whether to encrypt backup data with 256-bit AES encryption. Setting this parameter to TRUE excludes the use of the compress and checksum parameters, which you must set to FALSE. If you set more than one of these parameters to TRUE, the priority order is: compress, checksum, NSR_AES_ENCRYPTION. **Notice:** If the encryption phrase has changed between the time of the backup and the time the backup is restored, the NSR_ENCRYPTION_PHRASES parameter must include the original phrase to enable the recovery.	• FALSE (default). • TRUE.
NSR_ARCH_LOGS_SEQUENTIAL	Specifies whether NMSAP backs up archive logs in alphabetical order to optimize the log removal (cleanup) during an archive log backup. Setting this parameter to TRUE causes the **backint** program to back up archive logs in alphabetical order, which speeds up the log cleanup process during the archive log backup. Optional for manual and scheduled backups of archive logs with **brarchive**.	• FALSE (default). • TRUE. **Note:** When you use the non-default value TRUE, the load balancing parameters **ss_group_by_fs** and **ss_size_max** are ignored during the **brarchive** backup.
NSR_DEBUG_DIR	Specifies the directory of the **backint** diagnostic logs.	• Default location on UNIX: /nsr/applogs/ • Default location on Windows: C:\Program Files\Legato\nsr\applogs\ C:\Program Files\EMC NetWorker\nsr\ applogs (after a new installation with NetWorker client 8.0 or later)
NSR_DEDUP_BACKUP	Specifies whether to perform a deduplication backup. Mandatory for manual deduplication backups only. Do not set for scheduled backups. **Note:** For scheduled deduplication backups, set the Deduplication Backup attribute in the NetWorker Client resource, instead of setting this parameter.	• FALSE (default) = Deduplication is not performed during an NMSAP backup. Other NSR_DEDUP_* parameters are ignored. • TRUE = Deduplication is performed during an NMSAP backup. If you do not set NSR_DEDUP_NODE, the backup fails.
NSR_DEDUP_CACHE_ENABLED	Specifies whether a cache is used during a deduplication backup. Optional for deduplication backups. Not using a cache decreases the backup performance, but also decreases the disk usage in the /nsr/dedup/cache directory. **Notice:** When you use the non-default value FALSE, you require knowledge of Avamar operations.	• TRUE (default) = A cache is used to increase performance during a deduplication backup. This value is recommended usually. • FALSE = A cache is not used during a deduplication backup.
NSR_DEDUP_CACHE_TAG	Specifies the name of the cache used by the **nsravtar** process during an NMSAP backup. Optional for deduplication backups.	• Undefined (default). • String value of the tag that will generate a deduplication cache name. Do not include the client name in the value.

Table 14 Supported **backint** parameters (page 4 of 8)

Parameter	Description	Default and valid values
NSR_DEDUP_CHUNK_SIZE	Specifies the size in bytes of data chunks that the Avamar server uses in a deduplication backup. Optional for deduplication backups. **Notice:** When you adjust the data chunk size, you require expert knowledge of Avamar operations and the data to be backed up.	• 0 (default) = Variable sizes are used for the data chunks, as determined by the Avamar server. This value is recommended in most cases. • Value greater than zero = A fixed data chunk size to use for a deduplication backup. For example: 1024, 2048, 5096, 8194, or other value as recommended in the Avamar documentation.
NSR_DEDUP_NODE	Specifies the NetWorker De-duplication Node resource (Avamar server) to be used for the backup. The name must exactly match the Deduplication Node attribute set in the NetWorker Client resource. Mandatory for manual deduplication backups only. Do not set for scheduled deduplication backups.	• Undefined (default). • Name of the NetWorker De-duplication Node resource.
NSR_DEVICE_INTERFACE **Note:** This parameter is deprecated. It is supported in the current NMSAP release, but will be unsupported in a future release.	Specifies whether the backup is always stored on the Data Domain device from the specified pool. Optional for manual deduplication backups with the Data Domain media type only. Set the parameter when the backup pool contains a mixture of Data Domain devices and other types of devices. For example: AFTD, tape, and so on. Do not set for scheduled deduplication backups. Instead, set the Data Domain Backup attribute in the NMSAP Client resource when the pool has mixed devices for a scheduled deduplication backup.	• Undefined (default) = The backup data might be stored on any device from the pool selected by NetWorker. • DATA_DOMAIN = The backup data is always stored on the Data Domain device.
NSR_DIRECT_ACCESS	Specifies the method used to perform a backup to a Data Domain device or an AFTD. Optional for a manual backup with any NetWorker server release or a scheduled backup with NetWorker server release earlier than 8.0. If the target device is on a Data Domain system: • Data is deduplicated on the NMSAP client when the Client Direct feature is enabled. • Data is deduplicated on the storage node when the Client Direct feature is disabled. This parameter is ignored during scheduled backups with NetWorker server release 8.0 or later and during restores. For scheduled backups with NetWorker server release 8.0 or later, you can enable the Client Direct feature with the Client Direct setting in the wizard or the Client resource.	• Default (default) = The backup tries to use the Client Direct feature to bypass the storage node and write data directly to the target device. If the backup cannot use this feature, the backup uses the storage node. • No = The backup does not try to use the Client Direct feature. The backup uses the storage node only. • Yes = The backup tries to use the Client Direct feature. If the backup cannot use this feature, the backup fails. **Note:** The Yes value is deprecated. The value is supported in the current NMSAP release, but will be unsupported in a future release.
NSR_ENCRYPTION_PHRASES	Specifies the original phrase to enable the recovery. You can specify multiple phrases to try for the recovery. Mandatory if the NSR_AES_ENCRYPTION phrase has changed between the time of the backup and the time the backup is restored.	Any valid string. For example: NSR_ENCRYPTION_PHRASES = "*phrase 1*", "*phrase 2*" Enclose each phrase in double quotes, and separate phrases with a comma. Do not use a comma after the last phrase.

Table 14 Supported backint parameters (page 5 of 8)

Parameter	Description	Default and valid values
NSR_NWPATH	Specifies the pathname of the directory that contains the NetWorker binaries or Avamar binaries. Recommended for deduplication backups or restores if the NetWorker software is installed in a non-default location.	• Platform-specific default location of the NetWorker client binaries (default). • Valid directory pathname of the nsravtar binary.
NSR_PHYSICAL_HOST_LICENSE	Specifies whether NMSAP is licensed per cluster node or per virtual cluster name in an active-passive cluster environment with NetWorker server 7.6 SP1 or later. Optional in an active-passive cluster.	• FALSE (default) = NMSAP is licensed per virtual cluster name in the active-passive cluster. • TRUE = NMSAP is licensed per cluster node in the active-passive cluster.
NSR_RAW_DEVICE_SKIP_BYTES	Specifies to omit unwanted data from recovery on a raw device. Specifies the initial amount of data to skip. **Notice:** When you adjust the amount of data to skip, you require expert knowledge of the operating system and the volume manager specifications.	• Undefined (default). • Valid device name, followed by an equal sign and the amount of data to skip in bytes, kilobytes, megabytes, or gigabytes: NSR_RAW_DEVICE_SKIP_BYTES= /raw/dev1=skip[B|K|M|G] Specify multiple devices by separating the devices with a colon. For example, this setting skips 8 KB for the raw device /dev/rdsk/c2t4d0s5: NSR_RAW_DEVICE_SKIP_BYTES= /dev/rdsk/c2t4d0s5=8K
NSR_RECOVER_POOL	Specifies the name of the NetWorker volume pool to use for a restore. You can use this option to restore data from a specified volume pool if there are multiple copies (clones) of the backup in different volume pools. Optional for restores. Supported for normal restores only, not for snapshot restores.	• Pool determined by the NetWorker server (default). • Valid name of a NetWorker volume pool that contains a cloned backup to use for a restore.
NSR_RELOCATION_DEST	For a relocated restore, specifies a new root directory for SAP datafiles when SAPDATA_HOME is changed but the structure of subdirectories under SAPDATA_HOME is not modified.	• Undefined (default). • Same value as the new SAPDATA_HOME value.
NSR_SAVESET_BROWSE	Specifies the date when the entry for the backup is removed from the NetWorker client index and the associated backup files are no longer readily available for browsing. **Note:** For a scheduled backup, this parameter overrides the Browse Policy attribute setting in the NetWorker Client resource.	• Browse policy specified in the NetWorker Client resource for the client, as determined by the NetWorker server (default). • Valid date in nsr_getdate(3) format.
NSR_SAVESET_RETENTION	Specifies the date when the save set becomes recyclable and the associated data on the volume can be overwritten. **Note:** For a scheduled backup, this parameter overrides the Retention Policy attribute setting in the NetWorker Client resource.	• Retention policy specified in the NetWorker Client resource for the client (default). • Valid date in nsr_getdate(3) format.

Table 14 Supported **backint** parameters (page 6 of 8)

Parameter	Description	Default and valid values
parallelism	Specifies the number of save sets or save streams to send simultaneously to the NetWorker server. Typically, this setting must be equal to the sum of the "target sessions" for all the devices dedicated to the NMSAP backup or restore. You must configure the NetWorker server to support this parallelism value or greater. "Configuring the scheduled backup resources without the wizard" on page 36 provides details about the parallelism setting in the Client resource. **Note:** The **parallelism** value is reduced if the value is greater than the savesets parameter value.	• 8 (default). • Any positive integer.
pool	Specifies the NetWorker Media Pool resource, defined on the NetWorker server, which receives backup data from the SAP Oracle server. This parameter is used for manual backups and is not recommended for scheduled backups. **Note:** If set for scheduled backups, this parameter overrides the NetWorker server setting. To use multiple pools to separate data: 1. Create separate init*DBSID*.utl parameter files. 2. Use the **-r** option to specify the parameter file name to use at the command line with **brbackup** or **brarchive**. For example, a pool named ARCHData is used specifically for archive logs. You can create a separate parameter file for archive logs, for example, named archiveC11.utl, and set the pool attribute to ARCHData. To use the pool to back up the archive logs, type this command at the command line: **brarchive -u sys/admin -d util_file -r archiveC11.utl -m all -s save**	• Most appropriate pool, selected by the NetWorker server (default). • Valid name of a NetWorker volume pool.
prev_bk_restore	UNIX only. When the **query_index** parameter is set to FALSE, the **prev_bk_restore** parameter specifies whether to restore the previous backup if the required backup cannot be found.	• FALSE (default). • TRUE.
ps_backup_mode ps_archive_mode ps_restore_mode ps_inquire_mode ps_opaque_pfilename ps_exclude_backup_bi_run_nums ps_exclude_archive_bi_run_nums ps_exclude_backup_paths ps_exclude_archive_paths ps_ps_before_nonps ps_group_objs	Chapter 7, "Snapshot Backups and Restores," provides details about the PowerSnap or NSM parameters.	

Table 14 Supported **backint** parameters (page 7 of 8)

Parameter	Description	Default and valid values
query_index	UNIX only (Windows is always TRUE). Specifies whether to query the NetWorker server indexes for validation of the requested files and backup IDs before a restore begins.	• FALSE (default) = The query does not occur before a restore. • TRUE = The query occurs before a restore.
raw_dir	Specifies the directories for raw disk partitions on UNIX only. Any files below these directories are considered to be raw disk partitions. Do not set this parameter to the /dev or /devices directories, which are already treated as raw devices. **Note:** The listed partitions are pointed to by the symbolic links under $SAPDATA_HOME/sapraw/*TBS_number*/.	• Undefined (default). • Directory pathnames of the raw disk partitions, separated by a semicolon (;). For example: raw_dir = /oracle/data;/sap/data
retry_count	Specifies the number of times to retry a failed backup for each save set.	• 0 (default). • Any positive integer.
savesets	Specifies the number of save sets to divide the files on a client and distribute the backup load. If the value is equal to or greater than the number of database files, then a separate save set is made for each file. If the value is less than the number of database files, then a save set might contain more than one file. This parameter is ignored if the **ss_group_by_fs** parameter is set to TRUE.	• 20 (default). • Any positive integer.
sem_timeout	Specifies the amount of time in minutes that **backint** waits for **brbackup** or **brconnect** to remove the semaphore file. If the semaphore file is not deleted, **backint** exits with an error at the end of this timeout period.	• 30 (default). • Any positive integer.
server	Specifies the hostname of the NetWorker server that the NMSAP **backint** program uses for backup, restore, and inquiry sessions. **Note:** You do not need to set this parameter for a scheduled backup, but if you set the parameter, the value must match the server that started the backup or an error occurs.	• Local host (default). • NetWorker server hostname.
ss_group_by_fs	If you set this parameter to TRUE, the operation ignores the **savesets** and **ss_size_max** parameters and groups save sets by file system instead of file size. This efficient grouping of files can improve performance of scheduled backups, index searches, and restore times.	• FALSE (default). • TRUE.
ss_size_max	Specifies the maximum save set size in megabytes. If you do not set this parameter or you set the parameter to zero, the save set size is unrestricted. The value must be equal to or greater than the size of the largest datafile.	• 0 (default). • Any positive integer.

Table 14 Supported **backint** parameters (page 8 of 8)

Parameter	Description	Default and valid values
ssNameFormat	Specifies the naming convention for save sets: • If you set this parameter to old, then the name for all the save sets is backint:*DBSID*. • If you set this parameter to new, then the save set name for each session differs according to the files being backed up. The save set name uses the format backint:*DBSID*:*full_path* of the first file name in the save set. If you set each save set to store one file, a value of new simplifies the process of browsing the media database. The media database shows each file name as part of the save set name. • If you set this parameter to old_pid or new_pid, then the save set name is generated according to the old or new naming convention and the process ID is added to the save set name.	• old (default). • new. • old_pid. • new_pid.

NMSAP nsrsapsv parameters

The **nsrsapsv** parameters provide environmental and other values to the NMSAP scheduled backup program, **nsrsapsv**.

You can use these parameters to perform the following operations among others:

- Specify non-default locations of required programs and files.
- Configure system-specific environment variables.
- Identify the specific SAP Oracle database to back up.
- Specify the BR*Tools command and options used for scheduled backups.

You can set the parameters in the wizard or in the configuration file, nsrsapsv.cfg, for non-wizard configurations.

Configuring the nsrsapsv configuration file

The NMSAP software includes a configuration file template, nsrsapsv.cfg, that you can use for the non-wizard configuration of scheduled backups. The template file is located in the following directory:

- On Linux and UNIX: /etc/nsrsapsv.cfg
- On Windows: *NetWorker_install_directory*\nsr\bin\nsrsapsv.cfg

Make a copy of the configuration file template before you customize the file for backups. You can use any preferred name or location for the customized configuration file.

Note: When you uninstall NMSAP or upgrade NMSAP to a new release, the system deletes the original template file and any settings you made in the file.

To set parameters in the NMSAP backup configuration file, nsrsapsv.cfg, use the following format and guidelines:

- Use this format for each parameter setting:

  ```
  parameter_name = parameter_value
  ```

- If you back up multiple databases in a single backup configuration, specify the parameter settings in the configuration file as follows:

  - For parameter settings common to all the databases, specify the parameter settings outside of the braces.
  - For parameter settings unique to specific databases on the SAP Oracle client, group the parameter settings within braces.

  The following example shows the correct positions of parameter settings in the configuration file:

  ```
  # Global parameters common to all the databases
  parameter1 = value
  parameter2 = value
  parameter3 = value

  DBSID1 {
  # Parameter settings for DBSID1
  parameter4 = value1
  parameter5 = value
  }

  DBSID2 {
  # Parameter settings for DBSID2
  parameter4 = value2
  }
  ```

  where *DBSID1* and *DBSID2* are Oracle database instances that appear on separate lines in the Save Set attribute of the Client resource for the scheduled backup.

  A global parameter appears outside of all the braces. A database-specific parameter appears within the braces after a particular database SID.

- The following precedence rules apply to the parameter settings:

  - Global parameter settings apply to all the Oracle databases included in the backup.
  - If a global parameter is set more than once, the last setting takes precedence over all the previous settings of the global parameter.
  - Database-specific parameter settings within braces apply only to the particular Oracle database instance and override the corresponding global parameter settings for the backup of that specific database.
  - If a parameter appears more than once within the same braces, the last setting takes precedence over all the previous settings of the parameter within the braces.

- To use parameters in a scheduled backup, uncomment and modify the parameters as required.

- Parameter names and values are case-sensitive.

- Use full pathnames for parameters that specify a pathname or a file name. The following items are not supported in pathnames and file names:
  - Special Oracle characters, such as ?
  - Environment variables, such as $ORACLE_HOME and %ORACLE_HOME%
- Specify the full pathname of the configuration file in the Backup Command attribute of the Client resource for the scheduled backup. "Configuring the scheduled backup resources without the wizard" on page 36 describes the Client resource attributes.

Supported nsrsapsv parameters

Table 15 on page 120 describes the parameters in the NMSAP backup configuration file, nsrsapsv.cfg, that the **nsrsapsv** program supports.

Table 15 Supported **nsrsapsv** parameters (page 1 of 4)

Configuration parameter	Description	Default and valid values
BR_EXEC	Specifies the **brbackup** or **brarchive** command and its options that the **nsrsapsv** scheduled backup program executes. Mandatory for non-wizard configurations only. Do not use for wizard configurations. **Note:** Do not use the **-u** option, which identifies the username and password of the Oracle database administrator. Instead, you must encrypt the username and password by using the **nsrsapadm -P -z** *file_name* command. "Configuring the scheduled backup resources without the wizard" on page 36 provides details about the username and password encryption. **Caution:** If you save a wizard configuration to a file, such as nsrsapsv.cfg, the file contains the following parameters that the **nsrsapsv** program uses to generate the **brbackup** or **brarchive** command at runtime: • BKUP_TYPE • BKUP_OBJECTS • TABLESPACE • DATAFILE • LOGS_NUM • LOGS_DEL • BRARCHIVE_CLI • BRBACKUP_CLI • SAP_CONFIG You must not use these wizard parameters if you configured the nsrsapsv.cfg file manually.	• **brbackup** (default). • **brbackup** or **brarchive** and command-line options.
HOMEDRIVE	Specifies the drive name where Windows system files reside. Verify this setting by typing **set homedrive** on the command line. Optional. Use on Windows only.	• Undefined (default). • Valid disk drive. For example: C:

Table 15 Supported **nsrsapsv** parameters (page 2 of 4)

Configuration parameter	Description	Default and valid values
NLS_LANG	Specifies the language character set in the following format: LANGUAGE_TERRITORY.CHARACTERSET Mandatory parameter. The Oracle documentation provides details.	• AMERICAN_AMERICA.US7ASCII (default). • Valid Oracle setting for NLS_LANG variable.
NSR_SAP_SECURE_RUN	Hides the Oracle user password passed to the **brbackup -u** or **brarchive -u** command from operating system commands, such as **ps -ef**. Optional. Use on UNIX only.	• FALSE (default). • TRUE.
NSR_SAP_USING_RMAN_OPTION	If you use RMAN to back up database files, set this parameter to TRUE. For example: NSR_SAP_USING_RMAN_OPTION=TRUE	• FALSE (default). • TRUE.
NSR_SAP_WAIT_BRTOOLS_DONE_MINS	Specifies how long (after a backup is terminated by the user) the **nsrsapsv** program waits for the **brbackup** program to do the following: • Perform a cleanup routine. • Remove tablespaces from backup status.	• 2 minutes (default). • Positive number of minutes.
ORACLE_BIN	Specifies the pathname of the Oracle binaries location. The specified pathname is appended to the PATH environment variable so that all the Oracle binaries can be found. Mandatory only if the Oracle binaries are not in the default location, $ORACLE_HOME/bin.	• $ORACLE_HOME/bin (default). • Valid full pathname of the bin directory of the Oracle server installation.
ORACLE_HOME	Specifies the pathname of the home directory of the Oracle server installation. Mandatory parameter.	• Undefined (default). • Valid full pathname of the home directory of the Oracle server installation. For example: /db/oracle/product/10.2.0
ORACLE_SID	Specifies the system identification (SID) for the Oracle instance to be backed up. Mandatory. For a non-wizard configuration, must be set either in the configuration file or in the Save Set field of the Client resource. For example, if the save set name in the NetWorker Client resource is backint:SAP and this parameter is not specified in the configuration file, then SAP is used for the Oracle SID.	• Oracle SID derived from the save set name in the NetWorker Client resource used for the backup (default). • A valid Oracle database SID.
ORACLE_USR_PASSWD	Contains the SAP user's encrypted Oracle username and password. Optional parameter. Do not manually add or edit this parameter. Use the **nsrsapadm -P -z** command instead. "Configuring the scheduled backup resources without the wizard" on page 36 provides details about the username and password encryption. Passwords that you enter through the wizard are not stored in the configuration file but are securely stored in a lockbox.	Uneditable value set with the **nsrsapadm -P -z** command.

Table 15 Supported **nsrsapsv** parameters (page 3 of 4)

Configuration parameter	Description	Default and valid values
OS_USR_PASSWD	Contains the SAP user's operating system username and password. Mandatory parameter. Do not manually add or edit this parameter. Use the **nsrsapadm -P -z** command instead. "Configuring the scheduled backup resources without the wizard" on page 36 provides details about the username and password encryption. Passwords that you enter through the wizard are not stored in the configuration file but are securely stored in a lockbox.	Uneditable value set with the **nsrsapadm -P -z** command.
PATH	Specifies the pathname of the NetWorker client binary file and any other required search pathnames. Optional parameter. The specified value is appended to the PATH environment variable. To specify multiple search pathnames, use one of the following two methods: • PATH=d:\dir1;d:\dir2;d:\dir1\dir2\dir3 • PATH=d:\dir1 PATH=d:\dir2 PATH=d:\dir1\dir2\dir3	• Undefined (default). • Valid pathnames, separated by semicolons on UNIX or colons on Windows.
POSTCMD	Specifies a postprocessing script to run after a scheduled backup: • The postprocessing script file might need permissions that allow execution by the root user. • The script must return a zero value when it succeeds, and a non-zero value when it fails. • On UNIX, the first line of the script must contain the following interpreter directive: #!/bin/sh Optional parameter. **Note:** If the scheduled backup fails, the postprocessing script still runs. If the postprocessing script fails, an error message appears but the scheduled backup succeeds.	• Undefined (default). • Valid full pathname of a postprocessing script file. The pathname must not contain any spaces. For example, instead of setting POSTCMD to C:\Program Files\Legato\nsr\postcmd.bat, set the parameter to C:\Progra~1\Legato\nsr\postcmd.bat. Also, instead of setting POSTCMD to C:\Program Files\EMC NetWorker\nsr\postcmd.bat, set the parameter to C:\Progra~1\EMC NetWorker \nsr\postcmd.bat. • If the value is undefined or invalid, a postprocessing script does not run after the scheduled backup.
PRECMD	Specifies a preprocessing script to run before a scheduled backup: • The preprocessing script file might need permissions that allow execution by the root user. • The script must return a zero value when it succeeds, and a non-zero value when it fails. The return of a non-zero value causes the scheduled backup to fail. • On UNIX, the first line of the script must contain the following interpreter directive: #!/bin/sh Optional parameter. **Note:** If the preprocessing script fails, NMSAP does not perform a scheduled backup, an error message appears, and any postprocessing script does not run.	• Undefined (default). • Valid full pathname of a preprocessing script file. The pathname must not contain any spaces. For example, instead of setting PRECMD to C:\Program Files\Legato\nsr\precmd.bat, set the parameter to C:\Progra~1\Legato\nsr\precmd.bat. Also, instead of setting PRECMD to C:\Program Files\EMC NetWorker\nsr\precmd.bat, set the parameter to C:\Progra~1\EMC NetWorker \nsr\precmd.bat. • If the value is undefined or invalid, a preprocessing script does not run before the scheduled backup.

Table 15 Supported **nsrsapsv** parameters (page 4 of 4)

Configuration parameter	Description	Default and valid values
SAP_BIN	Specifies the pathname of the location of the BR*Tools binary files. Mandatory parameter. This location should also be where the **backint** (UNIX) or **backint.exe** (Windows) executable resides, after it is manually moved to this location following the NMSAP installation. This location is added to the PATH environment variable so that the BR*Tools binaries and **backint** can be found.	• Undefined (default). • Valid full pathname of the BR*Tools location. For example: /usr/sap/SAP/SYS/exe/run
SAPDATA_HOME	Specifies the pathname of the root directory of the SAP Oracle datafiles. Mandatory parameter. The SAP documentation provides details.	• Undefined. • Valid full pathname of the root directory of the SAP Oracle datafiles. For example: d:\orant\SAP\
SAP-specific environment variables: SAPARCH SAPBACKUP SAPCHECK SAPREORG SAPTRACE	Mandatory for **brbackup** to run correctly on Windows systems. These variables are normally set in the SAP environment on Windows. Examples: SAPARCH=d:\orant\SAP\saparch SAPBACKUP=d:\orant\SAP\sapbackup SAPCHECK=d:\orant\SAP\sapcheck SAPREORG=d:\orant\SAP\sapreorg SAPTRACE=d:\orant\SAP\saptrace	• UNIX default: $ORACLE_HOME/sap*xxx* where *xxx* is the appropriate suffix: arch, backup, check, reorg, or trace. • Windows default: None. • Valid full pathname of the SAP log directory.
SAPSWITCH	Specifies an alternative location of the switch files during **file_online** backups. Optional parameter. For manual backups, set the parameter in the environment. For scheduled backups, the parameter supports both client-side and server-side configuration files. You must not set the parameter in the **backint** configuration file. Requires BR*Tools 7.1 or later. If you do not set the parameter correctly, the backup fails and logs a message in the **backint** debug log. For a successful backup, unset SAPSWITCH and remove the generated switch files.	• OS-dependent default location: - On Windows: %SAPBACKUP% - On UNIX: $ORACLE_HOME/sapbackup • Valid directory pathname with no spaces. For example: d:\dir1
Any *name_path*=*value* pair	Appends values to any environment variable named *name_path*, such as LD_LIBRARY_PATH, LIBPATH, or SHLIB_PATH. • If an environment variable with this name already exists, then the specified parameter value is appended to the existing value for the environment variable. • If an environment variable with this name does not exist, then the variable is created. Optional parameter.	Any valid environment variable and pathname. For example: LD_LIBRARY_PATH= /u01/app/oracle/product/11.2.0/dbhome_1/lib
Any *name*=*value* pair	Adds any environment variable named *name*. If the environment variable specified by *name* already exists, then the variable is overwritten. Optional parameter.	Any valid environment variable and value. For example: BR_TRACE=1 BR_TRACE is set to 1 in the environment, which instructs **brbackup** or **brarchive** to print out additional trace information.

NMSAP parameters for RMAN backups and restores

If you select RMAN as the backup and restore utility as described in "Choosing either backint or RMAN as the backup and restore utility" on page 29, then you must set the NMSAP parameters for RMAN backups and restores through BR*Tools parameters.

Configuring the RMAN parameters

You must set the NMSAP parameters for RMAN backups and restores in the BR*Tools initialization profile init*DBSID*.sap with either the rman_send option or the rman_parms option.

Note: Set the parameters with the rman_send option unless stated otherwise.

The BR*Tools initialization file is located in the following directory:

- On UNIX or Linux: $ORACLE_HOME/dbs
- On Windows: %ORACLE_HOME%\DATABASE

Supported NMSAP RMAN parameters

Table 16 on page 124 describes the NMSAP parameters to configure the RMAN backups and restores support.

Table 16 Supported NSR_* parameters for RMAN (page 1 of 3)

Parameter	Description	Default and valid values
NSR_AES_ENCRYPTION	Corresponds to the NSR_AES_ENCRYPTION parameter in Table 14 on page 111.	
NSR_CHECKSUM	Corresponds to the checksum parameter in Table 14 on page 111.	
NSR_CLIENT	Corresponds to the client parameter in Table 14 on page 111.	
NSR_COMPRESSION	Corresponds to the compress parameter in Table 14 on page 111.	
NSR_DATA_VOLUME_POOL	Corresponds to the pool parameter in Table 14 on page 111.	
NSR_DEBUG_LEVEL	Controls the amount of debug information that NMSAP writes to the debug log file, located in the directory specified by NSR_DIAGNOSTIC_DEST or in the default directory, /nsr/apps/logs (UNIX) or *NetWorker_install_path*\apps\logs (Windows). This parameter controls the debug level for debug messages generated by RMAN operations only. Optional parameter. **Note:** You must set this parameter in the rman_parms parameter. Do not set this parameter in the rman_send parameter.	• 0 (default, no debugging). • 0 to 9.
NSR_DEDUP_BACKUP	Corresponds to the NSR_DEDUP_BACKUP parameter in Table 14 on page 111.	

Table 16 Supported NSR_* parameters for RMAN (page 2 of 3)

Parameter	Description	Default and valid values
NSR_DEDUP_CACHE_ENABLED	Corresponds to the NSR_DEDUP_CACHE_ENABLED parameter in Table 14 on page 111.	
NSR_DEDUP_CACHE_TAG	Corresponds to the NSR_DEDUP_CACHE_TAG parameter in Table 14 on page 111. Set a different value for each channel. If you use the same tag value for more than one channel, the deduplication backup fails. Set this parameter with the rman_send parameter in the BR*Tools initialization profile init*DBSID*.sap. "Configuring deduplication backups with Avamar and Oracle RMAN" on page 42 gives an example.	• / (forward slash, for all RMAN channels (default). • Alphanumeric string that will generate a deduplication cache name. Do not include the client name in the value. Recommended value is *DBSID_channel-ID*. For example: orcl10g_1
NSR_DEDUP_CHUNK_SIZE	Corresponds to the NSR_DEDUP_CHUNK_SIZE parameter in Table 14 on page 111.	
NSR_DEDUP_NODE	Corresponds to the NSR_DEDUP_NODE parameter in Table 14 on page 111.	
NSR_DEVICE_INTERFACE	Corresponds to the NSR_DEVICE_INTERFACE parameter in Table 14 on page 111.	
NSR_DIAGNOSTIC_DEST	Specifies the directory location of all the NMSAP debug logs generated for an RMAN operation. Optional parameter. **Note:** You must set this parameter in the rman_parms parameter. Do not set this parameter in the rman_send parameter.	• /nsr/apps/logs (UNIX) or *NetWorker_install_path*\apps\logs (Windows) (default). • Valid pathname of the directory where NMSAP generates the debug logs.
NSR_DIRECT_ACCESS	Corresponds to the NSR_DIRECT_ACCESS parameter in Table 14 on page 111.	
NSR_ENCRYPTION_PHRASES	Corresponds to the NSR_ENCRYPTION_PHRASES parameter in Table 14 on page 111.	
NSR_NO_BUSY_ERRORS	Specifies whether a scheduled backup fails immediately when the NetWorker server is busy or waits for the NetWorker server to accept the connection. Optional parameter. **Note:** You must always set this parameter to FALSE for proxy Oracle backups.	• FALSE (default) = The scheduled backup waits for the NetWorker server to accept the connection. • TRUE = The scheduled backup fails immediately when the NetWorker server is busy.
NSR_NO_MULTIPLEX	When set for a specific RMAN channel, specifies whether multiplexing is disabled during a backup on the NetWorker device that the RMAN channel uses. If you disable multiplexing, the backup cannot write other save sets to the device. Optional parameter. To optimize restore operations, RMAN requires NMSAP backups to not be multiplexed. Setting the parameter to TRUE can affect the backup performance. For example, the device can sit idle during part of the backup. If the performance is adversely affected, reset the parameter to FALSE.	• FALSE (default) = Multiplexing is enabled on the device that the RMAN channel uses. • TRUE = Multiplexing is disabled on the device that the RMAN channel uses. **Note:** If you use a random access NetWorker device, such as an advanced file device, do not set the parameter to TRUE.

Table 16 Supported NSR_* parameters for RMAN (page 3 of 3)

Parameter	Description	Default and valid values
NSR_NWPATH	Corresponds to the NSR_NWPATH parameter in Table 14 on page 111.	
NSR_PHYSICAL_HOST_LICENSE	Corresponds to the NSR_PHYSICAL_HOST_LICENSE parameter in Table 14 on page 111.	
NSR_RETENTION_DISABLED	Specifies whether the NetWorker browse policy and retention policy are disabled. Optional parameter. Set to TRUE to use Oracle policies only (not NetWorker policies) to manage the backup data lifecycle. Then the RMAN catalog and NetWorker indexes cannot become unsynchronized, such as when a NetWorker index entry expires but the corresponding RMAN catalog entry is not expired.	• FALSE (default) = NetWorker browse and retention policies are enabled and used to manage the lifecycle of the Oracle backup data. • TRUE = NetWorker browse and retention policies are disabled. You use only Oracle policies to manage the lifecycle of the Oracle backup data.
NSR_SAVESET_BROWSE	Corresponds to the NSR_SAVESET_BROWSE parameter in Table 14 on page 111.	
NSR_SAVESET_RETENTION	Corresponds to the NSR_SAVESET_RETENTION parameter in Table 14 on page 111.	
NSR_SERVER	Corresponds to the server parameter in Table 14 on page 111.	

APPENDIX B
Examples of SAP Command Options

This appendix includes the following topics:

- Examples of brbackup and brarchive command syntax and options 128
- Examples of brrestore command syntax and options 129
- Examples of brrecover command syntax and options 130

Examples of brbackup and brarchive command syntax and options

You can use the SAP **brbackup** and **brarchive** commands with the NMSAP program from any command prompt. Examples of the syntax and options for these commands are as follows:

```
brbackup [-c force] [-d {util_file | util_file_online | rman_util}]
   [-m {all | all_data | full | incr | tablespace_list | file_ID |
   file_ID1_range | file_list}] [-p profile] [-q check]
   [-r parameter_file] [-t {online | offline | offline_force |
   offline_standby | online_split | offline_split}] [-u user/password]
   [-w [use_dbv | only_config]]

brarchive [-c force] [-d {util_file | rman_util}] [-f stop]
   [-m delay_time] [-p profile] [-q check] [-r parameter_file]
   [-u user/password]
```

Options enclosed in brackets ([ ]) are optional. Options enclosed in braces ({ }) must use at least one of the enclosed options. Variables are in *italics*. Keywords are in **bold** text. Table 17 on page 128 lists examples of the command options. The SAP documentation describes these commands.

Note: The command-line options overwrite the corresponding parameters set in the initialization profile init*DBSID*.sap.

Table 17 Options for **brbackup** and **brarchive** commands (page 1 of 2)

Option	Description
-c force	Suppresses most of the confirmation messages that interrupt the backup process.
-d util_file | util_file_online | rman_util	Specifies to use NMSAP with **backint** or RMAN for the backup or archive.
-f stop	Instructs **brarchive** to wait for the next offline redo log file written by Oracle, and then send the file to **backint** for archiving.
-m *database_objects_to_back_up*	Specifies the database objects to back up, for example, the whole database, selected tablespaces or datafiles, incremental RMAN backup, and so on. The **brbackup** program uses this option.
-m *delay_time*	Specifies the delay time between Oracle creating the offline redo log file and sending datafiles to the database in standby mode. The **brarchive** program uses this option.
-m *non-database_objects_to_back_up*	Specifies what non-database files or folders to back up. Use one of the following keywords: **sap_dir**, **ora_dir**, **all_dir**, *full_directory_path*. The **brbackup** program uses this option.
-p *profile*	Specifies a BR*Tools intialization profile if the file does not have the default name or is not stored in the default location.
-r *parameter_file*	Specifies the parameter file, init*DBSID*.utl, that NMSAP **backint** uses during the backup or archive process.

Table 17 Options for **brbackup** and **brarchive** commands (page 2 of 2)

Option	Description
-t *backup_type*	Instructs **brbackup** and NMSAP **backint** what type of backup to perform. During an online backup, to reduce the number of redo logs that Oracle generates, use this option with the **-d util_file_online** option.
-u *user/password*	Specifies the username and password of the Oracle database administrator.
-w use_dbv | only_config	Verifies the backup after the files are backed up. Helps detect possible hardware problems. The **use_dbv** option performs the backup, followed by a restore of the backup to a temporary location. This option approximately doubles the backup time.

Examples of brrestore command syntax and options

You can use the SAP **brrestore** command with the NMSAP **backint** program from any command prompt. An example of the syntax and options for this command is as follows:

```
brrestore [-c force] [-d {util_file | rman_util}] [-f last |
   brtools_log1, brtools_log2,.. | yyyy-mm-dd hh-mmss | number_of_days]
   [-m {all | all_data | full | incr | tablespace_list | file_ID |
   file_ID1_range | file_list | non_db}] [-p profile] [-q check]
   [-r parameter_file]
```

Options in brackets ([ ]) are optional. Options in braces ({ }) must use at least one of the enclosed options. Table 18 on page 129 lists examples of the command options.

The SAP documentation describes this command.

Table 18 Options for **brrestore** command

Option	Description
-c force	Suppresses most of the confirmation messages that interrupt the restore process.
-d util_file | rman_util	Specifies to use NMSAP with **backint** or RMAN for the restore.
-f *restore_to_complete*	Specifies which restores to restart to restore missing files.
-m *objects_to_restore*	Specifies the database objects to restore, for example, the whole database, selected tablespaces or datafiles, and incremental RMAN backup.
-m non_db	Specifies the restore of data from a directory (non-database) backup.
-p *profile*	Specifies a BR*Tools initialization profile if the file does not have the default name or is not stored in the default location.
-r *parameter_file*	Specifies the parameter file, init*DBSID*.utl, that NMSAP **backint** uses during the restore process.

Examples of brrecover command syntax and options

You can use the SAP **brrecover** command with the NMSAP program from any command prompt. An example of the syntax and options for this command is as follows:

```
brrecover [-c force] [-d {util_file | rman_util}] [-p profile]
   [-pit yyyy-mo-dd hh.mi.ss] [-r parameter_file] [-scn scn]
   [-t complete | dbpit | tspit | reset | restore | apply | disaster]
   [-tsp tablespace_name | tablespace_name_list] [-u user/password]
```

For example:

```
brrecover -t complete -p initGC2.sap
```

Table 19 on page 130 lists examples of the command options.

The SAP documentation describes these commands.

Table 19 Options for **brrecover** command

Option	Description
-c force	Suppresses most of the confirmation messages that interrupt the recovery process.
-d util_file | **rman_util**	Recovers NMSAP backups performed with **backint** (*util_file*) or RMAN (*rman_file*).
-p *profile*	Specifies a BR*Tools initialization profile if the file does not have the default name or is not stored in the default location.
-pit *yyyy-mo-dd hh.mi.ss*	Recovers the database or tablespaces for a specific point-in-time.
-r *parameter_file*	Specifies the parameter file, init*DBSID*.utl, which NMSAP **backint** uses during the backup or archive process.
-scn *scn*	Recovers the database to the specified Oracle system change number.
-t complete | **dbpit** | **tspit** | **reset** | **restore** | **apply** | **disaster**	Specifies the type of recovery: • **complete**: complete database recovery • **dbpit**: database point-in-time recovery • **tspit**: tablespace point-in-time recovery • **reset**: whole database reset • **restore**: restore of individual backup files • **apply**: apply offline redo log files (archive logs) • **disaster**: disaster recovery
-tsp *tablespace_name* | *tablespace_name_list*	Recovers a single specified tablespace or the tablespaces listed in the specified file.
-u *user/password*	Specifies the username and password of the Oracle database administrator.

APPENDIX C
Troubleshooting and Error Messages

This appendix includes the following topics:

- Verifying the release information 132
- Generating diagnostic logs 132
- Backup and restore problems 133
- NMSAP error messages 133

Verifying the release information

When making queries or requests to an EMC Customer Support Representative, provide specific information about the NMSAP software you are using.

To verify the release information for the installation, use the appropriate command or procedure:

- On UNIX, type the following command as the root user:

  ```
  what file_name | more
  ```

  where *file_name* is the name of an NMSAP binary file, for example, **backint** or **nsrsapsv**.

- On Linux, type the following command as the root user:

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

  where *file_name* is the name of an NMSAP binary file, for example, **backint** or **nsrsapsv**.

- On Windows:

  a. Locate the NMSAP binary file, for example, **backint.exe** or **nsrsapsv.exe**.

  b. Right-click the file, and select **Properties**.

  c. In the **Properties** window, click the **Version** tab to display the version information.

Generating diagnostic logs

To generate diagnostic logs, set the following parameters:

- Set NSR_DEBUG_DIR if you do not want to use the default location for the **backint** diagnotic logs, which is /nsr/applogs (UNIX) or *NetWorker_installation_path*\nsr\applogs (Windows).
- To debug a failed scheduled backup only, set NSR_DEBUG_LEVEL = 9 in the NMSAP configuration file or in the Advanced Options table of the wizard.
- Set debug_level = 9 in the init*DBSID*.utl file or in the Advanced Options table of the wizard.
- Set nsr_debug_msg = TRUE in the init*DBSID*.utl file or in the Advanced Options table of the wizard.

Note: The recommended debug level is 9. Use this debug level for testing and EMC Customer Support diagnostics only.
Do not leave the debug settings in place for an extended time because the log files can quickly increase in size.

Backup and restore problems

Table 20 on page 133 provides guidelines for solving problems that might occur during an NMSAP backup or restore.

Table 20 NMSAP backup or restore problems

Problem	Possible reason or solution
The data is not backed up using the settings in the Client resource on the NetWorker server.	NMSAP uses the Client resource settings only for scheduled backups. For manual backups, you must specify the settings in the init*DBSID*.utl file. You must specify the client settings in the init*DBSID*.utl file on the SAP Oracle server. "Configuring the backint parameter file" on page 110 provides details.
The bootstrap notification report was not printed to the printer specified in the Group resource on the NMSAP server.	Bootstrap notification reports are not generated after a manual NMSAP backup. "Monitoring manual backups" on page 57 describes the generation of a bootstrap notification report.
An online backup of an Oracle tablespace is taking a long time.	Oracle software creates more online redo logs during an online backup than during an offline backup. This occurrence might prolong the online backup.
After a backup, the parallelism setting in the NMSAP operation log, backint*DBSID*.log.raw, is different from the configuration setting.	The **backint** program adjusts the parallelism setting during the backup session depending on other parameters, such as when the number of files within the backup session is lower than the server parallelism setting.
A specified backup of an Oracle directory failed.	NMSAP does not support the backup of directories. Specify each database object within the directory to back up and then perform the backup.
You are unable to view the files backed up to the NetWorker server from the BrGui program on the SAP Oracle server.	Ensure that the SAP user has proper privileges to view the information, for example, the Operate NetWorker privilege.
You are unable to view backup information in NetWorker online indexes.	When you start a restore within a certain timeframe that expired or otherwise is not available, **brrestore** restores files from previous backups, depending on whether the **prev_bk_restore** parameter is set to Yes. The **prev_bk_restore** in "Configuring the backint parameter file" on page 110 provides details. Ensure that the SAP user's operating system authorization has the appropriate permission to access the NetWorker server.

NMSAP error messages

Table 21 on page 133 lists possible error messages that might appear in the backint*DBSID*.log.raw file.

Table 21 NMSAP error messages (page 1 of 4)

Error message	Description	Solution
BACKUP: Bad input line: *line* INQUIRE: Bad input line: *line* RESTORE: Bad input line: *line*	One of the lines in the input file had a bad format. There must be only one or two specifications on each input line (file name and size, if it is a special file).	Check the input file that the BR*Tools binary generated to ensure that the file has the correct format. If not and this error recurs, contact SAP customer support.
Cannot connect to server: *error*	The **backint** program was unable to connect to the NetWorker server to start reading the media database.	Enusre that you specify the correct NetWorker server. Check the log file to see if any other messages refer to this problem.
Cannot reopen *file_name* as stderr	The **backint** program was unable to open a log file for writing.	Check the permissions on the file listed in the message and the permissions on the directory.

Table 21 NMSAP error messages (page 2 of 4)

Error message	Description	Solution
Cannot start session with server: *error*	The **backint** program was unable to start reading the media database on the NetWorker server.	Ensure that you specify the correct NetWorker server. Check the log file to see if any other messages refer to this problem.
Checking for deletion of semaphore file: *error*	The system could not confirm the existence of the semaphore file due to a system error.	Check to see if the .switch.sem file is still in the SAPBACKUP directory. If so, delete the file before running the SAP backup again.
Creating directive file: *error*	The system cannot create the directive file for use by the NetWorker server. This directive file is created so that the NetWorker software can process files with the correct attributes.	Check the directory where the directive file is being created, specified by the backint_tmpdir parameter in the NMSAP parameter file, to ensure that files can write to the directory.
Empty input file	The input file that contains the list of files that require backup or restore is empty.	Ensure that you have selected database objects for backup or restore.
Error opening input file: *error*	The operation could not open the input file that lists all the files to be backed up or restored. The file might not exist, or the file might not have read permissions.	Ensure that the input file exists and is readable.
Error opening output file: *error*	The operation could not open the output file for the reason specified.	Check the permissions on the output file and directory, and check for sufficient disk space to create a file.
Error: *file_name* isn't a regular file, raw partition, or directory.	The **backint** program does not support the file type, such as a symbolic link or a named pipe.	Check the file name to see what type of file is being backed up. If **brbackup** requests a backup of special files, contact SAP customer support.
Error: Too many symlinks	There are too many (more than 100) symbolic links to save.	Consider restructuring the directories to eliminate the extra symbolic links if the list of database files to be backed up contains more than 100 symbolic links.
Error: unexpected inquire case.	The files requested in the input file do not match the SAP **backint** specification. Valid file specifications include: • #NULL is specified for a backup ID, with or without a file name. • A file name is specified with a backup ID. • A backup ID is specified without a file name.	Check the backup input file generated by **brbackup**. If the input file appears to be the wrong format, contact SAP customer support.
File *file_name* not found in index, no attempt to recover will be made	The NetWorker software did not save the file name specified for recovery. The file name does not appear in the client file index.	Check the specified file name to ensure that the name is correct. Check previous backups to determine whether the file was saved in a previous backup.
File was *file_name*, lstat error	NMSAP tried to obtain information for a symbolic link that does not exist or NMSAP cannot access because permission is denied.	Check the file to ensure that the file exists and is a valid symbolic link.
Improperly formatted backup id: *backup ID*	The backup ID is incorrect. The backup ID must specify either a number or the word #NULL.	Check the input file **brrestore** generated to ensure that the file has the correct format. If not and this error keeps occurring, contact SAP customer support.
Lookup failed on *file_name (backup_ID)*	The **backint** program was trying to look up a file name or backup ID in the client file index, but the index query failed. The next message must explain why the index query failed.	Check the next error message to determine why the index query failed.

Table 21 NMSAP error messages (page 3 of 4)

Error message	Description	Solution
Non-recursive directory backup is not supported at this time	You have tried to back up a directory. NMSAP does support the backup of directories.	Select specific database objects to back up from the BrGui program and restart the backup.
Not enough savesets configured. Increase "savesets" setting.	The number or size of the save sets to be backed up exceeds the current settings for the number of save sets allowed or the maximum save set size.	Increase the number of save sets or the maximum save set size: • The **savesets** parameter specifies the number of save sets. • The **ss_size_max** parameter specifies the maximum save set size. Table 14 on page 111 provides details.
Open param file: *file_name*, error: *error_messsage*	Unable to open the **backint** parameter file, init*DBSID*.utl.	Try to open the parameter file for **backint** in any text editor. If you are unable to open the parameter file, replace the file with the original file from the NMSAP installation package.
Opening switch list file for online backup: *error*	When performing an online backup, **backint** tried to open a file to communicate with **brbackup**. This file could not be opened for the specified reason.	Check if the .switch.lis file exists in the SAPBACKUP directory. If so, check the permissions on this file. Normally, NMSAP deletes and re-creates this file for every tablespace to be switched into backup mode.
Opening switch log file for online backup: *error*	When performing an online backup, **backint** expects **brbackup** to provide a log file of the tablespaces that were switched into or out of backup mode.	Check if the .switch.log file is still in the SAPBACKUP directory. If so, delete the file before running the SAP backup again.
Opening switch semaphore file for online backup: *error*	When performing an online backup, **backint** tries to open a file to communicate with **brbackup**. You cannot open this file for the reason specified.	Check if the .switch.sem file exists in the SAPBACKUP directory. If so, check this file's permissions. Normally, NMSAP deletes and re-creates this file for every tablespace to be switched into backup mode.
Semaphore file not deleted in *time* seconds.	When performing an online backup, the SAP module waited for the switch semaphore file to be deleted. After waiting for the number of seconds, the switch semaphore file was not deleted.	If **brbackup** appears to be running correctly but slowly, you can increase the **sem_timeout** setting for **backint**.
Switch log file indicates an error.	The **brconnect** program indicated in the switch log file that there was an error switching one of the tablespaces into or out of backup status. This error is a fatal error in the **backint** specification.	Investigate the error messages in the switch log file to determine the problem. Check the SAP installation or the SAP documentation to determine the problem.
Unable to allocate memory: *error*	The **backint** program was unable to allocate memory.	Check the memory usage on the computer.
Unable to execute child backint process.	The **backint** process could not run a subprocess to backup an individual save set.	Ensure that the **backint** binary is in the directory from which **brbackup** or **brrestore** runs. Check the log file for any other messages that might help pinpoint the problem.
Unable to find pid *process ID* in list of files	The **backint** program checked the status of a subprocess created to save individual files. However, the subprocess ID did not match any of the expected process IDs.	Ensure that all the files were saved by checking the rest of the messages from the backup process. In particular, check for the message "*x* of *y* files saved at *time*." Retry the backup if all the files were not saved.

Table 21 NMSAP error messages (page 4 of 4)

Error message	Description	Solution
Unable to open output file: *error*	The output file could not be opened due to the specified error.	Check the permissions on the output file and directory, and check for sufficient disk space to create a file.
Unable to query with savetime and filename both absent	The **backint** program tried to find a file in the client file index, but neither the save time nor the file name were provided.	Check the input file for any incorrect file information.
Use absolute path name for: *file_name*	The file name specified in the input file was not an absolute pathname. Without a full pathname, the file could not be restored or inquired.	Check the input file **brrestore** generated to ensure that the file has the correct format. If not and this error recurs, contact SAP customer support.

GLOSSARY

This glossary contains the definitions of terms found in this manual. Most of the terms are specific to the NMSAP software. For terms specific to the NetWorker software, refer to the latest *EMC NetWorker Administration Guide*.

A

active-active application cluster Type of cluster configuration where a group of linked virtual or physical hosts with shared storage, called cluster nodes, can access the database data from multiple nodes concurrently.

active-passive cluster Type of cluster configuration where the data server runs on the active physical node, and other nodes are passive nodes that maintain data updates and wait to take over if the active node fails.

administrator Person who normally installs, configures, and maintains software on network computers, and who adds users and defines user privileges.

archive Process by which NetWorker software backs up directories or files to an archive volume to free disk space. Archived data can be deleted but is not recyclable.

attribute Feature of a NetWorker resource. A setting or information that the resource provides.

autochanger See “library.”

B

backup

1. Duplicate of database or application data or an entire computer system stored separately from the original, which can be used to recover the original if it is destroyed or damaged.
2. Operation that saves data to a volume for use during a recovery.

backup level See “level.”

backup volume See “volume.”

bootstrap Save set that is essential for disaster recovery procedures with the NetWorker server. The bootstrap consists of three components that reside on the NetWorker server: the media database, the resource database, and a server index.

browse policy NetWorker policy that specifies the period of time during which backup entries are retained in the client file index. The index makes the associated backed-up data readily accessible for recovery. See also “retention policy.”

BR*Tools SAP backup utilities, specifically the **brbackup**, **brrestore**, **brarchive**, and **brrecover** programs.

C

client Computer, workstation, or fileserver whose data can be backed up and restored with NetWorker software.

Client Direct Feature that enables clients to deduplicate backup data and send the deduplicated data directly to AFTD or DD Boost storage devices, bypassing the NetWorker storage node. The storage node manages the backup devices but does not handle the backup data.

client file index Database maintained by the NetWorker server that tracks every database object, file, or file system backed up. The NetWorker server maintains a single index file for each client computer. The tracking information for each backup is deleted from the index when the browse time of the backup expires.

client-initiated backup See “manual backup.”

client-side configuration NetWorker module backup configuration, made without the configuration wizard, that is performed through the NetWorker Management Console and configuration files or parameters stored on the client host, as compared to server-side configuration. See also “server-side configuration.”

clone Duplicate copy of backed-up data, which is indexed and tracked by the NetWorker server. Single save sets or entire volumes can be cloned.

clone volume Exact duplicate of a backup or archive volume. NetWorker software can track four types of volumes (backup, archive, backup clone, and archive clone). Save sets of these different types may not be intermixed on one volume. Clone volumes may be used in exactly the same way as the original backup or archive volume.

cluster nodes A group of linked virtual or physical hosts with shared storage in a cluster, which work together and represent themselves as a single host called a virtual cluster host.

conventional storage Storage library attached to the NetWorker server or storage node, used to store conventional backups or snapshot backups. Also known as secondary storage. See also “primary storage.”

D

daemon Process on UNIX systems that runs in the background and performs a specified operation at predefined times or in response to certain events.

Data Domain device Logical storage device created on a Data Domain system, used to store deduplicated NetWorker backups. Each device appears as a folder on the Data Domain system and appears with a storage volume name in NMC. A Data Domain device is also known as a DD Boost device.

data mover host Host used in PowerSnap or NSM backups that is separate from the database server host, with access to the primary storage unit. During a live backup, either the database server host or data mover host backs up a point-in-time copy (snapshot) from the primary storage to conventional storage.

database

1. A collection of data arranged for ease and speed of update, search, and retrieval by computer software.
2. An instance of a database management system (DBMS), which in a simple case might be a single file containing many records, each of which contains the same set of fields.

DBA (database administrator)

Person who is typically responsible for installing, configuring, and maintaining database systems.

DBSID

Variable representing the name of the SAP Oracle database instance.

DD Boost

An optimized library and communication framework with a special Data Domain API that allows the NetWorker software to define and interact with storage devices on the Data Domain system.

deduplication backup

Type of backup in which redundant data blocks are identified and only unique blocks of data are stored. When the deduplicated data is restored, the data is returned to its original native format.

deferred live backup

Type of snapshot backup in which an existing point-in-time copy (snapshot) of data, which was created on the primary storage unit by an instant backup, is backed up to secondary storage. The snapshot is retained on the primary storage.

device

1. Storage unit that can contain a backup volume. A storage unit can be a tape device, optical drive, autochanger, or disk connected to the server or storage node.
2. General term that refers to storage hardware.
3. Access path to the physical drive, when dynamic drive sharing (DDS) is enabled.

direct file access (DFA)

See “Client Direct.”

directive

Instruction that directs NetWorker software to take special actions on a given set of files for a specified client during a backup or recovery operation. Directives are ignored in manual (unscheduled) backups.

disaster recovery

Restore and recovery of business operations and data in the event of hardware failure or software corruption.

distributed segment processing (DSP)

Part of the DD Boost interface, which enables data deduplication to be performed on a host before the data is sent to the Data Domain system for storage.

drive

Hardware device through which media can be read or written to. See also “device.”

E

event-based backup

See “probe-based backup.”

expiration date

Date when a volume changes from read/write to read-only.

expired save set

Save set that has exceeded its browse time and has been removed from the NetWorker client file index. Expired save sets can no longer be browsed.

F

firewall A system designed to prevent unauthorized access to or from a private network.

full backup See “level.”

G

group Client computer or group of clients that are configured to back up files during a NetWorker scheduled backup, according to a single designated schedule or set of conditions.

H

high-availability system System of multiple computers configured as cluster nodes on a network that ensures the application services continue despite a hardware or software failure.

host Computer on a network.

I

immediate live backup Type of snapshot backup in which an existing point-in-time copy (snapshot) of data, which was created on the primary storage during an instant backup, is immediately backed up to secondary storage. The snapshot is automatically deleted from the primary storage.

incremental backup See “level.”

instance Combination of processes that runs each time a database starts up.

instant backup Type of snapshot backup that creates a point-in-time copy (snapshot) of data on the primary storage unit, which may be immediately recovered as a backup copy.

instant restore Type of snapshot restore that copies data created during an instant backup to its original location or to an alternate location.

Internationalization (I18N) Process of adapting software to accept input and output of data in various languages and locales.

J

jukebox See “library.”

L

label Electronic header on a volume used for identification by NetWorker or other data mover application.

level Backup configuration option that specifies how much data is saved during a scheduled or manual backup:

- A full backup backs up all data objects, regardless of when they last changed.
- An incremental backup backs up only data objects that have changed since the previous backup.

library Hardware device containing one or more removable media drives, as well as slots for pieces of media, media access ports, and a robotic mechanism for moving pieces of media between these components. Libraries automate media loading and mounting functions during backup and recovery. The term library is synonymous with autochanger, autoloader, carousel, datawheel, jukebox, and near-line storage.

live backup Backup to conventional storage media of a previously created snapshot. Also known as a rollover. The two types of live backup are as follows:

- "deferred live backup"
- "immediate live backup"

M

manual backup Backup that a user performs from the client, also known as an unscheduled, on-demand, or ad hoc backup.

media Physical storage, such as magnetic tape, optical disk, or file system, to which backup data is written. See also "volume."

media index Database that contains indexed entries of storage volume location and the life cycle status of all data and volumes managed by the NetWorker server. Also known as media database.

media pool See "pool."

multiplex To simultaneously write data from more than one save set to the same storage device.

N

NetWorker Management Console (NMC) Software program that is used to manage NetWorker servers and clients. The NMC server also provides reporting and monitoring capabilities for all NetWorker processes.

NetWorker server Computer on a network that runs the NetWorker server software, contains the online indexes, and provides backup and restore services to the clients and storage nodes on the same network.

NetWorker Snapshot Management (NSM) EMC NetWorker software integrated into the NetWorker client with NetWorker release 8.1, which provides point-in-time snapshots of data to be backed up. Applications that are running on the host system continue to write data during the snapshot operation. The snapshots include data from open files.

NMSAP NetWorker Module for SAP with Oracle software.

NMSAP wizard NetWorker client backup configuration wizard that incorporates NMSAP features and functionality. A user launches the wizard from the NetWorker Management Console.

notification Message sent to the NetWorker administrator about important NetWorker events.

O

offline backup Backup of database objects performed while the corresponding database or instance is shut down and unavailable to users.

online backup Backup of database objects performed while the corresponding database or instance is running and available to users.

online indexes Databases located on the NetWorker server that contain all the information pertaining to the client backups (client file index) and backup volumes (media index).

operator Person who performs day-to-day data storage tasks such as loading backup volumes into storage devices, managing libraries, monitoring volume locations and server status, verifying backups, and labeling volumes.

Oracle Recovery Manager (RMAN) Oracle utility that acts as an intelligent interface to Oracle databases for the backup and restore of Oracle database objects.

P

parallelism Method that backs up or recovers data for multiple clients, or multiple save sets for one client, at the same time.

pathname Instructions to the operating system for accessing a file:

- An absolute pathname indicates how to find a file starting from the root directory and working down the directory tree.
- A relative pathname indicates how to find a file starting from the current location.

physical host Node or host that forms part of a cluster.

point-in-time copy (PIT copy) Fully usable copy of a defined collection of data, such as a consistent file system, database, or volume, which contains an image of the data as it appeared at a single point-in-time. A PIT copy is also called a shadow copy or a snapshot.

policy Defined rules for client backups that can be named and applied to multiple groups. Groups have dataset, schedule, browse, and retention policies.

pool

1. NetWorker sorting feature that assigns specific backup data to be stored on selected media volumes.
2. Collection of NetWorker backup volumes to which specific data has been backed up.

PowerSnap EMC NetWorker Module that provides point-in-time snapshots of data to be backed up. Applications that are running on the host system continue to write data during the snapshot operation. The snapshots include data from open files.

primary storage Server storage subsystem that contains application data and any persistent snapshot backups of data. See also “conventional storage.”

probe-based backup Type of scheduled backup, also known as an event-based backup, where the NetWorker server initiates the backup only when specified conditions are met, as determined by one or more probes.

proxy client host Host used in PowerSnap or NSM snapshot backups that is separate from the database server host, with access to the primary storage unit. During a PowerSnap or NSM live backup, either the database server host or proxy client host backs up a point-in-time copy (snapshot) from the primary storage to secondary storage.

R

recover To apply transaction (redo) logs to make data consistent with a given point-in-time.

recyclable save set Save set whose browse and retention policies have expired in the NetWorker indexes. Recyclable save sets are removed from the media database.

recyclable volume NetWorker volume whose data has exceeded both its browse and retention policies and is now available to be relabeled and reused.

redo log Oracle transaction log file that records a history of all the transactions made to a database. Archived redo logs are backed up and used to recover a database to a specific point-in-time.

remote device Storage device that is attached to a storage node that is separate from the NetWorker server.

resource NetWorker software component that describes details of the NetWorker server or its clients. Clients, devices, schedules, groups, and policies are all NetWorker resources. Each resource has configurable attributes that define its properties.

resource database NetWorker database of information about each configured resource.

restore To retrieve individual datafiles from backup media and copy the files to disk, without applying transaction logs. See also “recover.”

restore from conventional storage Type of restore that restores a proxy backup from a secondary storage medium.

retention policy NetWorker setting that determines the minimum period of time that backup data is retained on a volume available for recovery. After this time is exceeded, the data is eligible to be overwritten. See also “browse policy.”

retrieve To locate and recover archived files and directories.

RMAN See “Oracle Recovery Manager (RMAN).”

rollback restore PowerSnap or NSM process by which a specific point-in-time copy (snapshot) of data is restored to the source location by using the hardware's particular capabilities. A rollback restore is a destructive save set restore.

rollover save set See “live backup.”

S

save NetWorker command that backs up client files to backup media volumes and makes data entries in the online index.

save set Collection of data from a single client computer, which is backed up on storage media.

save set ID (ssid) Internal identification number assigned to a save set.

save stream Data and save set information that is written to a storage volume during a backup. A save stream originates from a single save set.

scanner NetWorker command used to read a backup volume when the online indexes are not available.

scheduled backup Type of backup that is configured to start automatically at a specified time for a group of one or more NetWorker clients. A scheduled backup generates a bootstrap save set.

secondary storage See “conventional storage.”

server index See “client file index.”

server-side configuration NetWorker module backup configuration that is performed through the configuration wizard, with settings saved on the NetWorker server, as compared to client-side configuration. See also “client-side configuration.”

shared disk Storage disk that is connected to multiple nodes in the cluster.

snap set Group of files, volumes, or file systems from a single client that describes the collection of data for which a point-in-time copy is created on an external disk subsystem, such as a storage array.

snapshot Point-in-time, read-only copy of data created on a primary storage system during an instant backup.

snapshot policy Rules that control the lifecycle of a snap set. The snapshot policy specifies the frequency of snapshots and how long snapshots are retained before recycling.

ssid See “save set ID (ssid).”

stand-alone device Storage device that contains a single drive for backing up data. Stand-alone devices cannot store or automatically load backup volumes.

storage device See “device.”

storage node Storage device physically attached to a computer other than the NetWorker server, whose backup operations are administered from the controlling NetWorker server.

T

tablespace Database structure that consists of one or more data files.

target database Database that the NetWorker server backs up as a safeguard against data loss.

transaction log Record of named database transactions or list of changed files in a database, stored in a log file to execute quick restore and rollback transactions.

U

unscheduled backup See “manual backup.”

V

volume

1. Unit of physical storage medium, such as a magnetic tape, optical disk, or file system used to store data. Backup data must be stored on a backup volume and cannot be stored on an archive volume or a clone volume.
2. Identifiable unit of data storage that may reside on one or more computer disks.

volume name

Name that you assign to a backup volume when it is labeled. See also “label.”

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