

Symantec NetBackup™ for Oracle Administrator's Guide

UNIX, Windows, and Linux

Release 7.5



Symantec NetBackup™ for Oracle Administrator's Guide

The software described in this book is furnished under a license agreement and may be used only in accordance with the terms of the agreement.

Documentation version: 7.5

Legal Notice

Copyright © 2012 Symantec Corporation. All rights reserved.

Symantec and the Symantec Logo are trademarks or registered trademarks of Symantec Corporation or its affiliates in the U.S. and other countries. Other names may be trademarks of their respective owners.

This Symantec product may contain third party software for which Symantec is required to provide attribution to the third party ("Third Party Programs"). Some of the Third Party Programs are available under open source or free software licenses. The License Agreement accompanying the Software does not alter any rights or obligations you may have under those open source or free software licenses. Please see the Third Party Legal Notice Appendix to this Documentation or TPIP ReadMe File accompanying this Symantec product for more information on the Third Party Programs.

The product described in this document is distributed under licenses restricting its use, copying, distribution, and decompilation/reverse engineering. No part of this document may be reproduced in any form by any means without prior written authorization of Symantec Corporation and its licensors, if any.

THE DOCUMENTATION IS PROVIDED "AS IS" AND ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, ARE DISCLAIMED, EXCEPT TO THE EXTENT THAT SUCH DISCLAIMERS ARE HELD TO BE LEGALLY INVALID. SYMANTEC CORPORATION SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, PERFORMANCE, OR USE OF THIS DOCUMENTATION. THE INFORMATION CONTAINED IN THIS DOCUMENTATION IS SUBJECT TO CHANGE WITHOUT NOTICE.

The Licensed Software and Documentation are deemed to be commercial computer software as defined in FAR 12.212 and subject to restricted rights as defined in FAR Section 52.227-19 "Commercial Computer Software - Restricted Rights" and DFARS 227.7202, "Rights in Commercial Computer Software or Commercial Computer Software Documentation", as applicable, and any successor regulations. Any use, modification, reproduction release, performance, display or disclosure of the Licensed Software and Documentation by the U.S. Government shall be solely in accordance with the terms of this Agreement.

Symantec Corporation
350 Ellis Street
Mountain View, CA 94043
<http://www.symantec.com>

Technical Support

Symantec Technical Support maintains support centers globally. Technical Support's primary role is to respond to specific queries about product features and functionality. The Technical Support group also creates content for our online Knowledge Base. The Technical Support group works collaboratively with the other functional areas within Symantec to answer your questions in a timely fashion. For example, the Technical Support group works with Product Engineering and Symantec Security Response to provide alerting services and virus definition updates.

Symantec's support offerings include the following:

- A range of support options that give you the flexibility to select the right amount of service for any size organization
- Telephone and/or Web-based support that provides rapid response and up-to-the-minute information
- Upgrade assurance that delivers software upgrades
- Global support purchased on a regional business hours or 24 hours a day, 7 days a week basis
- Premium service offerings that include Account Management Services

For information about Symantec's support offerings, you can visit our Web site at the following URL:

www.symantec.com/business/support/

All support services will be delivered in accordance with your support agreement and the then-current enterprise technical support policy.

Contacting Technical Support

Customers with a current support agreement may access Technical Support information at the following URL:

www.symantec.com/business/support/

Before contacting Technical Support, make sure you have satisfied the system requirements that are listed in your product documentation. Also, you should be at the computer on which the problem occurred, in case it is necessary to replicate the problem.

When you contact Technical Support, please have the following information available:

- Product release level

- Hardware information
- Available memory, disk space, and NIC information
- Operating system
- Version and patch level
- Network topology
- Router, gateway, and IP address information
- Problem description:
 - Error messages and log files
 - Troubleshooting that was performed before contacting Symantec
 - Recent software configuration changes and network changes

Licensing and registration

If your Symantec product requires registration or a license key, access our technical support Web page at the following URL:

www.symantec.com/business/support/

Customer service

Customer service information is available at the following URL:

www.symantec.com/business/support/

Customer Service is available to assist with non-technical questions, such as the following types of issues:

- Questions regarding product licensing or serialization
- Product registration updates, such as address or name changes
- General product information (features, language availability, local dealers)
- Latest information about product updates and upgrades
- Information about upgrade assurance and support contracts
- Information about the Symantec Buying Programs
- Advice about Symantec's technical support options
- Nontechnical presales questions
- Issues that are related to CD-ROMs, DVDs, or manuals

Support agreement resources

If you want to contact Symantec regarding an existing support agreement, please contact the support agreement administration team for your region as follows:

Asia-Pacific and Japan customercare_apac@symantec.com

Europe, Middle-East, and Africa semea@symantec.com

North America and Latin America supportsolutions@symantec.com

Contents

Technical Support	4	
Chapter 1	Introduction	15
	About NetBackup for Oracle	15
	About NetBackup for Oracle features	16
	NetBackup for Oracle terminology	18
	NetBackup for Oracle operation	20
	About RMAN	21
	About the Oracle recovery catalog	23
	NetBackup for Oracle XML export and XML import	24
	NetBackup for Oracle XML export and import archiving features	24
	XML export archive process	25
	Sequence of operation: XML export archive	26
	XML import restore process	28
	Sequence of operation: XML import restore	29
Chapter 2	Installing NetBackup for Oracle	31
	Verifying the operating system and platform compatibility for NetBackup for Oracle	31
	NetBackup server and client requirements for NetBackup for Oracle	32
	Oracle server software requirements for NetBackup for Oracle	33
	Requirements for installing NetBackup for Oracle in a NetBackup cluster	33
	Configuration and licensing requirements for NetBackup for Oracle with Snapshot Client	33
	Adding license keys for NetBackup for Oracle backups	33
	About linking the Oracle Recovery Manager (RMAN) with NetBackup for UNIX and Linux	34
	Verifying environment variables and shutting down Oracle	35
	Linking the Oracle Recovery Manager (RMAN) with NetBackup for UNIX and Linux platforms	36

Chapter 3	Configuration	43
	About user interface terminology	43
	About permissions for NetBackup for Oracle log files (UNIX and Linux)	44
	Configuring the Maximum jobs per client	44
	About configuring a backup policy for an Oracle database	45
	Adding a new NetBackup for Oracle policy	46
	About policy attributes for NetBackup for Oracle	47
	About adding schedules to a NetBackup for Oracle policy	47
	About the NetBackup for Oracle backup types	47
	About backup schedules, templates, and scripts	49
	About backup schedules and Snapshot Client features	49
	About NetBackup for Oracle schedule properties	49
	Managing expired backup images	51
	Adding clients to a NetBackup for Oracle policy	52
	About adding backup selections to a Oracle policy	53
	About configuring the runtime environment	56
	About the order of precedence for runtime configuration variable settings when using scheduled backups with templates	56
	About the order of precedence for runtime configuration variable settings for all other Oracle backups	57
	About the Oracle RMAN environment	57
	About the environment variables set by a user in the XML export parameter file	59
	About the environment variables set by NetBackup for Oracle	59
	About the RMAN SEND command variables	60
	About the bp.conf file on UNIX and Linux systems	63
	About creating templates and shell scripts	64
	Starting the NetBackup Backup, Archive, and Restore interface	64
	Recovery Manager (RMAN) templates and shell scripts	65
	Creating RMAN templates using the NetBackup for Oracle RMAN template generation wizard	65
	Creating an RMAN script from a template	67
	About creating RMAN scripts manually	67
	About XML export templates and shell scripts	71
	Creating XML export templates using the NetBackup for Oracle wizard (UNIX and Linux)	71
	Creating XML export templates using the NetBackup for Oracle wizard (Windows)	72
	Creating an XML export script from a template	74

	Creating XML export scripts manually	75
	About storing templates	76
	About storing shell scripts	76
	Configuring the log on account for the NetBackup Client Service for NetBackup for Oracle on Windows	77
	Testing configuration settings for NetBackup for Oracle	78
Chapter 4	Performing backup and restores of Oracle	79
	Overview of using NetBackup for Oracle	79
	Maintaining the RMAN repository	80
	Querying the RMAN repository	84
	About performing backups	85
	Running NetBackup for Oracle templates	85
	Using bpdbsbora to run a backup template	86
	Running the NetBackup for Oracle shell script	87
	Running RMAN	87
	Browsing backups using the bplist command	88
	About NetBackup for Oracle restores	89
	Starting the recovery wizard	90
	Using the recovery wizard	91
	Using bpdbsbora to run a recovery template	92
	About a NetBackup for Oracle recovery shell script on the client	93
	Running RMAN on the client	93
	Redirecting a restore to a different client	93
	Performing an XML export archive	97
	Running NetBackup for Oracle XML export templates	98
	Using bpdbsbora to run an XML export template	99
	Running the NetBackup for Oracle XML export script on the client	100
	Running bpوراexp on the client as an Oracle user	100
	Writing to a directory versus writing to a storage unit	101
	About bpوراexp parameters	103
	Browsing XML export archives using bpوراimp parameters	106
	Browsing XML export archives using bplist	107
	Restoring an XML export archive	108
	Running the XML import wizard on the client	108
	Using bpdbsbora to run an XML import template	110
	Running an XML import script on the client	111
	Running bpوراimp on the client	111
	About bpوراimp parameters	112

	About redirecting a restore of an XML export archive to a different client	115
	Using NetBackup for Oracle in a Microsoft Windows cluster server environment	117
	About automatic backups of an Oracle clustered database on Windows	118
	About manual backups of an Oracle clustered database on Windows	118
	Bringing the database instance offline on Windows	118
	Bringing the database instance online on Windows	119
	User-directed backup or restore from the Windows client	120
Chapter 5	Guided Recovery	121
	About OpsCenter Guided Recovery	121
	Setting up for Guided Recovery cloning	122
	Guided Recovery cloning pre-operation checks	123
	Performing a Guided Recovery cloning operation	123
	Select a Master Server dialog	125
	Select Source Database panel	125
	Select Control File Backup screen	126
	Destination host and login screen	126
	Destination Parameters screen	127
	Selection summary screen	128
	Pre-clone check screen	128
	Job Details screen	128
	Guided Recovery Post-clone operations	128
	Troubleshooting Guided Recovery	129
	Troubleshooting files for metadata collection operations at the time of the backup	130
	Troubleshooting files for Guided Recovery validation operations	130
	Troubleshooting files for Guided Recovery cloning operations	131
Chapter 6	NetBackup for Oracle with Snapshot Client	133
	About NetBackup for Oracle with Snapshot Client	133
	Proxy copy	135
	NetBackup for Oracle stream-based operations	135
	NetBackup for Oracle file-based operations	136
	How NetBackup for Oracle with Snapshot Client works	137
	About the NetBackup for Oracle backup operation	138
	About the NetBackup for Oracle restore operation	138

Database objects supported by advanced backup methods	138
About NetBackup multistreaming	139
RMAN multiple channels	139
Restoring data files to a new location	140
Redirecting a restore to a different client	140
Symbolic links and raw data files (UNIX and Linux)	140
Quick I/O data files (UNIX and Linux)	141
RMAN incremental backups	141
Proxy backup examples	142
About configuring NetBackup for Oracle block-level incremental	
backups on UNIX and Linux	145
How BLI works with NetBackup for Oracle (UNIX and	
Linux)	145
Configuration requirements for BLI backups with NetBackup for	
Oracle	147
Configuring policies for BLI backups with NetBackup for	
Oracle	147
About Snapshot Client effects	148
How Snapshot Client software affects backup types	149
How Snapshot Client software affects schedule properties	149
How Snapshot Client software affects templates and	
scripts	150
NetBackup for Oracle with Snapshot Client environment	
variables	151
Chapter 7 Troubleshooting	153
About troubleshooting NetBackup for Oracle	154
About NetBackup for Oracle troubleshooting steps	154
NetBackup debug logs and reports	156
Enabling the debug logs for a NetBackup for Oracle client	
automatically (Windows)	157
Enabling the debug logs for NetBackup for Oracle manually	
(Windows)	158
Enabling the debug logs for a NetBackup for Oracle for UNIX or Linux	
client	159
About the NetBackup for Oracle log files	160
Setting the debug level on a NetBackup for Oracle Windows	
client	162
Setting the debug level on a UNIX or Linux client	162
About RMAN utility logs	163
Additional XML export and import logs	163
Troubleshooting RMAN backup or restore errors	163

	Verifying the RMAN script on UNIX and Linux	164
	Troubleshooting each stage of the backup or restore	164
	Troubleshooting XML export or XML import errors	166
	Checking the logs to determine the source of an error	166
	Troubleshooting each stage of the XML export or XML import	168
	Troubleshooting the UNIX or Linux browser interface and wizards	170
	Troubleshooting NetBackup for Oracle with Snapshot Client	171
	Minimizing timeout failures on large database restores	172
	Minimizing loading and unloading of tapes for database backups (UNIX and Linux)	173
Appendix A	Real Application Clusters	175
	About Real Application Clusters	175
	About virtual names and NetBackup for Oracle	175
	About RAC archiving schemes	176
	About backing up a database	180
	Example of restoring a database	181
	Troubleshooting database restores (UNIX and Linux)	181
	About restoring archive logs	182
Appendix B	Best practices for protecting Oracle RAC with NetBackup	183
	Oracle RAC with NetBackup best practices	183
	About NetBackup for Oracle operations	184
	Example RAC configuration: Failover VIP exists and backup is not load balanced	185
	Example RAC configuration: Failover VIP exists and backup is load balanced	187
	Example RAC configuration: Failover VIP is not available and backup is not load balanced	190
	Example RAC configuration: Failover VIP is not available, and backup is load balanced, one policy with custom script	191
	Example RAC configuration: Failover VIP is not available and backup is load balanced, simple script with manual policy failover	194
	Virtual names and RAC catalog maintenance	196

Appendix C	Deduplication best practices	197
	Optimizing and deduplicating stream-based and proxy copy Oracle backups	197
	Configuring a stream-based Oracle backup	198
	Example RMAN script for a stream-based backup	200
	Editing the RMAN script and configuring NetBackup for Oracle for a proxy copy backup	201
	Example RMAN script for a proxy copy backup	202
Appendix D	Snapshot Client support of SFRAC	205
	About Snapshot Client support of SFRAC	205
	NetBackup configuration for an SFRAC environment	205
	Configuring the SFRAC environment for a backup operation	206
	Performing a rollback restore in an SFRAC environment	207
	Troubleshooting NetBackup in an SFRAC environment	209
Appendix E	Script-based block-level incremental (BLI) backups without RMAN on UNIX and Linux systems	211
	About script-based block-level incremental (BLI) backups without RMAN	211
	About BLI backup and restore operations	212
	Verifying installation requirements for BLI backups without RMAN	212
	File system and Storage Checkpoint space management	213
	Creating NetBackup policies for script-based BLI backup	214
	Number of policies required for BLI backup	214
	About BLI policy attributes	216
	About the BLI client list	217
	Backup selections list for BLI backups	217
	About schedules for BLI backup policies	217
	Example Oracle BLI backup policy	218
	Setting the maximum jobs per client global attribute	220
	About BLI backup methods	220
	Creating notify scripts for BLI backups	221
	Performing backups and restores	226
	About NetBackup for Oracle agent automatic backups	226
	About NetBackup for Oracle manual backups	226
	Backing up Quick I/O files	227
	Restoring BLI backup images	228
	About NetBackup backup and restore logs	229
	About troubleshooting backup or restore errors	230

Troubleshooting stages of backup and restore operations	230
NetBackup restore and backup status codes	231
Improving NetBackup backup performance	233
About BLI backup and database recovery	233
Index	235

Introduction

This chapter includes the following topics:

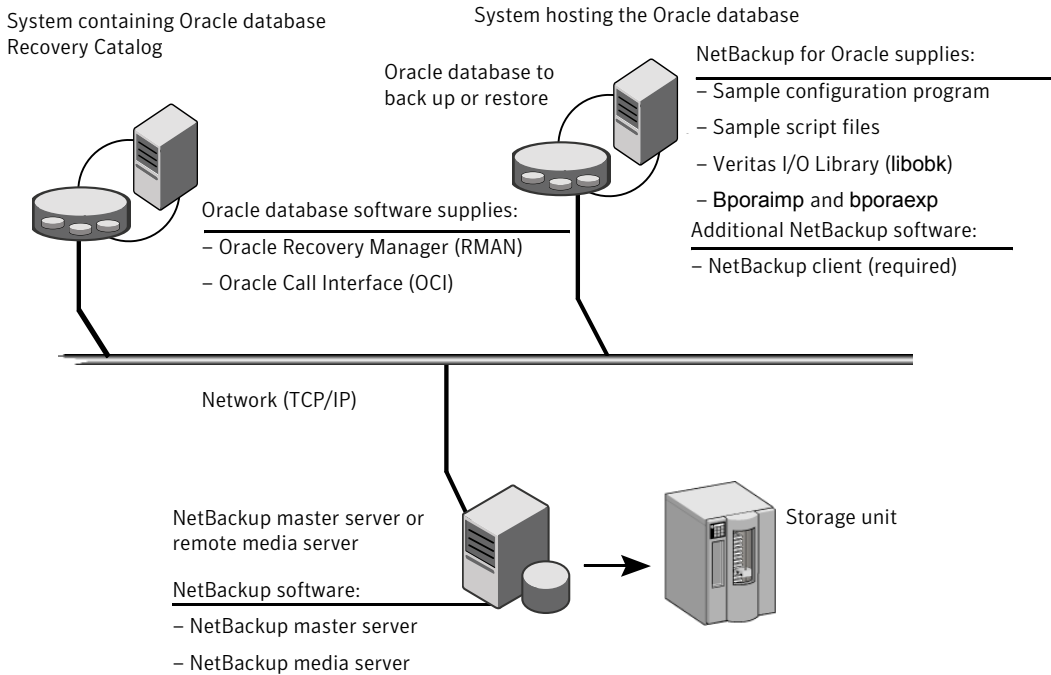
- [About NetBackup for Oracle](#)
- [About NetBackup for Oracle features](#)
- [NetBackup for Oracle terminology](#)
- [NetBackup for Oracle operation](#)
- [About RMAN](#)
- [About the Oracle recovery catalog](#)
- [NetBackup for Oracle XML export and XML import](#)

About NetBackup for Oracle

NetBackup integrates the database backup and recovery capabilities of the Oracle Recovery Manager (RMAN) with the backup and recovery management capabilities of NetBackup. NetBackup for Oracle also lets you export and import Oracle data in XML format for long-term archival and retrieval.

See [Figure 1-1](#) on page 16. shows the major components in a NetBackup configuration. The server that hosts the Oracle database must be a NetBackup client. It must also have NetBackup for Oracle licensed.

Figure 1-1 NetBackup for Oracle on a sample network



About NetBackup for Oracle features

The following table shows the NetBackup for Oracle main features:

Table 1-1 NetBackup for Oracle features

Feature	Description
Media and device management	All devices supported by Media Manager are available to NetBackup for Oracle.
Scheduling facilities	NetBackup scheduling facilities on the master server can be used to schedule automatic and unattended Oracle backups. This feature also lets you choose the times when these operations can occur. For example, to prevent interference with normal daytime operations, you can schedule your database backups to occur only at night.

Table 1-1 NetBackup for Oracle features (*continued*)

Feature	Description
Multiplexed backups and restores	NetBackup for Oracle lets you take advantage of NetBackup's multiplexing capabilities. Multiplexing directs multiple data streams to one backup device, thereby reducing the time necessary to complete the operation.
Transparent Oracle and regular file system backup and restore operations	<p>All backups and restores run simultaneously and transparently without any action from the NetBackup administrator.</p> <p>The database administrator can run database backup and restore operations through NetBackup. An administrator or any other authorized user can use NetBackup to run database backups and restores.</p> <p>Alternatively, you can use Oracle's Recovery Manager (RMAN) as if NetBackup were not present.</p>
Sharing the same storage units used for other file backups	You can share the same devices and media used for other backups or give Oracle exclusive use of certain devices and media. NetBackup for Oracle can use Media Manager, disk, and PureDisk storage units.
Centralized and networked backup operations	From the NetBackup master server, you can schedule database backups or start them manually for any client. The Oracle databases can also reside on hosts that are different from the devices on which NetBackup stores the backups.
Graphical user interfaces	<p>NetBackup provides the following graphical user interfaces for client users and administrators:</p> <ul style="list-style-type: none"> ■ Backup, Archive, and Restore user interface ■ NetBackup Administration Console for Java ■ NetBackup Administration Console for Windows ■ NetBackup OpsCenter <p>NetBackup OpsCenter is the Web graphical user interface that is used to perform an Oracle Guided Recovery cloning operation.</p> <p>See "About OpsCenter Guided Recovery" on page 121.</p> <p>A database administrator or NetBackup administrator can start backup or restore operations for Oracle from the NetBackup graphical user interface on the master server.</p>

Table 1-1 NetBackup for Oracle features (*continued*)

Feature	Description
Templates	The NetBackup for Oracle database wizards can create backup and recovery templates. You can launch the backup wizard and the recovery wizard from the Backup, Archive, and Restore interface. The wizards generate platform-independent templates that contain configuration information that the software uses when performing backups and restores. Because the wizard-generated templates do not support all the features native to Oracle, you may want to write a customized backup or restore script in an operating-system defined scripting language. You can use a template as the base for a script.
Oracle Guided Recovery cloning	Guided Recovery clones an Oracle database from a backup, and simplifies the process of creating a new database from backups of an existing database. Guided Recovery uses an Oracle cloning wizard that executes on the OpsCenter graphical user interface.
Parallel backup and restore operations	NetBackup for Oracle supports the parallel backup and restore RMAN capabilities. For example, the user can run more than one tape device at a time for a single Oracle backup or restore, thereby reducing the time necessary to complete the operation.
Compression	Compression increases backup performance over the network and reduces the size of the backup image that NetBackup writes to the storage unit.

NetBackup for Oracle terminology

[Table 1-2](#) explains some Oracle terms as they pertain to NetBackup.

Table 1-2 Oracle terms

Term	Definition
Full backup	<p>A full backup copies all blocks into the backup set, skipping only data file blocks that have never been used. Note that a full backup is not the same as a whole database backup; "full" is an indicator that the backup is not incremental.</p> <p>A full backup has no effect on subsequent incremental backups, which is why it is not considered part of the incremental strategy. In other words, a full backup does not affect which blocks are included in subsequent incremental backups.</p>

Table 1-2 Oracle terms (*continued*)

Term	Definition
Incremental backup	<p>An incremental backup is a backup of only those blocks that have changed since a previous backup. Oracle lets you create and restore incremental backups of data files, tablespaces, and a database. You can include a control file in an incremental backup set, but the control file is always included in its entirety. No blocks are skipped.</p>
Multilevel incremental backup	<p>RMAN lets you create multilevel backups. An integer identifies each level; for example, 0, 1, 2, and so on. A level 0 incremental backup, which is the base of subsequent incremental backups, copies all blocks containing data.</p> <p>When you generate a level n incremental backup in which n is greater than 0, you back up the following:</p> <p>All blocks that have been modified since the most recent backup at a level n or lower. This condition is the default type of incremental backup. It is called a differential incremental backup.</p> <p>All blocks that have been modified since the most recent backup at level $n-1$ or lower. This condition is called a cumulative incremental backup.</p> <p>The benefit to performing multilevel incremental backups is that you do not back up all of the blocks all of the time. Incremental backups at a level greater than zero (0) only copy blocks that were modified, which means that the backup size can be significantly smaller and the backup might require much less time. The size of the backup file depends solely upon the number of blocks that are modified and the incremental backup level.</p>
Differential incremental backup	<p>In a differential level n incremental backup, you back up all blocks that have changed since the most recent backup at level n or lower. For example, in a differential level 2 backup, you back up all blocks that are modified since the last level 2, level 1, or level 0 backup. Incremental backups are differential by default.</p>

Table 1-2 Oracle terms (*continued*)

Term	Definition
Cumulative incremental backup	<p>In a cumulative level n incremental backup, you back up all blocks that have changed since the most recent backup at level $n-1$ or lower. For example, in a cumulative level 2 backup, you back up all blocks that are changed since the most recent level 1 or level 0 backup.</p> <p>Cumulative incremental backups reduce the work that is needed for a restore by ensuring that you only need one incremental backup from any particular level at restore time. Cumulative backups require more space and time than differential incremental backups, however, because they duplicate the work that is done by previous backups at the same level.</p>

NetBackup for Oracle operation

The following are prerequisites for performing backups to a storage unit:

- On UNIX and Linux, linking with NetBackup
- On Windows, access to the NetBackup library
- Generating unique file names

On UNIX and Linux, NetBackup for Oracle includes a library of functions that enable RMAN to use NetBackup. See the instructions for how to link to this library.

See [“About linking the Oracle Recovery Manager \(RMAN\) with NetBackup for UNIX and Linux”](#) on page 34.

On Windows, NetBackup for Oracle includes a library of functions that enable RMAN to use NetBackup. This library is in `install_path\NetBackup\bin`.

When you use the `RMAN backup` command, each resulting backup set contains at least one backup piece (data file, data file copy, control file, or archive log) from the target database. You must give each backup piece a unique name using the `format` operand. Several substitution variables are available to aid in generating unique names. You can specify the `format` operand in the `backup` command or in the `allocate channel` command. NetBackup considers the backup piece name as the file being backed up, so this name must be unique in the catalog.

Either NetBackup users or automatic schedules start database backups by specifying a template or shell script in the file list of the Oracle policy. The template or shell script specifies the backup commands that RMAN performs on the client.

For a backup, the following items apply:

- The `rman` command starts the requested operation on the databases.
- When the process requires media to store backup data, RMAN starts a user-directed backup by issuing a backup request.
- The NetBackup media server connects to NetBackup for Oracle on the client and transfers the database data to secondary storage.

A restore works in essentially the same manner except that RMAN issues a restore request. This causes NetBackup to retrieve the data from secondary storage and send it to NetBackup for Oracle on the client.

RMAN supports parallel operations, so a single `rman` command can start more than one backup or restore on the NetBackup system.

The status for an RMAN operation is stored in the RMAN catalog or in the database control file. This same status is indicated by the output of the RMAN command used to run the backup or restore. This status is the only status that a database administrator must check to verify that a backup or restore has been successful.

NetBackup also logs status, but only for its own part of the operation. The database administrator cannot use the NetBackup status to determine whether `rman` was successful. Errors can occur in `rman` that do not affect NetBackup and are not recorded in its logs.

About RMAN

RMAN performs a wide variety of automated backup and recovery functions. During a backup or a restore, RMAN provides the interface to the databases, and it extracts and inserts data.

To start a database backup or restore, the database administrator runs a command that is called `rman`. This command can be run from the command line, a script, or an application such as NetBackup. The RMAN script is used as a parameter to the `rman` command and specifies the operations to be performed (for example, backup or restore). The RMAN script also defines other components of the operation, such as the database objects to be backed up or restored.

During a backup or restore, RMAN controls the data streams going into or out of a database. RMAN can access storage devices when it is integrated with a media management system, such as the system provided by NetBackup.

RMAN provides true incremental backups. An incremental backup backs up data files and includes only the blocks that have been changed since the last incremental backup. For more information on the backup and recovery process, see your Oracle documentation.

[Table 1-3](#) explains Oracle RMAN terms as they pertain to NetBackup.

Table 1-3 Oracle RMAN terms

Term	Definition
backup set	A backup set is a backup of one or more data files, control files, SPFILEs, and archived redo log files. Each backup set consists of one or more binary files called backup pieces. Backup pieces are written in a proprietary format that only RMAN can create or restore.
instance	An Oracle database instance consists of a System Global Area (SGA) and the Oracle background processes. When Oracle starts a database, it allocates an SGA and starts Oracle background processes. The SGA is de-allocated when the instance shuts down.
Real application clusters (RAC)	RAC is an option that allows multiple concurrent instances to share a single physical database.
RMAN	RMAN backs up, restores, and recovers database files. RMAN starts Oracle server processes on the target database. These Oracle server processes perform the backup and restore. RMAN performs backup and recovery procedures, and it greatly simplifies the tasks administrators perform during these processes. However, RMAN cannot directly manage the storage devices and media that is used in its backups, so it must be integrated with an application that has these capabilities. NetBackup for Oracle provides device and media management capabilities by integrating RMAN with NetBackup and its media management software. Other advantages are access to NetBackup's automatic scheduling facilities and the graphical interfaces.
RMAN repository	An RMAN recovery catalog or the database control file is a repository for information that RMAN uses and maintains. RMAN uses this information to determine how to run requested backup and restore actions. For a description of the recovery catalog, see your Oracle documentation.
<code>rman</code> command	The <code>rman</code> command starts an RMAN backup or restore. Your Oracle documentation describes this command.

Table 1-3 Oracle RMAN terms (*continued*)

Term	Definition
RMAN script	<p>The RMAN script specifies the commands for RMAN to perform (for example, backups, and restores). For information on RMAN commands and script files, see your Oracle documentation.</p> <p>The following directory contains example RMAN shell scripts:</p> <p>UNIX and Linux:</p> <pre>/usr/opensv/netbackup/ext/db_ext/oracle/samples/rman</pre> <p>Windows:</p> <pre>install_path\NetBackup\dbext\Oracle\samples\rman</pre> <p>These example scripts run RMAN commands and are fully commented to explain the features used. You can review these examples and use them as a starting point for developing backup, restore, and recovery scripts.</p>

About the Oracle recovery catalog

The recovery catalog is a repository of information. RMAN uses the information in the recovery catalog to determine how to perform requested backup and restore actions.

The recovery catalog contains information about the following software components:

- Data file and archive log backup sets and backup pieces.
- Data file copies.
- Archived redo logs and their copies.
- Tablespaces and data files on the target database.
- Stored scripts. These are named, user-created sequences of RMAN and SQL commands.

Oracle recommends that you use RMAN with a recovery catalog, especially if you have 20 or more data files. However, you are not required to maintain a recovery catalog with RMAN.

For information on the benefits and disadvantages of using a recovery catalog, see your Oracle documentation.

NetBackup for Oracle XML export and XML import

While Oracle RMAN performs backup, restore, and recovery of physical Oracle database objects (data files, tablespaces, control files, and archived redo logs), the NetBackup for Oracle XML export and XML import utilities provide backup and restore of logical database objects (tables, users, and rows).

The XML format is used to provide a self-identifying and system-independent format ideal for database archiving.

NetBackup for Oracle XML export and import archiving features

Table 1-4 describes NetBackup for Oracle XML export and XML import archiving features.

Table 1-4 NetBackup for Oracle XML export and XML import archiving features

Feature	Description
System- and database-independent archive format	<p>NetBackup for Oracle uses the eXtensible Markup Language (XML) standard to represent relational database table data that is extracted from an Oracle database.</p> <p>The eXtensible Markup Language (XML) is a universal format for structured documents and data. The XML 1.0 standards are produced by the World Wide Web Consortium and include the XML Schema standard.</p> <p>Unicode UTF-8 is the character set encoding generated by NetBackup for Oracle. Standard XML processors support UTF-8. US7ASCII is a strict subset of UTF-8.</p>
Self-identifying archive format	<p>The XML Schema standard is used to describe the table data that is included in an archive. In this way, the archive contains the key to understanding the format of the data as well as the data itself.</p>
Command line interfaces that allow export and import at row-level granularity	<p>Parameter files specify the table data to include in an archive and the table data to extract from an archive for import into an Oracle database.</p>
Restore destination option	<p>NetBackup for Oracle can either restore XML data to an operating system directory or import the data back into the Oracle database.</p>
Flexible archive image searches	<p>The NetBackup catalog contains information on the contents of the archive that can be searched by using flexible search criteria, such as tablename or user.</p>

XML export archive process

Figure 1-2 shows the XML export archive process.

Figure 1-2 XML export archives

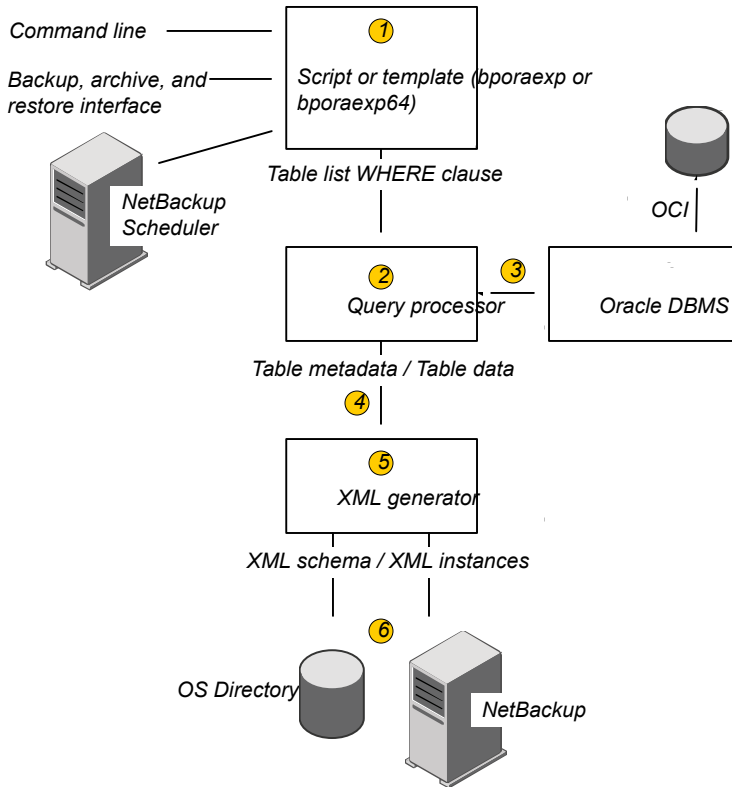


Table 1-5 describes the archive activity.

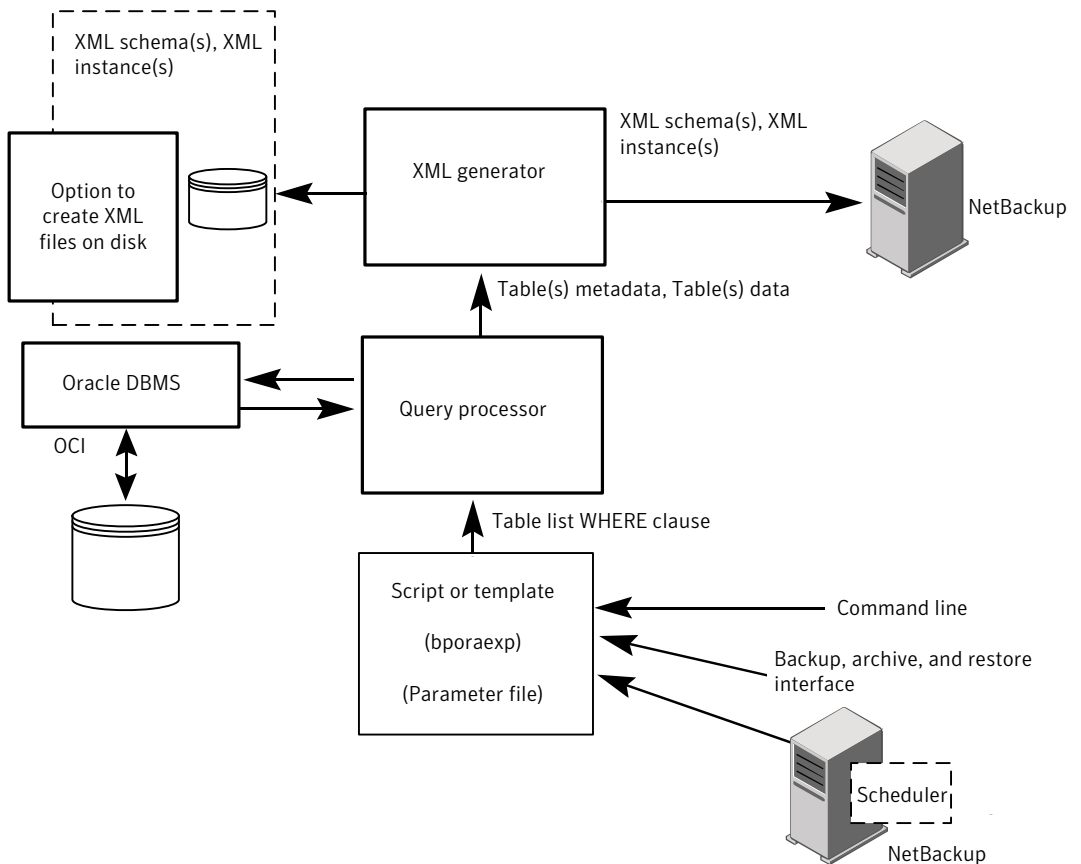
Table 1-5 Archive activity

Activity	Process
Oracle XML archive	NetBackup for Oracle extracts database table data, converts it into XML format, and stores XML data to either of the following types of repositories: <ul style="list-style-type: none">■ A directory■ A storage unit
XML export	NetBackup for Oracle converts Oracle table data to XML format (XML schema, or metadata, and XML instance, or data).
Archive	NetBackup stores the XML data on a NetBackup storage unit.
bporaexp/bporaexp64 command	NetBackup for Oracle's XML export utility converts Oracle database table data into a self-identifying XML schema document and instance document. They can be archived by NetBackup or redirected to an OS directory.

Sequence of operation: XML export archive

[Figure 1-3](#) shows data flow.

Figure 1-3 XML export archive data flow



NetBackup for Oracle users or automatic schedules start database XML export archives by performing a manual backup of an Oracle policy, by invoking the script or template at the command line on the client, or by invoking a template through the Backup, Archive, and Restore interface.

For an XML export archive:

- The NetBackup for Oracle script or template calls the `bporaexp` utility with a specified parameter file.
- The query processor uses the parameters in the specified file to build an SQL query for each table.
- Oracle's OCI API executes the queries on the Oracle instance to be archived.

- The query processor passes the output (including metadata and data for a single table or multiple tables) to the XML Generator.
- For each table passed, the XML generator builds one or more sets of XML schema and XML instance documents.
- XML data streams are backed up by NetBackup.
- Alternately, `bporaxp` allows the files to be saved to an operating system directory.

XML import restore process

Figure 1-4 shows the XML import restore process.

Figure 1-4 XML import restores

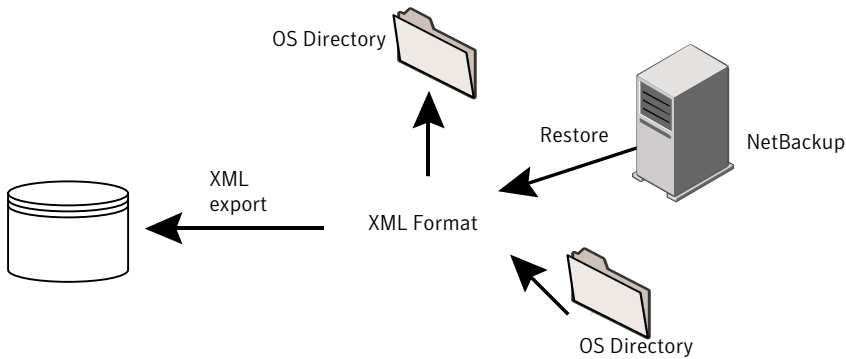


Table 1-6 describes the restore activity.

Table 1-6 Restore activity

Activity	Process
Oracle XML Restore	NetBackup for Oracle manages the retrieval of archived database table data, the parsing of the XML format, and the insertion of the data back into the Oracle database.
Restore	NetBackup retrieves the XML-formatted data from the storage unit.
XML import	NetBackup for Oracle parses XML-formatted Oracle table data and inserts data into the Oracle database.

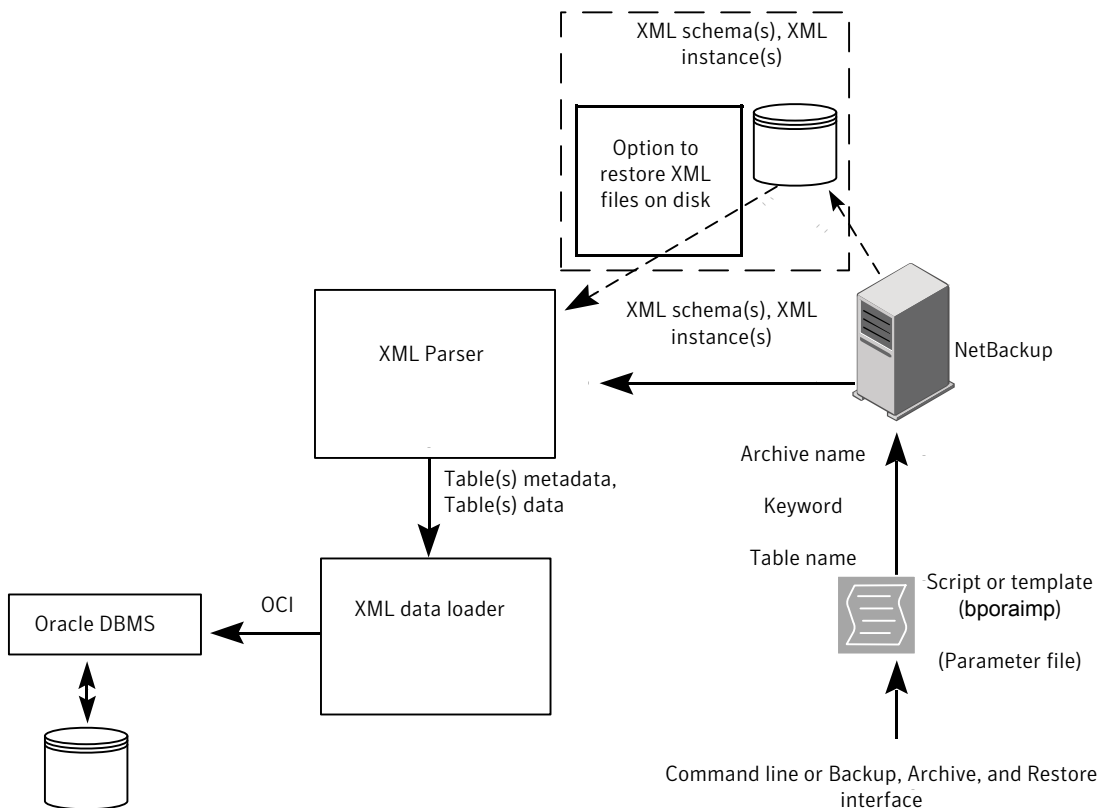
Table 1-6 Restore activity (continued)

Activity	Process
bporaimp/bporaimp64 commands	NetBackup for Oracle's XML import utility can parse the XML-formatted data for re-insertion into the database or can redirect the data to an OS directory.

Sequence of operation: XML import restore

Figure 1-5 shows data flow.

Figure 1-5 XML import restore data flow



NetBackup for Oracle users start database XML import restores by invoking a NetBackup for Oracle script or template at the client command line or by invoking an XML import restore template through the Backup, Archive, and Restore interface.

For an XML import restore:

- The NetBackup for Oracle script or template calls the `bporaimp` utility with a specified parameter file.
- The input parameters that identify the XML archive to restore are passed to NetBackup.
- NetBackup locates and reads the set of XML schema and instance documents from the NetBackup storage unit.
- The XML data stream is passed to an XML parser, which passes the data to the XML data loader.
- The XML data loader uses Oracle's OCI API to insert the data into the database. Optionally, `bporaimp` allows the XML data stream to bypass the XML parser and be sent to an operating system directory. In addition, users can restore the table metadata only into an operating system directory. `bporaimp` also allows import from an operating system directory into Oracle.

Installing NetBackup for Oracle

This chapter includes the following topics:

- [Verifying the operating system and platform compatibility for NetBackup for Oracle](#)
- [NetBackup server and client requirements for NetBackup for Oracle](#)
- [Oracle server software requirements for NetBackup for Oracle](#)
- [Requirements for installing NetBackup for Oracle in a NetBackup cluster](#)
- [Configuration and licensing requirements for NetBackup for Oracle with Snapshot Client](#)
- [Adding license keys for NetBackup for Oracle backups](#)
- [About linking the Oracle Recovery Manager \(RMAN\) with NetBackup for UNIX and Linux](#)

Verifying the operating system and platform compatibility for NetBackup for Oracle

Verify that the NetBackup for Oracle agent is supported on your operating system or platform.

To verify operating system and compatibility

- 1 Go to the Symantec Support Web page:
<http://www.symantec.com/business/support/index.jsp>
- 2 Click on the link for **NetBackup Enterprise Server**.

- 3 In the list of documents, click on the following document:
NetBackup Database Agent Compatibility List
- 4 For information on supported cluster environments for NetBackup for Oracle, see the following document:
NetBackup Cluster Compatibility List
- 5 For information on support for Snapshot Client, see the following document:
NetBackup Snapshot Client Compatibility List

NetBackup server and client requirements for NetBackup for Oracle

Every NetBackup server includes the NetBackup client software by default. Therefore, you can use NetBackup for Oracle on a NetBackup server or client (if NetBackup for Oracle is supported on that platform).

Verify that the following requirements are met for the NetBackup server:

- The NetBackup server software is installed and operational on the NetBackup server. The NetBackup server platform can be any that NetBackup supports. See the *NetBackup Installation Guide*.
- Make sure that you configure any backup media that the storage unit uses. The number of media volumes that are required depends on several things:
 - The devices used
 - The sizes of the databases that you want to back up
 - The amount of data that you want to archive
 - The size of your backups
 - The frequency of backups or archivesSee the *NetBackup Administrator's Guide, Volume I*.

Verify that the following requirements are met for the NetBackup clients:

- The NetBackup client software is installed on the computer that has the databases you want to back up.

Oracle server software requirements for NetBackup for Oracle

Verify the following regarding the Oracle server software on the NetBackup server or client:

- Oracle server software must be installed and operational.
- One or more Oracle instances must exist.

Requirements for installing NetBackup for Oracle in a NetBackup cluster

If you plan to use the database agent software on a NetBackup server configured in a NetBackup cluster, verify the following requirements:

- Your cluster environment is supported by NetBackup:
See [“Verifying the operating system and platform compatibility for NetBackup for Oracle”](#) on page 31.
- The NetBackup server software is installed and configured to work in a NetBackup cluster.
See the *NetBackup Installation Guide*.
See the *NetBackup Clustered Master Server Administrator's Guide*.
- The Oracle server software is installed and operational on each node to which NetBackup can failover.
- On each node where NetBackup server resides, add the license key for the database agent.

Configuration and licensing requirements for NetBackup for Oracle with Snapshot Client

To use NetBackup for Oracle with Snapshot Client, you must have a license for NetBackup Snapshot Client.

Adding license keys for NetBackup for Oracle backups

Note: To use NetBackup for Oracle with Snapshot Client, you must have a license for NetBackup Snapshot Client.

To use NetBackup for Oracle, add a valid license key for it on the master server. More information is available on how to add license keys.

See the *NetBackup Administrator's Guide, Volume I*.

In a NetBackup cluster, add the key on each node where the NetBackup server is installed.

To add a NetBackup for Oracle license key in the NetBackup Administration Console

- 1 On the master server, open the NetBackup Administration Console.
- 2 Choose **Help > License Keys**.
- 3 Click the **New** icon.
- 4 Type the license key and click **Add**.
- 5 Restart Oracle services on the client.

On UNIX and Linux, you can also add a license key by using the `get_license_key` command.

To add a NetBackup for Oracle license key with the `get_license_key` command

- 1 From the master server server, run the following command:

```
/usr/opensv/netbackup/bin/admincmd/get_license_key
```
- 2 When the system prompts you, type the host name of the NetBackup master server.

About linking the Oracle Recovery Manager (RMAN) with NetBackup for UNIX and Linux

Before writing to a storage unit, link the Oracle Server software with the NetBackup API library installed by NetBackup for Oracle. Oracle uses this library when it needs to write to or read from the devices that NetBackup Media Manager supports.

The following sub-topics explain how to link your Oracle software with the NetBackup API library. You can use either the linking script that NetBackup provides, or you can create the links manually. The linking process differs depending on your hardware platform, your Oracle Server release level, and your OS level. This topic does not address all the supported combinations, but it specifies OS level differences.

The default location for the NetBackup API library is `/usr/opensv/netbackup/bin`. The name of the NetBackup API library differs, depending on your platform.

[Table 2-1](#) lists the library names for the supported platforms.

Table 2-1 NetBackup API libraries

Platform	Oracle	Library name
AIX	64-bit	libobk.a64
HP Itanium	64-bit	libobk.so
HP-UX PARISC	64-bit	libobk.sl64
Linux x86	64-bit	libobk.so64
Linux Itanium	64-bit	libobk.so
IBM pSeries	64-bit	libobk.so
Solaris (SPARC)	64-bit	libobk.so.64.1
Solaris (x86)	64-bit	libobk.so.1

See [“NetBackup server and client requirements for NetBackup for Oracle”](#) on page 32.

Verifying environment variables and shutting down Oracle

The following procedure describes how to correctly define your environment variables and how to shut down the Oracle instances.

To verify environment variables and shut down Oracle instances

- 1 Make sure that your Oracle environment variables are defined.

Define the variables as follows:

`ORACLE_HOME` The directory path to the Oracle software location.

`ORACLE_SID` The name of the Oracle instance.

- 2 Become the Oracle user.

```
su - oracle
```

- 3 Determine if you need to link or re-link the library with NetBackup.

See [“Linking the Oracle Recovery Manager \(RMAN\) with NetBackup for UNIX and Linux platforms”](#) on page 36.

- 4 If this installation is an upgrade, restart the Oracle instance.

Linking the Oracle Recovery Manager (RMAN) with NetBackup for UNIX and Linux platforms

The procedures in this topic show how to link RMAN with NetBackup. The automatic method is preferred. Use the manual method only if the link script fails or if you receive Oracle messages to indicate that manual linking is required.

Link the library with NetBackup in the following circumstances:

- If you licensed NetBackup for Oracle for the first time.

Note: If you have a later Oracle release, you do not have to use the `make(1)` command to make a new Oracle executable to use the NetBackup for Oracle API library because the Oracle executable always searches for the shared library (for example, `$ORACLE_HOME/lib/libobk.so`).

The procedures reflect this change and describe the conditions under which you need to issue the `make(1)` command.

To automatically link the Oracle Recovery Manager (RMAN) with NetBackup

- 1 Run the `oracle_link` script that is located in `/usr/opensv/netbackup/bin/`.

This script determines the Oracle version level and then links Oracle with the NetBackup API library. This script writes output to `/tmp/make_trace.<pid>`. To change the trace file location, change the `MAKE_TRACE` variable in the `oracle_link` script.

- 2 If this installation is an upgrade, restart the Oracle instance.

To manually link the Oracle Recovery Manager (RMAN) with NetBackup

- ◆ Follow the instructions in one of the following platform-specific sub-topics:
 - See “[Manually linking AIX \(64-bit\)](#)” on page 36.
 - See “[Manually linking HP-UX PARISC \(64-bit\)](#)” on page 37.
 - See “[Manually linking HP Itanium \(64-bit\)](#)” on page 38.
 - See “[Manually linking Linux x86 \(64-bit\) and Linux IA-64](#)” on page 38.
 - See “[Manually linking IBM pSeries](#)” on page 39.
 - See “[Manually linking Solaris \(Opteron, 64-bit\)](#)” on page 40.
 - See “[Manually linking Solaris SPARC \(64-bit\)](#)” on page 40.

Manually linking AIX (64-bit)

Use this procedure for Oracle9i or later releases.

To manually link AIX (64-bit)

- 1 Type the following `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.*
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.a` exists.

For example:

```
mv libobk.a libobk.a.orig
```

- 4 Type the following `ln(1M)` command to create a new link:

```
ln -s /usr/opensv/netbackup/bin/libobk.a64 libobk.a
```

Manually linking HP-UX PARISC (64-bit)

Use this procedure for Oracle9i or later releases.

To manually link HP-UX (64-bit)

- 1 Type the following the `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.*
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.sl` or `libobk.a` are present.

- If `libobk.sl` exists, type the following command:

```
mv libobk.sl libobk.sl.orig
```

- If `libobk.a` exists, type the following command:

```
mv libobk.a libobk.a.orig
```

- 4 Type the following `ln(1)` command to create new links:

```
ln -s /usr/opensv/netbackup/bin/libobk.sl64 libobk.sl
```

Manually linking HP Itanium (64-bit)

Use this procedure for Oracle9.2 or later releases.

To manually link HP Itanium (64-bit)

- 1 Type the following the `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.so
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.so`.

For example:

```
mv libobk.so libobk.so.orig
```

- 4 Type the following `ln(1)` command to create new links:

```
ln -s /usr/opensv/netbackup/bin/libobk.so libobk.so
```

Manually linking Linux x86 (64-bit) and Linux IA-64

Use this procedure for Oracle 9i or later releases.

To manually Linux x86 (64-bit) and Linux IA-64

- 1 Type the following `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.so
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.so` is present.

For example:

```
mv libobk.so libobk.so.orig
```

- 4 Type the following `ln(1)` command to create a new link:

```
ln -s /usr/opensv/netbackup/bin/libobk.so64 libobk.so
```

Manually linking IBM pSeries

Use this procedure for Oracle 10g R2 or later releases.

To link manually IBM pSeries

- 1 Type the following `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.so
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.so` is present.

For example:

```
mv libobk.so libobk.so.orig
```

- 4 Type the following `ln(1)` command to create a new link:

```
ln -s /usr/opensv/netbackup/bin/libobk.so libobk.so
```

Manually linking Solaris (Opteron, 64-bit)

Use this procedure for Oracle 9i or later releases.

To manually link Solaris (Opteron, 64-bit)

- 1 Type the following `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.so
```

- 3 Use the `mv(1)` command to move the Oracle library to an alternate location. Perform this step if the output from step 2 shows that `libobk.so` is present.

For example:

```
mv libobk.so libobk.so.orig
```

- 4 Type the following `ln(1)` command to create a new link:

```
ln -s /usr/opensv/netbackup/bin/libobk.so.1 libobk.so
```

Manually linking Solaris SPARC (64-bit)

Use this procedure for Oracle 9i or later releases.

To manually link Solaris (64-bit)

- 1 Type the following `cd(1)` command to change directories:

```
cd $ORACLE_HOME/lib
```

- 2 Type the following `ls(1)` command to determine whether the Oracle library exists:

```
ls -l libobk.so
```

- 3 (Conditional) Use the `mv(1)` command to move the Oracle library to an alternate location.

Perform this step if the output from step 2 shows that `libobk.so` is present.

For example:

```
mv libobk.so libobk.so.orig
```

- 4 Type the following `ln(1)` command to create a new link:

```
ln -s /usr/opensv/netbackup/bin/libobk.so64.1 libobk.so
```

Rolling back changes after you link the Oracle Recovery Manager (RMAN) with NetBackup

If you run into problems and cannot re-link Oracle with the NetBackup API library, you can roll back what you have done.

To roll back changes after you link the Oracle Recovery Manager (RMAN) with NetBackup

- ◆ Enter the following:

```
cd $ORACLE_HOME/bin
cp oracle0 oracle
cd $ORACLE_HOME/lib64
mv libobk.so.orig libobk.so
```


Configuration

This chapter includes the following topics:

- [About user interface terminology](#)
- [About permissions for NetBackup for Oracle log files \(UNIX and Linux\)](#)
- [Configuring the Maximum jobs per client](#)
- [About configuring a backup policy for an Oracle database](#)
- [About configuring the runtime environment](#)
- [About creating templates and shell scripts](#)
- [Configuring the log on account for the NetBackup Client Service for NetBackup for Oracle on Windows](#)
- [Testing configuration settings for NetBackup for Oracle](#)

About user interface terminology

You perform many configuration steps from the NetBackup Administration Console on the master server. The type of console available depends on your master server platform. NetBackup supports a Java interface for both Windows and UNIX master servers. In addition, NetBackup supports a Windows interface for Windows master servers.

The Java and Windows interfaces are nearly identical. If interface differences exist in the configuration procedures, the term “Windows” or “Java” appears in the procedure to differentiate between the two interfaces.

About permissions for NetBackup for Oracle log files (UNIX and Linux)

NetBackup uses the `/usr/opensv/netbackup/logs` directory tree not only for the recording of troubleshooting information, but for progress and communication updates to users and other NetBackup applications. Restrictive permissions on these directories can not only disable the collection of troubleshooting data, but also prevent the application itself from functioning correctly.

Backup and restore operations fail when permissions are too restrictive. We recommend that you make all of the `usr/opensv/netbackup/logs` directories and subdirectories readable and writeable by all users (777 permissions). However, security requirements may prohibit global read-write access. If so, you can restrict permissions of specific directories to a single group or user if the following is true: Processes that run as members of that group or as that user initiate all backup and restore operations that are related to that directory.

Check that the `/usr/opensv/netbackup/logs/user_ops` directory tree has 777 permissions. The items in this directory need to be accessible for the applications to operate correctly.

If you restrict permissions on the other directories that are located in `/usr/opensv/netbackup/logs`, backup and restore operations are not affected. However, troubleshooting efforts may be hindered when processes do not have the appropriate permissions to update the debug logs therein.

Configuring the Maximum jobs per client

The following procedure shows how to set the **Maximum jobs per client** attribute.

To configure the maximum jobs per client

- 1 In the left pane of the NetBackup Administration Console, expand **NetBackup Management > Host Properties**.
- 2 Select **Master Server**.
- 3 In the right pane, double-click the server icon.
- 4 Click **Global Attributes**.
- 5 Change the **Maximum jobs per client** value to 99.

The **Maximum jobs per client** specifies the maximum number of concurrent backups that are allowed per client. The default is 1.

You can use the following formula to calculate a smaller value for the Maximum jobs per client setting:

Maximum jobs per client = *number_of_streams* X *number_of_policies*

Refer to the following definitions:

number_of_streams The number of backup streams between the database server and NetBackup. Each separate stream starts a new backup job on the client.

number_of_policies The number of policies of any type that can back up this client at the same time. This number can be greater than one. For example, a client can be in two policies to back up two different databases. These backup windows can overlap.

For Oracle backups and restores, the number of jobs is difficult to determine. This difficulty exists because Oracle internally determines when and how many streams to run in parallel to optimize performance.

Note: Enter a large enough value for the **Maximum jobs per client** attribute to meet the number of jobs that Oracle runs. You may need to experiment with different values at your site.

About configuring a backup policy for an Oracle database

A backup policy for a database defines the backup criteria for a specific group of one or more clients.

These criteria include the following:

- Storage unit and media to use
- Policy attributes
- Backup schedules
- Clients to be backed up
- Backup templates or script files to be run on the clients

To back up the database environment, define at least one Oracle policy with the appropriate schedules. A configuration can have a single policy that includes all clients, or there can be many policies, some of which include only one client.

Most requirements for database policies are the same as for file system backups. In addition to the policy attributes for this database agent, other attributes are available that you should consider.

See the *NetBackup Administrator's Guide, Volume I*.

To add and configure a policy, see the following topics:

- See [“Adding a new NetBackup for Oracle policy”](#) on page 46.
- See [“About policy attributes for NetBackup for Oracle”](#) on page 47.
- See [“About adding schedules to a NetBackup for Oracle policy”](#) on page 47.
- See [“Adding clients to a NetBackup for Oracle policy”](#) on page 52.
- See [“About adding backup selections to a Oracle policy”](#) on page 53.
- See [“About adding backup selections to a Oracle policy”](#) on page 53.

Adding a new NetBackup for Oracle policy

This topic describes how to add a new backup policy for a database.

To add a new NetBackup for Oracle policy

- 1 Log on to the master server as administrator (Windows) or root (UNIX).
- 2 Start the NetBackup Administration Console.
- 3 If your site has more than one master server, choose the one on which you want to add the policy.
- 4 Do one of the following:
 - Windows: In the left pane, right-click **Policies** and choose **New Policy**.
 - Java interface: In the left pane, click **Policies**. In the **All Policies** pane, right-click the master server, and click **New Policy**.
- 5 In the **Add a New Policy** dialog box, in the **Policy name** box, type a unique name for the new policy.
- 6 Click **OK**.
- 7 In the **Add New Policy** dialog box, in the **Policy type** list, select **Oracle**.

The database agent policy type does not appear in the drop-down list unless your master server has a license key for the database agent.
- 8 Complete the entries on the **Attributes** tab.

See [“About policy attributes for NetBackup for Oracle”](#) on page 47.
- 9 Add other policy information as follows:
 - Add schedules.

See [“About adding schedules to a NetBackup for Oracle policy”](#) on page 47.
 - Add clients.

See [“Adding clients to a NetBackup for Oracle policy”](#) on page 52.

- Add templates or scripts to the backup selections list.
 See [“About adding backup selections to a Oracle policy”](#) on page 53.

10 When you have added all the schedules, clients, and backup selections you need, click **OK**.

About policy attributes for NetBackup for Oracle

With a few exceptions, NetBackup manages a database backup like a file system backup. Other policy attributes vary according to your specific backup strategy and system configuration.

For more information on policy attributes, see the *NetBackup Administrator’s Guide, Volume I*.

Table 3-1 Policy attribute descriptions for NetBackup for Oracle policies

Attribute	Description
Policy type	Determines the types of clients that can be in the policy. In some cases the policy type determines the types of backups that NetBackup can perform on those clients. To use the Oracle database agent, you must define at least one policy of type that is Oracle.
Keyword phrase	For NetBackup for Oracle, the Keyword phrase entry is ignored.
Snapshot Client	This option enables backups with Snapshot Client.

About adding schedules to a NetBackup for Oracle policy

Each policy has its own set of schedules. These schedules initiate automatic backups and specify when a user can initiate operations. A database backup has these types of schedules: application backup and automatic backup.

About the NetBackup for Oracle backup types

[Table 3-2](#) shows the Oracle backup types you can specify.

Table 3-2 Oracle backup types

Backup type	Description
Application Backup	<p>The Application Backup schedule enables user-controlled NetBackup operations from the client. These operations include those initiated from the client and those initiated by an automatic schedule on the master server. NetBackup uses the Application Backup schedule when the user starts a backup manually. Configure at least one Application Backup schedule for each database policy. The Default-Application-Backup schedule is configured automatically as an Application Backup schedule.</p>
Automatic Full Backup	<p>An Automatic Full Backup copies all blocks into the backup set. It skips only the unused data file blocks. The Automatic Full Backup schedule enables scheduled NetBackup operations to be performed on the client. It is used to run a backup or XML export template or script automatically.</p>
Automatic Differential Incremental Backup	<p>An Automatic Differential Incremental Backup backs up all blocks that changed since the most recent full or incremental backup at level n or lower. For example, in a differential level 2 backup, NetBackup backs up all the blocks that were modified since the last level 2, level 1, or level 0 backup. Incremental backups are differential by default.</p> <p>For Oracle XML Exports, do not use an Automatic Cumulative Incremental Backup schedule or non-BLI (block level incremental) advanced methods of backup such as Snapshot Client.</p>
Automatic Cumulative Incremental Backup	<p>An Automatic Cumulative Incremental Backup backs up all blocks that changed since the most recent full backup at level $n-1$ or lower. For example, in a cumulative level 2 backup, NetBackup backs up all blocks that have changed since the most recent level 1 or level 0 backup.</p> <p>Cumulative incremental backups reduce the work that is needed for a restore. You need only one cumulative incremental backup from any particular level at restore time. However, cumulative backups typically require more space and time than Differential Incremental Backups. They duplicate the information in previous backups at the same level.</p> <p>For Oracle XML Exports, do not use an Automatic Cumulative Incremental Backup schedule or non-BLI (block level incremental) advanced methods of backup such as Snapshot Client.</p>

About backup schedules, templates, and scripts

Be aware of what may happen if an automatic schedule invokes a script that a user authored. NetBackup does not provide safeguards to prevent an automatic backup schedule, for example, from running a restore or recovery script.

To help guard against such mistakes, use a template instead of a script whenever possible. When a template runs, it detects the backup type on the schedule. You are responsible for specifying a template with the correct operation type (backup or restore) in the policy.

About backup schedules and Snapshot Client features

The information in this topic for types of backup schedules pertains to stream-based backups. If you use the Snapshot Client option, be aware that some of the information in that table may differ if you use certain Snapshot Client features.

More information backup schedules and Snapshot Client features is available.

See [“About backup schedules and Snapshot Client features”](#) on page 49.

About NetBackup for Oracle schedule properties

This topic describes the schedule properties that have a different meaning for database backups than for file system backups. Other schedule properties vary according to your specific backup strategy and system configuration. Additional information about other schedule properties is available.

See the *NetBackup Administrator’s Guide, Volume I*.

Table 3-3 Description of schedule properties

Property	Description
Type of backup	Specifies the type of backup that this schedule controls. The selection list shows only the backup types that apply to the policy you want to configure. See “About the NetBackup for Oracle backup types” on page 47.

Table 3-3 Description of schedule properties (*continued*)

Property	Description
Schedule type	<p>You can schedule a backup in one of the following ways:</p> <ul style="list-style-type: none"> ■ Frequency This setting is used only for scheduled backups. It is not used for user-directed backups. Frequency specifies the period of time that can elapse until the next backup or archive operation begins on this schedule. For example, assume that the frequency is seven days and a successful backup occurs on Wednesday. The next full backup does not occur until the following Wednesday. Typically, incremental backups have a shorter frequency than full backups. ■ Calendar This setting is used only for scheduled backups. It is not used for user-directed backups. The Calendar option allows you to schedule backup operations that are based on specific dates, recurring week days, or recurring days of the month.
Retention	<p>The retention period for an application backup schedule refers to the length of time that NetBackup keeps backup images (stream-based backups). The retention period for an automatic schedule controls how long NetBackup keeps records of when scheduled backups occurred (proxy backups). For example, if your database is backed up once every Sunday morning, you should select a retention period of at least 2 weeks.</p> <p>The retention period is affected by the type of schedule you select, as follows:</p> <ul style="list-style-type: none"> ■ Frequency-based scheduling Set a retention period that is longer than the frequency setting for the schedule. For example, if the frequency setting is set to one week, set the retention period to be more than one week. The NetBackup scheduler compares the latest record of the automatic backup schedule to the frequency of that automatic backup schedule to determine whether a backup is due. This means that if you set the retention period to expire the record too early, the scheduled backup frequency is unpredictable. However, if you set the retention period to be longer than necessary, the NetBackup catalog accumulates unnecessary records. Oracle is not notified when NetBackup expires a backup image. Use Oracle RMAN repository maintenance commands to periodically delete expired backup sets from the Oracle RMAN repository. Oracle XML export operations create archives for long-term storage and recovery. Set the retention level to a period of years or to infinity. ■ Calendar-based scheduling The retention period setting is not significant for calendar-based scheduling.
Multiple copies	<p>If you want to specify multiple copies of a backup for the policy, configure Multiple copies on the application backup schedule.</p>

Managing expired backup images

NetBackup and Oracle each maintain a repository of RMAN-initiated backup image information. Automatic expiration of backup images from both repositories is not supported. To manage expired backup images, use the Retention setting in Oracle or in the NetBackup Application Backup schedule to expire the Oracle backup images and then synchronize the NetBackup and Oracle repositories.

To manage expired backup images from the NetBackup repository, access the Retention setting of the Application Backup Schedule. Specify the length of time before NetBackup expires a backup image. The retention setting has a slightly different meaning for an Application Backup schedule versus an automatic backup schedule.

See [“About NetBackup for Oracle schedule properties”](#) on page 49.

You can also manage the expired backup images from the Oracle repository. This method sets the backup retention as an RMAN attribute, rather than a NetBackup attribute. RMAN deletes the obsolete but unexpired backups from NetBackup. The following items are also part of this process.

- Set the NetBackup backup retention for Oracle backups to be either infinite or significantly longer than the RMAN retention.
- Set the RMAN retention to the number or duration to keep the backup sets in the RMAN catalog. If no RMAN catalog exists, then use SQL to set an appropriate value for "control_file_record_keep_time". The minimum appropriate time is the catalog backup retention time plus the maximum time between catalog maintenance operations.
- On a regular basis, run the RMAN `delete obsolete` command to expire obsolete images from the RMAN catalog, the control file, and from NetBackup.
- If a cross-check of the catalog is required, perform the cross-check after RMAN deletes the obsolete backups.
- Stagger the initiation of any RMAN catalog maintenance functions to limit the number of concurrent checks or deletion requests that RMAN makes of the NetBackup master server.
- Perform the RMAN catalog maintenance functions on a more frequent basis to limit the number of NetBackup catalog requests in a single session.
- Ensure that the format that is specified for all RMAN backup piece names (except for autobackups of the control file) ends with `_%t`.
- Avoid the creation of many small backup pieces of database files or archive logs.

To manually remove references to backup images from the Oracle RMAN repository

- ◆ Use RMAN repository maintenance commands to remove references to backup files. You can use these commands to delete backup image information from both the Oracle RMAN repository and the NetBackup repository.

More information is available on the RMAN repository maintenance commands.

See [“Maintaining the RMAN repository”](#) on page 80.

When a request is issued to delete a backup file from the RMAN repository, RMAN sends the request to NetBackup to delete the corresponding image from the NetBackup repository, regardless of the retention level.

Adding clients to a NetBackup for Oracle policy

The client list contains a list of the clients on which your scripts are run during an automatic backup. A NetBackup client must be in at least one policy but can be in more than one.

NetBackup attempts to run each template in the backup selections list for each client in the client list. If a template is not valid on a particular client, the template is skipped. (For example, if the Oracle home that is specified in the template does not exist on that client.) A policy can contain multiple clients and multiple templates. Only a subset of the templates needs to be valid on each client. If the valid templates are successful, the entire backup is successful.

For a NetBackup for Oracle policy, clients you want to add must have the following software installed:

- Oracle
- NetBackup client or server
- The backup or XML export archive shell script(s), unless you use templates

To add clients to a NetBackup for Oracle policy

- 1 In the **Policy** dialog box, click the **Clients** tab.

To access the **Policy** dialog box, double-click the policy name in the **Policies** list in the NetBackup Administration Console.

- 2 Click **New**.

- 3 Type the name of the client and press **Enter** (Windows) or click **Add** (Java).

If Oracle is installed in a NetBackup cluster, specify the virtual Oracle name as the client name.

- 4 (Windows) To add another client, repeat step 2 and step 3.

- 5 (Java) To add another client, repeat step 3.
- 6 If this client is the last client you want to add, click **OK**.
- 7 (Java) In the **Policy** dialog box, click **Close**.

About adding backup selections to a Oracle policy

The backup selections list in a database policy has a different meaning than that for non-database policies. For example, in a Standard or MS-Windows policy, the list contains files and directories to be backed up.

In a database policy, you specify templates or scripts to be run.

Observe the following rules when you use templates or scripts:

- Make sure the scripts reside on each client in the client list.
Scripts can reside in any location. Make sure that NetBackup can access the location you choose and that NetBackup can run the scripts.
Note that templates do not reside on the clients. Templates reside on the NetBackup master server.
- NetBackup installs sample scripts when you install the software; you can modify these scripts for your own use.
Write the scripts to a location outside of the original installation location. In this way future NetBackup installations do not overwrite your site's scripts.
- If you use NetBackup for Oracle in a NetBackup server cluster, make sure that the scripts reside in a location that is available after a failover.

Add templates or scripts to the backup selections list only if you want to set up a policy for automatic backups. These templates or scripts are run for manual backups and for automatic schedules as specified under the **Schedules** tab. NetBackup runs the templates or scripts in the order that the templates or scripts appear in the backup selections list.

Adding a template to the backup selections list from the Java interface

The following procedure describes how to add a templates to the backup selections list with the Java interface.

Note: Be sure to specify the correct template name in the backup selections list to prevent an error or a wrong operation.

To add a template to the backup selections list from the Java interface

- 1 Open the Policy dialog box.
To access the Policy dialog box, double-click the policy name in the Policies list in the NetBackup Administration Console.
- 2 Click the Backup Selections tab.
- 3 Click **New**.
- 4 From the **Template Set** list, choose the template type by operation.
- 5 From the **Script or Template** list, select a template or type the name of a template.
Include the `.tpl` extension. Do not include the full path. For example, `weekly_full_backup.tpl`.
- 6 Click **Add** to add the template to the list.
- 7 Click **OK**.

Adding a script to the backup selections list from the Java interface

Note: Be sure to specify the correct script name in the backup selections list to prevent an error or a wrong operation.

To add a script to the backup selections list from the Java interface

- 1 Open the Policy dialog box.
To access the Policy dialog box, double-click the policy name in the Policies list in the NetBackup Administration Console.
- 2 Click the Backup Selections tab.
- 3 Click **New**.
- 4 In the Script or Template box, type the full path name of a script on the client.
For example:

```
/backup_scripts/db/cold_backup.sh  
C:\backup_scripts\db\cold_backup.cmd
```
- 5 Click **Add** to add the script to the list.
- 6 Click **OK**.

Adding a template to the backup selections list from the Windows interface

Note: Be sure to specify the correct template name in the backup selections list to prevent an error or a wrong operation.

To add a template to the backup selections list from the Windows interface

- 1 In the Policy dialog box, click the Backup Selections tab.
 To access the Policy dialog box, double-click the policy name in the Policies list in the NetBackup Administration Console.
- 2 Click **New**.
- 3 Click the **Template** button.



Alternatively, you can type the name of the template with the `.tpl` extension. Do not include the full path. For example, `weekly_full_backup.tpl`.

- 4 From the **Template set** list, choose the template type by operation.
- 5 From the **Template** list, choose the correct template.
- 6 Click **OK**.
- 7 Click **OK**.

Adding a script to the backup selections list from the Windows interface

Note: Be sure to specify the correct script name in the backup selections list to prevent an error or a wrong operation. The script must reside on the client before you try to add it to the backup selections list.

To add a script to the backup selections list from the Windows interface

- 1 In the Policy dialog box, click the Backup Selections tab.
 To access the Policy dialog box, double-click the policy name in the Policies list in the NetBackup Administration Console.
- 2 Click **New**.

- 3 Click the **Remote Folder** button.



Alternatively, you can type the full path name of the script on the client. For example:

```
/backup_scripts/db/cold_backup.sh  
C:\backup_scripts\db\cold_backup.cmd
```

- 4 Navigate to and select the script file.
- 5 Click **OK**.
- 6 Click **OK**.

About configuring the runtime environment

The order of precedence for runtime configuration is slightly different for scheduled backups using templates than for all other types of backups. The following topics describe the order of precedence for the runtime configuration variable settings.

About the order of precedence for runtime configuration variable settings when using scheduled backups with templates

The certain order applies when you use scheduled backups with templates.

The following is the order of precedence for the runtime configuration variable settings:

- Environment variables that NetBackup sets.
See [“About the environment variables set by a user in the XML export parameter file”](#) on page 59.
- Environment variables that the user sets.
 - For RMAN backups, the user with the Oracle RMAN `send` command and `parms` operand sets these variables.
See [“About the Oracle RMAN environment”](#) on page 57.
 - For XML export archives, the user in the XML export parameter file sets these environment variables.
See [“About the environment variables set by a user in the XML export parameter file”](#) on page 59.

- UNIX and Linux: User `bp.conf`.
See [“About the bp.conf file on UNIX and Linux systems”](#) on page 63.
- UNIX and Linux: Master `bp.conf`.
See [“About the bp.conf file on UNIX and Linux systems”](#) on page 63.

About the order of precedence for runtime configuration variable settings for all other Oracle backups

A certain order applies when you use Oracle backups other than scheduled backups with templates.

The following is the order of precedence for the runtime configuration variable settings:

- Environment variables that the user sets.
- For RMAN backups, the user with the Oracle RMAN `send` command and the `parms` operand sets these variables.
See [“About the Oracle RMAN environment”](#) on page 57.
- For XML export archives, the user in the XML export parameter file sets these environment variables.
See [“About the environment variables set by a user in the XML export parameter file”](#) on page 59.

The user can also set these variables on the Configuration Variables screen of the template generation wizards. However, variables set in this manner apply only for templates run from the client (through the wizard, or through Template Administration). When the scheduler runs these templates on the NetBackup master server, NetBackup overrides these variables.

- Environment variables that NetBackup sets.
UNIX/Linux: See [“About the environment variables set by NetBackup for Oracle”](#) on page 59.
Windows: See [“About the environment variables set by a user in the XML export parameter file”](#) on page 59.
- User `bp.conf` and master `bp.conf` on UNIX and Linux.
See [“About the bp.conf file on UNIX and Linux systems”](#) on page 63.

About the Oracle RMAN environment

On UNIX and Linux, when RMAN is connected to a database using TNS SQL*Net, the `send` command defines the RMAN environment. When RMAN is connected

to a database through a local connection, the `send` command or the `parms` operand defines the environment.

On UNIX and Linux, when RMAN is connected to a database through a `LISTENER` using SQL*Net, it takes on the environment of the `LISTENER`. Therefore, the environment that is defined at the system level is not visible when RMAN is running. In this case, the `send` command is used to modify the runtime environment.

On Windows, because components of RMAN run as services on Windows, special attention should be given to environment variables. The environment that a service runs in is established when the service is started, usually when the system is booted. Typically, a service is run under the `SYSTEM` account so it can take on the system level environment settings. Because a service provides RMAN functionality, an environment variable that is set at runtime is not visible during a backup or restore.

With templates, you specify the NetBackup for Oracle environment variables on the NetBackup for Oracle configuration variables wizard page.

Use the `send` command or the `parms` operand to specify NetBackup for Oracle environment variables for use during a backup or restore.

Example 1. This example uses the `send` command to specify the policy and server to use for a database backup. As this example shows, specify the variables in the string in the RMAN script after all channels have been allocated and before the `backup` command.

```
run {
    allocate channel t1 type 'SBT_TAPE';
    allocate channel t2 type 'SBT_TAPE';
        send 'NB_ORA_POLICY=your_policy, NB_ORA_SERV=your_server';
    backup
        (database format 'bk_%U_%t');
}
```

Example 2. This example uses the `parms` operand to specify the policy and server to use for a database backup. `parms` is set with each `allocate channel` command in the shell script.

```
run {
    allocate channel t1 type 'SBT_TAPE'
        parms="ENV=(NB_ORA_POLICY=your_pol,
NB_ORA_SERV=your_server)";
    allocate channel t2 type 'SBT_TAPE'
        parms="ENV=(NB_ORA_POLICY=your_pol,
```

```
NB_ORA_SERV=your_server)";
    backup
      (database format 'bk_%s_%p_%t');
  }
```

About the environment variables set by a user in the XML export parameter file

You can set the XML export parameter file in the Oracle user's environment. If you use templates, use the template generation wizard to set these variables.

On UNIX and Linux:

See [“About the environment variables set by a user in the XML export parameter file”](#) on page 59.

On Windows:

See [“Creating XML export templates using the NetBackup for Oracle wizard \(Windows\)”](#) on page 72.

[Table 3-4](#) shows the NetBackup for Oracle environment variables.

Table 3-4 NetBackup for Oracle environment variables

Environment variable	Purpose
NB_ORA_SERV	Specifies the name of NetBackup master server.
NB_ORA_CLIENT	Specifies the name of the Oracle client. On Windows, this variable is especially useful for specifying a virtual client name in a cluster.
NB_ORA_POLICY	Specifies the name of the policy to use for the Oracle backup.
NB_ORA_SCHED	Specifies the name of the Application Backup schedule to use for the Oracle backup.

About the environment variables set by NetBackup for Oracle

When a schedule runs, NetBackup sets environment variables for templates and shell scripts to use when you perform a NetBackup operation. These variables are set only if the backup is started from the server, either automatically by the NetBackup scheduler or manually through the administrator interface.

On UNIX and Linux, these variables can be used to perform conditional operations.

[Table 3-5](#) shows the variables.

Table 3-5 Variables that NetBackup for Oracle sets

Environment variable	Purpose
NB_ORA_SERV	Name of the NetBackup server.
NB_ORA_POLICY	Name of the Oracle policy.
NB_ORA_CLIENT	Name of the NetBackup client that hosts the Oracle database.
NB_ORA_FULL	Set to 1 for Automatic full backups.
NB_ORA_INCR	Set to 1 for Automatic Differential incremental backups.
NB_ORA_CINC	Set to 1 for Automatic Cumulative incremental backups.

About the RMAN SEND command variables

Oracle SEND command supports several options that are used with NetBackup for Oracle.

[Table 3-6](#) describes the options you can set for the RMAN SEND command.

Table 3-6 Options for the SEND command

Option	Purpose
BKUP_IMAGE_PERM	<p>Lets you set the permissions on a backup image at backup time. Possible values are the following:</p> <p>USER - set the permissions to 600. Only the original user who backed up the data has access to the backup images.</p> <p>GROUP - set the permissions to 660. Anyone from the same group as the original user who backed up the data has access to the backup images.</p> <p>ANY - set the permissions to 664. Anyone has access to the backup images.</p> <p>If this keyword is not specified, the permissions default to 660.</p> <p>To specify this keyword, use the send command to set the variable. For example:</p> <pre>SEND 'BKUP_IMAGE_PERM=ANY';</pre>
NB_ORA_CLIENT	Specifies the name of the Oracle client.
NB_ORA_COPY_NUMBER	Specifies which copy of the backup to use for the restore.

Table 3-6 Options for the SEND command (*continued*)

Option	Purpose
NB_ORA_METADATA	Enables (YES) and disables (NO) metadata collection for Guided Recovery operations.
NB_ORA_PARENT_JOBID	Enables the parent ID of the job ID to be displayed in the Activity Monitor (only valid if it is a scheduled job).
NB_ORA_PC_RESTORE	Specifies a snapshot rollback restore using a script or RMAN command.
NB_ORA_PC_SCHED	Specifies the NetBackup for the Oracle schedule that NetBackup uses for a proxy copy file-based backup. (This schedule can be Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental backup type). For scheduled backups, this variable is passed from the scheduler. When you create an RMAN template with the NetBackup for OracleRMANtemplate generation wizard, this variable is automatically created in the template.
NB_ORA_PC_STREAMS	<p>Specifies the number of backup streams that NetBackup starts simultaneously in each proxy copy session. When a backup starts, NetBackup groups all data files into a specified number of backup streams that are based on the file sizes. NetBackup tries to create streams of equal size. The default value for NB_ORA_PC_STREAMS is 1.</p> <p>Only a user can set this variable. When you create an RMAN template using the NetBackup for Oracle RMAN template generation wizard, it is automatically created in the template when you provide a value for the number of parallel streams.</p>
NB_ORA_POLICY	Specifies the name of the policy to use for the Oracle backup.
NB_ORA_RESTORE_PRIORITY	Specifies the restore priority in NetBackup.
NB_ORA_SCHED	Specifies the name of the Application Backup schedule to use for the Oracle backup.
NB_ORA_SERV	Specifies the name of the NetBackup master server.
CPF1_BK_CLASS	Backup Policy<%s> to be used for backup copy number 1.

Table 3-6 Options for the SEND command (*continued*)

Option	Purpose
CPF1_BK_POLICY	Application Backup <%s> to be used for backup copy number 1.
CPF1_POLICY	Policy<%s> to be used for backup copy number 1.
CPF1_SCHED	Application Backup Schedule <%s> for backup copy number 1.
CPF2_BK_CLASS	Backup Policy <%s> to be used for backup copy number 2.
CPF2_BK_POLICY	Application Backup <%s> to be used for backup copy number 2.
CPF2_POLICY	Policy<%s> to be used for backup copy number 2.
CPF2_SCHED	Application Backup Schedule <%s> for backup copy number 2.
CPF3_BK_CLASS	Backup Policy <%s> to be used for backup copy number 3.
CPF3_BK_POLICY	Application Backup <%s> to be used for backup copy number 3.
CPF3_POLICY	Policy<%s> to be used for backup copy number 3.
CPF3_SCHED	Application Backup Schedule <%s> for backup copy number 3.
CPF4_BK_CLASS	Backup Policy <%s> to be used for backup copy number 4.
CPF4_BK_POLICY	Application Backup <%s> to be used for backup copy number 4.
CPF4_POLICY	Policy<%s> to be used for backup copy number 4.
CPF4_SCHED	Application Backup Schedule <%s> for backup copy number 4.

For more information, see the *NetBackup System Administrator's Guide, Volume I*.

The following shows example `bp.conf` entries for an Oracle user:

```
SERVER=jupiter
CLIENT_READ_TIMEOUT=900
VERBOSE=1
```

About the bp.conf file on UNIX and Linux systems

A NetBackup for Oracle user can create an Oracle client `bp.conf` file in the Oracle user's home directory on the NetBackup for Oracle client host. When a NetBackup for Oracle operation is started, the user's `bp.conf` file is searched before the master configuration file (`/usr/opensv/netbackup/bp.conf`) on the client. Any option that is found at the user level overrides the same option's setting at the master level.

[Table 3-7](#) shows the options you can set in the user's `bp.conf` file.

Table 3-7 Options for the user `bp.conf` file

Option	Purpose
BPBACKUP_POLICY	This option specifies the name of the policy to use for the Oracle backup.
BPBACKUP_SCHED	This option specifies the name of the Application Backup type of schedule to use for the Oracle backup.
CLIENT_NAME	This option specifies the name of the Oracle client. This name is especially useful for a redirected restore operation.
CLIENT_READ_TIMEOUT	Use this option to increase the number of seconds that the Oracle client initially waits for a response from the NetBackup server. The default is the greater of 900 or <code>CLIENT_READ_TIMEOUT</code> .
SERVER	This option specifies the name of the NetBackup master server.
VERBOSE	This option causes NetBackup to include more information in its logs.

For more information, see the *NetBackup System Administrator's Guide, Volume I*.

The following shows example `bp.conf` entries for an Oracle user:

```
SERVER=jupiter
```

```
CLIENT_READ_TIMEOUT=900  
VERBOSE=1
```

About creating templates and shell scripts

RMAN templates and scripts contain commands that run NetBackup RMAN backup and recovery jobs. XML export and import templates and shell scripts contain commands that run NetBackup XML export backup and XML import restore jobs. Templates and scripts must be created before NetBackup can perform scheduled backups. These are the template files or shell scripts that are specified in policy configuration on the NetBackup server.

Starting the NetBackup Backup, Archive, and Restore interface

To start the NetBackup Backup, Archive, and Restore interface

- 1 Use operating system methods to log into the client upon which NetBackup for Oracle is installed.
- 2 Make sure that the Oracle database is in the `mount` or `open` state.
- 3 Start the NetBackup Backup, Archive, and Restore interface on the NetBackup client.

From the Windows Start menu, choose **All Programs > Symantec NetBackup > Backup, Archive, and Restore**.

- 4 On UNIX and Linux, run the following command:

```
/usr/opensv/java/jbpSA &
```

- 5 Provide the information that the logon dialog box requests.

On UNIX and Linux systems, how you log onto NetBackup depends on how your Oracle authentication is configured:

- OS authentication for Oracle:
Log on to NetBackup as an Oracle DBA UNIX account that includes `sysdba` privileges.
- Oracle authentication by password file:
Log on to NetBackup using any UNIX account, including root. You need to provide additional Oracle logon information later in the backup process.

For the host name, type the name of the client upon which the Oracle database and NetBackup for Oracle reside. Type your user name and password in the other fields. You can log on as a regular user.

On Windows, you do not have to log on as the administrator or as the Oracle administrator.

Recovery Manager (RMAN) templates and shell scripts

You can use templates or shell scripts with the NetBackup for Oracle agent.

The NetBackup for Oracle backup wizard creates backup templates. You can launch this wizard from the NetBackup Backup, Archive, and Restore interface.

See [“Creating RMAN templates using the NetBackup for Oracle RMAN template generation wizard”](#) on page 65.

The NetBackup for Oracle backup wizard does not support all of the RMAN commands and options that Oracle provides. Write a shell script if a template does not provide all the functionality you require.

Shell scripts are written by the user and must conform to RMAN and operating system shell syntax. Sample backup and recovery shell scripts are installed on the client with the NetBackup for Oracle agent. Modify these scripts to meet your individual requirements.

See [“About creating RMAN scripts manually”](#) on page 67.

NetBackup for Oracle also provides a utility, `bpdbsbora`, that can generate a shell script from a backup wizard template. A user can then create a template with the wizard and generate a shell script from the template. The user can then run the shell script or modify the shell script further.

See [“Creating an RMAN script from a template”](#) on page 67.

Creating RMAN templates using the NetBackup for Oracle RMAN template generation wizard

The NetBackup for Oracle backup wizard stores information about desired RMAN backup operations. The wizard uses the information to create a template that you can run immediately or you can save in a NetBackup location on the master server for later use.

For more information on backup strategies and RMAN functionality, see your Oracle documentation.

If Oracle is installed on a Windows system, the Backup, Archive, and Restore interface on the client displays an Oracle node in the left pane. From the client, expand the Oracle node in the left pane to view an Oracle instance hierarchy. Select a node in the left pane to view details in the right pane.

If your current logon does not have Oracle SYSDBA privileges, the system prompts you to enter your Oracle database logon user name and password with SYSDBA privileges to continue. Optionally, also enter your Net service name (TNS alias).

To create RMAN templates using the NetBackup for Oracle RMAN template generation wizard

- 1 Log on to NetBackup for Oracle client and start the NetBackup Backup, Archive, and Restore interface.

See [“Starting the NetBackup Backup, Archive, and Restore interface”](#) on page 64.

- 2 In the Backup, Archive, and Restore interface, expand an Oracle instance and select the database object(s) (data files, tablespaces, archived redo logs) to back up.

When you select the Oracle instance, you back up the whole database using RMAN

- 3 Choose **Actions > Backup**.

The NetBackup for Oracle RMAN template generation wizard displays the following screens for you to enter information about the backup operation you want to perform:

- Welcome (UNIX and Linux only)
- Target Database Logon Credentials
- Recovery Catalog Logon Credentials
- Archived redo logs
- Configuration Options
- Backup Options
- Database State
- NetBackup for Oracle Configuration Variables
- Backup Limits

If you need an explanation of any of the fields on the wizard screens or more details, click **Help** on the wizard screen.

- 4 After you complete the wizard, the Template Summary screen displays the summary of the backup template:

You can run the template immediately after the wizard finishes, save the template to the master server, or both. For explanations of your choices, click **Help**.

To save, to run, or to save and run the template, click **Finish**.

Creating an RMAN script from a template

You can use the `bpdbsbora` command to create a script from a backup template. This command generates RMAN shell scripts from templates that the backup wizard creates.

At the command prompt, type this command in the following format:

```
bpdbsbora -backup -g script_file -t templ_name -S server_name
```

Where:

<code>-backup</code>	Specifies the template type.
<code>-g script_file</code>	Specifies the name of the file to which you want <code>bpdbsbora</code> to write the script. Enclose <code>script_file</code> in quotation marks if it contains blanks. This option cannot be used with the <code>-r</code> (run) option.
<code>-t templ_name</code>	Specifies the name of the template that you want to use as the basis for the script. Make sure that the template exists . <code>bpdbsbora</code> retrieves backup templates from a known location on the master server, so specify only the template file name.
<code>-S server_name</code>	Specifies the master server upon which the template resides. When you specify the <code>bpdbsbora</code> command, it retrieves backup templates from the specified master server.

About creating RMAN scripts manually

You can create RMAN scripts manually instead of from the template generation wizard or from a template. When you create a script, you need to specify the type of backup and assign a name to the output file. Keep in mind the following considerations:

Backup type RMAN supports the following different types of backups:

- Full backup
- Level 0 Backup (Level 0 Incremental)
- Level *n* Backup (Differential incremental backup)
- Level *n* Backup (Cumulative incremental backup)

When generating a data file backup set, you can make either an incremental backup or a full backup. An incremental backup is a backup of one or more data files that contain only those blocks that have been modified since a previous backup. A full backup is a non-incremental backup of one or more data files that contain all blocks of the data files.

File names Observe the following with regard to file names:

- Each output file must have a unique name. Use the %U format specifier to satisfy this restriction. %U is equivalent to %u_%p_%c, and it guarantees the uniqueness of the backup set name in all circumstances.
- Put %t at the end of the backup file name format. NetBackup uses the timestamp as part of its search criteria for catalog images. Without this timestamp, performance might degrade as the NetBackup catalog grows.

About the NetBackup for Oracle sample scripts

When you install NetBackup for Oracle, the installation writes example scripts to the following directory:

Windows: `install_path\NetBackup\dbext\Oracle\samples\rman`

UNIX/Linux: `install_path/netbackup/ext/db_ext/oracle/samples/rman`

The Oracle example scripts are as follows:

Windows:

```
pit_database_restore.cmd
hot_tablespace_backup.cmd
hot_database_backup.cmd
database_restore.cmd
cold_duplex_database_backup_full.cmd
cold_database_backup.cmd
```

UNIX and Linux:

```

pit_database_restore.sh
hot_tablespace_backup.sh
hot_database_backup.sh
database_restore.sh
cold_duplex_database_backup_full.sh
cold_database_backup.sh

```

Table 3-8 explains some of the sample scripts that are provided with NetBackup for Oracle.

Table 3-8 NetBackup for Oracle sample scripts

Script	Purpose
UNIX and Linux: cold_database_backup.sh Windows: cold_database_backup.cmd	This script sets the environment and calls RMAN with the appropriate commands to perform a whole database backup. It is used for both full backups and incremental backups. When a schedule runs, NetBackup sets environment variables that the script uses to perform a backup.
UNIX and Linux: hot_database_backup.sh Windows: hot_database_backup.cmd	This script sets up the environment and calls RMAN with the appropriate commands to perform a whole database backup. It is used for both full backups and incremental backups. When a schedule runs, NetBackup sets environment variables that the script uses to perform the backup. With the proper schedules, you can use this script to run a backup every week on Friday night and an incremental backup each night for the rest of the week automatically.
UNIX and Linux: cold_duplex_database_backup_full.sh Windows: cold_duplex_database_backup_full.cmd	This script sets up the environment and calls RMAN to run commands that make two copies of a cold (consistent) database backup.

Using the NetBackup for Oracle sample scripts

The following procedure describes how to use the sample scripts to manually create your own script.

To use sample scripts provided by NetBackup for Oracle

- 1 Copy the example scripts to a different directory on your client. Oracle scripts can be located anywhere on the client.
- 2 Modify each script for your environment.
- 3 On UNIX and Linux, make sure the `su` command logs into the correct user.

If you do not include an `su - user` (*user* is Oracle administrator account) in your Oracle scripts, they do not run with the proper permissions and environment variables. Problems with your database backups and restores can arise.

About the `set duplex` command

RMAN provides an API that lets you make up to four backup sets simultaneously, each an exact duplicate of the others. Using NetBackup, for example, you can back up each copy to a different tape to protect against disaster, media damage, or human error. Use the `set duplex` and the `send` commands to take advantage of this feature.

The `set duplex` command specifies the number of copies of each backup piece to create. The `set duplex` command affects all channels that are allocated after you issue the command. It remains in effect until explicitly disabled or changed during the session. You cannot issue the `set duplex` command after allocating a channel.

The command syntax is:

```
set duplex = {ON | OFF | 1 | 2 | 3 | 4}
```

By default, `duplex` is `OFF` (a single backup set is produced). If you specify `ON`, it produces two identical backup sets.

Note that you must enable the `BACKUP_TAPE_IO_SLAVES` initialization parameter to perform duplexed backups. RMAN configures as much media as needed for the number of backup copies you request. For more information on `BACKUP_TAPE_IO_SLAVES`, see your Oracle documentation.

Use the `send` command to specify the policy and schedule to use with each backup. Because NetBackup uses the policy or schedule to determine what media to use, this information is required for each copy, or an error occurs.

The command syntax is as follows:

```
send 'keyword=value [, keyword=value,...]';
```

The keywords that are used to specify a policy are `CPF1_POLICY`, `CPF2_POLICY`, `CPF3_POLICY`, and `CPF4_POLICY`, which specify the backup policy for duplexed file 1 through duplexed file 4.

The keywords that are used to specify a schedule are `CPF1_SCHED`, `CPF2_SCHED`, `CPF3_SCHED`, and `CPF4_SCHED`, which specify the Application Backup schedule for duplexed file 1 through duplexed file 4.

About XML export templates and shell scripts

The following sections describe XML export templates and shell scripts. The templates and scripts are as follows:

Templates. The NetBackup for Oracle XML export wizard creates XML export templates. This wizard is initiated from the NetBackup Backup, Archive, and Restore interface.

The NetBackup for Oracle XML export wizard does not support all of the parameters that the command line utility `bpوراexp` provides. You can write a shell script if a template does not provide all of the required functionality.

Shell scripts. The user writes the shell scripts. They must conform to the operating system's shell syntax. Sample XML export and import shell scripts are installed on the client with the NetBackup for Oracle agent. Modify these scripts to meet your individual requirements.

NetBackup for Oracle also provides a utility, `bpдbsора`, that can generate a shell script from an XML export or import wizard template. A user can then create a template with the wizard and generate a shell script from it. The user can run or modify the shell script.

Creating XML export templates using the NetBackup for Oracle wizard (UNIX and Linux)

NetBackup for Oracle provides a wizard that solicits information about desired XML export operations. The wizard uses the information to create a template that can be run immediately or saved in a NetBackup-specific location on the current master server for later use.

To create XML export templates using the NetBackup for Oracle wizard

- 1 Open the Backup, Archive, and Restore interface.
See [“Starting the NetBackup Backup, Archive, and Restore interface”](#) on page 64.
- 2 Click the **Backup Files** tab.

- 3 In the left pane of the Backup, Archive, and Restore interface, expand the Oracle node.
- 4 In the left pane, select the Oracle instance.
Database objects that can be exported are listed under the Users node. Only the schema owners and objects accessible by the current user logon displays.
- 5 Expand the **Users** list to the schema owners of the objects to be exported.
- 6 In the right pane, select the Oracle objects to export.
- 7 Choose **Actions > Backup** to start the wizard.

The NetBackup for Oracle XML export wizard displays the following screens for you to enter information about the export operation you want to perform:

- Welcome
- Target Database Logon Credentials
- Configuration Options
- Archive Export Options
- NetBackup Archive Destination Options

If you need an explanation of any of the fields on the wizard screens or more details, click **Help** on the wizard screen.

- 8 When you have completed the wizard, the **Template Summary** screen displays the summary of the XML export template.

You can choose to run the template immediately after the wizard finishes, save the template to the master server, or both. For explanations of your choices, click **Help**.

To save, to run, or to save and run the template, click **Finish**.

Creating XML export templates using the NetBackup for Oracle wizard (Windows)

NetBackup for Oracle provides a wizard that solicits information about desired XML export operations. The wizard uses the information to create a template that can be run immediately or saved in a NetBackup-specific location on the current master server for later use.

To create XML export templates by using the NetBackup for Oracle wizard

- 1** Open the Backup, Archive, and Restore interface.
See [“Starting the NetBackup Backup, Archive, and Restore interface”](#) on page 64.
- 2** Choose **File > Select Files and Folders to Backup**.
- 3** In the left pane, expand the Oracle node.
Select a node in the left pane to view its details in the right pane.
- 4** (Optional) Enter your Oracle database logon **User name** and **Password** with SYSDBA privileges.
Perform this step if your current logon does not have Oracle SYSDBA privileges.
Optionally, also enter your Net service name (TNS alias).
- 5** In the left pane of the Backup, Archive, and Restore interface, select the Oracle instance.
Database objects that can be exported are listed under the Users node. Only the schema owners and objects accessible by the current user logon display.
- 6** Expand the User list to the schema owners of the objects to export.
- 7** In the right pane, select the Oracle objects to export.
- 8** Choose **Actions > Backup** to start the wizard.
The NetBackup for Oracle XML Export Template Generation Wizard displays the following screens for you to enter information about the export operation that you want:
 - Welcome
 - Target Database Logon Credentials
 - Configuration Options
 - Archive Export Options
 - NetBackup Archive Destination Options

If you need an explanation of any of the fields on the wizard screens or more details, click **Help** on the wizard screen.

- 9 After you complete the wizard, the Selection Summary screen displays the summary of the XML export template.

You can run the template immediately after the wizard finishes, save the template to the master server, or both. For explanations of your choices, click **Help**.

To save, to run, or to save and run the template, click **Finish**.

Creating an XML export script from a template

You can use the `bpdbsbora` command to create a script from an XML export template. This command generates XML export shell scripts from the templates that the XML export wizard creates.

To create an XML export script from a template

- ◆ At the command prompt, type this command using the following options:

```
bpdbsbora -export -g script_file -t templ_name -S server_name
```

where:

<code>-export</code>	Specifies the template type.
<code>-g <i>script_file</i></code>	Specifies the name of the file to which you want <code>bpdbsbora</code> to write the script. Enclose <i>script_file</i> in quotation marks if it contains blanks. This option cannot be used with the <code>-r</code> (run) option.
<code>-t <i>templ_name</i></code>	Specifies the name of the template that you want to use as the basis for the script. Make sure that the template exists. <code>bpdbsbora</code> retrieves XML export templates from a known location on the master server, so specify only the template file name.
<code>-S <i>server_name</i></code>	Specifies the master server upon which the template resides. When you specify the <code>bpdbsbora</code> command, it retrieves XML export templates from the specified master server.

Creating XML export scripts manually

When the database agent was initially installed, the installation software wrote example scripts to the following locations:

- For export:

UNIX/Linux: `/usr/opencv/netbackup/ext/db_ext/oracle/samples/bporaexp`

Windows: `install_path\NetBackup\dbext\Oracle\samples\bporaexp`

- For import:

UNIX/Linux: `/usr/opencv/netbackup/ext/db_ext/oracle/samples/bporaimp`

Windows: `install_path\NetBackup\dbext\Oracle\samples\bporaimp`

The example export scripts that are installed in `bporaexp` are as follows:

UNIX and Linux: `data_archiver_export.sh`

Windows: `data_archiver_export.cmd`

UNIX and Linux: `data_archiver_export64.sh`

`bporaexp_help.param`

`bporaexp_partitions.param`

`bporaexp_table_to_files.param`

`bporaexp_tables.param`

`bporaexp_tables_rows.param`

The example import scripts that are installed in `bporaimp` are as follows:

UNIX and Linux: `data_archiver_import.sh`

`data_archiver_import64.sh`

Windows: `data_archiver_import.cmd`

`bporaimp_archive.param`

`bporaimp_archive_schema_to_files.param`

`bporaimp_archive_to_users.param`

`bporaimp_bfile_table.param`

`bporaimp_help.param`

`bporaimp_ignore_rows_table.param`

`bporaimp_large_table.param`

`bporaimp_list.param`

`bporaimp_old_archive.param`

`bporaimp_partitions.pram`

```
bporaimp_table_from_files.param  
bporaimp_table_to_files.param  
bporaimp_table_to_user.param  
bporaimp_tables.param
```

To use the example scripts

- 1 Copy the example scripts to a different directory on your client. Oracle scripts can be located anywhere on the client.
- 2 Modify each script for your environment.
- 3 On UNIX and Linux, make sure that the `su` command logs into the correct user.

If you do not include an `su - user` (*user* is Oracle administrator account) in your Oracle scripts, they do not run with the proper permissions and environment variables. The result is problems with your database backups and restores.

About storing templates

The NetBackup for Oracle backup and XML export wizards save a template to a NetBackup-specific location on the current NetBackup master server. A backup or XML export template is retrieved from the master server as part of a backup (server-directed, scheduled, or user-directed) and is run on the client. Backup or XML export templates are associated with a policy by specifying its name in the policy backup selections list. Because backup or XML export templates are stored on the server in a known location, server-directed and scheduled backups or XML exports use the same copy of the template for each client in the policy client list.

Before you run a template on a NetBackup for Oracle client, NetBackup verifies the validity of the template for that client by checking the Oracle installation information that is stored in that template. Only valid templates are run on each client.

The NetBackup for Oracle recovery and XML import wizards save a template to a user-specified location on the client. The location that is specified should include a fully qualified path to a directory where the user has write access.

Templates store encrypted passwords that are decrypted at runtime.

About storing shell scripts

Shell scripts must reside on the NetBackup client. Backup or XML export shell scripts are associated with a policy by specifying the file name (including path) in the policy backup selections list. For server-directed or scheduled backups or

XML exports, each client in the policy's client list must have a copy of the script with the same name in the same location.

See “[About adding backup selections to a Oracle policy](#)” on page 53.

The backup and recovery processes sometimes require passwords for Oracle database access or system user accounts. Because a shell interprets the shell scripts, store the passwords in clear text.

Configuring the log on account for the NetBackup Client Service for NetBackup for Oracle on Windows

Because the NetBackup Client Service is started by default under the `SYSTEM` account, you also must give special attention to database user authentication. The `SYSTEM` account does not have permission to connect to the target database if you use OS authentication instead of passwords.

If you use OS authentication, run the NetBackup client service under an account that has `SYSDBA` privileges.

For more information on OS authentication, see your Oracle documentation.

Note: In a cluster environment, perform the steps on each database node in the cluster. For an off-host backup, perform the steps on the alternate client.

To configure the log on account for the NetBackup Client Service

- 1 Open the Windows Services application.
- 2 Double-click on the **NetBackup Client Service** entry.
- 3 Click on the **Log On** tab.
- 4 Type the account name with `SYSDBA` privileges.
- 5 Type the password.
- 6 Click **OK**.
- 7 Stop and start the NetBackup Client Service.
- 8 Close the Services control panel application.

Testing configuration settings for NetBackup for Oracle

After you configure the master server for NetBackup for Oracle, test the configuration settings. Perform a manual backup (or backups) with the automatic backup schedules you created. A description of status codes and other troubleshooting information is available.

See the *NetBackup Status Codes Reference Guide*.

See the *NetBackup Troubleshooting Guide*.

To test the configuration settings

- 1 Log onto the master server as administrator (Windows) or root (UNIX).
- 2 Start the NetBackup Administration Console.
- 3 In the left pane, click **Policies**.
- 4 Click the policy you want to test.
- 5 Select **Actions > Manual Backup**.

The **Schedules** pane contains the name of an automatic schedule (or schedules) configured for the policy that you want to test. The **Clients** pane contains the name of the client(s) listed in the policy that you want to test.

- 6 Follow the directions in the **Manual Backup** dialog box.
- 7 To check the status of the backup, click **Activity Monitor** in the NetBackup Administration Console.

When the Activity Monitor indicates job completion, check the output of the script(s) indicated in the policy you tested. The script shows the location to which the output is written. It is usually in the same directory as the original script, and it is similarly named.

The Activity Monitor and the script output indicate the status of the backup operation.

For more information, see the *Troubleshooting* chapter.

Performing backup and restores of Oracle

This chapter includes the following topics:

- [Overview of using NetBackup for Oracle](#)
- [Maintaining the RMAN repository](#)
- [Querying the RMAN repository](#)
- [About performing backups](#)
- [Browsing backups using the bplist command](#)
- [About NetBackup for Oracle restores](#)
- [Performing an XML export archive](#)
- [Browsing XML export archives using bporaimp parameters](#)
- [Browsing XML export archives using bplist](#)
- [Restoring an XML export archive](#)
- [Using NetBackup for Oracle in a Microsoft Windows cluster server environment](#)

Overview of using NetBackup for Oracle

The NetBackup graphical user interfaces and command line interfaces let you perform Oracle backup and recovery operations using Oracle RMAN utilities. They also let you perform Oracle archives and restores using NetBackup's XML export (`bporaexp` or `bporaexp64`) and import (`bporaimp` or `bporaimp64`) utilities.

You can also use the Oracle Enterprise Manager to perform Oracle backup and recovery operations. The Oracle RMAN command line interface is also used to maintain and query the RMAN repository.

Maintaining the RMAN repository

The RMAN repository is the collection of metadata about your target databases that RMAN uses to conduct its backup, recovery, and maintenance operations. You can either create a recovery catalog in which to store this information or let RMAN store it exclusively in the target database control file. Although RMAN can conduct all major backup and recovery operations using only the control file, some RMAN commands function only when you use a recovery catalog.

[Table 4-1](#) shows the tasks that are required to maintain the RMAN repository and a subset of the repository maintenance commands that are used to accomplish the tasks. Some of these commands might not be available with all versions of RMAN.

Table 4-1 Tasks and commands

Task	Commands used to accomplish the task
Register a database with the recovery catalog	Before using RMAN with a recovery catalog, register the target database in the recovery catalog. To register, start and mount the target database but do not open it. At the RMAN prompt, issue a <code>register database</code> command.
Reset the incarnation in the recovery catalog	The <code>reset database</code> command directs RMAN to create a new database incarnation record in the recovery catalog.

Table 4-1 Tasks and commands (*continued*)

Task	Commands used to accomplish the task
<p>Crosscheck the information in the RMAN repository</p>	<p>Because NetBackup can mark backup images as expired, the RMAN repository can contain outdated information. Run an RMAN crosscheck to ensure that data in the recovery catalog or control file is in sync with data in the backup image catalog. The crosscheck determines whether a backup set is available or expired, deletes expired backup sets, calls the Media Manager about the status of a backup piece, then marks it as available or expired.</p> <p>Use one of the following commands to check the specified files. You need to run separate commands to delete images or repository records.</p> <ul style="list-style-type: none"> ■ The <code>change . . . crosscheck</code> command queries Media Manager to determine if a backup piece is available. If not, RMAN marks the backup piece as expired. If it was expired but is now available, RMAN marks the backup piece as available. The command syntax is as follows: <pre>change backuppiece {primary_keylist filename_list tag} crosscheck; change backupset {primary_keylist} crosscheck;</pre> ■ The <code>crosscheck backupset</code> command operates on available and expired backup pieces. RMAN updates their status with the result (available or expired). <p>To crosscheck a database, start RMAN and connect to the target database and to the recovery catalog (if used). At the <code>rman</code> command prompt, enter the following:</p> <pre>allocate channel for maintenance type 'SBT_TAPE'; crosscheck backupset of database;</pre> <p>The length of time that RMAN crosschecks when the maintenance channel is connected to NetBackup depends on several factors:</p> <ul style="list-style-type: none"> ■ Number of RMAN backup pieces being crosschecked or that are past their NetBackup retention period when NetBackup expires them, not RMAN. ■ Format of the RMAN backup piece name and if the Symantec recommended <code>_%t</code> appears at the end of the format statement. ■ Number of Oracle clients. ■ Number of NetBackup policies of any kind. ■ Length of time that NetBackup retains backups and the number of backup images for the client in the NetBackup catalog. ■ Scheduling time and the length of time between RMAN catalog maintenance operations. ■ Speed and accuracy of hostname resolution available to the NetBackup master server. ■ Number and complexity of operations performed by the NetBackup master server during a catalog request. ■ Normal performance.

Table 4-1 Tasks and commands (*continued*)

Task	Commands used to accomplish the task
Delete obsolete backups	<p>The DELETE OBSOLETE command deletes backups that no longer need to satisfy specified recoverability requirements. You can delete obsolete files according to the configured default retention policy, or another retention policy specified by a DELETE OBSOLETE option. As with other forms of the DELETE command, the deleted files are removed from the backup media, deleted from the recovery catalog, and marked as DELETED in the control file.</p> <p>If you specify the DELETE OBSOLETE command with no arguments, then RMAN deletes all obsolete backups defined by the currently configured retention policy. For example,</p> <pre>Allocate channel for maintenance type 'SBT_TAPE'; DELETE OBSOLETE;</pre> <p>You can also use the REDUNDANCY or RECOVERY WINDOW clauses with DELETE to delete backups obsolete under a specific retention policy instead of the configured default:</p> <pre>DELETE OBSOLETE REDUNDANCY = 3; DELETE OBSOLETE RECOVERY WINDOW OR 7 DAYS;</pre>
Delete expired backups	<p>The <code>delete expired backupset</code> command operates only on expired backup pieces that are found in the recovery catalog. RMAN removes them from the recovery catalog.</p> <p>To delete expired backup sets of a database from the recovery catalog, start RMAN and connect to the target and recovery catalog databases. At the RMAN command prompt, type the following commands:</p> <pre>allocate channel for maintenance type 'SBT_TAPE'; delete expired backupset of database;</pre> <p>The <code>crosscheck</code> and <code>delete backupset</code> commands let you restrict the list of objects operated on to the specified Oracle device type (disk or SBT tape), object type (archived logs or database files), and date range.</p>

Table 4-1 Tasks and commands (*continued*)

Task	Commands used to accomplish the task
Resynchronize the recovery catalog	<p>RMAN compares the recovery catalog to either the current control file of the target database or a backup control file. It subsequently updates the catalog with the information that is missing or changed.</p> <p>If you are running in <code>ARCHIVELOG</code> mode, resynchronize the recovery catalog regularly since the recovery catalog is not updated automatically when a log switch occurs or when a redo log is archived.</p> <p>You must also resynchronize the recovery catalog after making any change to the physical structure of the target database. As with log archive operations, the recovery catalog is not automatically updated when a physical schema change is made.</p> <p>The RMAN <code>backup</code>, <code>copy</code>, <code>restore</code>, and <code>switch</code> commands update the recovery catalog automatically when the target database control file is available, and the recovery catalog database is available when any of these commands are executed.</p> <p>If the recovery catalog is unavailable when you issue <code>backup</code> or <code>copy</code> commands, you should resynchronize it manually.</p> <p>To resynchronize the recovery catalog, start RMAN and issue the <code>resync catalog</code> command.</p>
Change the availability of a backup set or file copy	<p>Periodically, you might need to notify RMAN that the status of a backup set, backup piece, data file copy, or archived redo log has changed. The RMAN <code>change</code> command enables you to make a variety of useful record changes.</p> <p>The <code>change ... uncatalog</code> command removes references to a backup piece, data file copy, or archive log from the recovery catalog. This command works only with a recovery catalog.</p> <p>The <code>change ... delete</code> command removes references to a backup piece, data file copy, or archive log from the control file and recovery catalog. It physically deletes the file. This command works with or without a recovery catalog.</p> <p>The <code>change ... crosscheck</code> command removes references to a backup piece, data file copy, or archive log from the control file and recovery catalog when that file no longer exists. This command works with or without a recovery catalog.</p> <p>The <code>change ... unavailable</code> command marks a backup piece, data file copy, or archive log as unavailable. This command works only with a recovery catalog.</p>
Validate the restore of backups	<p>A restore validation executes a restore test run without restoring the files. Test the restore of the entire database or individual tablespaces, data files, or control files.</p> <p>Use <code>restore ... validate</code> when you want RMAN to choose the backups to test.</p> <p>Use <code>validate backupset</code> when you want to specify the backup sets to test.</p>

Querying the RMAN repository

RMAN lets you generate a number of reports relevant for backup and recovery using the `report` and `list` commands. The `list` command lists the contents of the recovery catalog or control file, and the `report` command performs a more detailed analysis.

Use the `report` and `list` commands to determine what you have backed up and what you need to back up. The information is available whether or not you use a recovery catalog.

You can use the `report` command to answer many different questions.

Some examples are as follows:

- Which files need a backup?
- Which files have not had been backed up in awhile?
- Which files are not recoverable due to unrecoverable operations?
- Which backup files can be deleted?
- What was the physical schema of the database at some previous point in time?

The `list` command queries the recovery catalog and control file and produces a listing of its contents. The primary purpose of the `list` command is to determine the backups that are available.

You can list the following information:

- Backup sets containing a backup of a specified list of data files.
- Backup sets containing a backup of any data file that is a member of a specified list of tablespaces.
- All backup sets or copies of all data files in the database.
- Backup sets containing a backup of any archive logs with a specified name or within a specified range.
- Incarnations of a specified database or of all databases that are known to the recovery catalog.

For more information on querying the RMAN repository, see your Oracle documentation.

About performing backups

You can perform different types of backups using NetBackup. Backups can be run automatically using schedules that you determine, or you can run a backup manually. The following table describes these methods of running a backup.

Automatic backups	<p>When the NetBackup scheduler invokes a schedule for an automatic backup, the NetBackup for Oracle backup templates or shell scripts run as follows:</p> <ul style="list-style-type: none">■ In the same order as they appear in the file list■ On all clients in the client list <p>The NetBackup for Oracle backup templates or shell scripts start the database backup by running the <code>rman</code> command.</p> <p>When the backup is started through NetBackup, RMAN performs error checking. The <code>rman</code> command generates an error if it considers a command invalid, but it allows any of the commands it typically considers valid to proceed. When you specify the wrong script file name, you can start an unintended operation.</p>
Manual backups	<p>You can use the NetBackup server software to manually run an automatic backup schedule for the Oracle policy. For more information, see the <i>NetBackup Administrator's Guide, Volume I</i>.</p> <p>See “Testing configuration settings for NetBackup for Oracle” on page 78.</p>

Running NetBackup for Oracle templates

The Oracle template administration interface is available in the NetBackup Backup, Archive, and Restore interface.

Use this dialog to run, edit, delete, rename, and view existing backup templates. These are the templates created by the NetBackup for Oracle RMAN template generation wizard and stored in a predetermined location on the master server.

See [“Creating RMAN templates using the NetBackup for Oracle RMAN template generation wizard”](#) on page 65.

To use Oracle template administration

- 1 In the Backup, Archive, and Restore interface, choose Actions > **Administer Database Templates > Oracle**.

The **Select Template** list shows the names and descriptions of the RMAN backup templates that are stored on the current master server.

- 2 Select the name of the backup template you want to run.
- 3 Click **Run**.

You can use the View Status tool to see the status of the backup. Click Actions > **View Status**.

The Oracle template administration window provides the following functions:

Run	Runs the selected template.
Edit	Changes the contents of an existing template. The selected backup template is loaded into the NetBackup for Oracle RMAN template generation wizard.
Delete	Removes the selected template. On UNIX and Linux, you must be the root user or the template creator to delete a template. On Windows, you must be a system administrator or the template creator to delete a template.
Rename	Changes the name of the selected template. On UNIX and Linux, you must be the root user or the template creator to rename a template. On Windows, you must be a system administrator or the template creator to rename a template.
View	Displays a summary of the selected template.

Using `bpdbsbora` to run a backup template

The `bpdbsbora` command lets you run a backup template that is created by the NetBackup for Oracle RMAN template generation wizard.

At the command prompt, type this command using the following options:

```
bpdbsbora -backup -r -t templ_name [-S svr_name] [-L prog_file]
```

where:

<code>-backup</code>	Specifies the template type.
<code>-r</code>	Runs the template.
<code>-t <i>templ_name</i></code>	Specifies the name of the template that you want to use. <code>bpdbsbora</code> retrieves backup templates from a known location on the master server, so specify only the template file name.
<code>-S <i>server_name</i></code>	Optional. Specifies the master server upon which the templates reside. When it is specified, the <code>bpdbsbora</code> command retrieves backup templates from the specified master server.
<code>-L <i>prog_file</i></code>	Optional. Specifies a runtime progress log. Enclose <i>prog_file</i> in quotation marks (" ") if it contains space characters.

For example:

```
bpdbsbora -backup -r -t ORCLMonfull.tpl -S my_mast -L my_prog_log
```

Running the NetBackup for Oracle shell script

When you run a NetBackup for Oracle shell script on a client to initiate a backup from the operating system's command prompt, specify the full path name to the file that contains the script. For example:

```
UNIX/Linux: /oracle/scripts/db_full_backup.sh
```

```
Windows: N:\oracle\scripts\db_full_backup.cmd
```

The shell starts the database backup by running the Oracle shell script. The Oracle shell script contains commands to run `rman`.

The NetBackup installation script installs sample scripts in the following location:

```
UNIX/Linux: /usr/opencv/netbackup/ext/db_ext/oracle/samples/rman
```

```
Windows: install_path\NetBackup\dbext\oracle\samples\rman
```

Running RMAN

As an Oracle user, you can run the `rman` command from the operating system command prompt with the RMAN command file as a parameter. This topic describes how to set the master server to `hag` and the Oracle policy to `obk` before you start the backup.

On UNIX and Linux, at the command prompt, type the following:

```
# rman target 'internal/oracle@ORCL' rcvcat 'rman/rman@RCAT'  
# send '\NB_ORA_POLICY=obk,NB_ORA_SERV=hag' " cmdfile \\  
'/oracle/scripts/db_full_backup.rcv"
```

If you intend to connect to a database using a TNS alias, the `RMAN send` command specifies the environment variables. The example sets the master server to `hag` and the Oracle policy to `obk` before you start the backup.

See [“About the bp.conf file on UNIX and Linux systems”](#) on page 63.

On Windows, RMAN functionality runs as a service, so use the `send` operand to set up the runtime environment. To start a backup using the `rman` command from the command prompt, type the following:

```
# send '\NB_ORA_POLICY=obk,NB_ORA_SERV=hag' " cmdfile \\  
"N:\oracle\scripts\db_full_backup.rcv"
```

Note: To run script files for database operations other than backups or restores, Symantec recommends that you run the `rman` command directly rather than using NetBackup.

For `rman` command script syntax and examples, see your Oracle documentation.

Browsing backups using the bplist command

You can use the `bplist` command to browse Oracle backups. The command returns a list of backup file names.

Before using this command, log as follows into either the master server or to the client:

- On Windows, log on as administrator to the master server and to the client with the appropriate *altnames* entry.
- On UNIX and Linux, log on as root to the master server and to the client with the appropriate *altnames* entry.

The following example uses the command to search all Oracle backups for a client named `jupiter`:

```
# bplist -C jupiter -t 4 -R /  
  
/exb_n2bm5bco_1_1392342936  
/exb_mabm02ko_1_1392170136  
/exb_lqbltds6_1_1392083334
```


The `-t 4` on this command specifies the Oracle backups. The `-R` specifies the default number (999) of directory levels to search.

For more information on the `bplist` command, see the *NetBackup Commands Reference Guide*.

You can also use the `RMAN report` and `list` commands to browse Oracle backups.

See [“Querying the RMAN repository”](#) on page 84.

About NetBackup for Oracle restores

Make sure that a backup has completed successfully before you attempt a restore. An error occurs if a backup history does not exist.

NetBackup for Oracle includes a recovery wizard that solicits information from the user about the desired RMAN restore and recovery operations. The wizard uses the information to create a template.

The recovery wizard saves a recovery template locally in a user-specified location on the NetBackup client. Recovery templates are not stored on the master server because recovery is always user directed, not scheduled. Typically, you run the recovery template immediately and then delete it.

The recovery process sometimes requires passwords for Oracle database access and system user accounts. Templates store the encrypted passwords that are decrypted at runtime.

Because recovery can be a complex process, it might be necessary to perform manual steps as part of the operation. For more information, see your Oracle documentation.

The restore browser is used to display database objects. A hierarchical display is provided where objects can be selected for recovery. The top database node expands to show all of the installed databases.

On UNIX and Linux, the `oratab` file is read to get the names and location of each database.

On Windows, Oracle services are searched for in the Registry to get the names and location of each database.

The objects (tablespaces and data files) that make up an Oracle database are displayed by expanding an individual database node. This information is gathered from various database tables and views. Since you must be connected to the database before you can access its tables or views, logon criteria must be provided. When a user selects or expands a database node the wizard first tries to logon to the database using OS authentication. If the authentication fails the user is solicited for a user name and password. Optionally, the user is prompted for the Net Service

Name if the connection is through SQL-Net, which is then used to logon to the database. This user must have a sysdba privilege since the logon credentials that are also used to perform the RMAN restore. The logon fails if the database is not in a mount state or an open state.

On UNIX and Linux, the GUI uses the `bpubsonora` utility to access and query the database. If there is a problem when NetBackup attempts to connect or browse a database this utility can be run from the command line to debug the issue.

On Windows, NetBackup uses an API to browse the database. Logging is recorded in the `nbwin` folder.

The recovery wizard has several limitations:

- The database is displayed only in its current state. If objects have been deleted from the database since the last backup, these objects do not appear among the objects you can select for restore. To restore the objects that have been deleted, you need to restore the entire database point in time before the objects were deleted.
- Data is restored to the original location. The wizard does not provide a way for the user to specify alternate file names.
- The wizard does not restore control files.

Starting the recovery wizard

This topic describes how to start the recovery wizard.

To start the recovery wizard

- 1 Start the Backup, Archive, and Restore interface.

On UNIX and Linux, from the command line, run the following command:

```
/usr/opensv/netbackup/bin/jbpSA &
```

On Windows, from the Windows Start menu, choose **All Programs > Symantec NetBackup > Backup, Archive, and Restore**.

- 2 (Conditional) Change the policy type.

Perform this step if the Oracle node is not visible.

From the File menu (Windows) or Actions menu (UNIX and Linux), choose **Specify NetBackup Machines and Policy Type**.

- 3 On UNIX and Linux, click the Restore Files tab.
- 4 On Windows, click **Select for Restore**.

- 5 Expand the Oracle node in the left pane to view an Oracle instance hierarchy.
- 6 Select a node in the left pane to view details in the right pane.

Using the recovery wizard

When you are ready to perform a recovery, follow these steps to create and run a template with the recovery wizard.

To use the recovery wizard

- 1 Open the Backup, Archive, and Restore interface.
- 2 Select the Restore operation:
 - On Windows, click **Select for Restore**
 - On UNIX and Linux, click on the **Restore Files** tab. In the **Restore Type** list, select **Normal Backups**.
- 3 In the left pane, select the Oracle instance.
- 4 In the right pane, select the database object(s) (data files, tablespaces) you want to recover.

If you select the Oracle instance, the wizard recovers the entire database using RMAN.

- 5 Click Actions > **Restore**.

Enter information about the recovery operation you want to perform in the screens that the NetBackup for Oracle recovery wizard displays.

The screens are as follows:

- Welcome
- Target Database Logon Credentials
- Recovery Catalog Logon Credentials
- Recovery Options
- Restore Options
- Recover Limits
- Database State

If you need an explanation of any of the fields on the wizard screens, click **Help** on the wizard screen.

- 6 When you have completed the wizard, the Selection Summary screen displays the summary of the recovery template. Review this summary. You can choose to run the template immediately after the wizard finishes or save the template locally, or both.

If you need an explanation of any of the fields on the wizard panels, click **Help** on the wizard panel.
- 7 Click **Finish** to run, to save, or to run and save the recovery template.

Using bpdbsbora to run a recovery template

The `bpdbsbora` command lets you run a recovery template that is created by the NetBackup Recovery wizard.

At the command prompt, type this command and the following options:

```
bpdbsbora -restore -r -t templ_name [-L progress_file]
```

where:

<code>-restore</code>	Specifies the template type.
<code>-r</code>	Runs the template.
<code>-t <i>templ_name</i></code>	Specifies the full-path name of the template you want to use. Unlike backup templates, restore templates do not reside in a predetermined location on the master server. They are considered to be temporary in nature and should reside on the client. If the full path is not specified as part of the restore template name, the file might not be found.
<code>-L <i>progress_file</i></code>	Optional. Specifies a run-time process log. Enclose <i>progress_file</i> in quotation marks (" ") if it contains space characters.

For example:

For UNIX and Linux:

```
bpdbsbora -restore -r -t /oracle/restore_templates/ORCL_MON_Full.tpl
```

For Windows:

```
bpdbsbora -restore -r -t H:\oracle\restore_templates\ORCL_MON_Full.tpl
```

About a NetBackup for Oracle recovery shell script on the client

You can initiate a database recovery from the operating system command prompt by typing the full path to the shell script that performs an Oracle recovery. For example:

```
UNIX/Linux: /oracle/scripts/database_restore.sh
```

```
Windows: H:\oracle\scripts\database_restore.cmd
```

The operating system shell starts the database restore by running the Oracle shell script file. The Oracle shell script file contains commands to run RMAN.

The NetBackup installation script writes sample scripts to the following location:

```
UNIX/Linux: /usr/opensv/netbackup/ext/db_ext/oracle/samples/rman
```

```
Windows: install_path\Netbackup\dbext\oracle\samples\rman\
```

Running RMAN on the client

You can run the `rman` command from a command line on the client. Use the appropriate RMAN command file as a parameter.

On UNIX and Linux, the following example assumes that you are logged on as an Oracle administrator.

To run the `rman` command on the client

- ◆ At the command prompt, type the following:

```
UNIX and Linux: rman target 'internal/oracle@ORCL' rcvcat  
'rman/rman@RCAT' cmdfile '/oracle/scripts/database_restore.rcv'
```

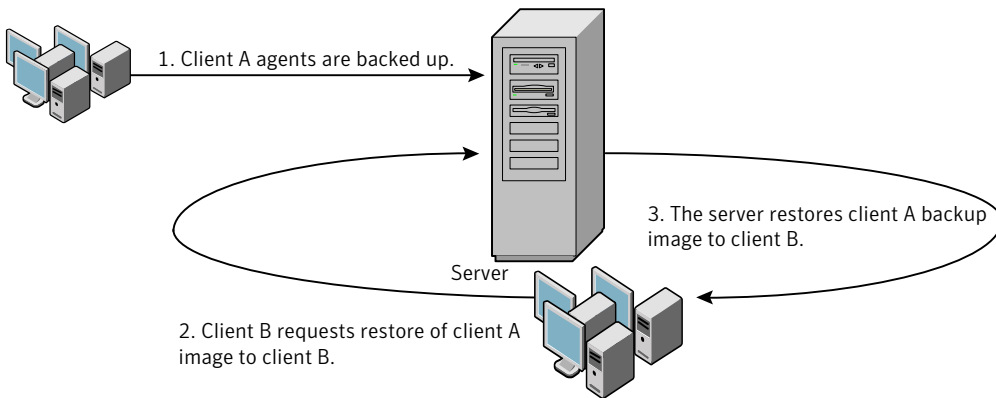
```
Windows: rman target 'internal/oracle@ORCL' rcvcat 'rman\rman@RCAT'  
cmdfile 'H:\oracle\scripts\database_restore.rcv'
```

Redirecting a restore to a different client

With NetBackup for Oracle you have the option to restore a database to a client other than the one that originally performed the backup. The process of restoring data to another client is called a redirected restore.

[Figure 4-1](#) shows a redirected restore.

Figure 4-1 Redirected restore



The user on client A cannot initiate a redirected restore to client B. Only the user on client B, which is the client receiving the backup image, can initiate the redirected restore. Any user who belongs to the database group that performed the backup can restore it, unless the `BKUP_IMAGE_PERM` variable is set to `USER`.

Configuring the NetBackup server for redirected restores

To perform redirected restores, configure the NetBackup server to allow this type of restore.

For more information about redirected restores, see the *NetBackup Administrator's Guide, Volume I*.

To remove restrictions for all clients, create the following file on the NetBackup master server:

```
UNIX/Linux: /usr/opensv/netbackup/db/altnames/No.Restrictions
```

```
Windows: install_path\NetBackup\db\altnames\No.Restrictions
```

To allow clients to restore only from specific clients, create the following file on the NetBackup master server:

```
UNIX/Linux: /usr/opensv/netbackup/db/altnames/client_name
```

```
Windows: install_path\NetBackup\db\altnames\client_name
```

Where *client_name* is the name of the client that is allowed to perform the redirected restore (the destination client). To the file, add the name of the NetBackup for Oracle source client.

About performing a redirected restore with RMAN

Perform the following procedure on the destination client host if you want to restore any RMAN backups that another client owns.

The user on client A cannot initiate a redirected restore to client B. Only the user on client B, which is the client receiving the backup image, can initiate the redirected restore. Any user who belongs to the database group that performed the backup can restore it, unless the `BKUP_IMAGE_PERM` variable is set to `USER`.

Note: If the RMAN catalog database has been lost, restore the catalog database first before continuing with the redirected restore.

To perform a redirected restore

- 1 Enable a network connection to the RMAN catalog database that the source client used.
- 2 Do one of the following:
 - On UNIX and Linux, set the `NB_ORA_CLIENT` environment variable to the source client.
 - On Windows, use the `rman parms` option to set the `NB_ORA_CLIENT` environment variable to the source client.
- 3 On UNIX and Linux, check the `bp.conf` files on the source client. Make sure that the `CLIENT_NAME` variable either is not set or is set to the hostname of the source client.
- 4 Make the `init.ora` file of the source client available to the destination client. Copy the file to the destination client or modify the file on the destination client. Change all location-specific parameters.
- 5 On Windows, create and start an Oracle service for the previously set `ORACLE_SID`. Create the folder to which you want to restore the data files.
- 6 On UNIX and Linux, grant write permission to the directory to which you want to restore the data files.
- 7 Set up a password file for the destination client database.
- 8 Start up the database in the `nomount` state.
- 9 Start RMAN, connecting to the catalog. On Windows, also connect to the target database.

- 10 On UNIX and Linux, set *dbid* to be the DBID of the source client database. Connect to the target database without using a user ID and password.
- 11 Run an RMAN restore script. On UNIX and Linux, you can alternatively type the RMAN commands for the restore.

Example - Performing a redirected restore of Oracle

For example, assume the following:

- Source client is `camel`
- Destination client is `giraffe`
- Master server is `lion`
- `ORACLE_SID` is `test`
- The user is connected to the Oracle database using a local connection, not SQL*Net
- UNIX user is `ora` on both `camel` and `giraffe`

To perform a redirected restore (example)

- 1 Create the following file on server `lion`:

UNIX and Linux: `/usr/opensv/netbackup/db/altnames/giraffe`

Windows: `install_path\NetBackup\db\altnames\giraffe`

Edit `giraffe` to contain the name `camel`:
- 2 Do one of the following:
 - UNIX and Linux: Log onto `giraffe` as `ora`. Set `SERVER=lion` in `$ORACLE_HOME/bp.conf`. This server must be the first server that is listed in the `bp.conf` file.
 - Windows: Use the BAR GUI to set `lion` as the master server.
- 3 Modify the network `tnsnames.ora` file to enable the RMAN catalog connection.
- 4 Create `inittest.ora.file`.
- 5 Windows: Using Oracle administration, create and start `ORACLESERVICE`.
- 6 Set the environment variable `ORACLE_SID` to `test`. On UNIX and Linux, also set `NB_ORA_CLIENT` to `camel`.

- 7 Make sure that the destination database directory exists and has appropriate access permissions.

The data files are restored to the directory path with the same name they had when they were backed up.

- 8 Start up the database in a `nomount` state.

On UNIX and Linux, the following is the output:

```
SQL> startup nomount pfile=$ORACLE_HOME/dbs/inittest.ora
%rman catalog rman/rman@rcat
RMAN> set dbid=<dbid of source database on camel>
RMAN> connect target/
RMAN> run {
RMAN>     ALLOCATE CHANNEL CH00 TYPE 'SBT_TAPE';
RMAN>     SEND 'NB_ORA_SERV=lion, NB_ORA_CLIENT=camel';
RMAN>     restore controlfile;
RMAN> }
```

```
SQL> alter database mount;
%orapwd file=$ORACLE_HOME/dbs/orapwtest password=<oracle>
%rman catalog rman/rman@RCVCAT
```

```
RMAN>set dbid=<Saved dbID of Source Target>
RMAN>connect target/
RMAN>run {
RMAN>     ALLOCATE CHANNEL CH00 TYPE 'SBT_TAPE';
RMAN>     ALLOCATE CHANNEL CH01 TYPE 'SBT_TAPE';
RMAN>     SEND 'NB_ORA_SERV=lion, NB_ORA_CLIENT=camel';
RMAN>     restore database;
RMAN>     restore archivelog all;
RMAN> }
```

```
SQL>recover database until cancel using backup controlfile;
```

Now apply the archived logs. Type `cancel` when you decide to stop recovery.

Performing an XML export archive

The following sections describe how to perform an XML export archive.

Table 4-2 Tasks and commands

Task	Commands used to accomplish the task
<p>Automatic backup of an Oracle policy</p>	<p>As with Oracle backups using RMAN, the most convenient way to create Oracle archives that consist of XML exports of data from your database is to set up schedules for automatic backups. The Oracle policy runs NetBackup for Oracle templates or shell scripts. For a backup using RMAN, a backup template is used, and for an XML export, an XML export template is used.</p> <p>When the NetBackup scheduler invokes a schedule for an automatic backup, the NetBackup for Oracle XML export templates or shell scripts run as follows:</p> <ul style="list-style-type: none"> ■ In the same order as they appear in the file list ■ On all clients in the client list <p>The NetBackup for Oracle XML export template or shell scripts start the XML export by running the NetBackup <code>bporaexp</code> or <code>bporaexp64</code> utility.</p>
<p>Manual backup of an Oracle policy</p>	<p>The administrator can use the NetBackup server software to manually run an automatic backup schedule for the Oracle policy. For more information, see the <i>NetBackup Administrator's Guide, Volume I</i>.</p> <p>See “Testing configuration settings for NetBackup for Oracle” on page 78.</p>
<p>User-directed XML exports from the client</p>	<p>The following sections describe procedures for performing user-directed XML exports.</p> <ul style="list-style-type: none"> ■ Running NetBackup for Oracle XML export templates. See “Running NetBackup for Oracle XML export templates” on page 98. ■ Using <code>bpdbsbora</code> to run an XML export template. See “Using bpdbsbora to run an XML export template” on page 99. ■ Running the NetBackup for Oracle XML export script on the client. See “Running the NetBackup for Oracle XML export script on the client” on page 100. ■ Running <code>bporaexp</code> on the client as an Oracle user. See “Running bporaexp on the client as an Oracle user” on page 100. ■ Writing to a directory versus writing to a storage unit. See “Writing to a directory versus writing to a storage unit” on page 101. ■ <code>bporaexp</code> parameters See “About bporaexp parameters” on page 103.

Running NetBackup for Oracle XML export templates

The Template Administration interface is available in the Backup, Archive, and Restore interface.

Use this dialog to run, edit, delete, rename, and view existing XML export templates. These are the templates created by the NetBackup for Oracle XML Export Wizard and stored in a predetermined location on the master server.

To use Oracle template administration

- 1 In the Backup, Archive, and Restore interface, click Actions > **Administer Database Templates > Oracle**.

The Oracle template administration window appears.

The **Select Template** list shows the names, descriptions, and types of the Oracle templates that are stored on the current master server.

- 2 Select the name of the XML export template you want to run.
- 3 Click **Run**.

The Oracle template administration window provides the following functions:

Run	Runs the selected template.
Edit	Changes the contents of an existing template. The selected XML export template is loaded into the NetBackup for Oracle XML export template generation wizard.
Delete	Removes the selected template. On UNIX and Linux, you must be the root user or the template creator to delete a template. On Windows, you must be the administrator or the template creator to delete a template.
Rename	Changes the name of the selected template. On UNIX and Linux, you must be the root user or the template creator to rename a template. On Windows, you must be the administrator or the template creator to rename a template.
View	Displays a summary of the selected template.

Using `bpdsbora` to run an XML export template

The `bpdsbora` command lets you run an XML export template that is created by the NetBackup for Oracle XML export wizard.

At the command prompt, type this command using the following options:

```
bpdsbora -export -r -t templ_name [-S server_name] [-L prog_log]
```

Where:

<code>-export</code>	Specifies the template type.
<code>-r</code>	Runs the template.
<code>-t <i>templ_name</i></code>	Specifies the name of the template that you want to use. <code>bpdbsbora</code> retrieves XML export templates from a known location on the master server, so specify only the file name.
<code>-S <i>server_name</i></code>	Optional. Identifies the master server. <code>bpdbsbora</code> retrieves XML export templates from a specific master server when you specify this option.
<code>-L <i>prog_log</i></code>	Optional. Specifies a runtime process log. Enclose <i>prog_log</i> in quotation marks (" ") if it contains space characters.

For example:

```
bpdbsbora -export -r -t sales.tpl -S my_server -L my_progress_log
```

Running the NetBackup for Oracle XML export script on the client

You can initiate a database XML export from the operating system command prompt: Type the full path to the shell script that performs the export. For example:

```
UNIX/Linux: /oracle/scripts/data_archiver_export.sh
```

```
Windows: N:\oracle\scripts\data_archiver_export.cmd
```

The operating system shell starts the database XML export archive by running the XML export script. The XML export script contains commands to run `bporaexp`.

The NetBackup for Oracle installation script installs sample scripts in the following location:

```
UNIX/Linux: /usr/opensv/netbackup/ext/db_ext/oracle/samples/bporaexp
```

```
Windows: install_path\NetBackup\dbext\oracle\samples\bporaexp
```

Running bporaexp on the client as an Oracle user

As an Oracle user you can also run the `bporaexp` command (`bporaexp64` on some platforms) from the operating system command prompt and specify a parameter file.

To run `bporaexp` on the client as an Oracle user

- 1 Create a parameter file that specifies the settings that determine how the backup is to be performed. Information is available about the `bporaexp` parameters.

See [“About `bporaexp` parameters”](#) on page 103.

- 2 Run the following command to specify the parameter file:

```
# bporaexp [username/password] parfile = filename | help=y
```

- 3 Configure the runtime environment, because this method does not call the full script that includes the runtime configuration.

On UNIX and Linux, check the sample scripts for runtime environment details.

See [“About configuring the runtime environment”](#) on page 56.

`bporaexp` creates a set of XML schema and instance documents that can be used to archive Oracle table data. For each archive, one master XML schema (`.xsd`) document is generated. In addition, `bporaexp` generates a table-specific schema (`.xsd`) document and a table specific instance (`.xml`) document for each table. Additional files are created if the table contains `LONG` or `LOB` columns.

See [“Performing an XML export archive”](#) on page 97.

Writing to a directory versus writing to a storage unit

One important aspect of the parameter file is the `DIRECTORY` parameter. If you specify the `DIRECTORY` parameter, the `bporaexp` (`bpdbsbora64` on some platforms) command writes the backup files to the operating system directory you specify. NetBackup does not write the files to a storage unit.

For example, assume that the archive `test1` contains one table, `USER1`. If the `directory` parameter is specified, NetBackup creates certain files when you run the `bporaexp` command.

```
UNIX/Linux: DIRECTORY=/db/netbackup/xml
```

```
Windows: DIRECTORY=db\netbackup\xml
```

[Table 4-3](#) shows the files NetBackup creates when you run the command.

Table 4-3 NetBackup files for example table USER1

File	Content
UNIX and Linux: /db/netbackup/xml/test1/test1.xsd Windows: \db\netbackup\xml\test1\test1.xsd	Master XML schema for table USER1
UNIX and Linux: /db/netbackup/xml/test1/USER1/TEST1.xsd Windows: \db\netbackup\xml\test1\USER1\TEST1.xsd	Table schema for table USER1
UNIX and Linux: /db/netbackup/xml/test1/USER1/TEST1.xml Windows: \db\netbackup\xml\test1\USER1\TEST1.xml	XML document for table USER1

If the `DIRECTORY` parameter is not specified, NetBackup writes the backup images to a storage unit. A NetBackup backup set is created and cataloged under the name:

```
UNIX and Linux: /Oracle/XMLArchive
Windows: \Oracle\xMLArchive
```

All NetBackup for Oracle `bporaexp` backups are cataloged using this convention.

Alternatively, if the parameter file does not contain the `DIRECTORY` parameter, NetBackup creates and catalogs the following files:

UNIX and Linux:

```
/Oracle/XMLArchive/test1/test1.xsd
/Oracle/XMLArchive/test1/USER1/TEST1.xsd
/Oracle/XMLArchive/test1/USER1/TEST1.xml
```

Windows:

```
\Oracle\xMLArchive\test1\test1.xsd
\Oracle\xMLArchive\test1\USER1\TEST1.xsd
\Oracle\xMLArchive\test1\USER1\TEST1.xml
```

In production, do not use the `DIRECTORY` parameter in the `bporaexp` parameter file. When you write to a storage unit, NetBackup offers the features that include searching and cataloging with the NetBackup catalog and automatic handling of output that exceeds file system limits. With the `DIRECTORY` parameter, file system limits, such as a 2 GB maximum, can cause an error.

To run `bpوراexp` on the client, run the following command:

```
bpوراexp [username/password] parfile = filename | help=y
```

On some UNIX platforms, the `bpوراexp64` command is used.

About bpوراexp parameters

This topic describes the available `bpوراexp` (`bpوراexp64` on some platforms) parameters.

Note the following:

- Use the NetBackup parameters `NB_ORA_SERV`, `NB_ORA_CLIENT`, `NB_ORA_POLICY`, and `NB_ORA_SCHED` to specify the NetBackup runtime configuration. Otherwise, the order of precedence for the runtime configuration variable settings is used.
- Some parameters are valid only when you write to a storage unit. Other parameters are valid only when you write to a directory. In the following table, the Target Location column contains either Storage Unit or Directory to indicate whether the parameter in that row applies to writing to a storage unit or to a directory. Parameters that are recognized when you write to a directory are ignored when you write to a storage unit.

Table 4-4 shows the available `bpوراexp` parameters with their default values.

Table 4-4 bpوراexp parameters and default values

Parameter	Required?	Default	Description	Target location
CONSISTENT	N	N	Specifies if <code>bpوراexp</code> uses the <code>SET TRANSACTION READ ONLY</code> statement to ensure that the data from all tables is consistent to a single point in time and does not change during the execution of the <code>bpوراexp</code> command. If the default of <code>CONSISTENT=N</code> is used, each table is exported as an independent transaction.	Directory
DIRECTORY	N	no default	Optionally specifies a directory for the output of the <code>bpوراexp</code> utility.	Directory
HELP	N	N	Displays a help message with descriptions of <code>bpوراexp</code> parameters. Does not export data if <code>HELP=Y</code> .	Directory

Table 4-4 bpوراexp parameters and default values (*continued*)

Parameter	Required?	Default	Description	Target location
KEYWORD	N	no default	Optionally specifies a keyword phrase that NetBackup associates with the image being created by the archive operation. Values for KEYWORD must be in double quotes.	Storage Unit
LOG	N	no default	Optionally specifies a file name to receive informational and error messages. If so, messages are logged on the log file and not displayed to the terminal display.	Directory
NAME	Y	no default	The name of the master XML schema file.	Directory
NB_ORA_SERV	N	default master server	Optionally specifies the name of the NetBackup master server.	Storage Unit
NB_ORA_CLIENT	N	default client	Optionally specifies the name of the NetBackup for Oracle client.	Storage Unit
NB_ORA_POLICY	N	default Oracle policy	Optionally specifies the name of the NetBackup for Oracle policy.	Storage Unit
NB_ORA_SCHED	N	default backup policy schedule	Optionally specifies the name of the backup policy schedule to use.	Storage Unit
OWNER	N	no default	Lists the Oracle schema owners to export. For each owner, the tables, partitions, and views that are owned by that Oracle account are exported by default. The PARTITIONS and VIEWS parameters can be used to exclude partitions and views.	Directory
PARTITIONS	N	Y	Optionally specifies whether or not table partitions are included. Only valid when used with the OWNER parameter.	Directory

Table 4-4 bpوراexp parameters and default values (continued)

Parameter	Required?	Default	Description	Target location
QUERY	N	no default	<p>Selects a subset of rows from a set of tables. The value of the query parameter is a string that contains a WHERE clause for a SQL select statement that is applied to all tables and table partitions listed in the TABLES parameter.</p> <p>For example, if TABLES = emp, bonus and QUERY = "where job = 'SALESMAN' and sal < 1600", two SQL statements are run:</p> <ul style="list-style-type: none"> ■ SELECT*FROM emp where job='SALESMAN' and sal<1600; ■ SELECT*FROM bonus where job='SALESMAN' and sal<1600; <p>Each query that runs refers to a single table at a time in the FROM clause, so it is illegal to have a join in the WHERE clause.</p>	Directory
ROW_BUFFER	N	1000	Specifies the size, in rows, of the buffer used to fetch rows. Tables with LONG columns are fetched one row at a time. The maximum value allowed is 32767.	Directory
TABLES	Y	no default	Lists the table names, view names, and partition names to export. The USERID must have SELECT privilege on the tables and views. The syntax used is:schema.table: partition name or schema.view name	Directory
USERID	Y	no default	Specifies the username/password (and optional connect string) of the user initiating the export. If a connect string is not provided, the ORACLE_SID environment variable is used.	Directory
VIEWS	N	Y	Optionally specifies whether or not views are included. Only valid when used with the OWNER parameter.	Directory

Browsing XML export archives using bporaimp parameters

To use the `bporaimp` (`bporaimp64` on some platforms) command to browse XML export archives created by using `bporaexp` (`bporaexp64` on some platforms), create a parameter file with the desired search criteria. First, set the variables `LIST=Y` and `USERID=username/`. Only the archives created using the Oracle `USERID` are listed.

The Oracle password is not required. The operating system account that is running `bporaimp` has access only to archives that were created using the same account.

Note: Only XML export archives created using NetBackup mode are searched. Exports stored in an operating system directory using the `DIRECTORY` parameter are not searched.

Use the `NB_ORA_SERV` and `NB_ORA_CLIENT` parameters to specify the NetBackup server and client. Otherwise, the order of precedence for the runtime configuration variable settings is used. You can also include the `LOG` parameter.

Information is available on the `LIST`, `LOG`, `NB_ORA_CLIENT`, `NB_ORA_SERV`, and `USERID` parameters.

See “[About bporaimp parameters](#)” on page 112.

[Table 4-5](#) shows other parameters you can include in the parameter file.

Table 4-5 Parameters you can include in a parameter file

Parameter	Default	Description
<code>ARCHIVE_DATE_FROM</code>	no default	Optionally specifies a start date for the archive search. Used with <code>ARCHIVE_DATE_TO</code> to specify a range. The date format is <code>mm/dd/yyyy [hh:mm:ss]</code> .
<code>ARCHIVE_DATE_TO</code>	no default	Optionally specifies an end date for the archive search. Used with <code>ARCHIVE_DATE_FROM</code> to specify a range. The date format is <code>mm/dd/yyyy [hh:mm:ss]</code> .

Table 4-5 Parameters you can include in a parameter file (*continued*)

Parameter	Default	Description
KEYWORD	no default	Optionally specifies a keyword phrase for NetBackup to use when searching for archives.
NAME	no default	The name of the master XML schema file.
FROMUSER	no default	Optionally specifies a comma-separated list of table owners.
TABLES	no default	Optionally specifies a list of table and partition names that were included in an archive.

For example, assume you named the list parameter file `bporaimp_list.param`. At the command prompt, type the following:

```
bporaimp parfile = bporaimp_list.param
```

Note: On some UNIX platforms, the `bporaimp64` command is used.

Browsing XML export archives using bplist

For a higher level view of the Oracle XML export archive list, you can use the `bplist` command. The result is the list of XML schema and instance document file names.

Note: Only XML export archives created using NetBackup mode are searched. Exports stored in an operating system directory using the `DIRECTORY` parameter are not searched.

The following UNIX or Linux example uses `bplist` to search all Oracle archives for a client named `jupiter`. The sample output is produced for two archives, `test1` and `little_sales`, where each archive has one Oracle table (`test1` has `USER1.TEST1` and `little_sales` has `USER1.LITTLE_SALES`).

```
/usr/opensv/netbackup/bin/bplist -C jupiter -t 4 -R /Oracle/XMLArch/  
/Oracle/XMLArchive/test1/test1.xsd  
/Oracle/XMLArchive/test1/USER1/TEST1.xsd  
/Oracle/XMLArchive/test1/USER1/TEST1.xml
```

```
/Oracle/XMLArchive/little_sales/little_sales.xsd  
/Oracle/XMLArchive/little_sales/USER1/LITTLE_SALES.xsd  
/Oracle/XMLArchive/little_sales/USER1/LITTLE_SALES.xml  
/exb_n2bm5bco_1_1392342936  
/exb_mabm02ko_1_1392170136  
/exb_lqbltds6_1_1392083334
```

The following Windows example uses `bplist` to search all Oracle archives for a client named `jupiter`. The sample output is produced for one archive, `test`.

```
install_path\NetBackup\bin\bplist -C jupiter -t 4 -R Oracle:\XMLArch\  
Oracle:\XMLArchive\test\test.xsd  
Oracle:\XMLArchive\test\SCOTT\BONUS.xsd  
Oracle:\XMLArchive\test\SCOTT\BONUS.xml  
Oracle:\XMLArchive\test\SCOTT\DEPT.xsd  
Oracle:\XMLArchive\test\SCOTT\DEPT.xml  
Oracle:\XMLArchive\test\SCOTT\EMP.xsd  
Oracle:\XMLArchive\test\SCOTT\EMP.xml  
Oracle:\XMLArchive\test\SCOTT\SALGRADE.xsd  
Oracle:\XMLArchive\test\SCOTT\SALGRADE.xml
```

The `-t 4` on this command specifies the Oracle backups or archives. The `-R` specifies the default number of directory levels to search, 999.

For more information on this command, see the `bplist` man page in the *NetBackup Commands Reference Guide*.

Restoring an XML export archive

Before you attempt to restore an archive, make sure that the XML archive has successfully completed. You can identify the correct archive to restore by browsing the XML export archives. NetBackup generates an error if an archive backup history does not exist.

Running the XML import wizard on the client

NetBackup for Oracle includes an XML import wizard that solicits information from the user about the desired import operations. The wizard uses the information to create a template. You can use the template immediately, or you can save it for later use.

The NetBackup for Oracle XML import wizard saves an XML import template locally in a user-specified location on the NetBackup client. XML import templates are not stored on the server because a restore is always user directed, not

scheduled. Typically, you run an XML import template immediately and then delete it.

The restore process requires a password for Oracle database access. Templates store encrypted passwords that are decrypted at runtime.

To start the XML import wizard

- 1 Start the NetBackup Backup, Archive, and Restore interface.

On UNIX and Linux, from the command line, run the following command:

```
/usr/opensv/netbackup/bin/jbpSA &
```

- 2 Do one of the following:
 - On UNIX and Linux: (Conditional) To change the policy type, choose Actions > **Specify NetBackup Machines and Policy Type**.
 - On Windows: From the Windows Start menu, choose **All Programs > Symantec NetBackup > Backup, Archive, and Restore**. To change the policy type, choose File > **Specify NetBackup Machines and Policy Type**. Perform this step if the Oracle node is not visible.
- 3 Do one of the following:
 - On Windows, click **Select for Restore**.
 - On UNIX and Linux, click the Restore Files tab.
- 4 Expand the Oracle node in the left pane to view an Oracle instance hierarchy in the right pane.

To use the XML import wizard

- 1 In the left pane of the Backup, Archive, and Restore interface, select the Oracle instance.

Database objects that can be imported are listed under the **Users** node. The tool displays only the schema owners and objects accessible by the current user login.
- 2 Expand the **Users** list to the schema owners of the objects to be imported.
- 3 In the right pane, select database objects that exist in the archive to be restored.
- 4 Choose Actions > **Restore**.
- 5 Enter information about the restore operation you want to perform in the screens that the NetBackup for Oracle XML import wizard displays.

The screens are as follows:

- Welcome
- Target Database Logon Credentials
- Archive Import Options
- NetBackup Archive Source Options
- NetBackup Import Destination Options (Windows)

If you need an explanation of any of the fields on the wizard screens, or more details, click **Help** on the wizard screen.

6 Review the summary.

When you have completed the wizard, the Selection Summary screen displays the summary of the XML import template.

You can choose to run the template immediately after the wizard finishes, save the template locally, or both. For explanations of your choices, click **Help**.

Using bpdbsbora to run an XML import template

The `bpdbsbora` command allows you to run an XML import template created by the NetBackup XML import wizard.

At the command prompt, type this command with the following options:

```
bpdbsbora -import -r -t template_name [-L progress_file]
```

where:

<code>-import</code>	Specifies the template type.
<code>-r</code>	Runs the template.
<code>-t <i>template_name</i></code>	Specifies the full path name of the template you want to use. Unlike backup templates, XML import templates do not reside in a predetermined location on the master server. They are considered to be temporary in nature and should reside on the client. If the full path is not specified as part of the XML import template name, it must reside in the current directory.
<code>-L <i>progress_file</i></code>	Optional. Specifies a run-time progress log. Enclose <i>progress_file</i> in quotation marks (") if it contains space characters.

For example:

```
UNIX/Linux: bpdbsbora -import -r -t /oracle/imp_tpls/sales_imp.tpl -L prog_file
```

```
Windows: bpdbsbora -import -r -t H:\oracle\imp_tpls\sales_imp.tpl -L prog_file
```

Running an XML import script on the client

You can initiate a restore from the operating system command prompt by typing the full path to the XML import script that initiates the restore. For example:

```
UNIX/Linux: /oracle/scripts/data_archiver_import.sh
```

```
Windows: H:\oracle\scripts\data_archiver_import.cmd
```

The operating system shell starts the database restore by running the XML import script file. The XML import script file contains commands to run `bporaimp` (`bporaimp64` on some platforms).

The NetBackup for Oracle installation script writes sample scripts to the following location:

```
UNIX/Linux: /usr/opensv/netbackup/ext/db_ext/oracle/samples/bporaimp
```

```
Windows: install_path\NetBackup\dbext\oracle\samples\bporaimp
```

Running bporaimp on the client

Run the `bporaimp` command from the operating system command line on the client using the appropriate parameter file.

The Windows account that runs `bporaimp` has access only to XML export archives that were created using the same Windows account.

The UNIX account that runs `bporaimp` has access only to XML export archives that were created using the same UNIX account. Be sure to configure the runtime environment, because this method does not call the full script that includes the runtime configuration. Check the sample scripts for runtime environment details.

To run bporaimp on the client

- ◆ At the command prompt, type the `bporaimp` command in the following format:

```
bporaimp [username/password] parfile = filename | help=y
```

On some UNIX platforms, the `bporaimp64` command is used.

See [“About bporaimp parameters”](#) on page 112.

About bporaimp parameters

Use the NetBackup parameters `NB_ORA_SERV` and `NB_ORA_CLIENT` to specify the NetBackup runtime configuration. Otherwise, the order of precedence for the runtime configuration variable settings is used.

Some parameters are valid only when writing to a storage unit. Other parameters are valid only when writing to a directory. In the following table, the right-most column contains either “Storage Unit” or “Directory” to indicate whether the parameter in that row is applicable for either writing to a storage unit or to a directory. Parameters that are recognized when writing to a directory are ignored when writing to a storage unit.

[Table 4-6](#) describes the `bporaimp` (`bporaimp64` on some platforms) parameters and default values.

Table 4-6 bporaimp parameters and default values

Parameter	Required?	Default	Description	Target location
<code>ARCHIVE_DATE_FROM</code>	N	no default	Optionally specifies a start date for the archive to be imported. Used with <code>ARCHIVE_DATE_TO</code> to specify a range. If not used, the most recent archive is imported. If the range used results in more than one archive, the most recent from the range is used. The date format is <code>mm/dd/yyyy [hh:mm:ss]</code> .	Storage Unit
<code>ARCHIVE_DATE_TO</code>	N	no default	Optionally specifies an end date for the archive to be imported. Used with <code>ARCHIVE_DATE_FROM</code> to specify a range. If not used, the most recent archive is imported. If the range used results in more than one archive, the most recent from the range is used. The date format is <code>mm/dd/yyyy [hh:mm:ss]</code> .	Storage Unit
<code>BFILE_DIRECTORY</code>	Y (if any table being imported has <code>BFILE</code> columns)	no default	Specifies a directory for the output of any <code>BFILE</code> columns being imported. Oracle’s <code>CREATE DIRECTORY</code> command can be used to create the <code>DIRECTORY</code> in Oracle, and the name should match the name used in the export file.	Directory

Table 4-6 bporaimp parameters and default values (*continued*)

Parameter	Required?	Default	Description	Target location
COMMIT	N	N	Specifies whether <code>bporaimp</code> should commit after each array insert. The size of the array is determined by <code>ROW_BUFFER</code> . By default, <code>bporaimp</code> commits only after loading each table, and performs a rollback when an error occurs, before continuing with the next object.	Directory
DIRECTORY	N	no default	Optionally specifies a directory for the input of the <code>bporaimp</code> utility.	Directory
FROMUSER	N	no default	Optionally specifies a comma-separated list of users to import from an archive containing multiple users' tables. If not specified, all of the tables are imported.	Directory
HELP	N	N	Displays a help message with descriptions of <code>bporaimp</code> parameters.	Directory
IGNORE_ROWS	N	N	Specifies whether or not rows should be inserted into a table that is not empty. The default is that the table already exists and that it is empty. If it is not empty, <code>IGNORE_ROWS = N</code> causes an error to be reported, and the table is skipped with no rows inserted. <code>IGNORE_ROWS = Y</code> causes rows to be inserted with errors reported in the log file. If <code>IGNORE_ROWS = Y</code> and an error such as a primary key constraint violation occurs, no data is inserted if <code>COMMIT = N</code> . However, if <code>COMMIT = Y</code> , the array of rows (size determined by <code>ROW_BUFFER</code>) is not inserted, but <code>bporaimp</code> continues to process additional row arrays in the order in which they were exported. To cause all rows that do not violate a primary key constraint to be inserted, set <code>COMMIT = Y, ROW_BUFFER = 1, and IGNORE_ROWS = Y</code> .	Directory
KEYWORD	N	no default	Optionally specifies a keyword phrase for NetBackup to use when searching for archives from which to restore files.	Storage Unit

Table 4-6 bporaimp parameters and default values (*continued*)

Parameter	Required?	Default	Description	Target location
LIST	N	N	LIST = Y queries the NetBackup catalog and lists the archives available. Does not import the data if LIST = Y.	Storage Unit
LOG	N	no default	Optionally specifies a file name to receive informational and error messages. If this parameter is specified, messages are logged in the log file and not displayed to the terminal display.	Directory
NAME	Y	no default	The name of the master XML schema file. This parameter is required if LIST = N.	Directory
NB_ORA_SERV	N	default master server	Optionally specifies the name of the NetBackup master server.	Storage Unit
NB_ORA_CLIENT	N	default client	Optionally specifies the name of the NetBackup for Oracle client.	Storage Unit
RESTORE_SCHEMA_ONLY	N	N	Used with RESTORE_TO_DIRECTORY to restore the XML schema files only to a directory.	Storage Unit
RESTORE_TO_DIRECTORY	N	no default	Optionally specifies a directory for the output of the bporaimp utility. If used, the XML data is not parsed and inserted into Oracle.	Storage Unit
ROW_BUFFER	N	1000	Specifies the size, in rows, of the buffer used to insert rows. Tables with LONG or LOB columns are inserted one row at a time. The maximum value allowed is 32767.	Directory

Table 4-6 bporaimp parameters and default values (*continued*)

Parameter	Required?	Default	Description	Target location
TABLES	N	no default	Optionally specifies a list of table, view, and partition names to import. If not used, all objects in the archive are imported. The objects must already exist, and the <code>USERID</code> must have <code>INSERT</code> privilege on the objects. The object names cannot be qualified with owner names, and the <code>FROMUSER</code> parameter is used to specify a particular owner. If a partition name is specified, it indicates the exported partition only and the rows are inserted according to the partitioning scheme of the target table. If the export contains partitions, and the import does not specify them, all are inserted.	Directory
TOUSER	N	no default	Optionally specifies a comma-separated list of users to import to that can be used with the <code>FROMUSER</code> parameter to change the table owners. The <code>TOUSER</code> Oracle accounts must already exist, and the <code>USERID</code> must have <code>INSERT</code> privilege on the tables that must also exist.	Directory
USERID	Y	no default	Specifies the username/password (and optional connect string) of the user initiating the import. If a connect string is not provided, the <code>ORACLE_SID</code> environment variable is used.	Directory

About redirecting a restore of an XML export archive to a different client

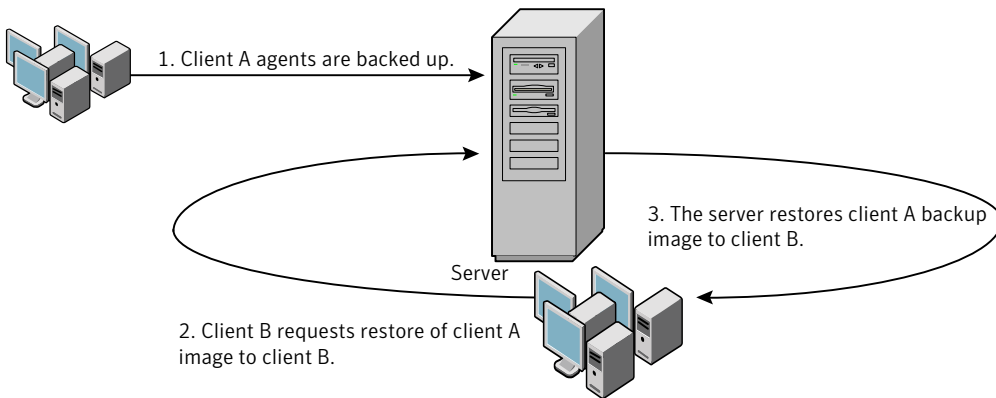
With NetBackup for Oracle you have the option to restore an XML export archive to a client other than the one that originally performed the XML export. The process of restoring data to another client is called a redirected restore.

Before you redirect the restore, see the following topic:

See [“Configuring the NetBackup server for redirected restores”](#) on page 94.

[Figure 4-2](#) illustrates a typical redirected restore.

Figure 4-2 Redirected restore of an XML export archive to a different client



The user on client A cannot initiate a redirected restore to client B. Only the user on client B, which is the client receiving the backup image, can initiate the redirected restore. Any user who belongs to the database group that performed the backup can restore it, unless the `BKUP_IMAGE_PERM` variable is set to `USER`.

Redirecting a restore of an XML export archive to a new client using `bporaimp`

On UNIX and Linux, any user who belongs to the database group that performed the archive can restore XML export archive. The `BKUP_IMAGE_PERM` variable must be set to `GROUP` or `ANY`, not `USER`.

Perform the following procedure on the new client host if you want to restore XML export archives that are owned by another client.

To redirect a restore of an XML export archive to a new client using `bporaimp`

- 1 Set the environment variables for `bporaimp` (`bporaimp64` on some platforms) on the new client, including `ORACLE_HOME` and `ORACLE_SID`.
- 2 In the `bporaimp` parameter file, include the following lines:

```
nb_ora_serv = NetBackup_server
nb_ora_client =
original_client_where_XML_export_occurred.
```

- 3 Specify any other `bporaimp` parameters.
See [“Running `bporaimp` on the client”](#) on page 111.
- 4 Run `bporaimp`.

Example - Using bporaimp for a redirected restore

For example, assume the following:

- Original client is `jupiter`
- New client is `saturn`
- Server is `jupiter`
- ORACLE_SID is `test` on both `saturn` and `jupiter`
- Windows user is `ora` on both `jupiter` and `saturn`
- UNIX user is `ora` on both `jupiter` and `saturn`
- Archive name is `sales`

To use bporaimp for a redirected restore (example)

- 1 Create the following file on server `jupiter`:

On UNIX and Linux: `/usr/opensv/netbackup/db/altnames/saturn`

On Windows: `install_path\NetBackup\db\altnames\saturn`

- 2 Edit the preceding file to contain the name `jupiter`.
- 3 Log on to `saturn` as `ora`.
- 4 Create file `bporaimp.param`.

Include the following parameters:

```
NAME = sales
NB_ORA_SERV = jupiter
NB_ORA_CLIENT = jupiter
USERID = orauser/orapasswd
```

- 5 Run `bporaimp parfile=bporaimp.param` to restore `sales` archive to `saturn` and to import the data into the `test` database on `saturn`.

Using NetBackup for Oracle in a Microsoft Windows cluster server environment

To use NetBackup for Oracle in a Microsoft Cluster Server environment, the following must be installed in the cluster nodes:

- NetBackup client or server (7.5)

- NetBackup for Oracle on Windows (7.5)
- Oracle Database version 8i Release 8.1.7 or greater
- Oracle Failsafe 3.11 for Oracle version 8i Release 8.1.7 or greater

NetBackup for Oracle users in a Microsoft cluster server environment must take some additional steps to prepare for server-directed backups, user-directed backups, and user-directed restores.

About automatic backups of an Oracle clustered database on Windows

The most convenient way to back up your clustered databases is to set up schedules for automatic backups. NetBackup for Oracle comes with sample scripts for clustered Oracle databases. The NetBackup for Oracle installation process installs the sample scripts in the following location:

```
install_path\NetBackup\dbext\oracle\samples\rman\
```

Modify the scripts to give values to the following variables:

- Oracle SID
- Oracle Home
- Cluster Name, Domain
- Failsafe Home
- Failsafe Userid
- Failsafe Password
- Failsafe Database Resource Name
- Virtual Oracle Database Name

For more information on how to back up or restore Microsoft cluster server using NetBackup, see the *NetBackup Administrator Guide for Windows, Volume I*.

About manual backups of an Oracle clustered database on Windows

Instructions are available for how to initiate a manual backup of an Oracle policy.

Bringing the database instance offline on Windows

Before you can perform a user-directed backup or restore from the client, you must take the database instance offline. You can use the Failsafe Graphical User Interface or the Failsafe command line (FSCMD).

To take the database instance offline with Failsafe Graphical User Interface

- 1 Select the Oracle database resource in the Failsafe Graphical User Interface.
- 2 Choose to bring it offline.

To take the database instance offline with Failsafe command line (FSCMD)

- ◆ Type the following command:

```
fscmd offlineresource salesdb /cluster=curly /offline=immediate /domain=domainname
/user=user /pwd=pwd
```

To bring the resource offline, the preceding command sets `offline=immediate`.

Alternately, you could specify one of the following, based on your need, as the argument:

<code>abort</code>	Shuts down the database instantaneously by aborting the database instance.
<code>immediate</code>	Shuts down the database immediately by terminating SQL statements in progress, rolling back uncommitted transactions and disconnecting users.
<code>normal</code>	Shuts down the database and doesn't allow new connections after the command was issued. This command waits for the connected users to disconnect before actually shutting down the database.
<code>transactional</code>	Shuts down the database only after all of the current transactions have completed.

Because the `offlineresource` operation shuts down the Oracle database service, enter the following command to start the Oracle database service:

```
net start OracleService
```

Bringing the database instance online on Windows

After you perform a user-directed backup or restore from the client, you must bring the database instance online. You can use the Failsafe Graphical User Interface or the Failsafe command line (FSCMD).

To bring the database instance online with Failsafe Graphical User Interface

- 1 Select the resource in the Failsafe Graphical User Interface.
- 2 Choose to bring it offline.

To bring the database instance online with Failsafe command line (FSCMD)

- ◆ If you are using the Failsafe command line (FSCMD), type the following command:

```
fscmd online resource salesdb /cluster=curly  
/offline=immediate /domain=domainname /user=user /pwd=pwd
```

User-directed backup or restore from the Windows client

This section explains the process to prepare a Microsoft cluster server environment for a user-directed backup or restore operation.

Note: When performing user directed backups, make sure you are on the node that owns the shared drive where the Oracle database is installed.

Note: When performing user-directed client restores with different configuration options of NetBackup failover media servers and a UNIX or Windows master server, see the *NetBackup Administrator's Guide*.

To perform a user-directed backup or restore from the client

- 1 Take the clustered Oracle database instance offline.
See [“Bringing the database instance offline on Windows”](#) on page 118.
- 2 Shut down and start up the database in `mount` state.
This is necessary to perform administrative tasks like backup and recovery. Use the `svrmgr1` or `sqlplus` utility from Oracle. At the command line, type the following:

```
Shutdown option [normal, abort, immediate]  
startup mount
```
- 3 Perform the backup or recovery.
See [“Using the recovery wizard”](#) on page 91.
- 4 Bring the Oracle database online with failsafe after the desired backup/restore is complete to enable it to fail over between the configured cluster of nodes.
See [“Bringing the database instance online on Windows”](#) on page 119.

Guided Recovery

This chapter includes the following topics:

- [About OpsCenter Guided Recovery](#)
- [Setting up for Guided Recovery cloning](#)
- [Guided Recovery cloning pre-operation checks](#)
- [Performing a Guided Recovery cloning operation](#)
- [Select a Master Server dialog](#)
- [Select Source Database panel](#)
- [Select Control File Backup screen](#)
- [Destination host and login screen](#)
- [Destination Parameters screen](#)
- [Selection summary screen](#)
- [Pre-clone check screen](#)
- [Job Details screen](#)
- [Guided Recovery Post-clone operations](#)
- [Troubleshooting Guided Recovery](#)

About OpsCenter Guided Recovery

The use of the OpsCenter Web-based user interface to guide a user through the Oracle cloning operation offers several benefits:

- The process is more automated, making the operation easier to perform.

- OpsCenter retrieves information for you such as databases and control files, shortening the Oracle clone setup time.
- A validation process increases the rate of successfully completing the cloning operation.
- You do not need access to the original database to perform the cloning operation.

Setting up for Guided Recovery cloning

Oracle uses metadata cataloging, which enables database information to display in OpsCenter. Metadata cataloging must occur during the backup from the Oracle database to be cloned. The collected metadata displays within the OpsCenter interface to guide the clone operation to enable metadata collection on the client host.

Do the following before you perform a Guided Recovery cloning operation:

- On UNIX and Linux systems, ensure that the Oracle metadata parameter in the client's `bp.conf` is set at backup time as follows:

```
ORACLE_METADATA=YES
```

Or, use the SEND command to set the metadata parameter:

```
SEND ORACLE_METADATA=YES
```

- On Windows systems, first place the following text into a text file (for example, `new_config.txt`):

```
ORACLE_METADATA=YES
```

Then send this newly created configuration file to the client host by using the following `bpsetconfig` command on the master or media server:

```
# bpsetconfig -h myoracleclient new_config.txt
```

`bpsetconfig` is located in the `install_path\NetBackup\bin\admincmd` directory.

- Set up all destination file paths before you run the cloning operation, because the operation does not create new file paths during the process. Ensure that the user has write access to these paths.

Guided Recovery cloning pre-operation checks

Check the following items before you begin the cloning process:

- Ensure that the source and destination systems and the source and destination databases are compatible. Examples are Solaris 9 to Solaris 10 and Oracle 11 to Oracle 11.
- The cloning operation does not support offline tablespaces or raw tablespaces.
- The cloning operation does not support Oracle Automatic Storage Management (ASM).
- To use a different user or a different group for the clone, you must change what the permissions of the backup image are to be at backup time. Add the 'BKUP_IMAGE_PERM=ANY' to the send commands during the backup of the source database.
See [“About the environment variables set by NetBackup for Oracle”](#) on page 59.
- If the destination client is different than the source client, perform an alternate restore procedure.
See [“Redirecting a restore to a different client”](#) on page 93.
- On Windows systems, if the NetBackup client service runs as the Oracle user, then that user needs to be granted the right to "Replace a process level token".
- On Oracle 9 for Windows, run the Oracle service under the Oracle user account. By default, it runs under the local system. On Oracle 10G systems and later, you can run under the local system.
- On Windows systems, if you are cloning to the same system, shut down the source database to successfully complete the operation. Otherwise, an error indicating the database cannot be mounted in exclusive mode appears.
- On UNIX and Linux systems, if the cloning user shares an existing Oracle home, the user must have write access to some directories such as DBS.

Performing a Guided Recovery cloning operation

You need to log onto OpsCenter, to perform a cloning operation. OpsCenter is the Web GUI that you use to perform all guided recovery operations.

To perform a cloning operation on an Oracle database in OpsCenter

- 1 When you log onto OpsCenter, the first screen that appears is the **Monitor Overview** screen. Along the top of the screen, click **Manage > Restore**.
- 2 On the **What do you want to restore?** screen, click **Clone Oracle Database**.

- 3 On the small **Select a Master Server** dialog box, use the drop-down menu to select the master server that you want to work with, then click **OK**.

See “[Select a Master Server dialog](#)” on page 125.

- 4 The **Select Source Database** screen lets you filter the list of databases by database name, host name, database version, platform, and date. The default condition is to display all databases that are backed up in the default date range. Click **Show Databases**.

More information is available on this screen.

See “[Select Source Database panel](#)” on page 125.

- 5 The databases appear under the filtering part of the same screen. Select the database on which you want to perform a cloning operation by clicking **option** at the left side of the desired database entry. Then click **Next>**.

- 6 The **Select Control File Backup** screen shows a timeline view of the control file backups. Select the icon for the desired control file backup from the timeline view. You can hover over the icon to display the control file details. If the icon represents multiple backups, you can hover over the icon to display all versions of the backup for that time periods.

Additional information is available to verify that you have selected the correct control file. The lower left corner of the screen lists three links. More information is available about these links.

See “[Select Control File Backup screen](#)” on page 126.

Click on the icon of the control file backup you want to restore for the clone of the selected database. The default is the latest backup selected. Then click **Next>**.

- 7 The **Destination Host and Login** screen contains parameters for the destination of the clone to be created. Enter the destination host name in the text box that is provided or click **Browse** and select from a list of available hosts. Note the following prerequisites concerning the destination host:

- The platform type of the source and destination must be the same.
- A NetBackup client must be installed.
- A compatible version of Oracle must be installed.

See “[Destination host and login screen](#)” on page 126.

For operating system authentication, enter a user name, password (Windows), and domain (Windows). Then click **Next>**.

- 8 The **Define Destination Parameters** screen appears. The five tabs on this screen are used to change database attributes, the destination paths of control files, data files, and redo logs, and restore options. After you have changed the destination parameters, click **Next>**.
See “[Destination Parameters screen](#)” on page 127.
- 9 The **Selection Summary** screen lets you scan the information you have entered on the previous screens. Links to the recovery sets and destination database attributes let you view and verify any changes you have made. When you are satisfied with the summary information, click **Next>**.
See “[Selection summary screen](#)” on page 128.
- 10 The **Pre-clone Check** screen lets you validate the database attributes and the file paths. To validate, click the underlined word **here**. If a directory path does not already exist, the validation check flags the error. If a file already exists, the validation check also flags the error, so that the cloning operation does not overwrite the file.
See “[Pre-clone check screen](#)” on page 128.

When you are ready to launch the cloning operation, click **Launch Cloning Process**. A display appears that is similar to the NetBackup Activity Monitor.

Select a Master Server dialog

From the pulldown menu, select the NetBackup master server that collected the backup information to be used for the cloning operation.

Select Source Database panel

When the **Select Source Database** screen first appears, the lowest portion of the screen shows a list of the latest backups for all the databases that the master server knows about for the default date range.

The upper portion of the screen shows parameters for filtering the list of databases. If the list is long, you can filter what databases appear by database name, host name, database version, and date range. Multiple filter parameters can be used at the same time.

For example, to show only the Solaris databases that are backed up between 11/05/2011 and 11/12/2011, select Solaris from the Platform: pulldown menu. Then select the dates from the calendar icons. Then click **Show Databases** to display the new filtered list of databases.

Select Control File Backup screen

The Guided Recovery **Select Control File Backup** screen is a timeline view of all the control files that are backed up for the selected database. The timeline displays an icon for each control file that is associated with the backed up database. When you first enter this screen, the latest backup control file is already selected .

Hover over the icon on the timeline to display a popup that shows information about that file: backup name, type of media, the size of the backup, etc.

Multiple control files may be displayed on the timeline. To view all the instances of control files, you may need to increase the scope of the timeline. You can display the timeline in days, weeks, months, or years. If multiple control files were backed up during a single timeline unit, a different icon appears representing more than one control file (for example, if the database was backed up twice in an hour). To select from among these files, hover over the icon. A popup lists each control file in table format. It shows several items including the backup name and the type of media. Click **option** next to the desired control file.

You can also click one of the links in the lower left of the screen to verify that you have selected the proper control file.

- **View Database Schema** shows the schema of the selected control file. It shows how the database is laid out by listing each data file name, tablespace name, and its size.
- **View Datafiles Recovery Set** shows the data file backups to be used for the restore process. It also shows the backup and image information that is displayed for each data file. The data file recovery set is generated only for the files that are backed up as part of an incremental strategy. Even though files that are backed up as part of a full backup do not appear in this list, the clone still completes successfully.
If the image spans media, only the first media is shown in the list.
- **View Archived Log Recovery Set** shows the archive log backups that may be used to recover the database to the latest point in time of that control file. This set is generated only for the files that are backed up as part of an incremental strategy. Even though files that are backed up as part of a full backup do not appear in this list, the clone still completes successfully.

Destination host and login screen

The Select Destination Parameters screen lets you enter the destination host and the Oracle logon information. For Windows, you are asked for the domain name, user name, and password. For UNIX and Linux, you are asked only for the user name.

The following rules apply to the selection of the destination host:

- The destination must be of the same platform type as the source of the clone.
- A NetBackup client must be installed.
- A compatible version of Oracle must be installed.

Destination Parameters screen

Guided Recovery uses many values from the source database as default values for the destination database. You can modify these values if not appropriate for the destination database.

Note: The Windows information you enter on this screen is case sensitive. Be sure to enter the Windows information appropriately.

The **Destination Parameters** screen contains the following tabs:

- **Database Attributes.** This pane appears when you first enter the Database Attributes screen. Each attribute name has identical source and destination attributes. You can change the destination attribute of the instance name, database name, and database home. Note that the instance name is case sensitive while the database name is not case sensitive.
If you use a temporary tablespace or datafiles, and you plan to write the datafiles back to the same location, do not modify the path. If you must modify the path, make sure it is identical to the source path including case (upper, lower, mixed). Otherwise, the clone fails with an error that indicates the temporary file already exists. This limitation does not affect UNIX and Linux systems.
- **Control File Paths.** This pane displays the source path and the destination path for each control file. You can change a control file destination path by clicking in the associated text window and entering the new path. You can also click Browse to navigate to the desired path. When you change a path, a highlight bar appears around the text window as a visual indicator that this path has changed.
- **Data File Paths.** This pane lets you change the destination path for one or more data files. Enter the path in the text window provided, then select the data files on which to apply it, and press the Apply option.
- **Redo Log Paths.** This pane displays the source path and the destination path for all redo logs. You can type in a new destination path or click Browse to navigate to the desired path. When you change a path, a highlight bar appears around the text window as a visual indicator that this path has changed.

- **Restore Options.** This pane displays restore options. The option that is displayed on this pane is **Number of parallel streams for restore and recover.**

When you are done making changes on this screen, click **Next>**. All the information from the previous screen is saved in preparation for the cloning operation. All the changes that are made in this screen are temporary and are active only for the cloning session.

Selection summary screen

The following information appears on this screen:

- The selected master server and the source database attributes.
- The date and time of the selected control file backup, and the backup media type.
- The database recovery set and the archived log recovery set.
- The destination database attributes selected in the previous screen and the database initialization parameters to be used for the cloning operation.

Pre-clone check screen

The Guided Recovery **Pre-clone Check** screen lets you validate the database attributes and the file paths. To validate, click the underlined word **here**. If a file path does not already exist, the validation check flags the error. If a file already exists, the validation check also flags the error, so that the cloning operation does not overwrite the file.

You can also specify an email address, so when the cloning process completes, an email is sent to you that gives you the status of the cloning operation along with other pertinent information.

Job Details screen

The Job Details screen is intended to reflect the NetBackup Activity Monitor. More information is available on the Activity Monitor.

See the *NetBackup Administrator's Guide, Volume I*.

Guided Recovery Post-clone operations

Perform the following after the cloning operation has completed:

- On UNIX and Linux systems, update the `oratab` file with the appropriate instance information.
- On UNIX and Linux systems, if the cloning operation fails, do the following cleanup:
 - If the database is active, shut down the database.
 - Remove `init<SID>.ora`, `spfile<SID>.ora`, and any other files associated with the SID being used, from the `<$ORACLE_HOME>/DBS` directory.
 - Remove all data files.
- On Windows systems, if the cloning operation fails, use the `dbca` utility to delete the database. `dbca` sometimes removes directories, so verify before retrying the operation.
- If a cloned Oracle database contains read-only tablespaces or datafiles, you must make them read-write before RMAN backs them up, or RMAN cannot restore them. After the backup (cloning operation), you can return the items to read-only.

The following shows an example of the sequence of steps in the process:

 - Back up Oracle database A which contains read-only tablespace TABLE1.
 - Clone database A to database B.
 - Use the Oracle `alter tablespace` command to make tablespace TABLE1 read-write. You may revert to read-only if you want.
 - Back up database B.
 - Use RMAN to restore database B.

Troubleshooting Guided Recovery

Guided Recovery operations are in addition to the normal NetBackup for Oracle operations.

On UNIX and Linux systems, gather all legacy logs at `VERBOSE=5`. On Windows systems, gather them at `General=2`, `Verbose=5`, and `Database=5`. All unified logs should be gathered at `DebugLevel=6` and `DiagnosticLevel=6`.

In addition to the troubleshooting methods and evidence that you use for resolving NetBackup for Oracle operations, there is also information that is required specifically for troubleshooting Guided Recovery when it fails.

Troubleshooting files for metadata collection operations at the time of the backup

The information in the following log files can be helpful when you troubleshoot Guided Recovery metadata collection operations.

From the Oracle client host:

- netbackup/logs/bphdb legacy logs
- netbackup/logs/dbclient legacy logs (The directory must be writable by the Oracle users.)
- ncf unified logs, OID 309, New Client Framework
- ncforautil unified logs, OID 360, New Client Framework Oracle Utility
- ncforaclepi, OID 348, New Client Framework Oracle Plugin

From the NetBackup media server: netbackup/logs/bpbrm legacy logs

From the NetBackup master server:

- netbackup/logs/bprd legacy logs
- nbars unified logs, OID 362, NetBackup Agent Request Service
- dars unified logs, OID 363, Database Agent Request Service

Troubleshooting files for Guided Recovery validation operations

The information in the following log files can be helpful when you troubleshoot Guided Recovery validation operations.

From the Oracle client host:

- netbackup/logs/vnetd legacy logs
- ncf unified logs, OID 309, New Client Framework
- ncfnbcs unified logs, OID 366, New Client Framework NetBackup Client Services

From the NetBackup master server:

- netbackup/logs/vnetd legacy logs
- nbars unified logs, OID 362, NetBackup Agent Request Service
- dars unified logs, OID 363, Database Agent Request Service

From the NetBackup master server:

- netbackup/logs/bprd legacy logs
- nbars unified logs, OID 362, NetBackup Agent Request Service

- dars unified logs, OID 363, Database Agent Request Service

From the Symantec OpsCenter server:

- <SYMCOpsCenterServer>/config/log.conf file
- opscnterserver unified logs, OID 148 (The default location is <SYMCOpsCenterServer >/logs)
- opscntergui unified log, OID 147 (The default location is <SYMCOpsCenterGUI>/logs)

Troubleshooting files for Guided Recovery cloning operations

The information in the following log files can help when you troubleshoot Guided Recovery cloning operations.

From the Oracle client host:

- netbackup/logs/bphdb legacy logs (Includes the obk_stdout and obk_stderr logs.)
- netbackup/logs/bpdsbora legacy logs
- netbackup/logs/dbclient legacy logs (The directory must be writable by the Oracle users.)
- A tar of netbackup/logs/user_ops (UNIX/Linux)
- A compress of NetBackup\Logs\user_ops (Windows)

From the NetBackup master server:

- netbackup/logs/vnetd legacy logs
- netbackup/logs/bprd legacy logs
- nbars unified logs, OID 362, NetBackup Agent Request Service
- dars unified logs, OID 363, Database Agent Request Service

From the Symantec OpsCenter server:

- <SYMCOpsCenterServer>/config/log.conf file
- opscnterserver unified logs, OID 148 (The default location is <SYMCOpsCenterServer >/logs)
- opscntergui unified log, OID 147 (The default location is <SYMCOpsCenterGUI>/logs)

NetBackup for Oracle with Snapshot Client

This chapter includes the following topics:

- [About NetBackup for Oracle with Snapshot Client](#)
- [How NetBackup for Oracle with Snapshot Client works](#)
- [About configuring NetBackup for Oracle block-level incremental backups on UNIX and Linux](#)
- [About Snapshot Client effects](#)

About NetBackup for Oracle with Snapshot Client

To use NetBackup for Oracle with Snapshot Client, NetBackup Snapshot Client and NetBackup for Oracle must both be licensed and installed.

Before you use NetBackup for Oracle with Snapshot Client, confirm that your platform is supported.

See [“Verifying the operating system and platform compatibility for NetBackup for Oracle”](#) on page 31.

A snapshot is a disk image of the client’s data that is made almost instantaneously. When it is used in conjunction with NetBackup Snapshot Client, NetBackup for Oracle can back up Oracle objects by taking snapshot images of the component files. Later, it backs up the snapshot version to the storage unit.

Snapshot backup captures the data at a particular instant without causing significant client downtime. Client operations and user access continue without interruption during the backup. The resulting capture or snapshot can be backed up without affecting the performance or availability of the database.

The following NetBackup Snapshot Client features are available for use with NetBackup for Oracle.

Table 6-1 Snapshot Client features used with NetBackup for Oracle

Feature	Description
Instant recovery	<p>This feature enables instant recovery of backups from disk. It combines snapshot technology with the ability to do rapid disk-based restores. NetBackup creates the image without interrupting user access to data. Optionally, the image is retained on disk as well as backed up to storage. Instant recovery enables block-level restores.</p>
Off-host backup	<p>An off-host backup shifts the burden of backup processing onto a separate backup agent, such as an alternate client. This reduces the effect on the client's computing resources ordinarily caused by a local backup. The backup agent reads the data from the client disk and writes it to storage.</p> <p>On UNIX and Linux, an off-host backup can also be directed to a NetBackup media server, or third-party copy device.</p>
Block-level incremental backup	<p>On UNIX and Linux, a block-level incremental (BLI) backup uses the change tracking capabilities of the Veritas File System (VxFS) Storage Checkpoint feature. In a BLI backup, only the changed blocks of data are backed up, not the entire file or file system. A BLI backup saves time, decreases the amount of backup media that is required, and significantly reduces CPU and network overhead during backups.</p> <p>You can perform a BLI backup with or without RMAN.</p>
Proxy copy	<p>A proxy copy is a special type of backup in which the NetBackup for Oracle agent manages the control of the data transfer. During the backup and restore operations, the proxy copy enables the agent to manage the entire data movement between the disks that contain the data files and the storage devices that NetBackup manages.</p> <p>Backups and restores remain tightly integrated with Oracle and its catalog, greatly simplifying administration tasks.</p>
File-based operations	<p>Oracle provides the list of files that require backup or restore to NetBackup for Oracle with Snapshot Client.</p> <p>More information is available.</p> <p>See "NetBackup for Oracle file-based operations" on page 136.</p>

Table 6-1 Snapshot Client features used with NetBackup for Oracle *(continued)*

Feature	Description
Stream-based operations	<p>Stream-based operations are the standard NetBackup implementation of conventional NetBackup for Oracle backup and restores.</p> <p>More information is available.</p> <p>See “NetBackup for Oracle stream-based operations” on page 135.</p>

Proxy copy

A proxy copy is a special type of backup in which NetBackup for Oracle agent manages the control of the data transfer. During the backup and restore operations, proxy copy enables the agent to manage the entire data movement between the disks that contain the data files and the storage devices that NetBackup manages.

With proxy copy, RMAN provides a list of files that require backup or restore to the NetBackup for Oracle agent. The agent determines how the data is moved and when to move the data. Proxy copy is an extension to Oracle’s Media Management API.

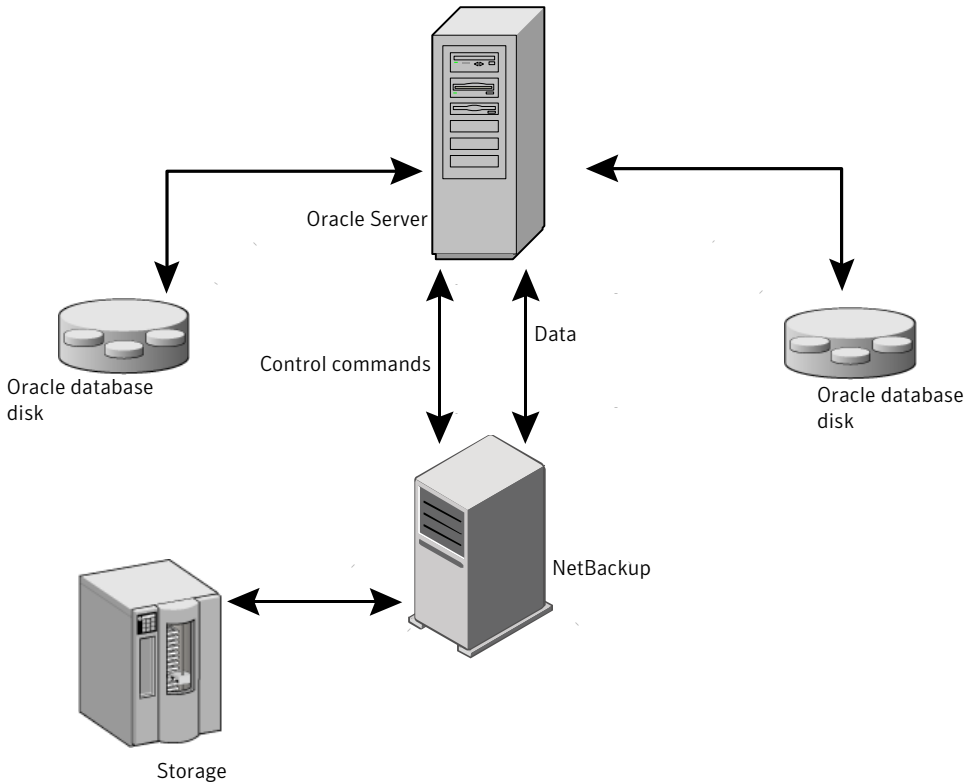
Backups and restores remain tightly integrated with RMAN and its catalog, greatly simplifying administration tasks.

NetBackup for Oracle stream-based operations

Stream-based operations are the standard NetBackup implementation of conventional RMAN backup and restores. In a stream-based backup, NetBackup moves the data that is provided by the server process. NetBackup captures the data stream content that RMAN provides. If the user has specified multiple streams, then RMAN opens multiple streams and NetBackup catalogs them as separate images.

[Figure 6-1](#) represents a stream-based backup or restore.

Figure 6-1 NetBackup for Oracle RMAN stream-based backup or restore

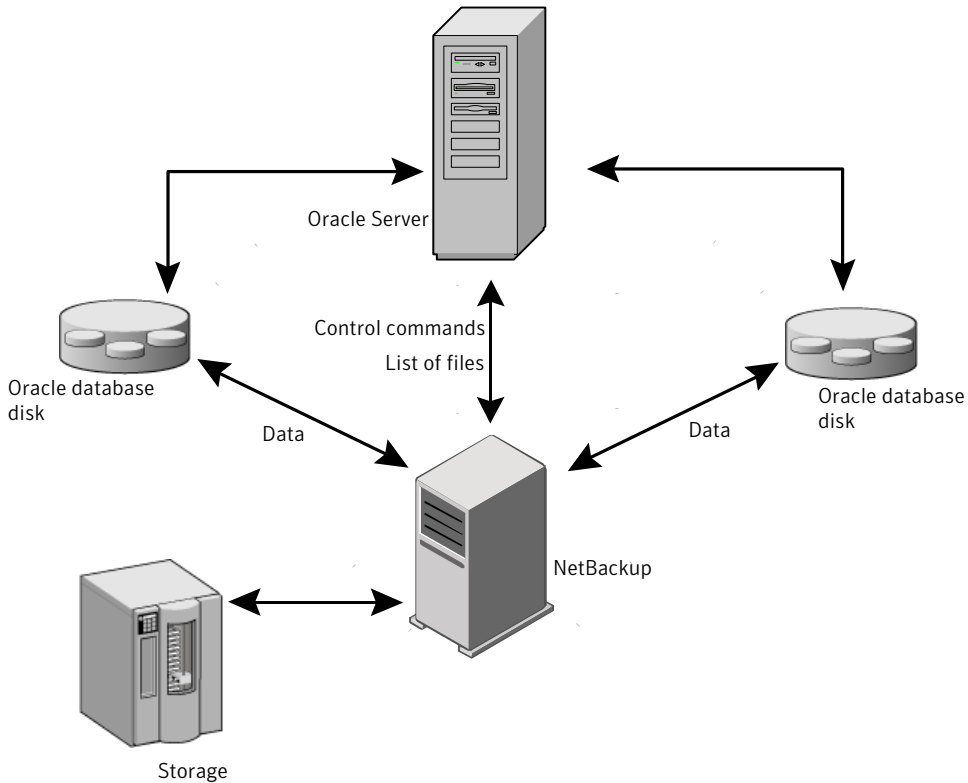


NetBackup for Oracle file-based operations

File-based operations are the NetBackup for Oracle with Snapshot Client implementation of Oracle proxy copy backups and restores. In a file-based operation, RMAN provides the list of files that require backup or restore to NetBackup for Oracle with Snapshot Client. NetBackup for Oracle with Snapshot Client performs the data movement.

[Figure 6-2](#) represents a file-based backup or restore.

Figure 6-2 NetBackup for Oracle with Snapshot Client file-based backup or restore



How NetBackup for Oracle with Snapshot Client works

NetBackup users or schedules start database backups or restores by specifying a template or shell script in the backup selections list of the Oracle policy. The template or shell script specifies backup or restore commands for the Oracle Recovery Manager (RMAN) to use when you perform the backup or restore on the client.

The RMAN `backup proxy` command initiates a proxy copy backup of the specified objects. The objects that can be backed up using the proxy copy functionality depend on the Oracle version. RMAN translates the objects into the physical file names and provides a list of file names to NetBackup for Oracle.

See [“Database objects supported by advanced backup methods”](#) on page 138.

The agent checks that the policy it uses for the backup is configured with the appropriate Snapshot Client attributes. The agent then initiates file-based backups of the Oracle files and uses the NetBackup Snapshot Client interface to perform the data movement.

When Oracle performs proxy copy backups, it puts the data files being backed up into backup mode. NetBackup then creates a snapshot of the files. After the snapshot has been created, the NetBackup for Oracle agent signals back to Oracle to take the data files out of backup mode. The data files that are being backed up are in backup mode only for the period of time necessary to capture a snapshot of the data.

About the NetBackup for Oracle backup operation

For a backup operation, the NetBackup for Oracle agent performs the following steps:

- Receives a list of files to back up from RMAN.
- A unique backup file name identifies each file in the NetBackup catalog. To ensure that this occurs, use the `format` operand to give each data file a unique name.
- Queries the policy to check whether the Snapshot Client policy attributes are specified.
- Initiates a configured number of Snapshot Client backups and waits until the jobs are completed.

See [“About NetBackup multistreaming”](#) on page 139.

About the NetBackup for Oracle restore operation

For a restore operation, the NetBackup for Oracle agent performs the following steps:

- Receives a list of files to restore from RMAN.
- Sends a restore request to the NetBackup server for all files in the list.
- Waits for all files in the file list to be restored by NetBackup.

Database objects supported by advanced backup methods

Oracle controls the kinds of database objects that can be backed up by proxy copy and, therefore, what NetBackup can back up using Snapshot Client backup methods. Oracle allows proxy copy backups of databases, tablespaces, and data files. With Oracle 10g releases and later, Oracle also allows proxy copy backups

of archived redo logs. As a result, NetBackup can use file-based Snapshot Client backup methods to back up these objects.

For control files and archived redo logs, Oracle RMAN performs conventional stream-based backups only. NetBackup for Oracle must use stream-based backups for control files and archived redo logs even when you use Snapshot Client methods for the other database objects.

Note: Oracle 10g and later releases support proxy copy backups for archived redo logs. Control files, however, must still be included in a stream-based backup schedule. If you use an Oracle 10g or later release, you can include archived redo logs located in your database proxy file backups, and you can ignore the instructions in this chapter that direct you to back up the archived redo logs in a stream-based backup schedule.

File-based and stream-based backups require different configurations. When configuring your NetBackup for Oracle with Snapshot Client backups, be sure to configure a policy that allows both kinds of backups.

About NetBackup multistreaming

On the initial call, NetBackup for Oracle with Snapshot Client returns a special entry to RMAN indicating that it supports proxy copy. It also indicates to RMAN that it supports an unlimited number of files to be proxy-copied in a single proxy copy session. The number of channels that are allocated for the RMAN `backup proxy` command does not control the degree of parallelism for proxy backups. RMAN uses only one channel for proxy copy backups except when a specific configuration is used.

The `NB_ORA_PC_STREAMS` variable controls the number of proxy copy backup streams to be started. By default, the agent initiates one backup job for all files. If the RMAN `send` command passes `NB_ORA_PC_STREAMS`, NetBackup for Oracle splits the files into the number of groups that are specified by the variable based on the file size. The agent attempts to create streams of equal size.

RMAN multiple channels

If you allocate multiple channels for an RMAN proxy copy backup session, RMAN uses only one channel to perform a proxy backup of all objects. All other channels could be used for a stream-based (non-proxy) backup of the control file or archived redo logs. Examples are available.

Restoring data files to a new location

NetBackup for Oracle with Snapshot Client can restore data files that are backed up by proxy to a new location. The new location can be specified by using the `RMAN set newname` command or `ALTER DATABASE RENAME DATAFILE` statement before initiating a restore. For example, to restore a data file for tablespace `TEST` to a new location, you can use the following RMAN commands:

```
RUN
{
  allocate channel t1 'SBT_TAPE';
  sql 'alter tablespace TEST offline immediate'
  # restore the datafile to a new location
  set newname for datafile '/oradata/test.f' to
  '/oradata_new/test.f';
  restore tablespace TEST;
  # make the control file recognize the restored file as current
  switch datafile all;
  recover tablespace TEST;
  release channel t1;
}
```

The RMAN procedure for data files that are backed up by proxy is the same as for conventionally backed up data files. RMAN knows that the data files were backed up by proxy, and it issues a proxy restore request to NetBackup for Oracle, which restores the data files to the new location. For more information on the required procedure, see your Oracle documentation.

Redirecting a restore to a different client

The procedure for restoring a proxy backup to a different destination client is the same as the procedure for stream-based, non-proxy backups.

Symbolic links and raw data files (UNIX and Linux)

NetBackup for Oracle with Snapshot Client backs up and restores data files that consist of symbolic links and regular files. Both the symbolic link and the file are backed up and restored. However, if you selected **Retain snapshots for instant recovery**, the symbolic link must reside on the same file system as the data file. When you use instant recovery, if the symbolic link resides on a different file system than the data file it points to, the restore fails.

NetBackup for Oracle with Snapshot Client backs up and restores data files created on raw partitions.

Quick I/O data files (UNIX and Linux)

NetBackup for Oracle with Snapshot Client backs up and restores Quick I/O Oracle data files. A Quick I/O file consists of two components: a hidden file with space allocated for it and a link that points to the Quick I/O interface of the hidden file.

On the backup, NetBackup for Oracle with Snapshot Client follows the symbolic link and backs up both components of the Quick I/O file: the symbolic link and the hidden file.

On the restore, NetBackup for Oracle with Snapshot Client restores both components from the backup image. If one or both of the components are missing, NetBackup for Oracle with Snapshot Client creates the missing component(s).

RMAN incremental backups

You can use proxy copy backups as a part of the incremental strategy with conventional non-proxy RMAN backups. RMAN lets you create a proxy copy incremental level 0 backup. This backup can be the base for subsequent RMAN traditional incremental backups (level 1-*n*). To accomplish this, perform a snapshot proxy copy (file-based) level 0 incremental backup and follow with an RMAN traditional (stream-based) level 1-*n* incremental backup.

In the following example, the first `run` command initiates a proxy copy backup of tablespace `tbs1`. NetBackup for Oracle uses a snapshot file-based backup to perform a full tablespace backup. RMAN designates this backup as eligible for incremental level 1-*n* backups. The second `run` command initiates a traditional non-proxy level 1 incremental backup of the same tablespace `tbs1`. In this case, NetBackup for Oracle performs a stream-based backup.

```
run {
  allocate channel t1 type 'SBT_TAPE';
  backup
    incremental level 0
    proxy
    format 'bk_%U_%t'
    tablespace tbs1;
  release channel t1;
}
```

```
run {
  allocate channel t1 type 'SBT_TAPE';
  backup
    incremental level 1
    format 'bk_%U_%t'
```

```

        tablespace tbs1;
    release channel t1;
}

```

Proxy backup examples

The following examples show how to use multiple channels in RMAN scripts with proxy backups.

Table 6-2 Proxy backup examples

Backup example	Sample script
<p>This RMAN sample script initiates a whole database backup, which includes the control file. RMAN starts one proxy copy backup session by sending a list of all data files to the NetBackup for Oracle agent on channel t1.</p>	<pre> run { allocate channel t1 type 'SBT_TAPE'; send 'NB_ORA_PC_STREAMS=3'; backup proxy format 'bk_%U_%t' (database); release channel t1; } </pre> <p>The agent splits the files into 3 streams and initiates a file-based backup for each stream. After the proxy backup is done, RMAN starts a non-proxy conventional backup of the control file on channel t1.</p>

Table 6-2 Proxy backup examples (*continued*)

Backup example	Sample script
<p>This RMAN sample script initiates a whole database backup, which includes the control file. RMAN starts one proxy copy backup session by sending a list of all data files to the NetBackup for Oracle agent on channel t1. The agent splits the files into 3 streams and initiates a file-based backup for each stream. At the same time, RMAN starts a non-proxy conventional backup of the control file on channel t2.</p>	<pre>run { allocate channel t1 type 'SBT_TAPE'; allocate channel t2 type 'SBT_TAPE'; send 'NB_ORA_PC_STREAMS=3'; backup proxy format 'bk_%U_%t' (database); release channel t1; release channel t2; }</pre> <p>If the RMAN recovery catalog is not used, then the version of the control file being backed up does not contain the information about the current backup. To include the information about the current backup, back up the control file as the last step in the backup operation. This step is not necessary if the recovery catalog is used.</p> <pre>Run { allocate channel t1 type 'SBT_TAPE'; backup format 'cntrl_%s_%p_%t' current controlfile; release channel t2; }</pre>

Table 6-2 Proxy backup examples (*continued*)

Backup example	Sample script
<p>In this sample script, RMAN initiates two proxy copy backups sequentially on channel t1. It starts a proxy backup of tablespace tbs1 data files. After the backup is done, it starts another proxy backup of tablespace tbs2 data files.</p>	<pre data-bbox="521 331 987 616">run { allocate channel t1 type 'SBT_TAPE'; backup proxy format 'bk_%U_%t' (tablespace tbs1); backup proxy format 'bk_%U_%t' (tablespace tbs2); release channel t1; }</pre> <p data-bbox="521 644 1193 786">This configuration can cause problems if the sequential backups create snapshots on the same volumes or create snapshots on separate volumes that share a snapshot resource specification. In such a situation, issue a single <code>backup</code> command such as the following which specifies both tablespaces rather than two separate <code>backup</code> commands:</p> <pre data-bbox="521 817 987 1015">run { allocate channel t1 type 'SBT_TAPE'; backup proxy format 'bk_%U_%t' (tablespace tbs1, tbs2); release channel t1; }</pre>
<p>In this example, RMAN distributes proxy copy backups over two channels. It creates two proxy copy backup sessions sending tbs1 data files on channel t1 and tbs2 data files on channel t2. Such a method is useful if you want to specify different NetBackup configurations for each channel. In this example, each <code>send</code> command specifies a different policy to be sent and used by each proxy backup.</p>	<pre data-bbox="521 1067 987 1414">run { allocate channel t1 type 'SBT_TAPE'; send 'NB_ORA_POLICY=policy1'; allocate channel t2 type 'SBT_TAPE'; send 'NB_ORA_POLICY=policy2'; backup proxy format 'bk_%U_%t' (tablespace tbs1 channel t1); (tablespace tbs2 channel t2); release channel t1; release channel t2; }</pre>

About configuring NetBackup for Oracle block-level incremental backups on UNIX and Linux

If only a small portion of a database changes on a daily basis, full database backups are costly in terms of time and media. The block-level incremental (BLI) backup interface extends the capabilities of NetBackup to back up only changed data blocks.

A database BLI backup is done at the file system block level, which means only changed blocks are backed up. Changed files are not backed up. VxFS Storage Checkpoint facility identifies changed blocks in real time. BLI backup does not need to search the entire database for the modified blocks. BLI backup saves time, decreases the amount of backup media that is required, and significantly reduces CPU and network overhead during backups. In addition, BLI backup allows more frequent backups, so backup images are more up to date.

BLI backup is particularly useful for any large databases that are sized in terms of hundreds of gigabytes or terabytes. Most traditional methods for database backup require that any change in the database—no matter how small—requires that the entire database is backed up. With BLI backup, only modified data blocks need to be backed up.

The recommended method for performing BLI backups is the proxy BLI agent with RMAN. This method supports the other features of NetBackup for Oracle, including the policy types and schedules and the convenience of the RMAN template generation wizard. It also remains tightly integrated with RMAN and its catalog, which greatly simplifies administration tasks.

You can also perform backups with the script-based BLI method without RMAN. See [“About script-based block-level incremental \(BLI\) backups without RMAN”](#) on page 211.

Note: Symantec recommends that Snapshot Client users who want to perform BLI backups use BLI with RMAN. NetBackup for Oracle also provides a method for BLI backup without RMAN that uses scripts to put tablespaces into, and take them out of, backup mode. This method is not recommended, and it requires a significantly different configuration.

How BLI works with NetBackup for Oracle (UNIX and Linux)

NetBackup supports BLI full backups and BLI incremental backups of Oracle databases.

BLI backup supports two types incremental backups: differential and cumulative. Full, differential incremental, and cumulative incremental backups are specified as part of the backup schedule. When performing a restore, NetBackup restores an appropriate full backup. Then it applies the changed blocks from the incremental backups.

Restoring any of the incremental backup images requires NetBackup to restore the last full backup image and all the subsequent incremental backups until the specified incremental backup image is restored. NetBackup performs this restore process automatically, and it is completely transparent. The media that stored the last full backup and the subsequent incremental backups must be available, or the restore cannot proceed.

Note that restoring a file rewrites all blocks in that file. The first subsequent differential incremental backup and all subsequent cumulative incremental backups back up all the blocks in the restored file. After restoring an entire database, the first subsequent backup results in a full backup.

The restore destination can be a VxFS, UFS (Solaris), JFS (AIX), or HFS (HP-UX) file system. The destination VxFS file system does not need to support the Storage Checkpoint feature to restore files, but a VxFS file system with the Storage Checkpoint feature is needed to perform BLI backups of the restored data.

This topic uses the following terms to describe BLI backups:

- **Full Backup.**

A backup in which NetBackup backs up the entire database file, not just data blocks changed since the last full or incremental backup.

- **Cumulative BLI Backup.**

This is a backup of all the data blocks of database files that changed since the last full backup. A cumulative BLI backup image contains only the data blocks of database files that changed since the last full backup, but a cumulative BLI backup can reduce the number of incremental backup images that must be applied to a restore operation. This speeds up the restore process.

- **Differential BLI backup.**

This is a backup in which NetBackup performs a backup of only those data blocks of database files that changed since the last backup of any type (full, cumulative incremental, or differential incremental backup) was performed.

When NetBackup initiates full database backups, followed by BLI backups, it creates, manages, and uses the appropriate Storage Checkpoints of the Oracle data file file systems.

Configuration requirements for BLI backups with NetBackup for Oracle

Before you configure BLI backups, make sure your configuration meets the following requirements:

- NetBackup for Oracle is installed, licensed, and configured.
- NetBackup Snapshot Client is installed and configured, and the license key for this option is registered.
- Veritas Storage Foundation for Oracle must be installed and configured.
- Veritas File System must have Storage Checkpoint licensed.

For more information on requirements, see the *NetBackup Snapshot Client Administrator's Guide*.

Configuring policies for BLI backups with NetBackup for Oracle

This topic explains how to configure BLI backups for Oracle policies. BLI backups do not back up all database objects. Include policies to perform file-based and stream-based backups.

Your backup configuration must ensure that the entire database can be successfully restored.

To configure a policy for BLI backups, configure the following:

- The BLI backup method on the policy attributes dialog box.
- An **Automatic Backup** schedule to perform full and incremental file-based backups of the data files.
- An **Application Backup** schedule to perform a stream-based backup of control files and archived redo logs. These files are backed up with standard RMAN operations.

To configure a policy for BLI backups

- 1 Open the policy you want to configure.
- 2 Click the **Attributes** tab.
- 3 From the **Policy Type** list, choose **Oracle**.
- 4 Select a **Policy storage**.
- 5 Select **Perform block level incremental backups**.
- 6 To configure schedules, click the **Schedules** tab.

Oracle does not support proxy backups of database control files and archived redo logs. To perform a whole database proxy backup, which automatically includes a backup of the control file, configure the following:

- One or more automatic backup schedules to perform proxy BLI backups of the data files.
 - An Application Backup schedule type to back up the control files and archived redo logs.
- 7 On the **Clients** tab, specify clients to be backed up with this policy.
 - 8 On the **Backup Selections** tab, specify the template or script.

About the types of NetBackup for Oracle BLI backups

NetBackup performs proxy BLI backups with Automatic Full Backup, Automatic Differential Incremental Backup, and Automatic Cumulative Incremental Backup schedules.

If a user initiates a backup and the proxy schedule name is not specified on the request with the `NB_ORA_PC_SCHED` environment variable, the NetBackup server starts an Automatic Full Backup schedule by default.

NetBackup for Oracle checks that a full backup was performed before it proceeds with an incremental backup. If the NetBackup scheduler or user initiates an incremental backup, and NetBackup for Oracle finds no record of a full backup using the same policy, it performs a full backup.

To ensure that it has a proper set of images to restore, NetBackup performs a full backup when it encounters the following situations:

- If the number of backup streams that is specified changed from the previous backup. This change can be made in the `NB_ORA_PC_STREAMS` environment variable.
- If NetBackup does not have a valid full backup image for the same policy in its database. For example, this situation can occur if images were expired.
- If a new file was added to or deleted from the list of files for an incremental backup.

NetBackup for Oracle always initiates a full backup under these conditions, even if you want to perform an incremental backup.

About Snapshot Client effects

The following topics describe how the Snapshot Client software affects backup types, schedule properties, and templates. Snapshot Client also affects scripts and environment variables.

How Snapshot Client software affects backup types

The backup types available on the Schedules tab of the policy play a different role for NetBackup for Oracle with Snapshot Client backups.

See [Table 6-3](#) on page 149.

Table 6-3 Backup types for Oracle policies

Backup type	Description
Application Backup	<p>The Application Backup schedule enables stream-based NetBackup operations. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.</p> <p>On UNIX and Linux clients, if you want to use Third-party Copy Device or a NetBackup Media Server as your data mover, override the policy storage unit. Specify a non-SAN media manager or other storage unit type for the Application Backup schedule. This schedule backs up control files and archived logs.</p>
Automatic Full Backup	For file-based proxy copy backups, the automatic backup schedule
Automatic Differential Incremental Backup,	types automatically start the backups by running the NetBackup for Oracle RMAN scripts or templates.
Automatic Cumulative Incremental Backup	If you specify an automatic backup type for a snapshot backup, a full backup is performed.

How Snapshot Client software affects schedule properties

Some schedule properties have a different meaning for Snapshot Client database backups than for a regular database backup. For a description of other schedule properties, see the information that is specific to standard database agent backups.

See “[About NetBackup for Oracle schedule properties](#)” on page 49.

[Table 6-4](#) explains the properties for Snapshot Client backups.

Table 6-4 Schedule properties

Property	Description
Retention	<p>Frequency based scheduling</p> <p>The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps stream-based, non-proxy backup images.</p> <p>For proxy backups, NetBackup uses the retention period for the automatic type of backup to specify how long to keep proxy file-based backup images.</p> <p>Calendar based scheduling</p> <p>The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps non-proxy backup images.</p> <p>For proxy backups, NetBackup for Oracle with Snapshot Client uses the retention period for the automatic type of backup to specify how long to keep proxy file-based backup images.</p>
Multiple copies	<p>If you use Multiple copies and want to specify multiple copies of non-proxy stream-based backups for your Oracle policy, configure Multiple copies on the Application Backup schedule.</p> <p>For proxy file-based backups, configure Multiple copies on the automatic backup schedule.</p>

How Snapshot Client software affects templates and scripts

On UNIX and Linux systems, you can use a template that was created by the RMAN template generation wizard to perform backups with Snapshot Client. After they are created, templates reside on the NetBackup master server and are available for use by other NetBackup for Oracle clients.

You can use a template that was created by the NetBackup for Oracle wizard to perform backups with Snapshot Client. After they are created, templates reside on the NetBackup master server and are available for use by other NetBackup for Oracle clients.

See [“About creating templates and shell scripts”](#) on page 64.

In the RMAN template generation wizard, the **Specify Maximum Limits** selection options on the backup limits screen are not applicable for proxy backups. RMAN uses these options only for conventional stream-based backups. If the template includes archived redo logs, NetBackup uses this option to back up the logs.

Whether you use a template or script, you must enable the advanced backup method for your clients. Configure this method on the Attributes tab of the policy. At run time, the template checks the policy attributes to determine if a Snapshot Client backup method is configured. Then it initiates the proxy file-based backup.

If you use a script, the script must reside on each client that is included in the policy. Include the Oracle `backup proxy` command in the script to perform the advanced backup method. Sample scripts are included with the installation.

NetBackup for Oracle with Snapshot Client environment variables

You can use environment variables to change the number of streams the proxy copy session uses or to specify an alternate backup schedule.

See [“About configuring the runtime environment”](#) on page 56.

The following list shows the variables that you can to set that are specific to NetBackup for Oracle with Snapshot Client:

`NB_ORA_PC_SCHED` The NetBackup for Oracle schedule NetBackup uses for a proxy copy file-based backup. (This schedule can be Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental backup type).

For scheduled backups, this variable is passed from the scheduler. When you create an RMAN template with the NetBackup for Oracle RMAN template generation wizard, this variable is automatically created in the template.

`NB_ORA_PC_STREAMS` Specifies the number of backup streams that NetBackup starts simultaneously in each proxy copy session. When a backup starts, NetBackup groups all data files into a specified number of backup streams that are based on the file sizes. NetBackup tries to create streams of equal size.

The default value for `NB_ORA_PC_STREAMS` is 1.

Only a user can set this variable. When you create an RMAN template using the NetBackup for Oracle RMAN template generation wizard, this variable is automatically created in the template when you provide a value for the **Number of parallel streams**.

For NetBackup for Oracle with Snapshot Client, the order of precedence for environment variables is the same as for standard NetBackup for Oracle. Refer to the instructions for how to configure the NetBackup and the user variables.

See [“About configuring the runtime environment”](#) on page 56.

NetBackup for Oracle installs sample scripts in the following location:

UNIX and Linux: `/usr/opencv/netbackup/ext/db_ext/oracle/samples/rman`

Windows: `install_path\NetBackup\dbext\oracle\samples\rman`

The following are the scripts for NetBackup for Oracle with Snapshot Client that show how to configure the required variables:

UNIX and Linux: <code>hot_database_backup_proxy.sh</code>	This script sets the environment and calls RMAN with the appropriate command to perform a whole database proxy backup. When NetBackup runs a schedule, it sets the environment variables that NetBackup for Oracle with Snapshot Client uses. The script shows how to use the RMAN <code>send</code> command to pass the NetBackup for Oracle with Snapshot Client variables with a vendor-specific quoted string.
Windows: <code>hot_database_backup_proxy.cmd</code>	

UNIX and Linux: <code>hot_tablespace_backup_proxy.sh</code>	This script sets the environment and calls RMAN with the appropriate command to perform a tablespace proxy backup.
Windows: <code>hot_tablespace_backup_proxy.cmd</code>	

If you use scripts, use the `send` command to pass the environment variables to the agent. The following example uses the `send` command to specify the values for `NB_ORA_PC_SCHED` and `NB_ORA_PC_STREAMS`:

```
run {
  allocate channel t1 type 'SBT_TAPE';
  send 'NB_ORA_PC_SCHED= sched, NB_ORA_PC_STREAMS= number';
  backup proxy
  (database format 'bk_%U_%t');
}
```

For more information, see the sample scripts that are provided with the agent. See [“Proxy backup examples”](#) on page 142.

Troubleshooting

This chapter includes the following topics:

- [About troubleshooting NetBackup for Oracle](#)
- [About NetBackup for Oracle troubleshooting steps](#)
- [NetBackup debug logs and reports](#)
- [Enabling the debug logs for a NetBackup for Oracle client automatically \(Windows\)](#)
- [Enabling the debug logs for NetBackup for Oracle manually \(Windows\)](#)
- [Enabling the debug logs for a NetBackup for Oracle for UNIX or Linux client](#)
- [About the NetBackup for Oracle log files](#)
- [Setting the debug level on a NetBackup for Oracle Windows client](#)
- [Setting the debug level on a UNIX or Linux client](#)
- [About RMAN utility logs](#)
- [Additional XML export and import logs](#)
- [Troubleshooting RMAN backup or restore errors](#)
- [Troubleshooting XML export or XML import errors](#)
- [Troubleshooting the UNIX or Linux browser interface and wizards](#)
- [Troubleshooting NetBackup for Oracle with Snapshot Client](#)
- [Minimizing timeout failures on large database restores](#)
- [Minimizing loading and unloading of tapes for database backups \(UNIX and Linux\)](#)

About troubleshooting NetBackup for Oracle

NetBackup, NetBackup for Oracle, and the Oracle Recovery Manager (RMAN) all provide reports on database backup, archive, and restore operations. These reports are useful for finding errors that are associated with those applications.

About NetBackup for Oracle troubleshooting steps

When troubleshooting NetBackup for Oracle problems, the following items are referred to as the API:

- On UNIX and Linux, the `libobk` module is called the API. Many media manager vendors also call the `libobk` module DMO (Database Module).
- On Windows, `orasbt.dll` is called the API.

To perform this procedure, ensure that NetBackup 7.5 is properly installed and configured:

To perform general troubleshooting steps

- 1 When verifying your installation, ensure that the NetBackup for Oracle binaries exist.

On UNIX and Linux, these are located in `/usr/opensv/netbackup/bin`.

The binaries are as follows:

<p>On Windows: <code>install_path\NetBackup\bin\bphdb.exe</code></p>	<p>This binary resides on the client and is used by both the NetBackup scheduler and the graphical interface to start backups. The main purpose of <code>bphdb</code> is to run an Oracle template or shell script that in turn calls <code>rman</code>, <code>bporaexp</code>, or <code>bporaimp</code>.</p>
---	---

<p>On Windows: <code>c:\Windows\System32\orasbt.dll</code></p>	<p>Provides functions that RMAN can call.</p>
---	---

<p>On UNIX and Linux: <code>libobk</code></p>	<p>A shared library module that contains functions that RMAN can call. This library is loaded when RMAN is started. The name of this binary depends on the operating system.</p> <p>See “About linking the Oracle Recovery Manager (RMAN) with NetBackup for UNIX and Linux” on page 34.</p>
---	--

- 2 For XML export and XML import, verify that the following binaries exist.

On Windows: `install_path\NetBackup\bin\bporaexp.exe`

On Windows: `install_path\NetBackup\bin\bporaimp.exe`

On Windows: `install_path\NetBackup\bin\bpora8.dll`

On Windows: `install_path\NetBackup\bin\bpora9.dll`

On UNIX and Linux: `/usr/opensv/netbackup/bin/bporaexp` (or `bporaexp64`)

On UNIX and Linux: `/usr/opensv/netbackup/bin/bporaimp` (or `bporaimp64`)

On UNIX and Linux: `/usr/opensv/lib/libbpora64.so.8.0`
 (`libbpora64.sl.8.0` on HP-UX)

On UNIX and Linux: `/usr/opensv/lib/libbpora64.so.9.0`
 (`libbpora64.sl.9.0` on HP-UX)

- 3 For the Backup, Archive, and Restore interface, verify that the following binaries exist.
 - On Windows: `install_path\NetBackup\bin\bpdbbsora.exe`
 - On Windows: `install_path\NetBackup\bin\bpubsora.exe`
 - On Windows: `install_path\NetBackup\bin\dbsbrman.dll`
 - On UNIX and Linux: `/usr/opensv/netbackup/bin/bpdbbsora`
 - On UNIX and Linux: `/usr/opensv/netbackup/bin/bpubsora`
 - On UNIX and Linux: `/usr/opensv/lib/libdbsbrman.so` (`libdbsbrman.sl` on HP-UX)
- 4 Check that both the NetBackup server and client software work properly. That is, check that normal operating system files can be backed up and restored from the client. The NetBackup client must be running the same version of software as the NetBackup server.
- 5 The logs can become very large, especially `bpdbm`. Ensure that enough free disk space exists in the log directory disk partition.
- 6 Check that the following NetBackup log directories exist:
 - On the UNIX and Linux client: `bpdbbsora`, `bporaexp` (or `boraexp64`), `bporaimp` (or `boraimp64`), `bpubsora`, `dbclient`, `bphdb`, and `bpcd`. These directories must have 777 permissions.
 - On the Windows client: `bpdbbsora`, `bporaexp`, `bporaimp`, `bpubsora`, `dbclient`, `bphdb`, `bplist`, and `bpcd`.
 - On the master server: `bprd` and `bpdbm`.
 - On the host with the storage unit: `bpbrm` and `bptm`.The `VERBOSE` level must be 5.
- 7 On UNIX and Linux, check that the `/usr/opensv/netbackup/logs/user_ops` directory and subdirectories have 777 permissions. They must exist and be accessible for the applications to operate correctly.

See “[About permissions for NetBackup for Oracle log files \(UNIX and Linux\)](#)” on page 44.

NetBackup debug logs and reports

The NetBackup server and client software let you enable detailed debugging logs. The information in these log files can help you troubleshoot the problems that occur outside of either the database agent or RMAN.

Note the following with regard to these logs:

- These logs do not reveal the errors that occur when RMAN is running unless those errors also affect NetBackup. Oracle may (or may not) write errors in the application to the NetBackup logs. Your best sources for Oracle error information are the logs provided by Oracle.
- Generally, each debug log corresponds to a NetBackup process and executable. However, for an RMAN backup, the debug log is created in the `dbclient` directory, which has no corresponding executable.

More detailed information about the debug log files is available.

See the *NetBackup Troubleshooting Guide*.

Also refer to the following file:

Windows: `install_path\NetBackup\logs\README.debug` file

UNIX and Linux: `/usr/opensv/netbackup/logs/README.debug` file

NetBackup provides other reports that are useful in isolating problems. One such report is All Logs Entries on the server. Information on server reports is available.

See the *NetBackup Administrator's Guide*.

Enabling the debug logs for a NetBackup for Oracle client automatically (Windows)

You can enable debug logging by running a batch file that creates each log directory. To create all log file directories automatically, run the following:

```
install_path\NetBackup\logs\mklogdir.bat
```

Or, you can manually create the directories for the log files you want created.

See [“Enabling the debug logs for NetBackup for Oracle manually \(Windows\)”](#) on page 158.

Enabling the debug logs for NetBackup for Oracle manually (Windows)

Creating the NetBackup for Oracle for Windows database agent logs manually

- 1 Create the following directories on the client in a DOS window:

```
install_path\NetBackup\logs\bpbackup  
install_path\NetBackup\logs\bpbkar32  
  
install_path\NetBackup\logs\bpdbsbora  
install_path\NetBackup\logs\bpubsora  
  
install_path\NetBackup\logs\bphdb  
  
install_path\NetBackup\logs\bporaexp  
install_path\NetBackup\logs\bporaimp  
  
install_path\NetBackup\logs\bprestore  
  
install_path\NetBackup\logs\tar32  
install_path\NetBackup\logs\dbclient
```

For example:

```
cd install_path\NetBackup\logs  
mkdir bphdb
```

- 2 Make sure there is share access to the log directories.
- 3 Enable logging for the `nbpem`, `nbjm`, and `nbrb` scheduling processes, which use unified logging.

NetBackup writes unified logs to `install_path\NetBackup\logs`.

You do not need to create log directories for processes that use unified logging. For information on how to use logs and reports, see the *NetBackup Troubleshooting Guide*.

Enabling the debug logs for a NetBackup for Oracle for UNIX or Linux client

Enabling the NetBackup for Oracle logs manually (UNIX/Linux)

- 1 Create the following directories on the client:

```

/usr/opensv/netbackup/logs/bpbackup
/usr/opensv/netbackup/logs/bpbkar

/usr/opensv/netbackup/logs/bpdsbora
/usr/opensv/netbackup/logs/bpubsora

/usr/opensv/netbackup/logs/bphdb

/usr/opensv/netbackup/logs/bporaexp
/usr/opensv/netbackup/logs/bporaimp

/usr/opensv/netbackup/logs/bprestore

/usr/opensv/netbackup/logs/tar
/usr/opensv/netbackup/logs/dbclient
chmod 777 /usr/opensv/netbackup/logs/dbclient
    
```

For example:

```

cd /usr/opensv/netbackup/logs
mkdir bphdb
    
```

- 2 The `user_ops`, each of the log directories, and any subdirectories should have 777 permissions. They must exist and be accessible for the applications to operate correctly.

For example:

```

chmod 777 bphdb
    
```

See [“About permissions for NetBackup for Oracle log files \(UNIX and Linux\)”](#) on page 44.

- 3 Enable logging for the `nbpem`, `nbjm`, and `nbrb` scheduling processes that use unified logging.

NetBackup writes unified logs to `/usr/opensv/logs`.

You do not need to create log directories for processes that use unified logging.

Information on how to use logs and reports is available.

See the *NetBackup Troubleshooting Guide*.

About the NetBackup for Oracle log files

[Table 7-1](#) describes the logs created when you create the log directories. Use a text editor to view the contents of the logs.

The log are located in the following directories:

UNIX and Linux: `/usr/opensv/netbackup/logs/<cmd>`

Windows: `install_path\NetBackup\logs\<cmd>`

For example, the logs for `bphdb` all appear in the

`/usr/opensv/netbackup/logs/bphdb` directory (UNIX and Linux) or the `install_path\NetBackup\logs\bphdb` directory (Windows).

Table 7-1 Log files

Log directory	Description
bphdb	<p>The <code>bphdb</code> directory contains the following types of logs:</p> <ul style="list-style-type: none"> <p>■ UNIX and Linux: <code>obk_stdout.mmdyy</code> Windows: <code>obk_stdout.mmdyy.hhmmss.txt</code> Unless it is redirected elsewhere, NetBackup writes template or shell script output to this file.</p> <p>■ UNIX and Linux: <code>obk_stderr.mmdyy</code> Windows: <code>obk_stderr.mmdyy.hhmmss.txt</code> Unless it is redirected elsewhere, NetBackup writes template or shell script errors to this file.</p> <p>■ UNIX and Linux: <code>log.mmdyy</code> Windows: <code>mmdyy.log</code> This log contains debugging information for the <code>bphdb</code> process. <code>bphdb</code> is the NetBackup database backup binary. It is invoked when an automatic backup schedule is run. NetBackup for Oracle uses this client process for template or shell script execution.</p>

Table 7-1 Log files (continued)

Log directory	Description
dbclient	<p>The <code>dbclient</code> directory contains the following execution log:</p> <ul style="list-style-type: none"> ■ UNIX and Linux: <code>log.mmdyy</code> ■ Windows: <code>mmdyy.log</code> <p>This log contains debugging information and execution status for the Oracle for NetBackup client processes.</p> <p>On UNIX and Linux, this library program is <code>libobk</code>.</p> <p>On Windows, the processes are linked to the library program provided with NetBackup for Oracle.</p>
bpdsbora	<p>The <code>bpdsbora</code> directory contains the following execution log:</p> <ul style="list-style-type: none"> ■ UNIX and Linux: <code>log.mmdyy</code> ■ Windows: <code>mmdyy.log</code> <p>This log contains debugging information and execution status for the NetBackup for Oracle backup and recovery wizards and for the <code>bpdsbora</code> command line utility. This log also contains the debugging information and execution status information that is generated when an Oracle template is run from an automatic schedule (when <code>bphdb</code> invokes <code>bpdsbora</code> to run the template).</p>
bporaexp64	<p>The <code>bporaexp</code> (or <code>bporaexp64</code> on UNIX and Linux) directory contains the following execution log:</p> <ul style="list-style-type: none"> ■ UNIX and Linux: <code>log.mmdyy.log</code> ■ Windows: <code>mmdyy.log</code> <p>This log contains debugging information and execution status for the <code>bporaexp</code> (<code>bporaexp64</code>) program that performs XML exports.</p>
bporaimp64	<p>The <code>bporaimp</code> (or <code>bporaimp64</code> on UNIX and Linux) directory contains the following execution log:</p> <ul style="list-style-type: none"> ■ UNIX and Linux: <code>log.mmdyy</code> ■ Windows: <code>mmdyy.log</code> <p>This log contains debugging information and execution status for the <code>bporaimp</code> (<code>bporaimp64</code>) program that performs XML exports.</p>

Setting the debug level on a NetBackup for Oracle Windows client

To control the amount of information that is written to the debug logs, change the Database debug level. Typically, the default value of 0 is sufficient. However, technical support may ask you to set the value higher to analyze a problem.

The debug logs are located in `install_path\NetBackup\logs`.

To change the amount of debug information in other log directories, set the other debug levels. For instance, Verbose.

To set the debug level on a NetBackup for Oracle for Windows client

- 1 From the Windows Start menu, choose **Programs > Symantec NetBackup > Backup, Archive, and Restore**.
- 2 Select **File > NetBackup Client Properties**.
- 3 Click the **Troubleshooting** tab.
- 4 Set the **Database** debug level.
- 5 Click **OK** to save your changes.
- 6 Stop and start the Oracle database services. This action is necessary for `orasbt.dll` to pick up the new debug level.

Setting the debug level on a UNIX or Linux client

To control the amount of information that is written to the debug logs, change the “Database” debug level. Typically, the default value of 0 is sufficient. However, Technical Support may ask you to set the value higher to analyze a problem.

The debug logs are located in `/user/openv/netbackup/logs`.

To set the debug level on a UNIX or Linux client

- ◆ Enter the following line in the `bp.conf` file.

```
VERBOSE = X
```

Where *X* is the debug level you want.

About RMAN utility logs

RMAN uses a command language interpreter, and it can be run in interactive or batch mode. You can use the following syntax to specify a log file on the command line to record significant RMAN actions:

```
msglog 'logfile_name'
```

Additional XML export and import logs

The `bporaexp` and `bporaimp` utilities perform error logging and tracing in the file that is specified by the `LOG` parameter. The log files contain Oracle errors and other errors that are not related to NetBackup.

When `bporaexp` and `bporaimp` are used and the backup images are written to a storage unit, these errors are also logged in the NetBackup debug logs. These logs appear in the following directories:

Windows:

```
install_path\NetBackup\logs\bporaexp
install_path\NetBackup\logs\bporaimp
```

UNIX and Linux:

```
/user/opensv/netbackup/logs/bporaexp
/user/opensv/netbackup/logs/bporaimp
```

When you use `bporaexp` and `bporaimp` and the backup images are written to an operating system directory, the file that is specified by the `LOG=` parameter is the only source of error logging and tracing.

Troubleshooting RMAN backup or restore errors

An RMAN backup error can originate from NetBackup or from Oracle, as follows:

- On the NetBackup side, an error can be from the API, from the NetBackup server or client, or from Media Manager.
- On the Oracle side, an error can be from RMAN or from the target database instance.

Symantec suggests that you use the following steps when troubleshooting a failed operation:

- Check the logs to determine the source of the error.

- Troubleshoot each stage of the backup or restore.

Verifying the RMAN script on UNIX and Linux

The following procedure describes how to verify that the RMAN script works correctly.

To verify the RMAN script

- 1 Use RMAN to make a backup directly to disk. Do not use NetBackup.
- 2 Use RMAN with NetBackup to create a backup.
- 3 Check the `/usr/opensv/netbackup/logs/dbclient` directory permissions. They should be set to `777`.
- 4 Look for a log file in `/usr/opensv/netbackup/logs/dbclient`
If no log file exists, `libobk` is not linked into Oracle properly.
See [“Testing configuration settings for NetBackup for Oracle”](#) on page 78.

Troubleshooting each stage of the backup or restore

The following explains the sequence of events for an action initiated by RMAN and suggests solutions for problems that can occur at each point in the sequence:

- `rman` starts.

A backup or restore can be started in any of the following ways:

- From an RMAN backup or restore initiated from the operating system prompt such as:

```
rman target user/pwd[@TNS_alias] \  
rcvcat user/pwd[@TNS_alias]\  
cmdfile RMAN_script_file_name
```

Where the `RMAN_script_file_name` is fully qualified.

- Using a template that runs from the NetBackup client interface or from `bpdsbora`.
- Manually from the administrator interface on the master server.
- Automatically by an automatic backup schedule.
If an error occurs now, check the RMAN log.
- RMAN verifies its environment and then issues requests to the API.
On Windows, some information, such as the NetBackup version, API versions, and trace file name, is registered with RMAN. An error now is usually due to

a problem with client and server communication. Check the messages in the `bprd` and `bpcd` logs for clues.

On UNIX and Linux, some information, such as the NetBackup version, API versions, trace file name, and NetBackup signal handlers, is registered with RMAN. An error now is usually due to a problem with client and server communication. Check the messages in the `bprd` and `bpcd` logs for clues. Also verify the `bp.conf` entries on the client.

- RMAN issues a backup or restore request.

The API gathers necessary parameters and sends the `backup` or `restore` request to the NetBackup server. The API waits until both the server and client are ready to transfer data before returning.

The API then sends this information to the master server's `bprd` process.

To troubleshoot a problem in this part of the first sequence, examine the following file:

On Windows: `install_path\NetBackup\logs\dbclient\mmdyy.log`

On UNIX and Linux: `/usr/openv/netbackup/logs/dbclient/log.mmdyy`

If the `bprd` process failed, check the logs for `bprd` and `bpbrm`.

A failure now is frequently due to bad NetBackup server or Oracle policy configuration parameters.

NetBackup can usually select the correct Oracle policy and schedules, but NetBackup can select a policy or schedule in error if there are several Oracle policies in its database.

On Windows, try setting the `SERVER` and `NB_ORA_POLICY` values in the client environment.

On UNIX and Linux, try setting the `SERVER` and `POLICY` values in the `bp.conf` file on the client or by setting environment variables.

For example, the following C Shell `setenv` commands specify the Oracle policy, schedule, and server for NetBackup to use:

```
setenv NB_ORA_POLICY polycyname
setenv NB_ORA_SCHED application_backup_schedule_name
setenv NB_ORA_SERV NetBackup_server
```

- RMAN issues read or write requests to the API, which then transfers data to or from the NetBackup server.

A failure here is probably due to NetBackup media, network, or timeout errors.

- RMAN tells the API to close the session.

The API waits for the server to complete its necessary actions (for example, it verifies the backup image) and then exits.

An error can originate from either NetBackup or RMAN, as follows:

- RMAN aborts if it encounters an error while it reads a data file during the backup (for example, if Oracle blocks are out of sequence). It also aborts if NetBackup sends a bad backup image during the restore.
- NetBackup might return an error code to the API if for some reason it could not complete the backup successfully.

Troubleshooting XML export or XML import errors

An XML export or import error can originate from NetBackup or from Oracle, as follows:

- On the NetBackup side, an error can be from the `bporaexp` or `bporaimp` programs, the NetBackup server or client, or Media Manager.
- On the Oracle side, an error can be from the target database.

Use the following steps when troubleshooting a failed operation:

- Check the logs to determine the source of the error.
- Troubleshoot each stage of the XML export or XML import.
The following sections describe these steps in detail.

On UNIX and Linux, these sections describe the log files from the `bporaexp` and `bporaimp` commands. The logs are created in

```
/usr/opensv/netbackup/logs/bporaexp OR  
/usr/opensv/netbackup/logs/bporaimp.
```

Checking the logs to determine the source of an error

This topic describes how to check the logs to determine the source of an error.

To check the logs

- 1 Check the `bporaexp` or `bporaimp` log.

If the `LOG` parameter is specified in the `bporaexp` or `bporaimp` command's `parfile`, the commands write logs to the file that is specified as the argument to the `LOG` parameter. The commands write log information to the screen if `LOG` is not specified.

For example, incorrect installation or configuration causes the following common problems:

- The `ORACLE_HOME` environment variable was not set.

- The `bporaexp` or `bporaimp` program was unable to connect to the target database.

When `bporaexp` and `bporaimp` are being used and the backup images are being written to an operating system directory, these logs are the only source of error logging and tracking.

2 Check the NetBackup logs.

On Windows, the first NetBackup log to check is

`install_path\NetBackup\logs\bporaexp\log.mmddyy` or
`install_path\NetBackup\logs\bporaimp\log.mmddyy`.

On UNIX and Linux, the first NetBackup log to check is

`/usr/opensv/netbackup/logs/bporaexp/log.mmddyy` or
`/usr/opensv/netbackup/logs/bporaimp/log.mmddyy`.

Examine these logs for messages that show how to determine the source of an error.

These logs are written by the NetBackup client and contain the following:

- Requests from `bporaexp` and `bporaimp`
- Activities between `bporaexp` and `bporaimp` and NetBackup processes

If the logs do not contain any messages, the following conditions could be present:

- `bporaexp` or `bporaimp` terminated before requesting service from NetBackup.
- `bphdb` (if started by the scheduler or graphical user interface) did not start the template or shell script successfully. Check the `bphdb` logs for `stderr` and `stdout` files.

Try to run the XML export or XML import template or script file from the command line to determine the problem.

On UNIX and Linux, the error is usually due to a file permission problem for `bphdb` itself or for the export or import script file.

Ensure that the full XML export or import script file name is entered correctly in the Backup Selections list of the Oracle policy configuration, or for templates, that the name is correct.

On UNIX and Linux, logs are not created in this directory if the permissions are not set for the Oracle user to write to the directory. The full permissions setting, `chmod 777`, is best.

Troubleshooting each stage of the XML export or XML import

The information in this section does not apply to you if `DIRECTORY` is specified in `bporaexp` or `bporaimp` command's `parfile`.

The following explains the sequence of events for an action initiated by `bporaexp` or `bporaimp` in NetBackup mode; that is, when `DIRECTORY` is not specified in the `bporaexp` or `bporaimp` command's `parfile`. It suggests solutions for problems that can occur at each point in the sequence.

To troubleshoot by stage

1 `bporaexp` or `bporaimp` starts.

An export or import can be started in any of the following ways:

- Command line from the system prompt.

For example:

```
bporaexp parfile = parameter_filename
bporaimp parfile = parameter_filename
```

- Using a template run from the NetBackup client GUI or `bpdbsbora`.
- Manually from the NetBackup Administration Console on the master server.
- Automatically by an automatic export schedule.

If an error occurs now, check the `bporaexp` or `bporaimp` log.

2 `bporaexp` or `bporaimp` verifies its environment and then connects to Oracle and NetBackup.

Oracle connect errors can be caused by an Oracle environment problem, a database problem, an incorrect userid, or an incorrect password.

A NetBackup error now is usually due to a problem with client and server communication. Check the messages in the `bprd` and `bpcd` logs for clues.

Also verify the `bp.conf` entries on the UNIX or Linux client.

3 `bporaexp` or `bporaimp` issues a backup or restore request.

`bporaexp` or `bporaimp` gathers necessary parameters, sends the backup or restore request to the NetBackup server, and waits until both the server and client are ready to transfer data before proceeding.

The NetBackup client interfaces gather information from the following places:

- The environment, including `bporaexp` and `bporaimp` parameter files. If you are using templates, the parameter files are generated from the template.
 If you are using scripts, you have to generate the parameter file manually.
- Server configuration parameters on Windows.
- The user's `bp.conf` and `/usr/opensv/netbackup/bp.conf` files on the UNIX or Linux client.

This information is sent to the master server's `bprd` process.

To troubleshoot a backup problem in this part of the sequence, examine the following file:

Windows: `install_path\NetBackup\logs\bporaexp\log.mmdyy`

UNIX and Linux: `/usr/opensv/netbackup/logs/bporaexp/log.mmdyy`

If the `bprd` process failed, check the `bprd` and `bpbrm` logs.

Frequently, incorrect NetBackup server or Oracle policy configuration parameters cause failures at this point.

NetBackup can usually select the correct Oracle policy and schedules, but NetBackup can select a policy or schedule in error if there are several Oracle policies in its database.

Try setting the `SERVER` and `POLICY` values in the client environment or by setting the following `bporaexp` parameters:

Try setting the `SERVER` and `POLICY` values in the `bp.conf` file on the client or by setting the following `bporaexp` parameters:

```
NB_ORA_POLICY=policyname
NB_ORA_SCHED=schedule
NB_ORA_SERV=NetBackup_server
NB_ORA_CLIENT=NetBackup_client
```

To troubleshoot a restore, examine the following log file:

Windows: `install_path\NetBackup\logs\bporaimp\log.mmdyy`

UNIX and Linux: `/usr/opensv/netbackup/logs/bporaimp/log.mmdyy`

Make sure that the correct NetBackup server and NetBackup client values are being used by setting the following `bporaimp` parameters:

```
NB_ORA_SERV=NetBackup_server
NB_ORA_CLIENT=NetBackup_client
```

Set these parameters to the same values that were used for the XML export operation.

- 4 `bporaexp` or `bporaimp` issues read or write requests to the NetBackup client, which then transfers data to or from the NetBackup server.

`bporaexp` builds an SQL query for each table being archived, and it uses the Oracle Call Interface (OCI) to run the query. The query results are translated into XML. The XML output is passed to the NetBackup client interfaces.

The reverse process is used by `bporaimp`. That is, XML data is restored, parsed, and inserted into the database.

A failure here is probably due to an Oracle error, or to a NetBackup media, network, or timeout error.

- 5 `bporaexp` or `bporaimp` tells the NetBackup client to close the session and disconnects from the Oracle database.

The NetBackup client waits for the server to complete its necessary actions (backup image verification and so on) and then exits.

Troubleshooting the UNIX or Linux browser interface and wizards

If you do not see the Oracle instance in your Backup, Archive, and Restore interface, verify the following:

- A NetBackup for Oracle license is installed on the master server.
- For browsing in the restore window, the policy type must be set to Oracle.

Perform the following actions to change the client policy type:

- On the **Actions** menu, select **Specify NetBackup Machines and Policy type**.
- In the **Policy type** drop-down list, select **Oracle**.
- Click **OK**.

On Windows, to change the client policy type:

- On the **File** menu, select **Specify NetBackup Machines and Policy Type**.
- On the **Specify NetBackup Machines** dialog, click the **Clients/Policy Type** tab.
- In the **Policy Type** drop-down list, select **Oracle**.
- Click **OK**.

- On UNIX and Linux, the `oratab` file is in the correct location (`/etc/oratab` or `/var/opt/oracle/oratab`) and contains all of the available Oracle SIDs. Although Oracle allows the use of wild cards in the `oratab` file, the NetBackup BAR GUI requires that each SID be specified.

If you have trouble connecting to the Oracle database, verify the following:

- Make sure that the database is in a mount state or an open state.
- Make sure that your login ID and password have Oracle SYSDBA privileges. Initially, NetBackup for Oracle attempts OS Authentication to log on. If that fails, you are prompted for a user name, password, and an optional Transparent Network Substrate (TNS) alias. The user name and password you enter must have SYSDBA privileges.
- In a clustered environment, failure to connect to the database can mean a problem with the network configuration. The browser must connect locally. However, in some environments, all connections are considered to be remote connections, even a connection to a local database. This behavior is true for example in an Oracle Real Application Clusters (RAC) environment. In such cases, you must make the connection using a TNS alias.

In a Linux environment, Oracle backups and restores fail if the Linux logon is not the Oracle user. In such cases, Oracle generates the following message:

```
INF - ORA-19554: error allocating device, device type: SBT_TAPE, device name:
INF - ORA-27211: Failed to load Media Management Library
```

If you want to start an Oracle job as someone other than an Oracle user, augment the default shared library search path. Use the Linux `ldconfig(8)` command to add `$ORACLE_HOME/lib` to the search path.

Troubleshooting NetBackup for Oracle with Snapshot Client

In addition to the debug logs used for troubleshooting problems that occur with NetBackup and NetBackup for Oracle described in the previous sections, additional debug logs are used for troubleshooting NetBackup for Oracle with Snapshot Client.

Snapshot Client backup and debug messages are written to the following subdirectories of:

```
UNIX and Linux: /usr/opensv/netbackup/logs/
```

Windows: `install_path\NetBackup\logs`

The logs are as follows:

- `bpbrm` on the NetBackup media server
- `bptm/bpdm` on the NetBackup media server
- `bpbkar` on the NetBackup client and alternate client
- `bpfis` on the NetBackup client and alternate client
- `bpffi` on the NetBackup client or alternate client

Snapshot Client restore and debug messages are written to the following subdirectories on the NetBackup master server:

- `bprestore`. This is almost always a client log on the NetBackup host that initiated the restore by using `bprestore`.
- `bprd`. on the NetBackup master server.
- `bpbrm` on the NetBackup master server.
- `bptm/bpdm` on the NetBackup media server. (Both tape and disk backup log to `bptm`, disk backups also log to `bpdm`.)
- `tar` on the NetBackup client or redirected client.

Additional troubleshooting information, including troubleshooting installation problems, is available in the *NetBackup Snapshot Client Administrator's Guide*.

See “[About NetBackup for Oracle troubleshooting steps](#)” on page 154.

Minimizing timeout failures on large database restores

Large database restores sometimes fail when multiple restore sessions compete for resources. In this situation, a restore session can be delayed while waiting for media or device access. If the delay is too long, the restore session times out. Use the following procedure to minimize session timeouts and to allow the restores to complete successfully.

To minimize timeout failures on large database restores

- 1 In the NetBackup Administration Console, expand **NetBackup Management > Host Properties > Clients**
- 2 Set the **Client read timeout** property to a large value.
 The default for the **Client read timeout** setting is 300 seconds (5 minutes). For database agent clients, increase the value significantly from the recommended value.
 See the *NetBackup Administrator's Guide, Volume 1*.
 For example, change this setting to 30-60 minutes to minimize timeout errors.
- 3 Click **OK** for each client.

Minimizing loading and unloading of tapes for database backups (UNIX and Linux)

You can minimize excessive unloading and reloading of tapes between multistreamed database backups by making changes on the NetBackup media server.

To minimize loading and unloading of tapes

- ◆ In the `/usr/openv/netbackup/bp.conf` file on the NetBackup media server, add the following options:
 - `MEDIA_UNMOUNT_DELAY`.
 - `MEDIA_REQUEST_DELAY`. Use this variable only with non-robotic drives, such as tape stackers.

Real Application Clusters

This appendix includes the following topics:

- [About Real Application Clusters](#)
- [About virtual names and NetBackup for Oracle](#)
- [About RAC archiving schemes](#)
- [About backing up a database](#)
- [Example of restoring a database](#)
- [Troubleshooting database restores \(UNIX and Linux\)](#)
- [About restoring archive logs](#)

About Real Application Clusters

In a Real Application Clusters (RAC) environment, many Oracle instances exist on separate servers, each with direct connectivity to a single Oracle database. All the servers can run transactions concurrently against the same database. Should any single server or instance fail, processing continues on the surviving servers.

RAC supports all Oracle backup features that are available in exclusive mode, including online backups and offline backups of an entire database or individual tablespaces.

About virtual names and NetBackup for Oracle

A virtual name is a network host name resource (mapped to an IP address) that is associated with an application. If it is possible, use virtual names for the client nodes and server nodes. When you use a virtual node name for the client, you can

specify a single client entity for all of the Oracle backups. This action lets NetBackup perform a restore to any physical node.

Warning: Do not use a single virtual client name if the backup is load balanced across more than one node. In a load-balanced configuration, the node that hosts the IP address to which the virtual name resolves, generates successful backups, but the jobs originating from the other nodes fail with status code 54.

If a virtual client name is not used, a regular restore can be performed only from the node that is associated to the client name that is specified on the backup. Another possible solution in this environment is to use an alternate client restore.

Oracle 11g R2 Grid Infrastructure (CRS) includes the Single Client Access Name (SCAN) feature. A single hostname can resolve to multiple IP addresses each assigned to a different physical node in the cluster.

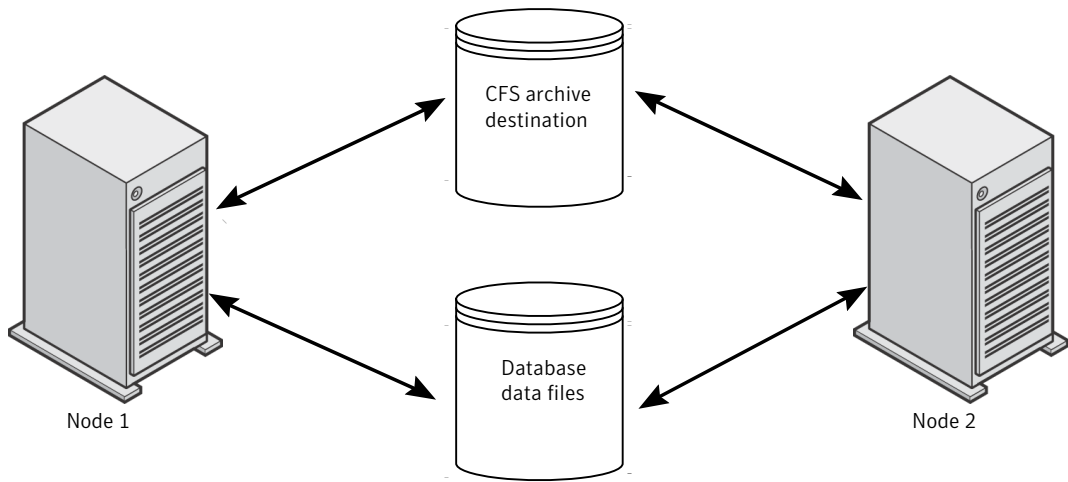
If a SCAN hostname is used in a NetBackup policy that receives the Application Backup request, the following occurs: This abstraction of the client name causes backup and restore jobs to fail with status code 54. Also, the client side fails with status code 6 (backup) or status code 5 (restore).

Ensure that the client that appears in the NetBackup Oracle policy is not a SCAN. Also, ensure that any NB_ORA_CLIENT or CLIENT_NAME that the node provides in the backup request is not a SCAN. These names must resolve on both the master server and the media server to an IP address that allows the server processes to connect to the node where the request originated.

About RAC archiving schemes

The preferred RAC configuration uses a cluster file system archiving scheme. In this scheme, each node writes to a single Cluster File System (CFS) archived log destination and can read the archived log files of the other nodes.

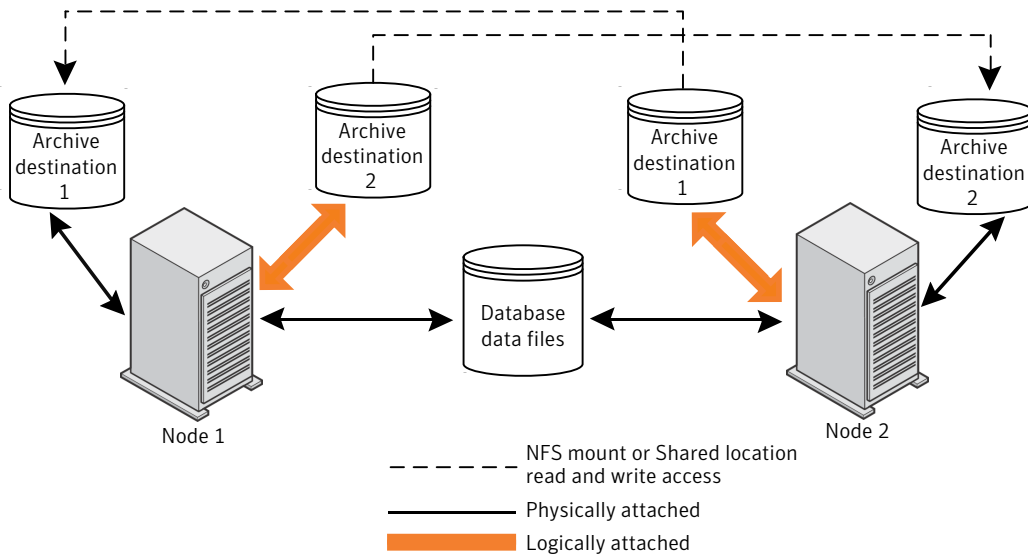
[Figure A-1](#) depicts a CFS archiving scheme.

Figure A-1 CFS archiving scheme

If the CFS solution is not available, Oracle recommends a scheme like that in [Figure A-2](#). In [Figure A-2](#), each node archives to a local directory and writes a copy to each of the other nodes' archive directories. The locations are shared between the nodes (with read and write permissions) by NFS mounting the directory (UNIX) or sharing the locations (Windows).

[Figure A-2](#) describes non-CFS local archiving scheme with archive sharing.

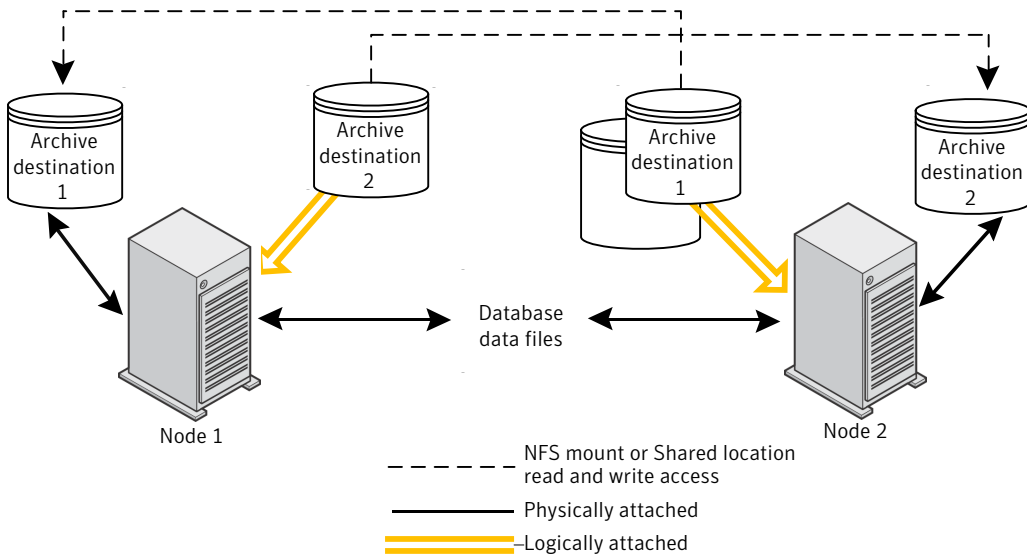
Figure A-2 Non-CFS local archiving scheme with archive sharing



A scheme similar to the previous one exists if each node archives to a local directory, and the locations are shared (read-only) with the other nodes in the cluster. These locations are shared among the nodes by NFS-mounting the directory (UNIX) or sharing the locations (Windows). Therefore, each node can read each archive destination.

Figure A-3 describes non-CFS local archiving scheme with archive read-only sharing.

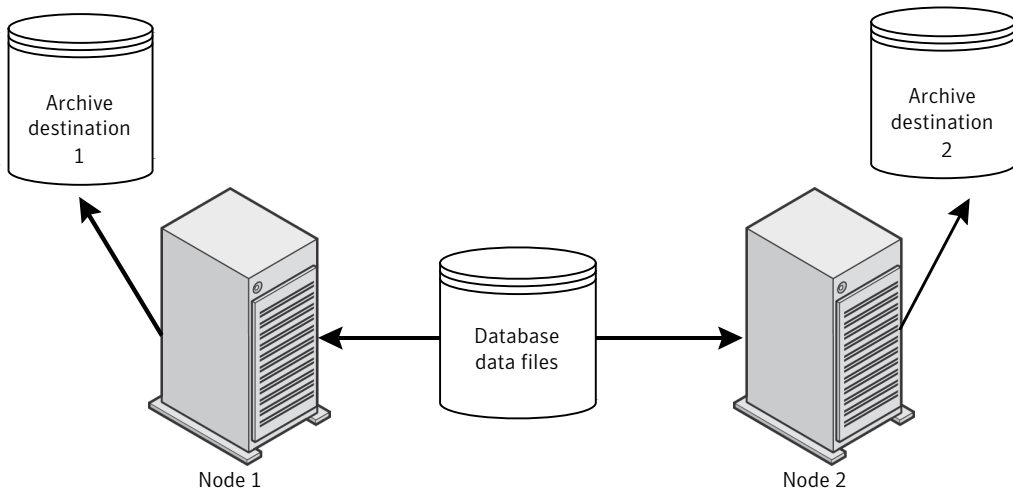
Figure A-3 Non-CFS local archiving scheme with archive read-only sharing



The simplest archiving scheme is local archiving with no sharing. Each node writes only to the local destination, and no access is given to the other nodes in the cluster.

Figure A-4 describes non-CFS local archiving scheme with no archive sharing.

Figure A-4 Non-CFS local archiving scheme with no archive sharing



For more information about configuration and additional archiving scheme examples see your Oracle documentation.

About backing up a database

If you are in a RAC environment and you chose one of the archive log schemes that are described in the previous topic, you can perform a backup with typical RMAN scripts.

In the following example, RMAN backs up the database, including all of the archive logs. This example assumes that the archive logs are accessible by each node in the cluster. If they are not, then the archive logs need to be backed up separately on each node.

Note: This example works only if the backup is not load balanced across multiple nodes, because `NB_ORA_CLIENT=$NB_ORA_CLIENT` evaluates only to the node on which the RMAN script is executed.

```
RUN
{
  ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';

  ***** SEND command for UNIX and Linux systems:

  SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT, NB_ORA_SERV=$NB_ORA_SERV';

  ***** SEND command for Windows systems:

  SEND 'NB_ORA_CLIENT=saturn, NB_ORA_SERV=jupiter';

  BACKUP
    DATABASE;
  sql 'alter system archive log current';
  RELEASE CHANNEL ch00;
  ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';

  ***** SEND command for UNIX and Linux systems:

  SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT, NB_ORA_SERV=$NB_ORA_SERV';

  ***** SEND command for Windows systems:

  SEND 'NB_ORA_CLIENT=saturn, NB_ORA_SERV=jupiter';

  BACKUP
    ARCHIVELOG ALL ;
```

```
RELEASE CHANNEL ch00;  
}
```

Example of restoring a database

Restoring the database from the nodes where the backup was performed is straightforward and identical to a typical RMAN restore.

In this example, all of the backup images to be restored must all be accessible via the client name `saturn` in the image database on the master server `jupiter`.

The following example restores the entire database from any node:

```
RUN {  
  ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';  
  SEND 'NB_ORA_CLIENT=saturn, NB_ORA_SERV=jupiter';  
  RESTORE  
    DATABASE;  
  RECOVER  
    DATABASE;  
  RELEASE CHANNEL ch00;  
}
```

Note: This example works only if the backup is not load balanced across multiple nodes, because `NB_ORA_CLIENT=$NB_ORA_CLIENT` evaluates only to the node on which the RMAN script is executed.

Troubleshooting database restores (UNIX and Linux)

An RMAN restore to one node of a cluster can fail with a status code 39 when the following situation is present:

- The `NB_ORA_CLIENT` environment variable is set to the virtual host name of the cluster.
- The `CLIENT_NAME` variable in the user or master `bp.conf` file on the client is set to the virtual host name of the cluster.

To remedy this problem, set the `CLIENT_NAME` variable to the node name.

More information is available on restores and redirected restores.

See “[About NetBackup for Oracle restores](#)” on page 89.

About restoring archive logs

You can use the typical RMAN script to restore the archive logs under the following circumstances:

- If the remote archived log destinations allow write access.
See [Figure A-2](#) on page 178.
- If the archive logs reside on a CFS.
See [Figure A-1](#) on page 177.

In the examples that follow, the client is saturn and the server is jupiter. The names jupiter and saturn can be either the physical names or the virtual names of the nodes in the cluster.

The following example restores all of the archive logs:

```
RUN {  
  ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';  
  SEND 'NB_ORA_CLIENT=saturn, NB_ORA_SERV=jupiter';  
  RESTORE  
    ARCHIVELOG ALL;  
  RELEASE CHANNEL ch00;  
}
```

If the remote archive logs destinations do not allow write access, use a script such as the following to restore the archive logs:

```
RUN {  
  ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';  
  SEND 'NB_ORA_CLIENT=saturn, NB_ORA_SERV=jupiter';  
  SET ARCHIVELOG DESTINATION TO <directory>;  
  RESTORE  
    ARCHIVELOG ALL;  
  RELEASE CHANNEL ch00;  
}
```

where <directory> is the directory into which you copied the archive logs.

Use a script like the preceding one if your configuration is like that shown in one of the following topics:

- See [Figure A-3](#) on page 179.
- See [Figure A-4](#) on page 179.

Best practices for protecting Oracle RAC with NetBackup

This appendix includes the following topics:

- [Oracle RAC with NetBackup best practices](#)
- [About NetBackup for Oracle operations](#)
- [Example RAC configuration: Failover VIP exists and backup is not load balanced](#)
- [Example RAC configuration: Failover VIP exists and backup is load balanced](#)
- [Example RAC configuration: Failover VIP is not available and backup is not load balanced](#)
- [Example RAC configuration: Failover VIP is not available, and backup is load balanced, one policy with custom script](#)
- [Example RAC configuration: Failover VIP is not available and backup is load balanced, simple script with manual policy failover](#)
- [Virtual names and RAC catalog maintenance](#)

Oracle RAC with NetBackup best practices

The Real Application Clusters (RAC) option allows multiple concurrent instances to share a single physical database. This section describes the methods that can be used to balance the backup load across multiple nodes of an Oracle RAC database.

Oracle database backup and recovery are more difficult as databases grow in size and greater demands on database availability limit the time to perform backups. Often the backup time window is too short to accommodate a complete backup process by using only one backup node in the cluster. Database administrators need more efficient methods to complete these large backups in the allotted time. For the Oracle RAC database, Oracle can split the backups into pieces and send them in parallel from multiple nodes, which shortens the processing time.

About NetBackup for Oracle operations

The following lists what occurs when you initiate RMAN:

- The NetBackup Oracle policy can contain one or more client names and one or more backup scripts to execute.

Note: Oracle 11g R2 Grid Infrastructure (CRS) includes the Single Client Access Name (SCAN) feature. This feature allows a single hostname to resolve to multiple IP addresses each assigned to a different physical node in a cluster. Ensure that the client that appears in the NetBackup Oracle policy is not a SCAN. Also, ensure that any NB_ORA_CLIENT or CLIENT_NAME provided by the dbclient host in the backup request is not a SCAN. These names must reliably resolve on both the master server and the media server to an IP address that will allow the server processes to connect to the dbclient host from which the backup request originated.

If the SCAN hostname is used in a NetBackup policy, this abstraction of the client name will lead to backup and restore jobs failing with status 54. The client side will fail with status 6 (backup) or status 5 (restore).

- The NetBackup master server uses the automatic schedules in the Oracle policy to determine when the scripts are run on the clients.
- The NetBackup scheduler starts one Automatic Backup job for each client in the policy. The jobs can run concurrently. The scheduler executes each script on each client in the specified sequence. All the scripts for one client run in the same automatic job.
- The backup scripts start RMAN.
- If an automatic schedule and script do not exist in the policy, a process on the client can still initiate RMAN when necessary.

The following lists what occurs when RMAN requests the backup:

- RMAN connects to the appropriate Oracle instance(s) for the backup. Hence, the script may execute on one host, but the backup may take place on a different host.
- RMAN allocates one or more channels according to the backup script.
- RMAN sends one or more backup set pieces on each channel, in sequence.
- Each channel interacts with NetBackup for Oracle and sends a user-directed backup request to the NetBackup master server for each backup set piece.
- Each request becomes a separate NetBackup Application Backup job. Hence there can be one Application Backup job queued or active, concurrently, per allocated channel.
- For the Application Backup jobs, by default the NetBackup master server selects the first policy it finds of type Oracle for this client. It also uses the first schedule of type Application Backup within the policy.
- The NetBackup master server must be able to match the requesting client name to an Oracle policy and Application Backup schedule, or the job fails.
- RMAN can send one or more of the variables NB_ORA_CLIENT, NB_ORA_POLICY, and NB_ORA_SCHEDULE to the NetBackup master to override the selected defaults for the job.

The following lists how NetBackup receives the data from RMAN:

- The Application Backup jobs activate and the NetBackup media server processes connect to the provided client name to receive the data. Hence, the client name that is sent in the user-directed request must bring the data connection back to the requesting host.
- RMAN sends the appropriate data on the appropriate channel, and the data is transferred to storage.

Note: Symantec recommends that you do not use the NetBackup for Oracle Template Wizard to implement RAC backups. Templates do not provide the functionality that is needed to ensure that RMAN is started on only one host or that it handle load balancing across several hosts. Start RMAN by using a backup script or an Oracle launch mechanism.

Example RAC configuration: Failover VIP exists and backup is not load balanced

In this configuration, a failover `vipname` exists such that the NetBackup media server can always reach an available host to execute the backup script. Further,

since load balancing is disabled, RMAN allocates the channels on a single host, typically the same host where the script executes.

The configuration is as follows:

- Configure the policy to specify the failover `vipname` as the client name. The automatic schedule then runs the backup script on a host that is currently operational.
- The backup script or an identical copy must be accessible to all hosts in the cluster. The clustered file system is a good location.
- Configure the backup script so that RMAN provides to NetBackup the same client name, regardless of the active host. The failover `vipname` from the policy is ideal since that name is already in the policy. It floats to the active instance-host and ensures successful data transfer, and all the backups are stored under that single client name.

```
ALLOCATE CHANNEL ... ;  
SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT';  
BACKUP ... ;
```

You can also use the failover `vipname` from the policy instead of `$NB_ORA_CLIENT`.

- The NetBackup master server configuration must allow the physical host names access to all of the backup images.

```
cd /usr/opensv/netbackup/db/altnames  
echo "hostname1" >> hostname1  
echo "vipname1" >> hostname1  
echo "hostname2" >> hostname1  
echo "vipname2" >> hostname1  
echo "failover_vipname" >> hostname1  
cp hostname1 hostname2
```

- If the client hosts use `REQUIRED_INTERFACE` or another means to force NetBackup to use the IP addresses associated with the `vipnames` for the outbound user-directed backup requests, then also allow the `vipnames` to access all of the backup images.

```
cd /usr/opensv/netbackup/db/altnames  
cp hostname1 vipname1  
cp hostname1 vipname2
```

The backup script then runs on the active host that currently hosts the failover `vipname`. RMAN allocates the channels on that host to perform the backup. The

Application Backup jobs queue to the failover `vipname`, and the NetBackup media server connects back to the failover `vipname` for the data transfer. The backup images are stored under the failover `vipname` regardless of which host performed the backup. Restores can take place from either host as long as the restore request is configured to `SEND 'NB_ORA_CLIENT=failover vipname'`;

Example RAC configuration: Failover VIP exists and backup is load balanced

In this configuration, the NetBackup master server can always use the failover `vipname` to reach an active host to run the backup script. However, because RMAN allocates the channels on both hosts, the NetBackup media server must connect back to the correct host to obtain the data for each request. Hence, the backup images are stored under two different client names which also differ from the failover `vipname` that is used to execute the script.

- Set up the policy to specify the failover `vipname` as the client name. Thus, the Automatic schedule executes the backup script on a host that is currently operational.
- The backup script or an identical copy must be accessible to all hosts in the cluster. The clustered file system is a good location.
- Do not configure the backup script to send a single value for `NB_ORA_CLIENT`. The NetBackup media server must connect back to the correct host, which depends on which host originated the user-directed backup request. Select one of the following three methods to accomplish this task:
- Configure the backup to provide a host specific client name with each backup request using one of the following three options:
 - Configure RMAN to bind specific channels to specific instances and send specific client names on each channel for backup image storage and for connect-back to the requesting host for the data transfer. Do not use the failover VIP name, because it is active on only one of the hosts.

```
ALLOCATE CHANNEL 1 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 2 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
ALLOCATE CHANNEL 3 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 4 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
```

Note: If one or more of these nodes are down, these allocation operations fail which causes the backup to fail.

- Alternatively, configure Oracle to bind specific channels to specific hosts.

```
CONFIGURE CHANNEL 1 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
  "ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 2 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
  "ENV=(NB_ORA_CLIENT=vipname2)";
CONFIGURE CHANNEL 3 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
  "ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 4 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
  "ENV=(NB_ORA_CLIENT=vipname2)";
```

- By default, the backup uses CLIENT_NAME from the bp.conf file which should be distinct for each host and is typically the physical hostname.
- Because CLIENT_NAME or NB_ORA_CLIENT values must differ from the failover vipname in the policy, the NetBackup master server cannot accept the user-directed backup request unless it implements one of the following options.
Option A: Modify the existing policy and the backup script to handle multiple client names.
 - Add both vipnames to the policy, in addition to the failover vipname.
 - Modify the script so that it exits with status 0 if the client name is not the failover vipname.**Option B:** Alternatively, use a separate policy to accept the backup requests.
 - Create a second policy to receive the backup requests from RMAN.
 - Set the policy type to be Oracle.
 - Set the policy to contain the VIP, client, or host names as configured for NB_ORA_CLIENT or CLIENT_NAME in the previous step.
 - The Application Backup schedule must have an open window to accept the backups.
 - The policy does not need a backup script or an automatic schedule.
 - Instead of the policy with the automatic schedule, configure the backup script to provide the name of this policy with each user-directed backup request:

```
ALLOCATE CHANNEL...PARMS='ENV=(NB_ORA_POLICY=<second_policy_name>)';
or
SEND 'NB_ORA_POLICY=<second_policy_name>';
```

- The NetBackup master server configuration must allow the physical host names access to the backup images that are stored under the failover `vipnames` as follows:

```
cd /usr/opensv/netbackup/db/altnames
echo "failover_vipname" >> hostname1
echo "hostname1" >> hostname1
echo "vipname1" >> hostname1
echo "hostname2" >> hostname1
echo "vipname2" >> hostname1
cp hostname1 hostname2
```

- If the client hosts use `REQUIRED_INTERFACE` or another means to force NetBackup to use the IP addresses associated with the `vipnames` for the outbound user-directed backup requests, then also allow the `vipnames` to access all of the backup images.

```
cd /usr/opensv/netbackup/db/altnames
cp hostname1 vipname1
cp hostname1 vipname2
```

Option A: The NetBackup scheduler starts three automatic jobs, and each runs the backup script (two of them on the same host). The two executions of the backup script that receive the `vipnames` exit immediately with status 0 to avoid a redundant backup and any retries. The third execution of the backup script that receives the `failover_vipname`, starts RMAN. RMAN then sends the data for backup by using the appropriate client name for the instance-host. NetBackup stores the backup images under the initiating policy by using both client names.

Option B: The first policy runs the backup script by using the `failover_vipname`. RMAN sends the name of the second policy and the configured client names for each channel with the user-directed request from each host. The second policy stores the backup images by using both client names.

Either client can initiate a restore. RMAN must be configured with 'SET AUTOLOCATE ON;' to request the backupset pieces from the appropriate instance-host that performed the backup. Alternatively, you can restore from either host-instance if you configure each restore request to include the correct client name used at the time the backupset piece was transferred to storage.

```
SEND 'NB_ORA_CLIENT=client_name_used_by_backup'
```

Example RAC configuration: Failover VIP is not available and backup is not load balanced

In this configuration, `hostname1` or `vipname1` and `hostname2` or `vipname2` allow connections to the respective hosts in the cluster. You need a special configuration to ensure that the backup script executes on at least one of the hosts but not on both hosts. Otherwise, a backup may not occur if the specified instance is down, or a redundant backup occurs if both of the specified instances are active.

For ease of discussion, the term `primary` refers to the instance on which the backup normally occurs and `secondary` refers to the other instance which may be used if the backup of the primary is unavailable. In addition, because the backup may occur on either host, the backup images have the potential to be stored under both client names depending on the host which is active at the time of the backup. The configuration is as follows:

- The policy specifies client names for both hosts, either `hostname1` and `hostname2`, or `vipname1` and `vipname2` to ensure that the backup is attempted on a host which is currently operational.
- The backup script must be accessible to both hosts in the cluster, the clustered file system makes a good location.
- The backup script should be customized so that it starts RMAN on exactly one of the clients. If executed on the primary, then start RMAN and perform the backup. If executed on the secondary and the primary is up, then exit with status 0 so that the NetBackup scheduler does not retry this client. If executed on the secondary and the primary is down, then start RMAN and perform the backup. You can build the script customization around a `tnsping` to the primary or even a query of the database to see if the other instance is open and able to perform the backup.

```
$ select INST_ID,STATUS,STARTUP_TIME, HOST_NAME from gv$instance;
```

```
INST_ID STATUS STARTUP_T HOST_NAM
-----
1 OPEN 13-JAN-09 vipname1
2 OPEN 13-JAN-09 vipname2
```

- Each user-directed backup request must use a client name which allows the NetBackup media server to connect back to the correct host for the data transfer. By default, the backup uses the `CLIENT_NAME` from the `bp.conf` file which will be distinct for each host. A better solution is to configure RMAN to provide the appropriate client name from the policy as follows:

Example RAC configuration: Failover VIP is not available, and backup is load balanced, one policy with custom script

```
SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT';
```

- Configure the NetBackup master server to give the physical host names access to all of the backup images.

```
cd /usr/opensv/netbackup/db/altnames
echo "hostname1" >> hostname1
echo "vipname1" >> hostname1
echo "hostname2" >> hostname1
echo "vipname2" >> hostname1
cp hostname1 hostname2
```

- If REQUIRED_INTERFACE or another means is used on the client hosts to force NetBackup to use the IP addresses associated with the vip names for the outbound user-directed backup requests, then the NetBackup master configuration must be extended in the reverse direction.

```
cd /usr/opensv/netbackup/db/altnames
cp hostname1 vipname1
cp hostname1 vipname2
```

Either client can initiate a restore. RMAN must be configured with 'SET AUTOLOCATE ON;' to request the backupset pieces from the appropriate instance-host that performed the backup. Alternatively, you can restore from either host-instance if you configure each restore request to include the correct client name that is used at the time the backupset piece was transferred to storage.

```
SEND 'NB_ORA_CLIENT=client_name_used_by_backup'
```

Example RAC configuration: Failover VIP is not available, and backup is load balanced, one policy with custom script

A load-balanced backup without a failover vipname must overcome the combined challenges of the preceding configurations. Because a failover vipname does not exist, the NetBackup scheduler must attempt to execute the backup script on both hosts and the script must start RMAN on only one of the hosts. Because RMAN may allocate channels on both instances, the user-directed requests must present host specific names so that the connect-back from the NetBackup media server is able to retrieve the data from the correct host.

- The policy should specify both client names, either `hostname1` and `hostname2` or `vipname1` and `vipname2`, to ensure that the backup script is executed on a host which is currently operational.
- The backup script must be accessible to both hosts in the cluster. The clustered file system makes a good location.
- The backup script should be customized so that it starts RMAN on exactly one of the clients. If executed on the primary, then start RMAN and perform the backup. If executed on the secondary and the primary is up, then exit with status 0 so that the NetBackup scheduler does not retry this client. If executed on the secondary and the primary is down, then start RMAN and perform the backup. The script customization could be built around a `tnsping` to the primary or even a query of the database to see if the other instance is open and able to perform the backup, e.g.

```
$ select INST_ID,STATUS,STARTUP_TIME, HOST_NAME from gv$instance;
```

```
INST_ID STATUS STARTUP_T HOST_NAM
-----
1 OPEN 13-JAN-09 vipname1
2 OPEN 13-JAN-09 vipname2
```

- The backup script must not be configured to send a single value for `NB_ORA_CLIENT` because the NetBackup media server needs to connect back to the correct host depending on which host originated the user-directed backup request.
- Configure the backup to provide a host specific client name with each backup request using one of the following three options:
 - Configure RMAN to bind specific channels to specific instances and send specific client names on each channel for backup image storage and for connect-back to the requesting host for the data transfer. Do not use the failover VIP name, because it is active on only one of the hosts.

```
ALLOCATE CHANNEL 1 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 2 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
ALLOCATE CHANNEL 3 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 4 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
```

Note: If one or more of these nodes are down, these allocation operations fail which causes the backup to fail.

- Alternatively, configure Oracle to bind specific channels to specific hosts.

Example RAC configuration: Failover VIP is not available, and backup is load balanced, one policy with custom script

```
CONFIGURE CHANNEL 1 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
  "ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 2 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
  "ENV=(NB_ORA_CLIENT=vipname2)";
CONFIGURE CHANNEL 3 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
  "ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 4 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
  "ENV=(NB_ORA_CLIENT=vipname2)";
```

- By default, the backup uses CLIENT_NAME from the bp.conf file which should be distinct for each host and is typically the physical hostname.
- Configure the NetBackup master server to allow the physical host names access to all of the backup images.

```
cd /usr/opnv/netbackup/db/altnames
echo "hostname1" >> hostname1
echo "vipname1" >> hostname1
echo "hostname2" >> hostname1
echo "vipname2" >> hostname1
cp hostname1 hostname2
```

- If REQUIRED_INTERFACE or another means is used on the client hosts to force NetBackup to use the IP addresses associated with the vip names for the outbound user-directed backup requests, then the NetBackup master configuration must be extended in the reverse direction.

```
cd /usr/openv/netbackup/db/altnames
cp hostname1 vipname1
cp hostname1 vipname2
```

The net result is that the backup script runs on all of the currently active hosts but only starts RMAN on one host. RMAN allocates channels across the hosts for load balancing. The user-directed backup requests include a NB_ORA_CLIENT or CLIENT_NAME specific to the requesting host and which matches the policy. The connect-back for data transfer and the backup image are stored under that name.

Either client can initiate a restore and RMAN can be configured with 'SET AUTOLOCATE ON;' to request the backupset pieces from the appropriate instance/host that performed the backup. Alternatively, restores can take place from either host or instance as long as the restore request is configured to specify the same client name as used at the time of the backup.

```
SEND 'NB_ORA_CLIENT=client_name_used_by_backup';
```

Example RAC configuration: Failover VIP is not available and backup is load balanced, simple script with manual policy failover

Some implementations of RAC (Linux/Windows) do not include a failover VIP. On sites which do not need a robust backup script that determines the active instance in realtime, use the following configuration to manually initiate a backup from the secondary host when the primary host is down.

- Create a first Oracle policy with an Application Backup schedule to receive the backup images from both hosts. Configure both vipnames or host names as clients in the policy. Do not configure an Automatic Backup schedule or a Backup Selection (script).
- Create a second Oracle policy to execute the backup script on the primary host. Configure the vipname or host name of the primary host in the policy. Configure the pathname to the backup script in the policy. Create an Automatic Backup schedule with an open window in the policy.
- Create a third Oracle policy that can be used to manually execute the backup script on the secondary host when the primary host is unavailable. Configure the vipname or host name of the secondary host in the policy. Configure the pathname to the backup script in the policy. Create an Automatic Backup schedule without an open window in the policy.
- The backup script must be accessible to both hosts in the cluster, the clustered file system makes a good location.
- Configure the backup to provide a host specific client name with each backup request using one of the following three options:
 - Configure RMAN to bind specific channels to specific instances and send specific client names on each channel for backup image storage and for connect-back to the requesting host for the data transfer. Do not use the failover VIP name, because it is active on only one of the hosts.

```
ALLOCATE CHANNEL 1 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 2 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
ALLOCATE CHANNEL 3 ... PARMS='ENV=(NB_ORA_CLIENT=vipname1)' CONNECT='sys/passwd@vipname1';
ALLOCATE CHANNEL 4 ... PARMS='ENV=(NB_ORA_CLIENT=vipname2)' CONNECT='sys/passwd@vipname2';
```

Note: If one or more of these nodes are down, these allocation operations fail which causes the backup to fail.

Example RAC configuration: Failover VIP is not available and backup is load balanced, simple script with manual policy failover

- Alternatively, configure Oracle to bind specific channels to specific hosts.

```
CONFIGURE CHANNEL 1 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
"ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 2 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
"ENV=(NB_ORA_CLIENT=vipname2)";
CONFIGURE CHANNEL 3 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname1' PARMS
"ENV=(NB_ORA_CLIENT=vipname1)";
CONFIGURE CHANNEL 4 DEVICE TYPE 'SBT_TAPE' CONNECT 'sys/passwd@vipname2' PARMS
"ENV=(NB_ORA_CLIENT=vipname2)";
```

- By default, the backup uses CLIENT_NAME from the bp.conf file which should be distinct for each host and is typically the physical hostname.
- Configure the NetBackup master server to allow the physical host names access to all of the backup images.

```
cd /usr/oprnet/netbackup/db/altnames
echo "hostname1" >> hostname1
echo "vipname1" >> hostname1
echo "hostname2" >> hostname1
echo "vipname2" >> hostname1
cp hostname1 hostname2
```

If REQUIRED_INTERFACE or another means is being utilized on the client hosts to force NetBackup to use the IP addresses associated with the vipnames for the outbound user-directed backup requests, then also let the vipnames access all of the backup images.

```
cd /usr/openv/netbackup/db/altnames
cp hostname1 vipname1
cp hostname1 vipname2
```

The second policy executes the backup script on the primary host when it is scheduled. RMAN starts the backup process on all of the hosts, and they send back the appropriate NB_ORA_CLIENT or CLIENT_NAME for that host. If the primary is down, initiate the secondary policy manually from the NetBackup master server and perform a similar backup. You can restore from either host or instance if either of these conditions is true: The 'SET AUTOLOCATE ON'; is enabled for the instance or the restore request is configured to specify the same client name as used when the backupset piece was transferred to storage.

```
SEND 'NB_ORA_CLIENT=client_name_used_by_backup';
```

Virtual names and RAC catalog maintenance

If virtual names are available to be used with NB_ORA_CLIENT, then the following technique can be used to simplify catalog maintenance and restores.

Before performing the initial backup of the RAC cluster, create a single directory in the NetBackup image database to hold the backup images for all the client hosts and then create symbolic links to that directory for each of the virtual names. If a failover_vipname exists, it is the preferred name for this directory.

```
cd /usr/opensv/netbackup/db/images
mkdir racname
ln -s racname vipname1
ln -s racname vipname2
```

In this configuration, the backup from each host via a virtual name will be placed into the common directory. Subsequent restore and maintenance functions can then use either virtual name to access all the images. In addition, if altnames is configured appropriately, the common directory name can be used as a client name for alternate client restores with or without AUTOLOCATE enabled.

```
cd /usr/opensv/netbackup/db/altnames
echo "racname" >> hostname1
echo "racname" >> hostname2
echo "racname" >> redirected_client
SEND 'NB_ORA_CLIENT=racname';
```

Note: Use this technique only when virtual names for the instances are available. If you use physical names, the backup images from standard backups are mixed with the Oracle backup images within a single image directory, resulting in two potential problems. First, either host may restore the files that normally reside only on the other host. Second, if the same file exists on both hosts but with different content, select the correct backup image from which to restore. A similar configuration is possible with NTFS on a Windows master server (Windows 2000 and later) using junctions in place of symbolic links.

See [“Oracle RAC with NetBackup best practices”](#) on page 183.

See [“About NetBackup for Oracle operations”](#) on page 184.

Deduplication best practices

This appendix includes the following topics:

- [Optimizing and deduplicating stream-based and proxy copy Oracle backups](#)
- [Configuring a stream-based Oracle backup](#)
- [Example RMAN script for a stream-based backup](#)
- [Editing the RMAN script and configuring NetBackup for Oracle for a proxy copy backup](#)
- [Example RMAN script for a proxy copy backup](#)

Optimizing and deduplicating stream-based and proxy copy Oracle backups

NetBackup enables you to perform optimized deduplication of Oracle databases. You can perform either a stream-based backup or a proxy copy backup.

Symantec recommends that you perform a proxy copy when one or more of the following are true:

- The Oracle database that you want to back up is at the Oracle 10gR1 revision level or lower.
- The database consists of many small tablespaces.
- The database administrator or the backup administrator does not want to set `FILESERSET=1`.

To configure a proxy copy Oracle backup, you need to edit the RMAN script and configure NetBackup for Oracle.

See [“Editing the RMAN script and configuring NetBackup for Oracle for a proxy copy backup”](#) on page 201.

For stream-based backups, Symantec recommends that you specify `FILESERSET=1` for all Oracle database backups. When `FILESERSET=1` is specified, Oracle generates the backup set identically each time, with the same data from the same files in the same sequence each time the database is backed up. This uniformity ensures better deduplication. In addition, when `FILESERSET=1` is in effect, Oracle does not perform multiplexing, so Oracle includes only one file in each backup set. If `FILESERSET` is specified with a number other than 1, Oracle groups files together unpredictably and deduplication rates suffer.

Symantec recommends that you test your database backups by running both stream-based backups and proxy copy backups. Measure the deduplication rates and the backup times, and see which method fits best in your environment. The Oracle database files themselves benefit the most from deduplication. Typically, the archive logs and the control files are unique, so they benefit less from deduplication.

For information about the backup methods, see the following:

- See [“Configuring a stream-based Oracle backup”](#) on page 198.
- See [“Editing the RMAN script and configuring NetBackup for Oracle for a proxy copy backup”](#) on page 201.

Configuring a stream-based Oracle backup

The following procedure explains how to reconfigure an existing Oracle RMAN specification to achieve a stream-based, optimized, deduplicated Oracle backup.

To configure a stream-based Oracle backup

- 1 On the client computer that hosts the Oracle database, open the RMAN backup script in a text editor, and make the following edits:
 - Add the `FILESERSET=1` parameter to the part of the RMAN script that specifies how you want to back up the database.
Do not add `FILESERSET=1` to the section of the RMAN script that specifies how to back up the control files or archive logs. Typically, these other data objects are unique to each backup, so there is very little potential gain from optimizing the control file and archive log backups for deduplication.

Example RMAN script after editing:

```
BACKUP  
FILESERSET=1
```

```
%BACKUP_TYPE%
FORMAT 'bk_u%%u_s%%s_p%%p_t%%t'
DATABASE;
```

The addition of `FILESPESET=1` suppresses Oracle multiplexing of more than one data file into a backup set. When you suppress Oracle multiplexing, Oracle creates the backup set identically each time the backup runs. NetBackup can deduplicate these identical backup sets.

- Specify parallel backup streams for the database backup. Specify appropriate `ALLOCATE CHANNEL` and `RELEASE CHANNEL` parameters in the backup script.

For an example that shows an edited backup script, see the following:

See [“Example RMAN script for a stream-based backup”](#) on page 200.

- 2 Disable Oracle's optimization and encryption for the duration of the database backup.

By default, Oracle disables optimization and encryption. If optimization and encryption are enabled, run the following RMAN commands from the command line to disable optimization and encryption:

```
RMAN> CONFIGURE BACKUP OPTIMIZATION OFF;
RMAN> CONFIGURE ENCRYPTION FOR DATABASE OFF;
```

If your site requires encryption, you can specify encryption in the NetBackup for Oracle backup policy.

- 3 Disable Oracle's compression for the duration of the database backup.

By default, Oracle disables compression. If compression is enabled, Oracle compresses unused sections in streams, and the result is unpredictable deduplication rates. If compression is enabled, run the following RMAN command from the command line to disable compression:

```
RMAN> CONFIGURE DEVICE TYPE SBT_TAPE BACKUP TYPE TO BACKUPSET;
```

If your site requires compression, you can specify compression in the NetBackup for Oracle backup policy.

- 4 Configure a NetBackup for Oracle policy.

If you want to compress or encrypt the backup, enable compression and encryption in the NetBackup `pd.conf` file.

Run a full database backup as soon as you can. The policy can perform incremental backups until the full backup can be run.

Note: Make sure that Oracle optimization, encryption, and compression are disabled for the entirety of the database backup. Make sure to check specifications outside of the RMAN backup script, too.

Example RMAN script for a stream-based backup

The following is an example fragment from an RMAN script that performs an optimized, deduplicated, stream-based backup of an Oracle database.

```

RUN {

# Back up the database.
# Use 4 channels as 4 parallel backup streams.

ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
ALLOCATE CHANNEL ch01 TYPE 'SBT_TAPE';
ALLOCATE CHANNEL ch02 TYPE 'SBT_TAPE';
ALLOCATE CHANNEL ch03 TYPE 'SBT_TAPE';
SEND ' NB_ORA_SERV=$NB_ORA_SERV';

BACKUP
    $BACKUP_TYPE
    SKIP INACCESSIBLE
    TAG hot_db_bk_level0
    # The following line sets FILESPERSET to 1 and facilitates database deduplication.
    FILESPERSET 1
    FORMAT 'bk_%s_%p_%t'
    DATABASE;
    sql 'alter system archive log current';
RELEASE CHANNEL ch00;
RELEASE CHANNEL ch01;
RELEASE CHANNEL ch02;
RELEASE CHANNEL ch03;

# Back up the archive logs
# The FILESPERSET parameter setting depends on the number of archive logs you have.

ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
ALLOCATE CHANNEL ch01 TYPE 'SBT_TAPE';
SEND ' NB_ORA_SERV=$NB_ORA_SERV';

```



```

BACKUP
    FILESPERSET 20
    FORMAT 'al_%s_%p_%t'
    ARCHIVELOG ALL DELETE INPUT;
RELEASE CHANNEL ch00;
RELEASE CHANNEL ch01;
#
# Note: During the process of backing up the database, RMAN also backs up the
# control file. This version of the control file does not contain the
# information about the current backup because "nocatalog" has been specified.
# To include the information about the current backup, the control file should
# be backed up as the last step of the RMAN section. This step would not be
# necessary if we were using a recovery catalog or auto control file backups.
#
ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
SEND ' NB_ORA_SERV=$NB_ORA_SERV';
BACKUP
    FORMAT 'cntrl_%s_%p_%t'
    CURRENT CONTROLFILE;
RELEASE CHANNEL ch00;
}

```

Editing the RMAN script and configuring NetBackup for Oracle for a proxy copy backup

The following procedure explains how to edit the RMAN script on the client.

To edit the RMAN script

- 1 On the client computer that hosts the Oracle database, open the RMAN backup script in a text editor, and make the following edits:
 - Add `PROXY` to the list of commands that backs up the data files.
- Example RMAN script after editing:

```

BACKUP
    FORMAT 'bk_u%u_s%s_p%p_t%t'
    PROXY
    DATABASE;

```

- Specify the `NB_ORA_PC_STREAMS` parameter in the database backup script.
- For an example that shows an edited backup script, see the following:

See “[Example RMAN script for a proxy copy backup](#)” on page 202.

- 2 Disable Oracle's optimization and encryption for the duration of the database backup.

By default, Oracle disables optimization and encryption. If the optimization and encryption are enabled, run the following RMAN commands from the command line to disable optimization and encryption:

```
RMAN> CONFIGURE BACKUP OPTIMIZATION OFF;  
RMAN> CONFIGURE ENCRYPTION FOR DATABASE OFF;
```

If your site requires encryption, you can specify encryption in the NetBackup for Oracle backup policy.

- 3 Disable Oracle's compression for the duration of the database backup.

By default, Oracle disables compression. If compression is enabled, Oracle compresses unused sections in streams, and the result is unpredictable deduplication rates. If compression is enabled, run the following RMAN command from the command line to disable compression:

```
RMAN> CONFIGURE DEVICE TYPE SBT_TAPE BACKUP TYPE TO BACKUPSET;
```

If your site requires compression, you can specify compression in the NetBackup for Oracle backup policy.

- 4 Configure a NetBackup for Oracle policy.

If you want to compress or encrypt the backup, enable compression and encryption in the NetBackup `pd.conf` file.

Run a full database backup as soon as you can. You can perform incremental backups until the full backup can be run.

Note: Make sure that Oracle optimization, encryption, and compression are disabled for the entirety of the database backup. Also, make sure to check specifications outside of the RMAN backup script.

Example RMAN script for a proxy copy backup

The following is an example of an RMAN script that performs an optimized, deduplicated, proxy copy backup of an Oracle database.

```
RUN {
```

```
# Back up the database.

ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';

# Specify 2 streams, one stream per channel.

SEND 'NB_ORA_PC_STREAMS=2';
BACKUP
    PROXY
    SKIP INACCESSIBLE
    TAG hot_db_bk_proxy
    FORMAT 'bk_%s_%p_%t'
    DATABASE;
    sql 'alter system archive log current';
RELEASE CHANNEL ch00;

# Back up the archive logs.
# The FILESPERSET parameter setting depends on the number of archive logs you have.

ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
ALLOCATE CHANNEL ch01 TYPE 'SBT_TAPE';
SEND ' NB_ORA_SERV=$NB_ORA_SERV';
BACKUP
    FILESPERSET 20
    FORMAT 'al_%s_%p_%t'
    ARCHIVELOG ALL DELETE INPUT;
RELEASE CHANNEL ch00;
RELEASE CHANNEL ch01;

#
# Note: During the process of backing up the database, RMAN also backs up the
# control file. This version of the control file does not contain the
# information about the current backup because "nocatalog" has been specified.
# To include the information about the current backup, the control file should
# be backed up as the last step of the RMAN section. This step would not be
# necessary if we were using a recovery catalog or auto control file backups.
#
ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
SEND ' NB_ORA_SERV=$NB_ORA_SERV';

BACKUP
    FORMAT 'cntrl_%s_%p_%t'
```

Example RMAN script for a proxy copy backup

```
CURRENT CONTROLFILE;  
RELEASE CHANNEL ch00;  
}
```

Snapshot Client support of SFRAC

This appendix includes the following topics:

- [About Snapshot Client support of SFRAC](#)
- [NetBackup configuration for an SFRAC environment](#)
- [Configuring the SFRAC environment for a backup operation](#)
- [Performing a rollback restore in an SFRAC environment](#)
- [Troubleshooting NetBackup in an SFRAC environment](#)

About Snapshot Client support of SFRAC

Veritas Storage Foundation for the Oracle Real Application Clusters (RAC) environment leverages storage management and high availability technologies for deployment of Oracle RAC on UNIX and Linux environments.

Storage Foundation is a complete solution for heterogeneous online storage management. Based on VxVM and VxFS, it provides a standard set of integrated tools to centrally manage data growth, maximize storage hardware usage, and provide data protection.

NetBackup configuration for an SFRAC environment

To perform the offhost snapshot backup of Oracle database in the SFRAC environment, the NetBackup client software must be installed on each node of the cluster.

You need to configure the following:

- On the master server or media server that resides outside of the cluster, you must configure the policy to back up the Oracle RAC database.
- Configure the alternate client so that the snapshot is taken using that offhost. The alternate client should not be part of the cluster.

Configuring the SFRAC environment for a backup operation

The backup and rollback operations involve the Oracle Agent and the hardware array. The configuration steps required for both of these operations should also be done before taking the snapshot.

The following lists the prerequisites before you perform a backup in the SFRAC environment.

To configure the SFRAC environment for a backup operation

- 1 Configure a virtual IP or virtual name over the cluster. NetBackup refers to the client by using this virtual name.
- 2 The NetBackup client name on each node of the cluster must match the virtual name that is configured on the cluster. Do one of the following:
 - If you have already installed the client, change the `CLIENT_NAME` entry in the `bp.conf` file of the NetBackup directory to the following:

```
CLIENT_NAME = <virtual_name>
```

- Alternatively, add the following parameter to the RMAN script file that you are using for backup and restore, and keep the default `CLIENT_NAME` as the hostname:

```
NB_ORA_CLIENT = <host_name>
```

- 3 Specify the required host mode options in the storage array that provides the storage LUNs. For example, in the Host group options of an Hitachi array, enter the type of host (for example, Solaris) and enable the VERITAS Database Edition/Advanced Cluster for Oracle RAC (Solaris) option.
- 4 Add the following line to the `bp.conf` file, on each node in the cluster.

```
PREFERRED_NETWORK = <virtual-host-name>
```

This entry is required when running a rollback operation.

- 5 If the CFS version that you run does not support group quiescence, enable serial quiescence by adding the following lines to the `/usr/opensv/lib/vxfi/configfiles/vxfsfi.conf` file.

```
[QUIESCENCE_INFO]
"QUIESCENCE_SERIAL_QUIESCENCE"=dword:00000001
```
- 6 Ensure that the database is in open (read-write) mode.
- 7 Ensure that the service group for the database in VCS is in the online state.
- 8 Because only the master node of the cluster supports the rollback restore, change the virtual IP before a rollback operation so that it points to the master node.
- 9 Configure a snapshot backup policy for the SFRAC environment. In the backup selection tab of the policy, make sure that you provide a path name to the RMAN script. Make sure that the script resides on all the nodes of the cluster. Parameters like ORACLE_SID can differ on each of the nodes. For example, on node 1, the ORACLE_SID can be symc1 and on node 2, the ORACLE_SID can be symc2.

Performing a rollback restore in an SFRAC environment

The following procedure describes the manual steps that are needed to restore volumes and file systems by using the snapshot rollback method in an SFRAC environment.

A typical host deployment for running NetBackup for Oracle in an SFRAC environment is as follows: Host A and Host B are in the cluster and Host C is used as an alternate client. The instant recovery snapshot is taken using the Oracle policy and the Hardware Snapshot FIM (frozen image method).

The application I/O stack is built upon the hardware array of VxVM (CVM) and VxFS (CFS).

The Veritas Cluster Server (VCS) controls the Oracle RAC database and other required essential resources such as shared storage. VCS defines and manages its resources as a single unit called a service group. A service group contains all the necessary components and resources of an application.

The following are entities in the VCS that monitor the application I/O stack:

- CFSMount contains the mount points (cfs) where data files, archive logs, and control files are stored.

- CVMVolDg contains all the Volume Groups (cvm) configured on top of the various array LUNs that participate in the hardware snapshot.
- The Database Resource Group contains the database instance and assists in failover.

To perform a rollback restore in the SFRAC environment

- 1 Ensure that you previously created a virtual IP for the clustered node. Point that virtual IP to the master node of the cluster.
- 2 On all the clustered nodes, take the VCS database service group (Oracle, CFSSMount, and CVMVolDg resources) offline by using the following command:

```
# hagrps -offline <DB_Service_Group> -any
```

- 3 Freeze the database service group.

```
# hagrps -freeze <DB_Service_Group>
```

- 4 Mount the CFSSMount points manually outside VCS on the master node. This action helps when you start the database in mount state.

```
# mount -F vxfs -o cluster <mntPt>
```

- 5 Start the database with mount option on the clustered master node

```
# sqlplus /as sysdba  
# startup mount;
```

- 6 Run the rollback restore operation from the RMAN script or the client GUI. A sample RMAN script file (`hot_database_backup_proc`) is located in the following directory path:

```
/usr/opensv/netbackup/ext/db_ext/oracle/samples/rman
```

To perform PIT rollback, add the following parameter to the script:

```
NB_ORA_PC_RESTORE=rollback
```

- 7 Unmount the CFS on the master node.

```
# umount <mntPt>
```


8 Unfreeze the VCS database service group.

```
# hagrps -unfreeze <DB_Service_Group>
```

9 On all the clustered nodes, take the VCS database service group (Oracle, CFSSMount, and CVMVolDg resources) back online:

```
# hagrps -online <DB_Service_Group> -any
```

Troubleshooting NetBackup in an SFRAC environment

The following describes some common errors and how to troubleshoot them:

- **Problem:** The backup failed with error code 6 displayed in the GUI. The `rman_script.out` file shows the following error:

```
RMAN-06403: could not obtain a fully authorized session
ORA-01034: ORACLE not available
ORA-27101: shared memory realm does not exist
SVR4 Error: 2: No such file or directory
```

Resolution: Check the `ORACLE_HOME` and `ORACLE_SID` values. `ORACLE_HOME` should not have an extra `'` at the end.

- **Problem:** The backup failed with error code 239. The `dbclient` logs show the following log statement:

```
serverResponse: ERR - server exited with status 239: the specified
client does not exist in the specified policy
01:02:23.844 [4000] <16> CreateNewImage: ERR - serverResponse() fail
```

Resolution: The client name mentioned in the policy and in the `bp.conf` file at the client are different.

- **Problem:** The backup failed with error 156. The `bpfis` logs show the following error.

```
CVxFSPlugin::vxFreezeAll : ioctl VX_FREEZE_ALL failed with errno : 16
CVxFSPlugin::quiesce - Could not quiesce as VX_FREEZE_ALL failed and
VX_FREEZE is not allowed
```

Resolution: Add the following lines to the

`/usr/opensv/lib/vxfi/configfiles/vxfspi.conf` file:

```
file:[QUIESCENCE_INFO]
"QUIESCENCE_SERIAL_QUIESCENCE"=dword:00000001
```

- **Problem:** The rollback failed with the following error displayed in the GUI:

```
Failed to process backup file <bk_113_1_728619266>
```

The dbclient logs show the following error:

```
xbsa_ProcessError: INF - leaving  
xbsa_QueryObject: ERR - VxBSAQueryObject: Failed with error: Server  
Status: client is not validated to use the server  
xbsa_QueryObject: INF - leaving (3)  
int_FindBackupImage: INF - leaving  
int_AddToFileList: ERR - Failed to process backup file  
<bk_113_1_728619266>
```

Resolution : Add the following line in the `bp.conf` file on the master node of the cluster `PREFERRED_NETWORK = <virtual_name>`

Script-based block-level incremental (BLI) backups without RMAN on UNIX and Linux systems

This appendix includes the following topics:

- [About script-based block-level incremental \(BLI\) backups without RMAN](#)
- [About BLI backup and restore operations](#)
- [Verifying installation requirements for BLI backups without RMAN](#)
- [Creating NetBackup policies for script-based BLI backup](#)
- [Performing backups and restores](#)
- [About troubleshooting backup or restore errors](#)

About script-based block-level incremental (BLI) backups without RMAN

NetBackup for Oracle with Snapshot Client extends the capabilities of NetBackup to back up only changed data blocks of Oracle database files. NetBackup recommends using RMAN-based BLI backups, which allow the use of templates and remain tightly integrated with Oracle administration.

If you choose to use script-based BLI backups without RMAN, you can configure NetBackup for BLI support. A BLI backup backs up only the changed data blocks

of Oracle database files. NetBackup for Oracle script-based BLI performs backups using the Storage Checkpoint facility in the Veritas File System (VxFS) available through the Veritas Storage Foundation for Oracle.

About BLI backup and restore operations

A BLI backup performs database backups by obtaining the changed blocks identified by the Storage Checkpoints. BLI backups can also be performed while the database is online or offline. As with Storage Checkpoints, you must enable archive log mode to perform online BLI backups.

A BLI backup places the tablespaces in backup mode, takes a Storage Checkpoint, and then performs the backup. You specify how and when to back up the database when configuring the NetBackup notify scripts.

For example, suppose at 4:00 p.m. you lost a disk drive and its mirrored drive. A number of user tablespaces reside on the disk drive, and you want to recover all committed transactions up to the time you lost the drive. Because the BLI backup facility lets you perform more frequent backups, you did an online differential incremental backup at 1:00 p.m.

You recover by shutting down the database, installing new replacement disk drives, and restoring all the data files with NetBackup. Then you apply the archive logs to recover the tablespaces on the failed drive. If you used Fulldata Storage Checkpoints, the extra redo logs generated during an online backup are small, the media recovery part of the database recovery takes very little time. Moreover, because you have a recent backup, the entire recovery is accomplished quickly.

Verifying installation requirements for BLI backups without RMAN

Verify the following requirements before you begin the installation.

To verify the installation requirements

- 1 Make sure that the following products are properly installed and configured:
 - NetBackup
 - A supported level of Oracle
 - NetBackup for Oracle

- Veritas Storage Foundation for Oracle

- 2 Verify licensing.

The products must have valid licenses. To check for licenses, enter the following commands based on your version:

For VxFS versions earlier than 3.5:

```
# vxlicense -p
```

For VxFS versions 3.5 or later:

```
# vxlicrep
```

The command displays all the valid licenses that are installed on the system. If you have valid licenses, the Storage Checkpoint feature and the Veritas Storage Foundation for Oracle appear in the list.

- 3 Verify that both the NetBackup server (master and media) and client software work properly.

Particularly, verify that you can back up and restore typical operating system files from the client.

File system and Storage Checkpoint space management

To support BLI backups, the VxFS file systems need extra disk space to keep track of the block change information. The space required depends on the database workload while the backup is running. If the database is offline during the entire backup window (a cold database backup) or you use Nodata Storage Checkpoints, the additional space required by each file system is about 1% of the file system size.

If the database is online while the backup is running (a hot database backup or quick freeze database backup using Fulldata Storage Checkpoints), the additional space required by each file system depends on the duration of the backup and the database workload. If the workload is light during the backup or the backup window is relatively short (such as for incremental backups), an additional 10% of the file system size is usually sufficient. If the database has a heavy workload while a full backup is running, the file systems may require more space.

Creating NetBackup policies for script-based BLI backup

To allow full and incremental backups, you must add at least one Standard type policy to NetBackup and define the appropriate schedules for that policy. Use the NetBackup Administration Console to add policies. NetBackup policies define the criteria for the backup.

These criteria include the following:

- Policy attributes
- Clients and the files or directories to be backed up on the client
- Storage unit to use
- Backup schedules

While most database NetBackup BLI backup policy requirements are the same as for file system backups, the following items have special requirements:

- The number of policies that are required
See [“Number of policies required for BLI backup”](#) on page 214.
- Policy attribute values
See [“About BLI policy attributes”](#) on page 216.
- The BLI client list
See [“About the BLI client list”](#) on page 217.
- The list of directories and files to back up
See [“Backup selections list for BLI backups”](#) on page 217.
- Schedules
See [“About schedules for BLI backup policies”](#) on page 217.

Number of policies required for BLI backup

A database BLI backup requires at least one Standard type policy.

This policy usually includes the following:

- One full backup schedule
- One incremental backup schedule
- One user-directed backup schedule for control files and archive logs

Only one backup stream is initiated for each backup policy during automatic backups. To enable multiple backup streams, define multiple policies for the same database. If you have more than one database SID, configure policies for each SID.

If you intend to do simultaneous backups of more than one SID on the same file system, use Nodata Storage Checkpoints. Set the `METHOD` to `NODATA_CKPT_HOT`.

For example, to back up file systems `F1`, `F2`, `F3`, and `F4` with two streams, you need to define two policies (`P1` and `P2`) with `F1` and `F2` backed up in `P1`, and `F3` and `F4` backed up in `P2`. If you have one large file system that needs to be backed up with multiple streams, divide the files in the file system between different policies. After a file is added to a policy, it should stay in that policy. If you must rearrange the file list, do so only prior to a full backup.

If you have more than one policy defined for an Oracle instance, the instance is grouped by the NetBackup keyword phrase. Identify one of the policies as the `POLICY_IN_CONTROL` in the NetBackup notify scripts. This policy performs database shutdowns and restarts. All policies with the same keyword phrase need to be configured to start simultaneously.

Warning: Care must be taken when specifying the keyword phrase. A multistream backup is attempted if the backup process finds more than one policy with the following characteristics: Each policy has the BLI attribute set, each policy is active, each policy contains the same client, and each policy has an identical keyword phrase.

Typical failure status is "74 - timeout waiting for bpstart_notify to complete.

"See ["NetBackup restore and backup status codes"](#) on page 231.

You can check the file systems on the backup client to see if they are included in one of the NetBackup policies on the server. To see if you need to add any new file systems to the NetBackup policies, run the following commands from the server on a regular basis, perhaps as a `cron(1)` job:

```
# cd /usr/opensv/netbackup/bin/goodies/  
# ./check_coverage -coverage -client mars -mailid \nbadmin
```

The preceding command generates the following output and mails it to the specified `mailid`:

```
File System Backup Coverage Report (UNIX only)  
-----  
Key:      * - Policy is not active  
          UNCOVERED - Mount Point not covered by an active policy  
          MULTIPLE  - Mount Point covered by multiple active policies  
  
CLIENT:  mars  
Mount Point  Device                Backed Up By Policy  Notes
```

```

-----
/          /dev/vg00/lvol3  production_servers
/home      /dev/vg00/lvol5  production_servers
/oradata1  /dev/dsk/c1t0d0    block_incr1
/oradata2  /dev/dsk/c1t0d0    block_incr1
/oradata3  /dev/nbuvg/nbuvol UNCOVERED
/opt       /dev/vg00/lvol6  production_servers
/oracle    /dev/vg00/oracle  production_servers
/stand     /dev/vg00/lvol11  production_servers
/usr       /dev/vg00/lvol7  production_servers
/var       /dev/vg00/lvol8  production_servers

```

If there is an `UNCOVERED` file system that is used by Oracle, add it to one of the NetBackup policies so that all the necessary file systems are backed up at the same time.

Note: After a file system is added to a policy, it is a good idea to keep the file system in that policy. If you change the policy, NetBackup performs a full backup the next time backups are run even if an incremental backup is requested.

About BLI policy attributes

NetBackup applies policy attribute values when it backs up files.

The following attributes must be set for BLI backup:

Policy Type	Set to Standard.
Perform block level incremental backups	Select to enable BLI backups. If the BLI attribute is not enabled, NetBackup uses the standard method to back up the files in the file list.
Job Priority	Set so that the BLI backup policies run before other policies.
Keyword phrase	Define as the Oracle instance name (<code>\$ORACLE_SID</code>) in each of the policies for the same instance. Multistream backups start when all the policies with a particular keyword phrase complete their respective startup scripts. If you have multiple Oracle instances (SIDs) use a separate set of policies for each SID. If the SIDs are backed up simultaneously and any share a common file system for data files, use Nodata Storage Checkpoints. Set the <code>METHOD</code> to <code>NODATA_CKPT_HOT</code> .

Note: Do not change a keyword phrase after it is set in a policy. The keyword phrase is used in naming Storage Checkpoints. Changing the keyword phrase necessitates a full backup even if an incremental backup is requested.

The *NetBackup Administrator's Guide, Volume I* describes other policy attributes and how to configure them.

About the BLI client list

The client list specifies the clients upon which you configured a BLI backup. For a database backup, specify the name of the machine upon which the database resides. Specify the virtual hostname if clustered.

Backup selections list for BLI backups

The backup selections list specifies a list of directories and files to back up. The list must contain all the database files or their directory names. Using directory names, rather than file names, ensures that new database files added to an existing configuration are backed up without having to update the file list. Use the `check_coverage` script to make sure all file systems are backed up.

If you are using the Quick I/O interface, you need to specify both the Quick I/O file name and the associated hidden file in the file list (for example, `dbfile` and `.dbfile`), or you need to specify the directory that contains both files. NetBackup does not follow the symbolic links to automatically back up the hidden file if you enumerate only the `dbfile` explicitly in the backup selections list. They are both included if you enumerate their common directory.

When the NetBackup scheduler invokes an automatic backup schedule, it backs up the files one at a time, in the same order they appear in the backup selection list.

Oracle does not recommend backing up the online redo log, so it is recommended that you place online redo log files in a different file system than datafiles, archive log files, or database control files. Do not include the online redo log files in the file list.

About schedules for BLI backup policies

The NetBackup server starts these schedule types:

- Full Backup
- Differential Incremental Backup
- Cumulative Incremental Backup

Each BLI backup policy must include one full backup schedule and at least one incremental backup schedule. In addition, you must designate one of the BLI backup policies as the `POLICY_IN_CONTROL`. The policies for each stream must have the same types of schedules.

The *NetBackup Administrator's Guide, Volume I* describes other schedule attributes and how to configure them.

You can configure the following types of schedules:

- **User-directed backup schedule.** The user-directed backup schedule encompasses all the days and times when user-directed backups are allowed to occur. Set the backup window as described.
The policies for each stream must have the same types of schedules.
- **Automatically initiated backup schedules.** Include server-initiated backup schedules to specify the days and times for NetBackup to automatically start backups of the files specified in the policy file list. Set the backup window as described.

For server-initiated full and incremental backup schedules, set the start times and durations to define the appropriate windows for the backups. Follow the same procedure used to define backup schedules for other policies. For more information on these procedures, see the *NetBackup Administrator's Guide, Volume I*.

The backups are started by the scheduler only within the backup window specified. For the `POLICY_IN_CONTROL`, include in the user-directed backup schedule the time periods when the BLI backup policies complete.

Set the retention level and periods to meet user requirements.

Example Oracle BLI backup policy

The following example shows attributes and schedules for an Oracle BLI backup policy. Use the NetBackup Administration Console to add policies.

```
Policy Name: oracle_backup1
Policy Type: Standard
Active: yes
Block level incremental: yes
Job Priority: 0
Max Jobs/Policy: 1
Residence: oracle_tapes
Volume Pool: NetBackup
Keyword: ORA1
Client List: Sun4 Solaris2.6 mars
             HP9000-800 HP-UX11.00 mars
```

```
Backup Selections List: /oradata/oradata1
Schedule:          full
  Type:            Full Backup
  Frequency:       1 week
  Retention Level: 3 (one month)
  Daily Windows:
    Sunday 18:00:00 --> Monday 06:00:00
    Monday 18:00:00 --> Tuesday 06:00:00
    Tuesday 18:00:00 --> Wednesday 06:00:00
    Wednesday 18:00:00 --> Thursday 06:00:00
    Thursday 18:00:00 --> Friday 06:00:00
    Friday 18:00:00 --> Saturday 06:00:00
    Saturday 18:00:00 --> Sunday 06:00:00
Schedule:          incr
  Type:            Differential Incremental Backup
  Frequency:       1 day
  Retention Level: 3 (one month)
  Daily Windows:
    Sunday 18:00:00 --> Monday 06:00:00
    Monday 18:00:00 --> Tuesday 06:00:00
    Tuesday 18:00:00 --> Wednesday 06:00:00
    Wednesday 18:00:00 --> Thursday 06:00:00
    Thursday 18:00:00 --> Friday 06:00:00
    Friday 18:00:00 --> Saturday 06:00:00
    Saturday 18:00:00 --> Sunday 06:00:00
Schedule:          userbkup
  Type:            User Backup
  Retention Level: 3 (one month)
  Daily Windows:
    Sunday 00:00:00 --> Sunday 24:00:00
    Monday 00:00:00 --> Monday 24:00:00
    Tuesday 00:00:00 --> Tuesday 24:00:00
    Wednesday 00:00:00 --> Wednesday 24:00:00
    Thursday 00:00:00 --> Thursday 24:00:00
    Friday 00:00:00 --> Friday 24:00:00
    Saturday 00:00:00 --> Saturday 24:00:00
```

In this example, the `oracle_backup1` policy backs up all the files in `/oradata/oradata1`. The policy specifies a weekly full backup, a daily differential incremental backup, and a user-directed backup schedule. The archive logs and the control file are backed up using the user-directed schedule at the completion of the full or incremental backup.

Setting the maximum jobs per client global attribute

Set the **Maximum Jobs per Client** to the number of policies that have the same keyword phrase. This number can be greater than one when multiple job policies are defined to back up multiple file systems.

About BLI backup methods

You can choose from the following backup methods when configuring BLI notify scripts:

Table E-1 BLI backup terminology

Term	Definition
cold database backup	<p>A cold database backup is taken while the database is offline or closed. BLI backup shuts down the database and performs either full or block-level incremental backups. This backup method is also referred to in Oracle documentation as a "consistent whole database backup" or a "closed backup." The data from a cold backup is consistent, resulting in easier recovery procedures.</p> <p>To select this backup method, set <code>METHOD</code> to <code>SHUTDOWN_BKUP_RESTART</code>.</p> <p>In an offline backup, all database files are consistent to the same point in time (for example, when the database was last shutdown using typical methods). The database must stay shut down while the backup runs.</p>
hot database backup	<p>A hot database backup allows the database to be online and open while the backup is performed. With the Storage Checkpoint facility, this backup method runs database backups in parallel so a database does not need to be in backup mode for a long time.</p> <p>To select this backup method, set <code>METHOD</code> to <code>ALTER_TABLESPACE</code>.</p> <p>Hot backups are required if the database must be up and running 24 hours a day, 7 days a week.</p> <p>To use hot backups, the database must be in <code>ARCHIVELOG</code> mode. BLI backup uses the <code>alter tablespace begin backup</code> command and the <code>alter tablespace end backup</code> command to put the database into and take it out of backup mode. Oracle documentation refers to this method as an inconsistent whole database backup or open backup. Unlike the cold database backup method, the data in hot backups is fuzzy or inconsistent until the appropriate redo log files (online and archived) are applied after the restore operation to make the data consistent.</p>

Table E-1 BLI backup terminology (*continued*)

Term	Definition
Nodata storage checkpoint hot	<p>A Nodata storage checkpoint hot backup puts the tablespaces in backup mode for the duration of the backup. It uses a Nodata Storage Checkpoint to reduce the amount of file system space consumed.</p> <p>To select this backup method, set <code>METHOD</code> to <code>NODATA_CKPT_HOT</code>.</p> <p>Use this method if all of the following conditions are present:</p> <ul style="list-style-type: none"> ■ You are backing up multiple Oracle instances. ■ More than one instance shares the file system. ■ The backup of the instances can overlap in time.
quick freeze database backup	<p>The quick freeze database backup is different than an online database backup, because it requires the database to be brought down briefly to take a snapshot or Fulldata Storage Checkpoint of the database image. The Fulldata Storage Checkpoint is created in a few seconds and the database can be restarted immediately. A backup image from a quick freeze database backup is equivalent to a backup image from a cold database backup. You can choose this backup method when you configure BLI notify scripts.</p> <p>To select this backup method, set <code>METHOD</code> to <code>SHUTDOWN_CKPT_RESTART</code>.</p> <p>See “Creating notify scripts for BLI backups” on page 221.</p>

If the database is in `ARCHIVELOG` mode, you can use all four methods to back up the database. If the database is in `NOARCHIVELOG` mode, you can only select the cold backup or quick freeze backup.

When you use the cold and quick freeze database backups, the default shutdown command that you use in the `bpstart_notify.oracle_bli` script is `shutdown` or `shutdown normal`. These commands wait for all users to log off before it initiates the shutdown. In some circumstances, even after all interactive users are logged off, processes such as the Oracle Intelligent Agent (Oracle `dbstmp` account) can still be connected to the database, preventing the database shutdown. Attempt to use the default shutdown commands to shut down the database cleanly. Alternatively, you can use `shutdown immediate` to initiate the database shutdown immediately.

Creating notify scripts for BLI backups

Create notify scripts that run on the clients to synchronize the backup operation and the database operation. You need a set of three notify scripts for each policy

that is performing BLI backups. The scripts must be in the `/usr/opensv/netbackup/bin` directory on the NetBackup client.

The scripts are named as follows:

- `bpstart_notify.POLICY`
- `post_checkpoint_notify.POLICY`
- `bpend_notify.POLICY`

To create the notify scripts, run the following script as root:

```
/usr/opensv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts
```

This script copies the sample notify script templates to `/usr/opensv/netbackup/bin` and makes the necessary changes based on the information you provide.

The notify script templates are located on the local machine in the following location:

```
/usr/opensv/netbackup/ext/db_ext/oracle/samples
```

When you run `setup_bli_scripts` you need to supply the following information:

- Identify the `POLICY_IN_CONTROL`
See [“Identify the POLICY_IN_CONTROL for BLI backups”](#) on page 222.
- Provide the Oracle environment variables
See [“Oracle environment variables for BLI scripts”](#) on page 223.
- Select a backup method
- Notify scripts for other policies
See [“About BLI notify scripts for other policies”](#) on page 223.

See the information about how to use the notify scripts to back up your Oracle database.

Identify the `POLICY_IN_CONTROL` for BLI backups

If you have more than one policy defined on the server for one Oracle instance, identify one of the policies as the `POLICY_IN_CONTROL`. This is the policy that initiates the database `shutdown`, `startup`, or `alter tablespace` commands. The `POLICY_IN_CONTROL` can be any policy (for example, the first policy defined). This variable is stored in the notify scripts.

Oracle environment variables for BLI scripts

If you create notify scripts, or if you run `setup_bli_scripts`, you need to provide values for the Oracle environment variables.

These variables are as follows:

<code>ORACLE_DBA</code>	User name of the Oracle database administrator. Typically, <code>oracle</code> .
<code>ORACLE_BASE</code>	<code>\$ORACLE_BASE</code> of the Oracle instance.
<code>ORACLE_HOME</code>	<code>\$ORACLE_HOME</code> of the Oracle instance.
<code>ORACLE_SID</code>	Oracle instance ID (<code>\$ORACLE_SID</code>) if it is different from the keyword.
<code>ORACLE_LOGS</code>	Directory in which the Oracle archive logs reside.
<code>ORACLE_CNTRL</code>	Location to which a copy of the Oracle control file is written so that it can be backed up.
<code>SQLCMD</code>	<code>sqldba</code> , <code>svrmgrl</code> , or <code>sqlplus</code> command to start up or shut down the database.
<code>ORACLE_INIT</code>	Path name for the Oracle startup parameter file (<code>INIT.ORA</code>). If you are using an Oracle <code>SPFILE</code> as your parameter file, do not set the <code>ORACLE_INIT</code> environment variable.
<code>ORACLE_CONFIG</code>	Path name for the Oracle configuration file (<code>CONFIG.ORA</code>). Some database configurations use the <code>CONFIG.ORA</code> file to specify values for the database parameters that usually do not change. The <code>CONFIG.ORA</code> file can be called by the <code>INIT.ORA</code> file using an include statement.

About BLI notify scripts for other policies

If you have more than one policy defined to support multiple backup streams, create a copy of the notify scripts for each policy defined.

For example, assume that you have two policies defined, `oracle_backup1` and `oracle_backup2`. Also assume that `POLICY_IN_CONTROL` is set to `oracle_backup1`. You also need to create notify scripts for policy `oracle_backup2`. The `setup_bli_scripts` script performs this step automatically.

Sample setup_bli_scripts session

The following sample session shows how to use `setup_bli_scripts` to create the notify scripts.

```
#!/usr/opensv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts
```

```
Please enter the user name of your Oracle administrator? orac901
```

```
ORACLE_BASE is the Oracle environment variable that identifies  
the directory at the top of the Oracle software and administrative  
file structure. The value of this variable is typically  
/MOUNTPOINT/app/oracle
```

```
Please enter your ORACLE_BASE? /dbhome/oracle/orac901
```

```
ORACLE_HOME is the Oracle environment variable that identifies the  
directory containing the Oracle software for a given Oracle server  
release. The value of this variable is typically  
/dbhome/oracle/orac901/product/RELEASE
```

```
Please enter your ORACLE_HOME? /dbhome/oracle/orac901
```

```
sqlplus will be used.
```

```
The default "connect" statement that will be used to connect to the database is:  
"connect / as sysdba"
```

```
Would you like to modify the connect and use a specific login? (y/n) n
```

```
"connect / as sysdba" will be used.
```

```
Please enter the Oracle instance (ORACLE_SID) you want to back up? orac901
```

```
If you are using a CONFIG.ORA file, you need to specify where  
it is, so that it can be backed up. If this does not apply  
apply to your configuration, hit ENTER to go on. If this does  
apply to your configuration, specify the file path.
```

```
Typically this would be:
```

```
/dbhome/oracle/orac901/admin/orac901/pfile/configorac901.ora  
but this file could not be found.
```

```
Enter your Oracle config file path or hit ENTER:
```


To back up a copy of the Oracle control file, you need to specify a file path where Oracle can write a copy of the control file.

Please enter the file path where Oracle is to write a copy of your control file? /dbhome/oracle/orac901/admin/orac901/pfile/cntrlorac901.ora

To back up the Oracle archive logs, you need to specify their location.

Enter the directory path to your Oracle archive logs?
/dbhome/oracle/orac901/admin/orac901/arch

Do you have more archive log locations? (y/n): n

Do you want the output of successful executions of the NetBackup scripts mailed to you? y
Please enter the mail address to send it to? jdoe@company.com

Do you want the output of unsuccessful executions of the NetBackup scripts mailed to you? y
Please enter the mail address to send it to? jdoe@company.com

There are 4 backup methods to choose from:

- ALTER_TABLESPACE - Use alter tablespace begin backup method
- NODATA_CKPT_HOT - Use alter tablespace begin backup with nodata ckpts
- SHUTDOWN_CKPT_RESTART - Shutdown, create the ckpt clones, and restart
- SHUTDOWN_BKUP_RESTART - Shutdown the DB, backup, and then restart

If one of the methods requiring DB shutdown are selected, you may experience problems with timeouts if the database can't be shut down in a timely manner. You may want to change the shutdown command in the notify scripts to shutdown immediate, or you may have to increase the BPSTART_TIMEOUT value in the bp.conf file on the master server, or you may want to change the backup method to ALTER_TABLESPACE or NODATA_CKPT_HOT.

Note: the default BPSTART_TIMEOUT value is 300 seconds.

Do you want to use the ALTER_TABLESPACE method? y

You now need to decide on how many NetBackup policies you will have backing up simultaneously. The first one you enter will be known as the POLICY_IN_CONTROL in the scripts and will perform any needed DB operations. When you create the policies on the NetBackup server, you will have to divide the filesystems between these policies.

```
Please enter the name of the policy that will be the POLICY_IN_CONTROL? BLI_1
Please enter the name of another policy or DONE to stop? BLI_2
Please enter the name of another policy or DONE to stop? BLI_3
Please enter the name of another policy or DONE to stop? BLI_4
Please enter the name of another policy or DONE to stop? BLI_5
Please enter the name of another policy or DONE to stop? BLI_6
Please enter the name of another policy or DONE to stop? DONE
```

Performing backups and restores

After the installation and configuration are complete, you can use the NetBackup interfaces to start Oracle backups and restores. You can run backups manually by using schedules that you determine. You can also run a schedule manually.

Note: You must be the root user to perform all operations using the BLI backup software.

About NetBackup for Oracle agent automatic backups

The best way to back up databases is to set up schedules for automatic backups.

Note: You must be the root user to perform all operations using the BLI backup software.

Note: For HP-UX PA-RISC checkpoints to unmount and be cleaned up, create touch file `/usr/obj/obj_install/netbackup/AIO_READS_MAX` that contains the value 1.

About NetBackup for Oracle manual backups

You can also run an Automatic Backup schedule manually using the NetBackup Administration Console. For information about performing manual backups of schedules, see the *NetBackup Administrator's Guide, Volume I*.

Note: You must be the root user to perform all operations using the BLI backup software.

Note: For HP-UX PA-RISC checkpoints to unmount and be cleaned up, create touch file `/usr/opensv/netbackup/AIO_READS_MAX` that contains the value 1.

To perform a cold (offline) backup, set the environment variable `METHOD` in the `bpstart_notify` script on the client to `SHUTDOWN_BKUP_RESTART`. The `bpstart_notify` script shuts down the database before the backup begins and the `bpend_notify` script restarts the database after the backup completes.

To perform a hot (online) backup using Fulldata Storage Checkpoints, make sure the database is running in `ARCHIVELOG` mode and set the variable `METHOD` to `ALTER_TABLESPACE`. The `bpstart_notify` script changes the tablespaces to online backup mode before the backup begins, and the `post_checkpoint_notify` script changes the tablespaces back to normal mode after the Fulldata Storage Checkpoints are created.

To perform a Nodata Storage Checkpoint Hot (online) backup, make sure the database is running in `ARCHIVELOG` mode and set the environment variable `METHOD` in the `bpstart_notify` script to `NODATA_CKPT_HOT`. The `bpstart_notify` script changes the tablespaces to online backup mode before the backup begins. The `bpend_notify` script changes the tablespaces back to normal mode after the backup completes.

To perform a quick freeze backup, set the environment variable `METHOD` in the `bpstart_notify` script to `SHUTDOWN_CKPT_RESTART`. The `bpstart_notify` script shuts down the database and the `post_checkpoint_notify` script restarts it immediately after the Fulldata Storage Checkpoints are created. Taking VxFS Fulldata Storage Checkpoints is very fast (within a minute), and with the NetBackup queuing delay for scheduling the backup jobs, the database down time is typically only a few minutes.

Backing up Quick I/O files

A Quick I/O file consists of two components: a hidden file with the space allocated for it, and a link that points to the Quick I/O interface of the hidden file. Because NetBackup does not follow symbolic links, you must specify both the Quick I/O link and its hidden file in the list of files to be backed up.

Note: You must be the root user to perform all operations using the BLI backup software.

For example:

```
ls -la /db02
total 2192
drwxr-xr-x 2 root  root    96 Jan 20 17:39 .
drwxr-xr-x 9 root  root  8192 Jan 20 17:39 ..
-rw-r--r-- 1 oracle dba 1048576 Jan 20 17:39 .cust.dbf
lrwxrwxrwx 1 oracle dba    22 Jan 20 17:39 cust.dbf ->\
    .cust.dbf::cdev:vxfs:
```

The preceding example shows that you must include both the symbolic link `cust.dbf` and the hidden file `.cust.dbf` in the backup file list.

If you want to back up all Quick I/O files in a directory, you can simplify the process by only specifying the directory to be backed up. In this case, both components of each Quick I/O file is properly backed up. In general, you should specify directories to be backed up unless you only want to back up some files in those directories.

Note: For HP-UX PA-RISC checkpoints to unmount and be cleaned up, create touch file `/usr/obj/ntp/netbackup/AIO_READS_MAX` that contains the value 1.

Restoring BLI backup images

Restoring the backup images that a BLI backup creates is no different than restoring the backup images that are created using the default NetBackup configuration. Restoring to any of the incremental backup images requires NetBackup to restore the last full backup image and all the subsequent incremental backups until the specified incremental backup image is restored. NetBackup does this automatically. The media that stored the last full and the subsequent incrementals must be available, or the restore cannot proceed.

You can start the restore operations from the NetBackup client by using the Backup, Archive, and Restore interface. To restore the latest copy of each file, select either the files or parent directories with the latest backup date, and click **Restore**. For more information on restoring, see the *NetBackup Backup, Archive, and Restore Getting Started Guide*.

If the operation is to restore files from an incremental backup image, NetBackup issues multiple restore operations beginning from the last full backup image and the subsequent incremental backup images until the selected date. The activity of multiple restores is logged in the Progress Log.

If you plan to restore files backed up by another client or to direct a restore to another client, start the restore from the NetBackup server using the Backup, Archive, and Restore interface. Before you initiate a restore, a backup must have successfully completed or an error occurs during the execution.

For Solaris, the restore destination can be a VxFS or UFS file system. The destination file system does not need to support the Storage Checkpoint feature, but to be able to perform BLI backups of the restored data, a VxFS file system with the Storage Checkpoint feature is required.

For HP-UX, the restore destination can be a VxFS or HFS file system. The destination file system does not need to support the Storage Checkpoint feature to restore files. However, a VxFS file system with the Storage Checkpoint feature is required to perform BLI backups of the restored data.

For AIX, the restore destination can be a VxFS or JFS file system. The destination file system does not need to support the Storage Checkpoint feature to restore files. However, a VxFS file system with the Storage Checkpoint feature is required to perform BLI backups of the restored data.

Note that restoring a file causes all blocks in that file to be rewritten. Thus, all the blocks in the file are considered to have been modified. Thus, the first subsequent differential incremental backup and all subsequent cumulative incremental backups back up all of the blocks in the restored file. If you are restoring an entire database or a file system, the first subsequent backup backs up all blocks that are restored.

To restore a Quick I/O file, if both the symbolic link and the hidden file already exist, NetBackup restores both components from the backup image. If either one of the two components is missing, or both components are missing, NetBackup creates or overwrites as needed.

Oracle database recovery might be necessary after restoring the files. See the Oracle documentation for more information on doing database recovery.

About NetBackup backup and restore logs

NetBackup provides logs on the database backup and restore operations. These logs are useful for finding problems that are associated with those operations. The following table describes the most useful logs and reports for troubleshooting backup and restore operations.

Table E-2 NetBackup backup and restore logs

Log file type	Description
NetBackup progress logs	For user-directed backups and restores performed with Backup, Archive, and Restore interface, the most convenient log to use for NetBackup is the progress log. The progress log file is written to the user's home directory, by default in <code>/usr/openv/netbackup/logs/user_ops/username/logs</code> . This log indicates whether NetBackup was able to complete its part of the operation. You can view the progress log from the Backup, Archive, and Restore interface, or you can use a file editor such as <code>vi(1)</code> .

Table E-2 NetBackup backup and restore logs (*continued*)

Log file type	Description
NetBackup debug logs	<p>The NetBackup server and client software provide debug logs for troubleshooting problems that occur outside of BLI backups. To enable these debug logs on the server or client, create the appropriate directories under the following directory:</p> <pre style="margin-left: 20px;">/usr/opensv/netbackup/logs</pre> <p>For more information on debug logs, see the <i>NetBackup Troubleshooting Guide for UNIX and Windows</i> or see the <code>/usr/opensv/netbackup/logs/README.debug</code> file.</p>
NetBackup reports	<p>In addition to logs, NetBackup provides a set of reports that help isolate problems. One report is <code>All Log Entries</code> on the server. For a description of all reports, see the <i>NetBackup Administrator's Guide, Volume I</i>.</p>

About troubleshooting backup or restore errors

A backup or restore error can originate from NetBackup for Oracle, from the NetBackup server or client, from the Media Manager, or from VxFS. In addition to examining log files and reports, you should determine at which stage of the backup or restore operation the problem occurred. You can also use NetBackup status codes to determine the cause of the problem.

Troubleshooting stages of backup and restore operations

Refer to the following list to determine the source of a backup or restore error:

- A backup or restore can be started in either of the following ways:
 - Manually from the administrator interface on the master server
 - Automatically by a NetBackup server using a full schedule or incremental schedule

If an error occurs during the start operation, examine the Java reports window for the possible cause of the error.
- If the backup or restore starts successfully but eventually fails, one of the following can be the cause:
 - Server/Client communication problem
 - Schedule error
 - Media-related error
 - VxFS errors

For more information, see the *NetBackup Troubleshooting Guide for UNIX and Windows*.

- There can be insufficient disk space for the VxFS Fulldata Storage Checkpoints to keep track of changed block information. Check the `All Log Entries` report for errors.

If there is a file system out-of-space condition, increase the size of the file system so it is large enough for Fulldata Storage Checkpoints or use the Nodata Storage Checkpoint Hot backup method. This error does not affect the integrity of the backup images because a full backup of the affected file system occurs after the condition is fixed.

- If an incremental backup is intended, but the whole file system is backed up instead, one of the following conditions might be present:
 - Storage Checkpoints that keep track of changes have been removed
 - The **Block level incremental** attribute is not selected
 - Other errors with a nonzero status code

The most common cause of this problem is the file system removed the Storage Checkpoint that keeps track of the block changes. This action might occur if the file system runs out of space, and there are no volumes available to allocate to the file system. The integrity of the backup images is not affected, because a full backup of the file system occurs at the next backup opportunity after NetBackup detects that a Storage Checkpoint is missing.

NetBackup restore and backup status codes

The status codes and their meanings are as follows:

- Status Code 9. An extension package is needed but was not installed.
The client does not have the NetBackup binaries required to do BLI backups. Use `update_clients` on the server to push out new binaries. Also, use `vxlicense -p` to verify that the Storage Checkpoint feature [83] and the Veritas Storage Foundation for Oracle [100] are installed.
- Status Code 69. Invalid file list specification.
Look for a message such as the following in the error log on the server:

```
FTL - /oradata is not in a VxFS file system. A block incremental backup of it is not possible.
```

This indicates that there was an attempt to back up a file system that is not a VxFS file system with the **Block level incremental** attribute. This error can also occur if the file system is not mounted.

- Status Code 73. `bpstart_notify` failed.

When running the notify scripts, the `bpstart_notify` script exited with a nonzero status code, or the permission bits are set wrong on the `bpstart_notify` script. The script must have execute permission. If the permission bits are set, check the `bpstart_notify_output.Oracle_SID` file in the `/usr/opensv/netbackup/bin/BLOCK_INCR` directory.

- **Status Code 74.** Client timed out waiting for `bpstart_notify` to complete. Check the `BPSTART_TIMEOUT` setting on the NetBackup server. The `BPSTART_TIMEOUT` specified did not allow enough time for the script to complete. The shutdown database operation might be taking too long, or the script might be waiting for other streams to start. Check the `bpstart_notify_output.Oracle_SID` file and the `post_checkpoint_notify_output.Oracle_SID` file in the `/usr/opensv/netbackup/bin/BLOCK_INCR` directory. Make sure that the policies and schedules are configured with appropriate multiplexing factors and that the required storage units that allow all streams to start at the same time are configured. Check to see if all needed tape drives are working and available. Make sure that the database is not processing transactions so that the instance cannot be shut down immediately (if you are using one of the backup methods where the database is shut down). Finally, make sure that the priority on the BLI policies is higher than other policies, so they get access to the tape drives before the other policies.
- **Status Code 75.** Client timed out waiting for `bpend_notify` to complete. Check the `BPEND_TIMEOUT` setting on the NetBackup server. The `BPEND_TIMEOUT` specified did not allow enough time for the script to complete. The restart database operation might be taking too long, or the script might be waiting for other streams to call the `bpend_notify` script. Check the `bpend_notify_output.Oracle_SID` file and the `post_checkpoint_notify_output.Oracle_SID` file in the `/usr/opensv/netbackup/bin/BLOCK_INCR` directory. Make sure that the policies and schedules are configured with appropriate multiplexing factors and that the required storage units that can allow all streams to be started at the same time are configured. Verify that all needed tape drives are working and available during backup.
- **Status Code 77.** Execution of the specified system command returned a nonzero status code. Check the `post_checkpoint_notify_output.KEYWORD` file in the `/usr/opensv/netbackup/bin/BLOCK_INCR` directory for the possible cause. The `post_checkpoint_notify` script exited with a nonzero status code.
- **Status Code 143.** Invalid command protocol.

Check to see if the **Block level incremental** policy attribute is selected without a keyword specified. Set the **Keyword phrase** in the policies to the Oracle instance name (`$ORACLE_SID`).

Improving NetBackup backup performance

If backups are running slowly, check to see if the database has an excessive workload. BLI backups allow hot database backups and quick freeze database backups. Because the database is running during both of these backup methods while NetBackup is backing up the database files, Oracle I/O can affect the backup performance.

If the database is not running with a high transaction volume, troubleshoot NetBackup. If the incremental backup takes a long time to finish, it could mean that there are more changed blocks since the last incremental backup. Verify whether the size of the incremental backup image has increased, and consider increasing the frequency of incremental backups.

Finally, you can improve the speed at which backup is performed by using multiplexed backups. Assigning multiple policies to the same backup device is helpful when devices are not writing at their maximum capacity.

About BLI backup and database recovery

A BLI backup does not perform automatic database recovery. This process includes restoring the database files from NetBackup images and applying the Oracle redo log files to the database files. Follow the Oracle documentation to perform database recovery after a restore.

Index

Symbols

.xml 101
.xsc 101
/Oracle/XMLArchive 108

A

ALTER_TABLESPACE 220, 227
API
 error 163, 166
 libobk module 154
Application Backup schedule
 for block-level incremental backups 147
 overview 48
archive 26–27
ARCHIVE_DATE_FROM 106, 112
ARCHIVE_DATE_TO 106, 112
ARCHIVELOG 221, 227
attributes
 Block level incremental 231
automatic archive 98
automatic backup
 policy 85, 98, 118
 schedule
 manual backup 85, 98
automatic backups 226
Automatic Cumulative Incremental Backup schedule
 Snapshot Client effects 149
Automatic Differential Incremental Backup schedule
 overview 48
 Snapshot Client effects 149
Automatic Full Backup schedule 48
 Snapshot Client effects 149

B

backup
 automatic
 using scripts 85, 98, 118
 errors 230
 methods 221
 methods or types of 220

backup (*continued*)
 performing 226
 wizard
 invoking 150
backup media required 32
Backup Selections list
 adding scripts 54
 adding selections 53, 55
 adding templates 54–55
 overview 53
backups, automatic
 running manually 78
BFILE_DIRECTORY 112
binaries 155
 pushing out 231
BLI Backup
 restores 228
BLI no RMAN
 adding policies 214
 backup example 218
 cold backup 220
 goodies directory 215
 hot backup 220
 improving performance 233
 mailid 215
 requirements 213
 schedules 221
 standard policy type 214
 workload 233
Block level incremental 231
block-level incremental backup
 configuring 147
 overview 145
bp.conf 60, 63
 administrator 173
 troubleshooting 165, 169
BPBACKUP_POLICY 63
BPBACKUP_SCHED 61, 63
bpdbsbora
 for XML import 110
bpend_notify 222, 232
BPEND_TIMEOUT 232

bphdb log 160–161
 bplist 88

- browsing for backups 88
- browsing for XML export archives 107
- example 88

 bpوراexp 26–27, 100, 103
 bpوراexp64 103
 bpوراimp 29, 106–107

- performing a restore 111

 bpوراimp64 107, 111
 bpstart_notify 222, 227
 bpstart_notify.oracle_bli 221
 BPSTART_TIMEOUT 232
 browsing archives 106

C

check_coverage 217
 client read timeout property 173
 CLIENT_NAME 61, 63
 CLIENT_READ_TIMEOUT 61, 63
 clients list, for backup policies 52
 command

- bplist 88
- bpوراexp 100

 commands

- allocate channel 20
- backup 20, 83
- bplist 88, 107
- bpوراexp 26–27, 103
- bpوراimp 29, 106–107
- bpوراexp64 103
- change 83
- copy 83
- crosscheck 81
- crosscheck backupset 81
- delete expired backupset 82
- list 84
- register database 80
- report 84
- reset database 80
- restore 83
- resync catalog 83
- rman
 - execute backups 88
 - execute scripts 88
 - performing restore 93
 - script syntax 88
- send 70
- set duplex 70

commands (*continued*)

- switch 83

 COMMIT 113
 compatibility information 31
 configuration

- database user authentication 77

 CONSISTENT 103
 correcting errors 230

D

daemons

- see processes 160

 debug logs 230

- accessing 160
- debug level 162
- enabling 156–157
- in /usr/opensv/netbackup/logs 159
- in install_path\NetBackup\bslogs 158
- troubleshooting with log files 156

 DIRECTORY 103, 113
 DIRECTORY parameter 102

E

environment variables 151
 environmental variable

- user-directed backup 87

 error checking 85
 errors

- correcting 230

 example

- bplist 88
- RMAN script 68

 examples

- parameter files 76
- scripts 76

 execution log 161

F

failed operation

- troubleshooting 163, 166

 file system

- growing 231
- UNCOVERED 216

 file-based operations 136
 FROMUSER 107, 113

G

- Guided Recovery 121
 - Destination host and login screen 126
 - Job Details screen 128
 - metadata 122, 130
 - Performing a cloning operation 123
 - Post-clone operations 128
 - Pre-clone check screen 128
 - Pre-operation checks 123
 - Select Control File Backup screen 126
 - Select Destination Parameters screen 127
 - Select Master Server dialog 125
 - Select Source Database panel 125
 - Selection summary screen 128
 - Troubleshooting 129

H

- HELP 103, 113
- hot backup 220

I

- IGNORE_ROWS 113
- INIT.ORA 223
- installation
 - adding a license key 34
 - prerequisites in a cluster 33
 - requirements for NetBackup clients 32
 - requirements for NetBackup servers 32
- instant recovery
 - overview 134
 - see Snapshot Client 134

J

- Java interface 43
- jbpSA 109

K

- KEYWORD 104, 107, 113

L

- libobk
 - shared library module 155
- license keys, adding 34
- LIST 114
- LIST parameters 106
- LOG 104, 114

logs

- NetBackup progress 229

M

- manual archive 98
- manual backups 85, 98, 226
- maximum jobs per client 44
- multi-streamed backups 173
- multiple copies feature 50, 150
- multiplexing
 - overview 17

N

- NAME 104, 114
- NB_ORA_CLIENT 59, 103–104, 106, 112, 114
- NB_ORA_COPY_NUMBER 60
- NB_ORA_POLICY 59, 103–104
- NB_ORA_SCHED 59, 103–104
- NB_ORA_SERV 59, 103–104, 106, 112, 114
- nbjm scheduling process 160
- nbpem scheduling process 160
- nbrb scheduling process 160
- NetBackup
 - logs and reports 229
- NetBackup Client Service log on account,
 - configuring 77
- NetBackup mode 102

O

- offhost backup. *See* Snapshot Client
 - overview 134

Oracle

- environment variables 223
- Intelligent Agent 221
- Oracle Recovery Manager
 - errors 163
 - example RMAN script 68
- OWNER 104

P

- parameter file 27, 30, 100
- parms operand 58
- PARTITIONS 104
- permission bits 232
- policy configuration
 - adding clients 52
 - attributes 47
 - backup selections list 53

policy configuration (*continued*)

- for databases 46
- for Snapshot Client 147
- overview 45
- schedules 47
- testing 78

POLICY_IN_CONTROL 222–223

post_checkpoint_notify 222, 232

processes

- log files for NetBackup processes 160
- scheduling (nbpem)
 - nbjm. *See* nbrb

Progress Log 228

proxy copy 134–135

Q

QUERY 105

R

Recovery Wizard

- use with Snapshot Client 150

redirected restores 93, 115

redo log 217

remote folder button 56

reports 156

See also log files

- database operations 154

restore 28–29

- to a different client 93, 115

- user-directed 111

restore errors 230

RESTORE_SCHEMA_ONLY 114

RESTORE_TO_DIRECTORY 114

retention period

- for Snapshot Client 150

rman change command 52

RMAN repository

- browsing 88

- querying 84

RMAN script

- example 68

robust logging 160

ROW_BUFFER 105, 114

S

schedule

- automatic backup 85, 98, 118

schedules

- adding 47
- frequency 50
- properties 49
- properties for Snapshot Client 149
- retention for Snapshot Client 150
- types of schedules 47

scripts

- bpend_notify 232
- bpstart_notify.oracle_bli 221
- cautions for using 49
- check_coverage 217
- notify 227
- RMAN 21, 23
- scheduler 85, 98, 118
- XML export 71

send operand 88

SERVER 61, 63

setup_bli_scripts

- contents of 223

- sample of 224

shared library module

- libobk 155

SHUTDOWN_BKUP_RESTART 220, 227

SHUTDOWN_CKPT_RESTART 221, 227

snapshot backup 133

Snapshot Client

- effect on backup schedules 49
- effects on policies and schedules 148
- file-based operations 136
- overview 134
- proxy copy 134–135
- stream-based operations 135

Storage Checkpoint

- backup 221

- removing 231

stream-based operations 135

T

TABLES 105, 107, 115

templates

- administration 98
- advantages over scripts 49
- creating for XML export 71–72
- overview 18
- XML export 71

testing policy configuration 78

timeout failures

- minimizing 172

TOUSER 115
transaction logs
 see archive logs 147

U

UNCOVERED file system 216
Unicode 24
unified logging 158, 160
update_clients 231
user-directed archive 98
user-directed restore 111
USERID 105–106, 115
UTF-8 24

V

VERBOSE 61, 63
Verifying installation 155
Veritas Storage Foundation 147
VIEWS 105

W

Windows interface 43
wizard
 overview 18
 use with Snapshot Client 150

X

XML 24
XML export 26
XML Export Wizard 71
XML import 28
XML Import Wizard 109
XML instance 26–27, 29, 101
XML schema 24, 27, 29, 101