VERITAS

VERITAS NetBackup™ 5.1 for Oracle

System Administrator's Guide

for UNIX

Contents

Preface

This guide describes how to install, configure and use VERITAS NetBackup for Oracle on a UNIX platform. In this guide, VERITAS NetBackup for Oracle on UNIX is referred to as NetBackup for Oracle on UNIX.

For specific information about the NetBackup server software, refer to:

◆ *NetBackup System Administrator's Guide for UNIX, Volumes I and II*, if you have a UNIX server.

    or

◆ *NetBackup System Adminstrator's Guide for Windows, Volumes I and II*, if you have a Windows server.

This document is the same as `NetBackup_AdminGuide_Oracle_Unix.pdf` distributed with the NetBackup for Oracle on UNIX software.

Audience

This guide is intended for the:

◆ Oracle database system administrator responsible for configuring and using the Oracle Recovery Manager to back up and restore Oracle databases.

◆ NetBackup system administrator responsible for configuring NetBackup.

A system administrator is defined as a person with system administrator privileges and responsibilities.

This guide assumes:

◆ A basic understanding of system administration.

◆ A working understanding of the NetBackup client and server software.

◆ A familiarity with the information covered in the following NetBackup manuals:

   - *NetBackup Backup, Archive, and Restore Getting Started Guide*

   - *NetBackup System Administrator's Guide for UNIX, Volumes I and II* or *NetBackup System Administrator's Guide for Windows, Volumes I and II*

   - *NetBackup Troubleshooting Guide for UNIX and Windows*

◆ A thorough understanding of Oracle Recovery Manager

What Is In This Manual?

This guide is organized as follows:

◆ The Introduction chapter describes the technical features and concepts of NetBackup for Oracle.

◆ The QuickStart chapter explains how to quickly install and configure NetBackup for Oracle on UNIX, and run a backup of your Oracle database.

◆ The Installation chapter explains how to install NetBackup for Oracle on UNIX on your system.

◆ Configuration describes how to configure NetBackup and Oracle Recovery Manager for use with NetBackup for Oracle on UNIX. This information supplements the NetBackup administration manuals.

◆ The Using NetBackup for Oracle on UNIX chapter explains how to use NetBackup to perform backups and restores of Oracle databases. This information supplements the NetBackup manuals.

◆ The NetBackup for Oracle with Advanced Client chapter explains the advanced backup methods available for Oracle backups through NetBackup Advanced Client. This includes features formerly available in the NetBackup for Oracle ServerFree Agent and NetBackup for Oracle Advanced BLI Agent.

◆ Troubleshooting explains how to use NetBackup logs to troubleshoot NetBackup for Oracle on UNIX operations. This information supplements the NetBackup manuals.

◆ Appendix A explains Oracle 9i and 10g Real Application Clusters.

◆ Appendix B describes the configuration and use instructions for script-based BLI backups without RMAN, a feature of NetBackup for Oracle with Advanced Client.

Getting Help

VERITAS offers you a variety of support options.

Accessing the VERITAS Technical Support Web Site

The VERITAS Support Web site allows you to:

◆ obtain updated information about NetBackup for Oracle, including system requirements, supported platforms, and supported peripherals

◆ contact the VERITAS Technical Support staff and post questions to them

◆ get the latest patches, upgrades, and utilities

◆ view the NetBackup for Oracle Frequently Asked Questions (FAQ) page

◆ search the knowledge base for answers to technical support questions

◆ receive automatic notice of product updates

◆ find out about NetBackup for Oracle training

◆ read current white papers related to NetBackup for Oracle

The address for the VERITAS Technical Support Web site follows:

◆ http://support.veritas.com

Subscribing to VERITAS Email Notification Service

Subscribe to the VERITAS Email notification service to be informed of software alerts, newly published documentation, Beta programs, and other services.

Go to http://support.veritas.com. Select a product and click "E-mail Notifications" on the right side of the page. Your customer profile ensures you receive the latest VERITAS technical information pertaining to your specific interests.

Accessing VERITAS Telephone Support

Telephone support for NetBackup for Oracle is only available with a valid support contract. To contact VERITAS for technical support, dial the appropriate phone number listed on the Technical Support Guide included in the product box and have your product license information ready for quick navigation to the proper support group.

▼ **To locate the telephone support directory on the VERITAS web site**

1. Open http://support.veritas.com in your web browser.

2. Click the **Phone Support** icon. A page that contains VERITAS support numbers from around the world appears.

Accessing VERITAS E-mail Support

▼ **To contact support using E-mail on the VERITAS web site**

1. Open http://support.veritas.com in your web browser.

2. Click the **E-mail Support** icon. A brief electronic form will appear and prompt you to:
   - Select a language of your preference
   - Select a product and a platform
   - Associate your message to an existing technical support case
   - Provide additional contact and product information, and your message

3. Click **Send Message**.

Contacting VERITAS Licensing

For license information call 1-800-634-4747 option 3, fax 1-650-527-0952, or e-mail amercustomercare@veritas.com.

NetBackup for Oracle Manuals

The following manuals, along with the online help, are included in the NetBackup for Oracle documentation set. For a more detailed listing of NetBackup documents, refer to *NetBackup Release Notes for UNIX and Windows.*

If you have a UNIX server, refer to these documents:

◆ *VERITAS NetBackup System Administrator's Guide for UNIX, Volume I*

NetBackup_AdminGuideI_UNIXServer.pdf

Explains how to configure and manage NetBackup on a UNIX server, including managing storage units, backup policies, catalogs and host properties.

◆ *VERITAS NetBackup System Administrator's Guide for UNIX, Volume II*

NetBackup_AdminGuideII_UNIXServer.pdf

Explains additional NetBackup features such as notify scripts, enhanced authorization and authentication, and role-based security. The guide also discusses using NetBackup with AFS, Intelligent Disaster Recovery (IDR), and the BE Tape Reader.

◆ *NetBackup Media Manager System Administrator's Guide for UNIX*

Explains how to configure and manage the storage devices and media on UNIX NetBackup servers. Media Manager is part of NetBackup.

◆ *VERITAS NetBackup Troubleshooting Guide for UNIX and Windows*

Provides troubleshooting information for UNIX- and Windows-based NetBackup products, including Media Manager.

If you have a Windows server, refer to these documents:

◆ *VERITAS NetBackup System Administrator's Guide for Windows, Volume I*

NetBackup_AdminGuideI_WinServer.pdf

Explains how to configure and manage NetBackup on a Windows server, including managing storage units, backup policies, catalogs and host properties.

◆ *VERITAS NetBackup System Administrator's Guide for Windows, Volume II*

NetBackup_AdminGuideII_WinServer.pdf

Explains additional NetBackup features such as notify scripts, enhanced authorization and authentication, and role-based security. The guide also discusses using NetBackup with AFS, Intelligent Disaster Recovery (IDR), and the BE Tape Reader.

◆ *NetBackup Media Manager System Administrator's Guide for Windows*

Explains how to configure and manage the storage devices and media on Windows NetBackup servers. Media Manager is part of NetBackup.

◆ *VERITAS NetBackup Troubleshooting Guide for UNIX and Windows*

Provides troubleshooting information for UNIX- and Windows-based NetBackup products, including Media Manager.

Oracle Manuals

For this product, you may need the following manuals from Oracle:

◆ *Oracle Enterprise Manager Administrator's Guide*

◆ *Oracle Server Backup and Recovery Guide*

Glossary

If you encounter unfamiliar terminology, consult the NetBackup online glossary. The glossary contains terms and definitions for NetBackup and all additional NetBackup options and agents.

The NetBackup online glossary is included in the NetBackup help file.

▼ **To access the NetBackup online glossary**

1. In the NetBackup Administration Console, click **Help** > **Help Topics**.

2. Click the **Contents** tab.

3. Click **Glossary of NetBackup Terms**.

Use the scroll function to navigate through the glossary.

Accessibility Features

NetBackup contains features that make the user interface easier to use by people who are visually impaired and by people who have limited dexterity. Accessibility features include:

◆ Support for assistive technologies such as screen readers and voice input (Windows servers only)

◆ Support for keyboard (mouseless) navigation using accelerator keys and mnemonic keys

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

Conventions

The following conventions apply throughout the documentation set.

Product-Specific Conventions

The following term is used in the NetBackup for Oracle 5.1 documentation to increase readability while maintaining technical accuracy.

◆ Microsoft Windows, Windows

Terms used to describe a specific product or operating system developed by Microsoft, Inc. Some examples you may encounter in NetBackup documentation are, Windows servers, Windows 2000, Windows Server 2003, Windows clients, Windows platforms, or Windows GUI.

When Windows or Windows servers is used in the documentation, it refers to all of the currently supported Windows operating systems. When a specific Windows product is identified in the documentation, only that particular product is valid in that instance.

For a complete list of Windows operating systems and platforms that NetBackup supports, refer to the *NetBackup Release Notes for UNIX and Windows* or go to the VERITAS support web site at `http://www.support.veritas.com`.

Typographical Conventions

Here are the typographical conventions used throughout the manuals:

Conventions

Convention	Description
GUI Font	Used to depict graphical user interface (GUI) objects, such as fields, listboxes, menu commands, and so on. For example: Enter your password in the **Password** field.
Italics	Used for placeholder text, book titles, new terms, or emphasis. Replace placeholder text with your specific text. For example: Replace *filename* with the name of your file. Do *not* use file names that contain spaces.
	This font is also used to highlight NetBackup server-specific or operating system-specific differences. For example: *This step is only applicable for NetBackup Enterprise Server.*
`Code`	Used to show what commands you need to type, to identify pathnames where files are located, and to distinguish system or application text that is displayed to you or that is part of a code example.

Conventions (continued)

Convention	Description
Key+Key	Used to show that you must hold down the first key while pressing the second key. For example: Ctrl+S means hold down the Ctrl key while you press S.

You should use the appropriate conventions for your platform. For example, when specifying a path, use backslashes on Microsoft Windows and slashes on UNIX. Significant differences between the platforms are noted in the text.

Tips, notes, and cautions are used to emphasize information. The following samples describe when each is used.

Tip   Used for nice-to-know information, like a shortcut.

Note   Used for important information that you should know, but that shouldn't cause any damage to your data or your system if you choose to ignore it.

Caution   Used for information that will prevent a problem. Ignore a caution at your own risk.

Command Usage

The following conventions are frequently used in the synopsis of command usage.

brackets [ ]

   The enclosed command line component is optional.

Vertical bar or pipe (|)

   Separates optional arguments from which the user can choose. For example, when a command has the following format:

   `command arg1|arg2`

   In this example, the user can use either the *arg1* or *arg2* variable.

Navigating Multiple Menu Levels

When navigating multiple menu levels, a greater-than sign (>) is used to indicate a continued action.

The following example shows how the > is used to condense a series of menu selections into one step:

❖ Select **Start** > **Programs** > **VERITAS NetBackup** > **NetBackup Administration Console**.

The corresponding actions could be described in more steps as follows:

1. Click **Start** in the task bar.

2. Move your cursor to **Programs**.

3. Move your cursor to the right and highlight **VERITAS NetBackup**.

4. Move your cursor to the right. First highlight and then click **NetBackup Administration Console**.

Introduction 1

NetBackup for Oracle on UNIX integrates the database backup and recovery capabilities of Oracle Recovery Manager with the backup and recovery management capabilities of NetBackup and its Media Manager. NetBackup for Oracle also includes the export and import of Oracle data in XML format for long term archiving and retrieval.

This chapter introduces NetBackup for Oracle on UNIX and how it relates to Oracle Recovery Manager and NetBackup. Read this chapter for a description of:

◆ Features of NetBackup for Oracle on UNIX

◆ Terminology for NetBackup for Oracle on UNIX

◆ Technical Overview of NetBackup for Oracle on UNIX

To install, configure, and run a test backup of your Oracle database, follow the instructions in the next chapter, "NetBackup for Oracle QuickStart" on page 19.

Features of NetBackup for Oracle on UNIX

This section describes the NetBackup for Oracle on UNIX main features.

NetBackup for Oracle on UNIX main features

Feature	Description
Media and device management	All devices supported by Media Manager are available to NetBackup for Oracle on UNIX.
Scheduling facilities	NetBackup scheduling facilities on the master server can be used to schedule automatic and unattended Oracle backups.
	This 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.
Multiplexed backups and restores	NetBackup for Oracle on UNIX 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 execution of both Oracle and regular file system backup and restore operations	All backups and restores are run simultaneously and transparently without any action from the NetBackup administrator.
	An database administrator can run database backup and restore operations through NetBackup or use Oracle Recovery Manager as if NetBackup were not present.
	An administrator or any other authorized user can use NetBackup to run database backups and restores.
Sharing the same devices and tapes used during other file backups	It is possible to share the same devices and media used for other backups or to give Oracle exclusive use of certain devices and media.
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.

NetBackup for Oracle on UNIX main features

Feature	Description
Graphical user interfaces	NetBackup provides the following graphical user interfaces for client users and administrators:
	◆ Backup, Archive, and Restore user interface
	◆ NetBackup Administration Console for Java
	◆ NetBackup Administration Console for Windows
	A database administrator or NetBackup administrator can start backup or restore operations for Oracle from the NetBackup graphical user interface on the master server.
Parallel backup and restore operations	NetBackup for Oracle on UNIX supports the parallel backup and restore capabilities of the Oracle Recovery Manager. This permits the user to 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.

This section describes the NetBackup for Oracle XML Export and XML Import archiving features:.

Feature	Description
System and database-independent archive format	NetBackup for Oracle on UNIX uses the eXtensible Markup Language (XML) standard to represent relational database table data extracted from an Oracle database.
Self-identifying archive format	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.
Command line interfaces that allow export and import at row-level granularity	Parameter files control what table data will be included in an archive, and what table data will be extracted from an archive for import into an Oracle database.

Feature	Description
Restore destination option	NetBackup for Oracle on UNIX can either restore XML data to an Operating System directory, or import the data back into the Oracle database.
Flexible archive image searches	The NetBackup catalog contains information on the contents of the archive that can be searched using flexible search criteria, such as tablename or user.

Terminology for NetBackup for Oracle on UNIX

This section explains important terms that may be new to an Oracle database administrator or a NetBackup administrator.

NetBackup Terms

This section describes NetBackup terms as they apply to NetBackup for Oracle on UNIX.

NetBackup	NetBackup backs up and restores files, directories, raw partitions, and databases on client systems that have Oracle databases.
NetBackup policy	NetBackup policies define criteria for backups and restores. These criteria include storage unit and media to use, backup schedules, clients, files to back up, or backup templates or scripts to execute.
NetBackup schedule	NetBackup schedules control NetBackup operations such as: when backups can occur, the type of backup (full, incremental) to perform, and how long NetBackup retains the image (retention level).
Administrator-directed backups	NetBackup administrators are able to perform remote backups of all files, directories, databases, and raw partitions contained on client systems within a client/server network via NetBackup interfaces.
User-directed backups and restores	NetBackup users are able to perform backups of all files, directories, databases, and raw partitions contained on client systems within a client system.
Graphical interfaces	Graphical user interfaces are available for both users and administrators.
Media Manager	The Media Manager provides complete management and tracking of all devices and media used during backups and restores.

Templates	The NetBackup for Oracle on UNIX wizards are used to create backup and recovery templates used to perform RMAN and XML Export/Import operations. These wizards are initiated from the NetBackup Backup, Archive, and Restore interface. The wizards do not support all of the RMAN commands and options provided by Oracle or all of the XML Export/Import options provided by the NetBackup for Oracle command line utilities. A shell script should be written for situations where a template does not provide all of the required functionality.
`bpdbsbora`	NetBackup for Oracle also provides a utility, `bpdbsbora`, that runs the wizard-generated templates. The utility can also generate a shell script from a NetBackup for Oracle template.

For explanations of other NetBackup terms, consult the NetBackup online glossary. For instructions, see the "Glossary" section in the Preface.

XML Export and XML Import Terms

This section describes XML Export and Import terms. The graphics illustrate the relationships of the terms as they apply to both XML export archives and restores.

eXtensible Markup Language (XML)	XML 1.0 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.
Unicode UTF-8	The character set encoding generated by NetBackup for Oracle. UTF-8 is supported by standard XML processors and US7ASCII is a strict subset of UTF-8.

Archives
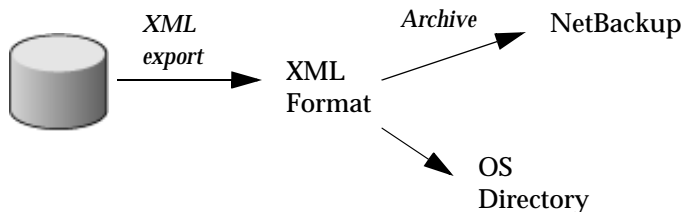
Oracle XML Archive	NetBackup for Oracle on UNIX manages the extraction of database table data, the conversion into XML format, and the storage of XML data on disk or tape.
XML export	NetBackup for Oracle on UNIX converts Oracle table data to XML format (XML schema, or metadata, and XML instance, or data).
Archive	NetBackup stores the XML data on a NetBackup storage unit.
bporaexp *command*	NetBackup for Oracle on UNIX's XML export utility converts Oracle database table data into a self-identifying XML schema document and instance document, and allows them to be archived by NetBackup or re-directed to an OS directory.

Restores

NetBackup for Oracle System Administrator's Guide for UNIX
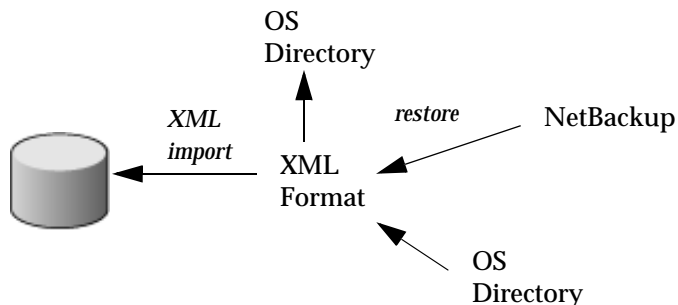
Oracle XML Restore	NetBackup for Oracle on UNIX manages the retrieval of archived database table data, the parsing of the XML format, and the insertion of the data back into the Oracle database.
Restore	NetBackup retrieves the XML-formatted data from the storage unit.
XML import	NetBackup for Oracle on UNIX parses XML- formatted Oracle table data and inserts data into the Oracle database.
`bporaimp` *command*	NetBackup for Oracle on UNIX's XML import utility can parse the XML-formatted data for re-insertion into the database, or can re-direct the data to an OS directory.

Oracle Terms

Full Backup	A full backup copies all blocks into the backup set, skipping only datafile 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.
	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.
Incremental Backup	An incremental backup is a backup of only those blocks that have changed since a previous backup. Oracle allows you to create and restore incremental backups of datafiles, 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.

Multi-Level Incremental Backup	Oracle Recovery Manager allows you to create multi-level backups. Each level is denoted by an integer, e.g., 0, 1, 2, etc. A level 0 incremental backup, which is the base of subsequent incremental backups, copies all blocks containing data.
	When you generate a level n incremental backup in which n is greater than 0, you back up:
	All blocks that have been modified since the most recent backup at a level n or lower (this is the default type of incremental backup, called Differential Incremental Backup)
	All blocks that have been modified since the most recent backup at level n-1 or lower (called a Cumulative Incremental Backup)
	The benefit of performing multi-level incremental backups is that you do not back up all of the blocks all of the time. Incremental backups at level greater than 0 only copy blocks that were modified, which means that the backup size may be significantly smaller and require much less time. The size of the backup file depends solely upon the number of blocks modified and the incremental backup level.
Differential Incremental Backup	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 modified since the last level 2, level 1, or level 0 backup. Incremental backups are differential by default.
Cumulative Incremental Backup	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 changed since the most recent level 1 or level 0 backup.
	Cumulative incremental backups reduce the work 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 done by previous backups at the same level.

Oracle RMAN Terms

Oracle Recovery Manager   Oracle Recovery Manager (RMAN) is used to back up, restore, and recover database files. Oracle Recovery Manager starts Oracle server processes on the target database. These Oracle server processes actually perform the backup and restore. Oracle Recovery Manager performs important backup and recovery procedures, and greatly simplifies the tasks administrators perform during these processes. However, it cannot directly manage the storage devices and media used in its backups and must be integrated with an application that has these capabilities. NetBackup for Oracle on UNIX provides device and media management capability by integrating the Oracle Recovery Manager 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 is used and maintained by Oracle Recovery Manager. Oracle Recovery Manager uses this information to determine how to execute requested backup and restore actions.

Oracle recommends that you use Oracle Recovery Manager with a recovery catalog, especially if you have 20 (or more) datafiles. However, you are not required to maintain a recovery catalog with Oracle Recovery Manager.

Because most information in the recovery catalog is also available in the target database's control file, Oracle Recovery Manager supports an operational mode where it uses the target database control file instead of a recovery catalog. This operational mode is appropriate for small databases where installation and administration of another database, for the sole purpose of maintaining the recovery catalog, would be burdensome.

For a detailed description of the recovery catalog, refer to the *Oracle Server Backup and Recovery Guide.*

`rman` *command*   The `rman` command is used to start a backup or restore by the Oracle Recovery Manager. Recovery Manager is an integral part of Oracle. This command is described in the *Oracle Server Backup and Recovery Guide.*

RMAN script

The RMAN script specifies the commands that Oracle Recovery Manager will perform (for example, backups, and restores). This command file is described in the *Oracle Server Backup and Recovery Guide* (available from the Oracle Corporation).

The *Oracle Server Backup and Recovery Guide* explains the `rman` commands and the command script files. Refer to that guide for details on command syntax and improving performance.

There are example RMAN scripts in the directory named *install_path*`/netbackup/ext/db_ext/oracle/samples/rman/`. These are shell scripts that execute RMAN commands and are fully commented to explain the features used. We recommend that you review these examples. You can use them as a starting point for developing backup, restore, and recovery scripts.

Technical Overview of NetBackup for Oracle on UNIX

The example network below shows the major components in a NetBackup for Oracle configuration.

The storage devices are connected to the NetBackup master server. A NetBackup media server can access the storage devices through the master server. Both the master server and the media server must have NetBackup server software installed.

The host with the database must be a NetBackup client and have NetBackup for Oracle installed.

System containing Oracle database Recovery Catalog

System containing Oracle database

Oracle database to back up or restore

NetBackup for Oracle supplies:

– Sample configuration program
– Sample script files
– VERITAS I/O Library (libobk)
– bporaexp utility
– bporaexp utility

Oracle database software supplies:

– Oracle Recovery Manager (rman)
– Oracle Call Interface (OCI)

Additional required NetBackup software:

– NetBackup Master Server
– NetBackup Client

Network (TCP/IP)

NetBackup master server or remote media server

NetBackup software:

– NetBackup Master Server
– NetBackup Media Server
  (if system is a media server)

Tape or optical storage device

Oracle Recovery Manager

How Does the Oracle Recovery Manager Work?

The Oracle Recovery Manager (RMAN) performs a wide variety of automated backup and recovery functions. During backup or restore, RMAN provides the interface to the databases and performs the actual extraction and insertion of data.

To start a database backup or restore, the database administrator must execute a command called `rman`. This command can be executed from the command line, a shell script, or an application such as NetBackup. The RMAN script is used as a parameter to the `rman` command and defines the commands 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, the Oracle Recovery Manager controls the data streams going into or out of a database. The Oracle Recovery Manager can access storage devices when it is integrated with a media management system, such as that provided by NetBackup and its Media Manager.

For more information, read the *Oracle Server Backup and Recovery Guide.*

How Does NetBackup for Oracle on UNIX Work?

Following are prerequisites for performing backups to tape:

◆ Linking with NetBackup and its Media Manager

◆ Generating unique file names

NetBackup for Oracle on UNIX includes a library of functions that enable the Oracle Recovery Manager to use NetBackup and its Media Manager. To link with this library, see "Linking Oracle8 with NetBackup for Oracle on UNIX" on page 39.

When using the `backup` command, each resulting backup set contains at least one backup piece (datafile, datafile 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. When an Oracle 8.0.x RMAN backup uses a file name that already exists in the catalog, the original backup having that name is deleted. In Oracle 8i or later, the RMAN backup will fail with a `file already exists in catalog` error.

For more information on generating unique file names, refer to the *Oracle Server Backup and Recovery Guide.*

NetBackup users or 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 Oracle Recovery Manager will perform on the client.

For a backup:

1. The `rman` command starts the requested operation on the databases.

2. When the process requires media to store backup data, RMAN starts a user-directed backup by issuing a backup request.

3. The NetBackup master server connects to NetBackup for Oracle on UNIX 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 UNIX on the client.

Since the Oracle Recovery Manager supports parallel operations, a single `rman` execution can start more than one backup or restore on the NetBackup system.

The status for an RMAN operation is stored in the Oracle Recovery Manager catalog or in the database control file. This is the same status that is indicated by the output of the script used to run the backup or restore. This 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.

Incremental Backup of Oracle Databases

The Oracle Recovery Manager provides true incremental backups. An incremental backup will back up datafiles, which include only the blocks that have been changed since the last incremental.

Refer to the *Oracle Server Administrator's Guide* and the *Oracle Server Backup and Recovery Guide* for more complete details on the backup and recovery process.

NetBackup for Oracle XML Export and XML Import

While Oracle RMAN performs backup, restore, and recovery of physical Oracle database objects (datafiles, 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.

Sequence of Operation: XML Export Archive
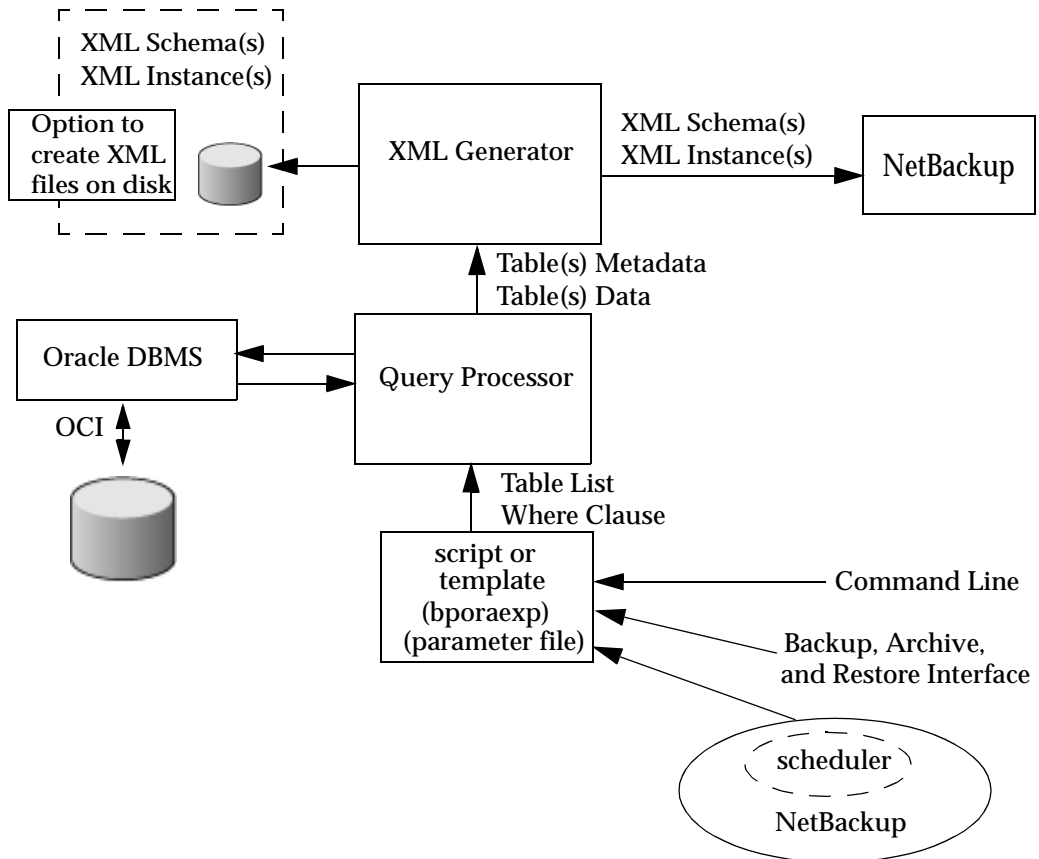
NetBackup for Oracle on UNIX users or schedules start database XML export archives by selecting a NetBackup for Oracle on UNIX script or template in the Backup scheduler, by invoking the script or template at the command line on the client, or by invoking a template through Backup, Archive, and Restore.

For an XML export archive:

1. The NetBackup for Oracle on UNIX script or template calls the `bporaexp` utility with a specified parameter file.

2. The Query Processor uses the parameters in the specified file to build an SQL query for each table.

3. Oracle's OCI API executes the queries on the Oracle instance to be archived.

4. The Query Processor passes the output (including metadata and data for a single table or multiple tables) to the XML Generator.

5. For each table passed, the XML Generator builds one or more sets of XML Schema and XML Instance documents.

6. XML data streams are backed up by NetBackup.

7. Alternately, `bporaexp` allows the files to be saved to an operating system directory.

Sequence of Operation: XML Import Restore
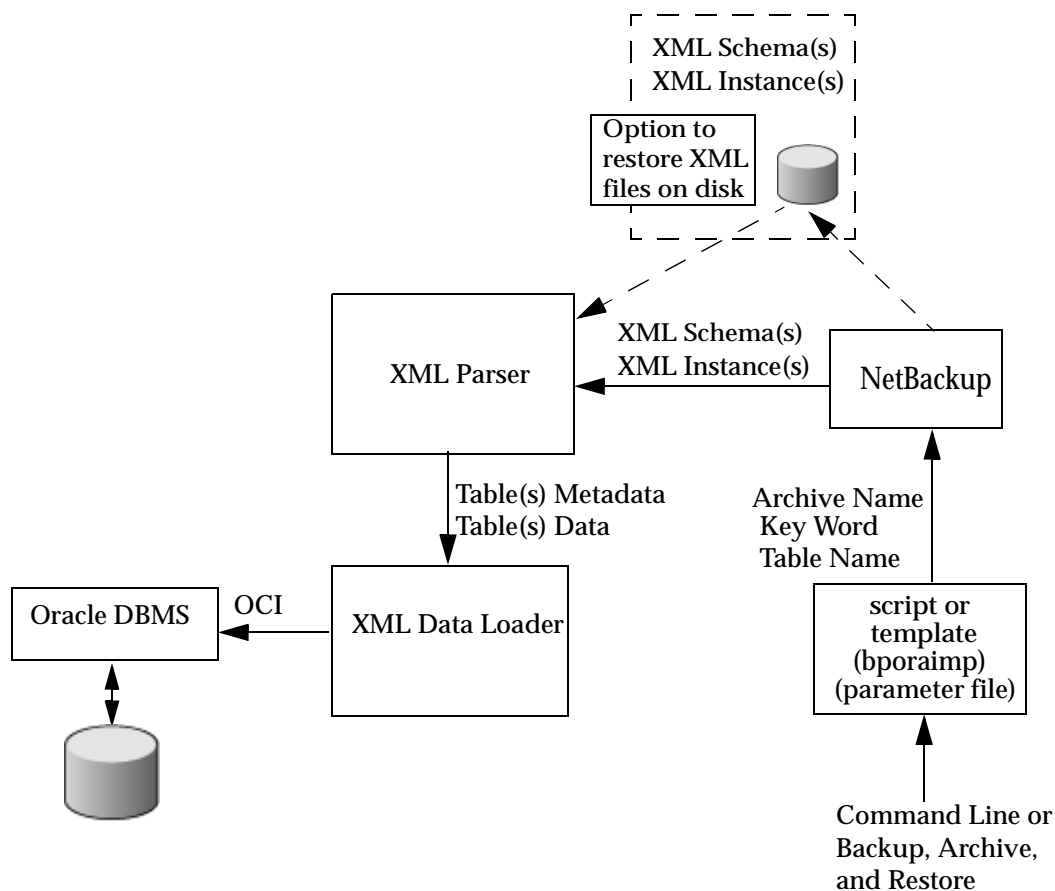
NetBackup for Oracle on UNIX users start database XML import restores by invoking a NetBackup for Oracle on UNIX script or template at the client command line, or invoking an XML import restore template through Backup, Archive, and Restore.

For an XML import restore:

1. The NetBackup for Oracle on UNIX script or template calls the bporaimp utility with a specified parameter file.

2. The input parameters that identify the XML Archive to restore are passed to NetBackup.

3. NetBackup locates and reads the set of XML schema and instance documents from the NetBackup storage unit.

4. The XML data stream is passed to an XML parser, which passes the data to the XML Data Loader.

5. 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.

NetBackup for Oracle QuickStart **2**

This chapter provides instructions to install and configure a simple NetBackup for Oracle deployment and to run an Oracle RMAN database backup. For more detailed instructions and background information, see the Installation, Configuration, and Using NetBackup for Oracle chapters of this manual.

The procedures in this chapter are valid for a regular Oracle RMAN backup with NetBackup for Oracle. For Oracle Advanced Client options, see Oracle Advanced Client chapter of this manual.

To install and configure NetBackup for Oracle, and run a backup, perform the following steps:

◆ Installing NetBackup for Oracle

◆ Configuring a NetBackup for Oracle Policy

◆ Backing Up the Oracle Database

Installing NetBackup for Oracle

In order to install NetBackup for Oracle, you must first ensure the following:

◆ The version of the NetBackup Client and the version of NetBackup for Oracle are the same (e.g., 5.1).

◆ The local machine must have adequate disk space.

   Less than one megabyte of additional disk space is required in the
   install_path/netbackup directory. However, more disk space may be necessary
   at run time.

   Reserve a minimum of one megabyte of disk space in the
   install_path/netbackup directory.

◆ NetBackup version 5.1 client or server software is installed and operational.

   This also means that the *install_path*/netbackup directory already exists.

Performing the NetBackup for Oracle Installation

During a local installation, the NetBackup for Oracle files are extracted and installed. You
also are prompted for configuration information. The local machine can be a client or a
master server that also happens to be a client.

The instructions that follow are for an initial, local installation on the NetBackup client
where the Oracle database is located.

▼ **To install NetBackup for Oracle**

   1. Log in as the root user on the machine.

   If you are already logged in, but are not the root user, execute the following command.

   su - root

   • If the local machine is a client, go to step 3.

   • If the local machine is a server, go to step 2.

   2. Make sure a valid license key for NetBackup for Oracle has been registered. To view
   or add license keys, perform one of the following:

   • Run the command
   install_path/netbackup/bin/admincmd/get_license_key.

   • Open the NetBackup Administration Console and choose **Help** > **License Keys**.

   3. Insert the CD-ROM into the drive.

4. Change the working directory to the CD-ROM directory.

```
cd /CD_mount_point
```

5. Load and install the software by executing the install script.

Note It is expected that the NetBackup version level (for example, 5.1) running on the local machine matches the version level of the database agent being installed.

```
./install
```

a. Select the NetBackup Database Agent Software option.

The following prompt will appear:

```
Do you want to do a local installation? (y/n) [n]
```

b. Answer **y**.

You are presented with a menu of all database agents available on the CD-ROM.

c. Select the NetBackup for Oracle option.

d. Enter **q** to quit selecting options.

A prompt will appear asking if the list is correct.

e. Answer **y**.

The following actions will occur:

- The version file, compressed tar file and install_dbext script will be loaded to directory *install_path*/netbackup/dbext.

- The install script will automatically execute the install_dbext script.

- If the receiving client is configured as an HP-UX11.00, HP-UX11.11, Solaris7, or Solaris8, IRIX65, AIX4.3.3, or AIX5 machine, both the 32 bit and 64 bit versions of NetBackup for Oracle will be installed.

- If install_dbext has successfully completed, there will be a version file in directory *install_path*/netbackup/ext/ that contains the version of NetBackup for Oracle that was installed and an installation timestamp.

Linking NetBackup for Oracle with RMAN

Linking RMAN with a library provided by NetBackup for Oracle on UNIX is the only NetBackup requirement. Before writing to sequential devices such as tape, you must link the Oracle Server software with the media management API library installed by NetBackup for Oracle on UNIX. Oracle uses this library when it needs to write to, or read from devices supported by Media Manager.

▼ **To link Oracle with NetBackup for Oracle on UNIX**

1. Become the Oracle user.

   ```
   su - oracle
   ```

2. Shutdown all of the Oracle instances (SIDs). The user must connect as `sysdba`, either using OS Authentication or Oracle Authentication (set up in the Oracle password file). The following example is for Oracle9i.

   Set the ORACLE_SID environment variable to the first SID.

   Connect as `sysdba` using OS Authentication:

   ```
   sqlplus /nolog
   connect / as sysdba
   shutdown immediate
   exit
   ```

   Connect as `sysdba` using Oracle Authentication (via password file):

   ```
   sqlplus /nolog
   connect userid/password as sysdba
   shutdown immediate
   exit
   ```

   Change the ORACLE_SID environment variable to any other SID that uses this Oracle installation and repeat above commands.

3. Set up automatic linking.

   a. Change directory to *install_path*/netbackup/bin/

   b. Run the `oracle_link` script:

   ```
   ./oracle_link
   ```

   This script determines the Oracle version level and then links Oracle to NetBackup accordingly. All output from this script will be captured in a `/tmp/make_trace.pid` file. To change the trace file location, change the *MAKE_TRACE* variable in the `oracle_link` script.

Configuring a NetBackup for Oracle Policy

To run an Oracle backup, you must first configure an Oracle policy in NetBackup. For details on any of the steps in this section, see the Configuration chapter.

Create the NetBackup for Oracle policy on the NetBackup master server. Following are directions for starting the NetBackup Administration Console.

For UNIX:

❖ Log on to the NetBackup server as the administrator, and start the NetBackup Administration Console from the `/usr/openv/netbackup/bin` directory by typing

```
./jnbSA
```

For Windows:

❖ Log on to the NetBackup server as the administrator, and start the NetBackup Administration Console from the **Start** menu:

Click **Start** > **VERITAS NetBackup** > **NetBackup Administration Console**

The procedure below uses the NetBackup Policy wizard to help you create a NetBackup for Oracle policy. In most cases, you can accept the default entries.

▼ **To create a NetBackup policy**

1. If necessary, use **File** > **Change Server** to select the server where you want to create the policy.

2. In the left pane, click **Policies**.

3. Right-click in the Policies pane, and click **New**.

   The Add a New Policy dialog is displayed.
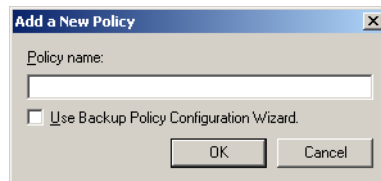
   a. In the **Policy name** box, type a unique name for the new policy.

   b. Check the box to use the policy configuration wizard. Click **OK**.

4. Complete the Backup Policy Configuration Wizard by supplying the following information:

    a. On the Policy Name and Type screen, select **Oracle** as the policy type.

    b. On the Client List screen, add the name of the NetBackup for Oracle client.

    c. On the Backup Type screen, click **Next** to accept the defaults.

    d. On the Rotation screen, click **Next** to accept the defaults.

    e. On the Start Window screen, click **Next** to accept the defaults.

    f. Click **Finish** to create the policy.

Backing Up the Oracle Database

NetBackup for Oracle includes a Backup Wizard that solicits information about desired RMAN backup operations. The wizard uses the information to create a template that can be run immediately to back up the Oracle database.

❖ To start the NetBackup Backup, Archive, and Restore interface on the NetBackup client, run:

*install_path***/netbackup/bin/jbpSA &**

How you log in to NetBackup depends on how your Oracle authentication is configured:

◆ OS authentication for Oracle:

Log in to NetBackup as an Oracle DBA UNIX account that includes `sysdba` privileges.

◆ Oracle authentication via password file:

Log in to NetBackup using any UNIX account, including `root`. You will need to provide additional Oracle login information later in the backup process.

If Oracle is installed, the Backup, Archive, and Restore interface for your Oracle client displays an Oracle node in the left pane. Click the **Backup Files** tab, and 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 Oracle authentication is via an Oracle password file, database logon credentials are required, and the following dialog appears when you select an instance to expand:
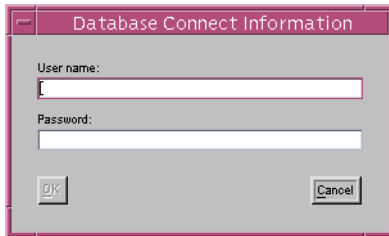
Enter your Oracle database login **User name** and **Password** with `sysdba` privileges to continue.

The following procedure explains how to use the NetBackup for Oracle Backup Wizard to back up your Oracle database.

Note The procedure is for an ONLINE backup, which requires that the Oracle database's archiving mode is set to ARCHIVELOG.

▼ **To back up the Oracle database using the Backup Wizard**

1. Select the Oracle instance you want to back up.

2. Click **Backup**. The NetBackup for Oracle Backup Wizard Welcome screen displays:
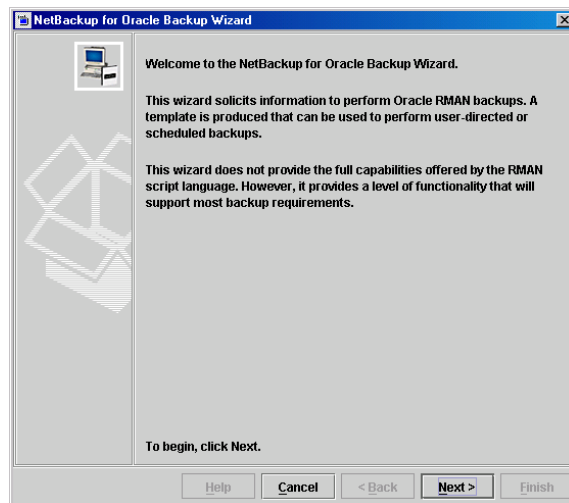
3. Click **Next**. The Target Database Logon Credentials screen displays:
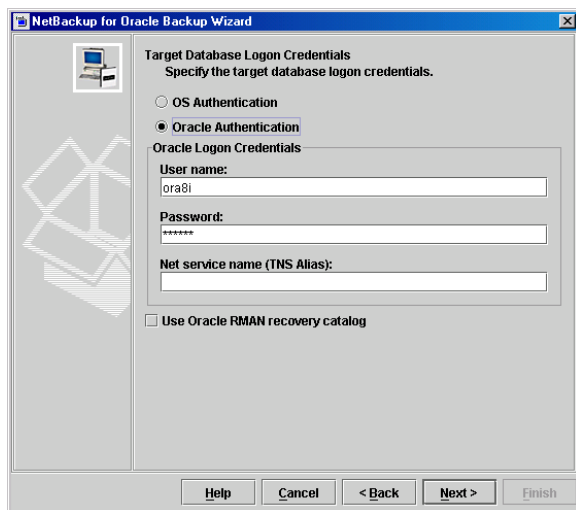
- If you use OS authentication for Oracle, click **OS Authentication**.

- If you use Oracle authentication via the password file, supply a **User name** and **Password** with Oracle `sysdba` privilege.

- Choose whether to **Use Oracle RMAN recovery catalog**. This option is not required. If this is your first NetBackup for Oracle backup, you can leave this option unchecked.

- If you did not choose to use the recovery catalog, skip to step 5.

4. Click **Next**.

- If you chose to use the recovery catalog, you will see the Recovery Catalog Logon Credentials screen. Supply the appropriate **User name** and **Password** for the recovery catalog.

5. Click **Next**. The Archived Redo Logs screen displays.

6. Click **Next** to accept all defaults. The Configuration Options screen displays.

7. Click **Next** to accept all defaults. The Backup Options screen displays.

8. Click **Next** to accept all defaults. The Database State screen displays.

9. Click **Next** to accept all defaults. The NetBackup Configuration Variables screen displays.

In the **Backup policy name** field, enter the name of the Oracle policy you created on the NetBackup master server.

10. Click **Next**. The Backup Limits screen displays.

11. Click **Next** to accept all defaults. The Template Summary screen displays.

12. Click **Perform backup immediately after wizard finishes**.

13. To start the backup, click **Finish**.

An ONLINE backup of your Oracle database begins. A NetBackup message window displays that the backup was successfully initiated. To check the progress of the backup in the Backup, Archive, and Restore status window, choose **Yes** in the message window. You can also check the status of the backup job in the Activity Monitor in the NetBackup Administration Console on the master server.

Installation 3

This chapter describes the NetBackup for Oracle installation and setup procedures. It includes a section on installation prerequisites. It also contains sections on configuring Recovery Manager.

▼ **To locate the latest Database Agent information on the VERITAS support web site**

1. Go to the VERITAS support web page: http://www.support.veritas.com.

2. From the Select Product Family list, choose **NetBackup Products**. The Select Product window refreshes showing a list of NetBackup products.

3. Select one of the NetBackup products. The page refreshes and displays a search window with four tabs.

4. Select **5.1** in the **Product Version** drop-down field.

5. Select a Product Platform.

6. Click the **Compatibility** tab. The page refreshes showing documents that contain compatibility information.

7. Click on the title of the document link for NetBackup Database Agent Compatibility List. A document appears that contains a downloadable file that enables you to view the supported database spreadsheet for this release.

Installation Prerequisites

Before installing NetBackup for Oracle, be sure you have completed the following procedures:

❖ Install the NetBackup server software on the server.

  The NetBackup server platform can be any of those that NetBackup supports.

  Refer to the *NetBackup Installation Guide for UNIX* or the *NetBackup Installation Guide for Windows.*

❖ Install the NetBackup client software on the client where you will be backing up the databases.

  Refer to the *NetBackup Installation Guide for UNIX* for installation instructions.

Now you are ready to install NetBackup for Oracle on the client where you will be backing up the databases. Refer to the next section for detailed instructions on installing NetBackup for Oracle.

Guidelines for Installing NetBackup for Oracle in a Cluster

◆ Prior to installing NetBackup for Oracle, the NetBackup server must be installed and configured to work in a cluster. (This is accomplished by following the instructions in the *NetBackup Installation Guide for UNIX*, including running the `cluster_config` script after the NetBackup server software has been installed.)

◆ Commands such as `bpplclients` and `update_dbclients` must be run from the active NetBackup node. If you are pushing the database agent software to clients located in a cluster, specify the individual node names (not virtual names) in the list of clients.

◆ If installing NetBackup for Oracle on a clustered NetBackup server, freeze the active NetBackup node before beginning the installation. Install on all the inactive nodes, then install on the active node. After you successfully install on the active node, unfreeze this node.

◆ The `cluster_config` script only needs to be run after the NetBackup server software has been installed. You do not need to run this script after installing NetBackup for Oracle on a NetBackup server or if you wish to install NetBackup for Oracle on a machine on which only the NetBackup client is installed.

Installing NetBackup for Oracle

There are two ways to install database agent software.

◆ Remote installation: Loads the software on a master server. The user then pushes the database software out to affected clients.

Refer to the following section.

◆ Local installation: Loads and installs the software only to the local machine.

Refer to "Local Installation of NetBackup for Oracle" on page 36.

Remote Installation of NetBackup for Oracle

During a remote installation, NetBackup for Oracle files are loaded onto the current machine, which must be a UNIX master server. The software is then distributed to the clients and installed.

Note In a clustered environment, the capability to push client software is only available from the active node.

Installation Requirements

◆ The version of the NetBackup client and the version of NetBackup for Oracle must be the same (for example, 5.1).

◆ There must be adequate disk space on each client that will receive the software.

Less than one megabyte of additional disk space is required in the client's *install_path*/netbackup directory. However, more disk space may be necessary at run time.

◆ NetBackup version 5.1 client software is installed and operational on each Oracle on UNIX client.

This also means that the directory *install_path*/netbackup already exists on each Oracle on UNIX client.

◆ In a clustered environment, NetBackup server software has been installed and configured to work in a cluster. (This is accomplished by following the instructions in the *NetBackup Installation Guide for UNIX*, including running the cluster_config script after the NetBackup server software is installed.)

Remote Installation Instructions

▼ **To perform a remote installation**

1. If installing NetBackup for Oracle on a clustered NetBackup server, first refer to the "Guidelines for Installing NetBackup for Oracle in a Cluster" earlier in this chapter.

2. Log in as the root user on the server.

   If you are already logged in, but are not the root user, run the following command.

   su - root

3. Make sure a valid license key for NetBackup for Oracle has been registered. To view or add license keys, perform one of the following:

   • Run the following command:

     install_path/netbackup/bin/admincmd/get_license_key.

   • Open the NetBackup Administration Console and choose **Help** > **License Keys**.

4. Insert the CD-ROM into the drive.

5. Change the working directory to the CD-ROM directory.

   cd /CD_mount_point

6. Load the software on the server by executing the install script.

   ./install

   a. Select the NetBackup Database Agent Software option.

      The following prompt appears:

      Do you want to do a local installation? (y/n) [n]

   b. Answer **n**.

      You are presented with a menu of all database agents available on the CD-ROM.

   c. Select the NetBackup for Oracle option.

   d. Enter **q** to quit selecting options.

      A prompt appears asking if the list is correct.

   e. Answer **y**.

The `install` script identifies the types of client software loaded during the installation of the NetBackup server. By default, any matching NetBackup for Oracle software is automatically loaded. If there are more platforms available, the script displays a menu giving you the opportunity to add more client types to the default list. Once the list is complete, database agent version files, compressed tar files and the `install_dbext` script are copied to directory *install_path*/netbackup/dbext.

7. Distribute and install the NetBackup for Oracle software on each client as described in the next sections.

Note In a clustered environment, the capability to distribute client software is only available from the active node.

There are two types of installation processes.

- *initial install*: Use an initial install if the clients you intend to update have not been added to policies of type Oracle.

- *upgrade install*: Use an upgrade install if all the clients you intend to update already have been added to policies of type Oracle.

Note The NetBackup version level (for example, 5.1) running on the clients you wish to update must be the same as the version level of the NetBackup for Oracle being installed.

Initial Installation on Clients

▼ **To perform an initial install on the clients**

1. Run the following command to create a file containing a list of clients currently configured in the NetBackup database.

```
cd install_path/netbackup/bin
./admincmd/bpplclients -allunique -noheader > filename
```

where *filename* is the name of the file to contain the list of unique clients. If no clients have been configured in the NetBackup database, and therefore *filename* is empty, create *filename* using the same format as that generated by bpplclients.

bpplclients generates output in following format:

hardware operating_system client_name

where:

     hardware is the hardware name. For example, execute the `ls` command in directory *install_path*/netbackup/client.

     operating_system is the operating system name. For example, execute the `ls` command in directory *install_path*/netbackup/client/*hardware*.

     client_name is the name of the client.

For example, the contents of *filename* might look like this:

```
Solaris Solaris8 curry
RS6000 AIX4.3.3 cypress
Linux RedHat2.4 bumper
HP9000-800 HP-UX11.00 blaze
```

2. Edit *filename*.

This is an optional step. Use it if the contents of *filename* need to be changed. Edit *filename* to contain only those clients you wish to update with NetBackup for Oracle software.

Note If you are pushing the database agent software to clients located in a cluster, specify the hostnames of the individual nodes (not virtual names) in the list of clients.

3. Specify *filename* in the `update_dbclients` command.

For example:

```
cd install_path/netbackup/bin
./update_dbclients Oracle -ClientList filename
```

Only clients listed in *filename* are updated.

Note If the receiving client is configured as an HP-UX11.00, HP-UX11.11, Solaris7, Solaris8, Solaris9, IRIX6.5, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for Oracle will be installed.

Upgrade Installation on Clients

▼ **To perform an upgrade installation on the clients**

1. Execute the following command.

```
cd install_path/netbackup/bin
./update_dbclients Oracle ALL ALL
```

This command looks at all possible clients and updates only the clients currently in the Oracle policy type.

Instead of ALL ALL, you may use -ClientList *filename* as explained in "Initial Installation on Clients" on page 33.

Note If you are pushing the database agent software to clients located in a cluster, specify the hostnames of the individual nodes (not virtual names) in the list of clients.

Note If the receiving client is configured as an HP-UX11.00, HP-UX11.11, Solaris7, Solaris8, Solaris9, IRIX6.5, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for Oracle will be installed.

Note With an initial or upgrade install, some clients may be skipped and not updated. Possible reasons are:
- the client is a PC client (which cannot be updated from a UNIX server)
- NetBackup for Oracle does not support that client's platform type
- the NetBackup for Oracle software for that client type was not loaded onto the server in step 6 of the "Remote Installation Instructions" on page 32
- (if using the ALL ALL method) the client does not belong to the Oracle policy type
All skipped clients are available in a file whose name is displayed by update_dbclients.

The number of updates required to distribute the software to the clients is displayed.

If more than one update will occur, you will see the following prompt:

```
Enter the number of simultaneous updates you wish to take place. 1 - max dflt
```

(must be in the range of 1 to *max*; default: *dflt*).

where:

max is the maximum number of simultaneous updates that is allowed. The value displayed ranges from 1 to 30.

dflt is the default number the program uses if you press Enter. The value displayed ranges from 1 to 15.

For example, if three client updates will be performed, the *max* and *dflt* values shown would be 3. If 50 client updates will be performed, the *max* value shown would be 30 and the *dflt* value shown would be 15.

update_dbclients starts the number of updates that you specify. If this number is less than the total number of client updates to be performed, new updates start as the previous updates finish until all of the updates have been completed.

Based on your answer, the time it will take to update the clients is displayed, followed by this question:

```
Do you want to upgrade the clients now? (y/n) [y]
```

2. Enter **y** or **n** for the prompt.

If you answer **n**, update_dbclients quits and leaves the list of clients it would have updated in a file. This file can later be used by the -ClientList parameter mentioned previously.

Answer **y** to continue the installation process.

If the update_dbclients command was successful in distributing the software to the client, it automatically runs the install_dbext script on the client. If install_dbext has successfully completed, there will be a version file in directory *install_path*/share that contains the version of NetBackup for Oracle that was installed. The update_dbclients command displays a note on whether the update was successful for each client. When the update_dbclients command has completed, it displays a file name that contains a complete log of what happened for each client. If the update failed for any client, the log file should be examined to determine the problem.

Local Installation of NetBackup for Oracle

During a local installation, the NetBackup for Oracle files are extracted and installed. The local machine can be a client or a master server that also happens to be a client.

Installation Requirements

◆ The version of the NetBackup client and the version of NetBackup for Oracle are the same (for example, 5.1).

◆ The local machine must have adequate disk space.

Less than one megabyte of additional disk space is required in the *install_path*/netbackup directory. However, more disk space may be necessary at run time.

◆ NetBackup version 5.1 client software is installed and operational.

This also means that the *install_path*/netbackup directory already exists.

◆ In a clustered environment, NetBackup server has been installed and configured to work in a cluster. (This is accomplished by following the instructions in the *NetBackup Installation Guide for UNIX*, including running the cluster_config script after installing the NetBackup server software.)

Local Install Instructions

▼ **To install NetBackup for Oracle to the local machine**

1. Log in as the root user on the machine.

   If you are already logged in, but are not the root user, run the following command.

   su - root

   - If the local machine is a client, go to step 3.
   - If the local machine is a server, go to step 2.

2. Make sure a valid license key for NetBackup for Oracle has been registered. In a NetBackup server clustered environment, the license key must be registered on each node. To view or add license keys, perform one of the following:

   - Run the command
     install_path/netbackup/bin/admincmd/get_license_key.

   - Open the NetBackup Administration Console and choose **Help** > **License Keys**.

3. Insert the CD-ROM into the drive.

4. Change the working directory to the CD-ROM directory.

   cd /CD_mount_point

5. Load and install the software by executing the install script.

Note It is expected that the NetBackup version level (for example, 5.1) running on the local machine matches the version level of the database agent being installed.

   ./install

   a. Select the NetBackup Database Agent Software option.

      The following prompt appears:

      Do you want to do a local installation? (y/n) [n]

   b. Answer **y**.

      You are presented with a menu of all database agents available on the CD-ROM.

   c. Select the NetBackup for Oracle option.

   d. Enter **q** to quit selecting options.

A prompt appears asking if the list is correct.

e. Answer **y**.

The following actions occur:

- The version file, compressed tar file and `install_dbext` script are loaded to directory *install_path*/netbackup/dbext.

- The `install` script automatically executes the `install_dbext` script.

- If the receiving client is configured as an HP-UX11.00, HP-UX11.11, Solaris7, Solaris8, Solaris9, IRIX6.5, AIX4.3.3, or AIX5 machine, both the 32-bit and 64-bit versions of NetBackup for Oracle will be installed.

- If `install_dbext` has successfully completed, there will be a version file in directory *install_path*/share that contains the version of NetBackup for Oracle that was installed and an installation timestamp.

f. Enter **q** to quit from the script.

Install Oracle Recovery Manager

To configure the Oracle Recovery Manager, refer to the Oracle Server Backup and Recovery Guide.

Linking RMAN with a library provided by NetBackup for Oracle on UNIX is the only NetBackup requirement. Before writing to sequential devices such as tape, you must link the Oracle Server software with the media management API library installed by NetBackup for Oracle on UNIX. Oracle uses this library when it needs to write to, or read from devices supported by Media Manager.

The default location for the NetBackup API library is */install_path/*netbackup/bin, while its name is:

◆ libobk.so on SGI and Linux

◆ libobk.so.1 on Solaris, Tru64 and Digital UNIX (32-bit)

◆ libobk.so64.1 on Solaris (64-bit)

◆ libobk.sl on HP-UX (32-bit)

◆ libobk.sl64 on HP-UX (64-bit)

◆ libobk.a on AIX (32-bit)

◆ libobk.a64 on AIX (64-bit)

◆ libobk.so64 on SGI (64-bit)

Refer to Chapter 5, "Troubleshooting," if you encounter problems.

Linking Oracle8 with NetBackup for Oracle on UNIX

This section documents the preferred way to link Oracle8 with the NetBackup API library. The linking process is not consistent across hardware platforms and Oracle Server release levels and on some platforms, it is not consistent across OS levels. For this writing, it was not possible to include all of the supported platform, OS level, and Oracle Server level combinations. However, OS levels are specified when known differences occur.

Runtime problems may occur if these linking instructions are not followed.

Automatic Linking

NetBackup for Oracle provides a script that in most cases will perform the necessary linking. Follow the instructions below to use this script to link Oracle with the NetBackup API library.

▼ **To automatically link Oracle8 with NetBackup for Oracle on UNIX**

1. Become the Oracle user.

```
su - oracle
```

2. Shutdown all of the Oracle instances (SIDs). The following example is for Oracle8i.

```
svrmgrl
connect internal
shutdown
exit
```

Change the ORACLE_SID environment variable to any other SID that uses this Oracle installation and repeat above commands.

3. Run the `oracle_link` script located in *install_path*/netbackup/bin/

This script determines the Oracle version level and then links Oracle to NetBackup accordingly. All output from this script will be captured in a /tmp/make_trace.pid file. To change the trace file location, change the *MAKE_TRACE* variable in the `oracle_link` script.

Manual Linking

The preferred method for linking Oracle to the NetBackup API library is to use the automatic linking script in the previous section. If you choose to create the link manually, the procedure varies between platforms and Oracle versions. Starting with version 8.0.4, Oracle is shipped with default media management software. To disable this media management software you must remove or rename the libobk file from *${ORACLE_HOME}/*lib. It may be a file or a symbolic link. To satisfy this and other linking requirements, you must follow the platform-specific instructions in the following sections.

▼ **To manually link Oracle to the NetBackup API library**

1. Become the Oracle user.

```
su - oracle
```

2. Shutdown all of the Oracle instances (SIDs). The following example is for Oracle8i.

```
svrmgrl
connect internal
shutdown
exit
```

Change the ORACLE_SID environment variable to any other SID that uses this Oracle installation and repeat above commands.

3. Make a copy of the existing Oracle executable:

```
cd ${ORACLE_HOME}/bin
cp oracle oracle.orig
```

4. Follow the instructions below for your specific platform and version of Oracle:

❖ On (32-bit or 64-bit) Solaris using 32-bit Oracle software.

    a. Create a symbolic link from Oracle to the NetBackup API library

Oracle8 Release 8.0.3, 8.0.4, 8.0.5, 8.0.5.1, and 8.0.6 and Oracle8i Release 8.1.5 and 8.1.7

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

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

```
ln -s /install_path/netbackup/bin/libobk.so.1 libobk.so
```

Oracle8i Release 8.1.6

```
cd ${ORACLE_HOME}/lib
ls -l libdsbtsh8.so
```

If libdsbtsh8.so exists.

```
mv libdsbtsh8.so libdsbtsh8.so.orig
```

```
ln -s /install_path/netbackup/bin/libobk.so.1 libdsbtsh8.so
```

Oracle8i Release 8.1.5, 8.1.6, and 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 8i, the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib*/*libobk.so.

    b. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

Oracle8 Release 8.0.3, 8.0.4, 8.0.5, 8.0.5.1, and 8.0.6

```
make -f ins_rdbms.mk ioracle
```

◆ Procedure to verify library is linked, VERITAS path should be first one.

```
$ ldd  $ORACLE_HOME/bin/oracle
   libobk.so =>        /install_path/netbackup/bin/libobk.so
   libnsl.so.1 =>   /usr/lib/libnsl.so.1
   libsocket.so.1 =>        /usr/lib/libsocket.so.1
   libdl.so.1 =>   /usr/lib/libdl.so.1
   libc.so.1 =>    /usr/lib/libc.so.1
   libaio.so.1 =>   /usr/lib/libaio.so.1
```

         NetBackup for Oracle System Administrator's Guide for UNIX

```
libm.so.1 =>    /usr/lib/libm.so.1
libmp.so.2 =>   /usr/lib/libmp.so.2
```

❖ On 64-bit Solaris using 64-bit Oracle software

    a. Create a symbolic link from Oracle to the NetBackup API library

Oracle8i Release 8.1.6

```
cd ${ORACLE_HOME}/lib64
ls -l libdsbtsh8.so
```

If libdsbtsh8.so exists.

```
mv libdsbtsh8.so libdsbtsh8.so.orig
```

```
ln -s /install_path/netbackup/bin/libobk.so.1 libdsbtsh8.so
```

Oracle8i Release 8.1.7

```
cd ${ORACLE_HOME}/lib64
ls -l libobk.so
```

If libobk.so exists.

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

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

Oracle8i Release 8.1.6 and 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle8i the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib*/*libobk.so.

◆ Procedure to verify library is linked, VERITAS path should be first one.

```
$ ldd   $ORACLE_HOME/bin/oracle
    libobk.so =>        /install_path/netbackup/bin/libobk.so
    libnsl.so.1 =>   /usr/lib/libnsl.so.1
    libsocket.so.1 =>        /usr/lib/libsocket.so.1
    libdl.so.1 =>    /usr/lib/libdl.so.1
    libc.so.1 =>     /usr/lib/libc.so.1
    libaio.so.1 =>   /usr/lib/libaio.so.1
    libm.so.1 =>     /usr/lib/libm.so.1
    libmp.so.2 =>    /usr/lib/libmp.so.2
```

❖ On (32-bit or 64-bit) HP-UX using 32-bit Oracle software.

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On HP-UX, make sure that the environment variable, SHLIB_PATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv SHLIB_PATH=${ORACLE_HOME}/lib:$SHLIB_PATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
SHLIB_PATH=${ORACLE_HOME}/lib:$SHLIB_PATH
export SHLIB_PATH
```

b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.sl
```

If libobk.sl exists.

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

```
ln -s /install_path/netbackup/bin/libobk.sl libobk.sl
```

Oracle8i Release 8.1.5, 8.1.6, and 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.sl.

c. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

Oracle8 Release 8.0.4

```
make -f ins_rdbms.mk ioracle LLIBMM="${ORACLE_HOME}/lib/libobk.sl"
```

Note The quotation marks must be included, as shown above, when executing this make command.

Oracle8 Release 8.0.5, 8.0.5.1 and 8.0.6 for HP-UX 11.00 9000/879

```
make -f ins_rdbms.mk ioracle LLIBOBK="${ORACLE_HOME}/lib/libobk.sl"
```

> **Note** The quotation marks must be included, as shown above, when executing this make command.

Oracle8 Release 8.0.5, 8.0.5.1, and 8.0.6 for HP-UX 10.20 9000/816

```
make -f ins_rdbms.mk ioracle LLIBMM="${ORACLE_HOME}/lib/libobk.sl" LIBMM=
```

> **Note** The quotation marks and LIBMM= must be included, as shown above, when executing this make command.

◆ Procedure to verify library is linked, VERITAS path should be first one.

```
$ chatr $ORACLE_HOME/bin/oracle
    libobk.so =>       /install_path/netbackup/bin/libobk.so
    libnsl.so.1 =>   /usr/lib/libnsl.so.1
    libsocket.so.1 =>         /usr/lib/libsocket.so.1
    libdl.so.1 =>    /usr/lib/libdl.so.1
    libc.so.1 =>     /usr/lib/libc.so.1
    libaio.so.1 =>   /usr/lib/libaio.so.1
    libm.so.1 =>     /usr/lib/libm.so.1
    libmp.so.2 =>    /usr/lib/libmp.so.2
```

❖ On 64-bit HP-UX using 64-bit Oracle software.

a. Create a symbolic link from Oracle to the NetBackup API library

Oracle 8.0.5.1

```
cd ${ORACLE_HOME}/lib
ls -l libobk.*
```

If libobk.sl exists.

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

If libobk.a exists.

```
mv libobk.a libobk.a.orig
ln -s /install_path/netbackup/bin/libobk.sl64  libobk.sl
```

Oracle8 Release 8.0.6

```
cd ${ORACLE_HOME}/lib64
ls -l libobk.*
```

If libobk.sl exists.

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

If libobk.a exists.

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

ln -s /install_path/netbackup/bin/libobk.sl64  libobk.sl
```

Oracle8i Release 8.1.6 and 8.1.7

```
cd ${ORACLE_HOME}/lib64
ls -l libobk.*
```

If libobk.sl exists.

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

If libobk.a exists.

```
mv libobk.a libobk.a.orig
ln -s /install_path/netbackup/bin/libobk.sl64  libobk.sl
```

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.sl.

b. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

Oracle8 Release 8.0.5.1

```
make -f ins_rdbms.mk ioracle LLIBOBK="$ORACLE_HOME/lib/libobk.sl"
```

Oracle8 Release 8.0.6

```
make -f ins_rdbms.mk ioracle LLIBOBK="$ORACLE_HOME/lib64/libobk.sl"
```

Note The quotation marks must be included, as shown above, when executing this make command.

Note Warnings generated during the make can be ignored.

❖ On Compaq Tru64/Digital UNIX (OSF1)

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On Digital UNIX, make sure that the environment variable, LD_LIBRARY_PATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
export LD_LIBRARY_PATH
```

b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.*
```

If libobk.so exists.

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

If libobk.a exists

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

```
ln -s /install_path/netbackup/bin/libobk.so.1 libobk.so.1
ln -s libobk.so.1 libobk.so
```

Note This platform requires the two symbolic links shown above, because while RMAN searches for libobk.so.1, some other applications search for libobk.so.

Oracle Release 8.1.6 and 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.so.1.

c. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

Oracle8 Release 8.0.4, 8.0.5, and 8.0.6

```
make -f ins_rdbms.mk ioracle PL_FLAGS=-call_shared LLIBMM=-lobk
```

Oracle8 Release 8.0.5.1

```
make -f ins_rdbms.mk ioracle PL_FLAGS="-rpath ${ORACLE_HOME}/lib"
```

Note The quotation marks must be included, as shown above, when executing this make command.

Oracle8i Release 8.1.5

- Oracle provided relinking script - preferred method.

  ```
  cd $ORACLE_HOME/bin
  relink oracle
  ```

  OR

- "make" command line

```
cd $ORACLE_HOME/rdbms/lib
make -f ins_rdbms.mk ioracle PL_FLAGS="-rpath ${ORACLE_HOME}/lib"
```

Note The quotation marks must be included, as shown above, when executing this make command.

◆ Procedure to verify library is linked, by Time-Stamp with CheckSum.

```
$ odump -Dl oracle
```

LIBRARY LIST SECTION

Name	Time-Stamp	CheckSum	Flags Version
oracle:			
libobk.so.1	Aug 31 09:00:16 1999	0xe22db854	0
libjox8.so	Mar 9 12:04:42 1999	0xae77f433	0
libexc.so	Dec 29 17:09:57 1997	0x3184247e	0 osf.1
librt.so	Dec 29 17:20:24 1997	0x3f3d024b	0 osf.1
libaio_raw.so	Jan 5 14:40:38 1998	0x568dc639	0 osf.1
libm.so	Dec 29 17:09:53 1997	0xf29b0962	0 osf.1
libxti.so	Dec 29 17:20:11 1997	0x89ffa69d	0 osf.1
libc.so	Dec 29 17:09:30 1997	0x5e955f9b	0 osf.1

❖ On (32-bit or 64-bit) AIX using 32-bit Oracle software.

    a. Set the Oracle user's library search path

    *${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On AIX, make sure that the environment variable, LIBPATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LIBPATH=${ORACLE_HOME}/lib:$LIBPATH
```

    Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LIBPATH=${ORACLE_HOME}/lib:$LIBPATH
export LIBPATH
```

    b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.a
```

    If libobk.a exists.

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

```
ln -s /install_path/netbackup/bin/libobk.a libobk.a
```

    Oracle8 Release 8.0.6 and Oracle8i Release 8.1.5, 8.1.6, and 8.1.7

    This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.a.

    c. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

    Oracle8 Release 8.0.4, 8.0.5, and 8.0.5.1

```
make -f ins_rdbms.mk ioracle LLIBMM=-lobk
```

◆ Procedure to verify library is linked, VERITAS path.

```
$ dump $ORACLE_HOME/bin/oracle
```

        Import File Strings

INDEX	PATH	BASE	MEMBER
0	/db/ora805/lib/:/db/ora805/rdbms/lib:/usr/lib:/lib		
1		libc_r.a	shr.o
2		libpthreads.a	hr_comm.o
3		libpthreads.a	hr_xpg5.o
4		libc_r.a	aio.o
5		libobk.a	shr.o
6	/	unix	

❖ On 64-bit AIX using 64-bit Oracle software.

   a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On AIX, make sure that the environment variable, LIBPATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LIBPATH=${ORACLE_HOME}/lib:$LIBPATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LIBPATH=${ORACLE_HOME}/lib64:$LIBPATH
export LIBPATH
```

   b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib64
ls -l libobk.a
```

If libobk.a exists.

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

```
ln -s /install_path/netbackup/bin/libobk.a64 libobk.a
```

Oracle8i Release 8.1.6 and 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib64/libobk.a.

❖ On 64-bit SGI (IRIX) using 64-bit Oracle

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On SGI, make sure that the environment variable, LD_LIBRARY_PATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
export LD_LIBRARY_PATH
```

b. Create a symbolic link from Oracle to the NetBackup API library

Oracle8i Release 8.1.6

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

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

```
ls -l libobk.so64
```

If libobk.so64 exists.

```
mv libobk.so64 libobk.so64.orig
```

```
ln -s /install_path/netbackup/bin/libobk.so64 libobk.so64
```

Oracle8i Release 8.1.7

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

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

```
ln -s /install_path/netbackup/bin/libobk.so64 libobk.so
```

Oracle8i Release 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.so64.

c. Make a new Oracle executable.

Oracle8i Release 8.1.6

```
cd ${ORACLE_HOME}/rdbms/lib
make -f ins_rdbms.mk ioracle LLIBOBK="${ORACLE_HOME}/lib/libobk.so" PL_FLAGS=-64
```

Note The quotation marks must be included, as shown above, when executing this `make` command.

Before you execute the `make` command, you need to specify the compiler defaults to enable the use of 64 bit objects. Create the compiler.default file:

1. Change to "lib" directory:

```
cd ${ORACLE_HOME}/lib
```

2. As the Oracle owner, create the "compiler.defaults" file:

```
echo "-DEFAULT:abi=64:isa=mips3:proc=r10k"> compiler.defaults
```

3. Set the "COMPILER_DEFAULTS_PATH" environment variable:

If using csh:

```
setenv COMPILER_DEFAULTS_PATH ${ORACLE_HOME}/lib
```

If using ksh or sh:

```
COMPILER_DEFAULTS_PATH=${ORACLE_HOME}/lib
export COMPILER_DEFAULTS_PATH
```

Note Warnings generated during the make can be ignored.

❖ On Linux

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On Redhat Linux, make sure that the environment variable, LD_LIBRARY_PATH, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
export LD_LIBRARY_PATH
```

b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

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

```
ln -s /install_path/netbackup/bin/libobk.so libobk.so
```

Oracle Release 8.1.7

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. The Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.so.

c. Make a new Oracle executable

```
cd ${ORACLE_HOME}/rdbms/lib
```

Oracle8i Release 8.1.6

```
make -f ins_rdbms.mk ioracle LLIBOBK="${ORACLE_HOME}/lib/libobk.so"
```

Note The quotation marks must be included, as shown above, when executing this make command.

Linking Oracle9i and Oracle10g with NetBackup for Oracle on UNIX

This section documents the preferred way to link Oracle9i and Oracle10g with the NetBackup API library. The linking process is not consistent across hardware platforms and Oracle Server release levels and on some platforms, it is not consistent across OS levels. For this writing, it was not possible to include all of the supported platform, OS level, and Oracle Server level combinations. However, OS levels are specified when known differences occur.

Runtime problems may occur if these linking instructions are not followed.

Automatic Linking

NetBackup for Oracle provides a script that in most cases will perform the necessary linking. Follow the instructions below to use this script to link Oracle with the NetBackup API library.

▼ **To automatically link Oracle9i and Oracle10g with NetBackup for Oracle on UNIX**

1. Become the Oracle user.

   ```
   su - oracle
   ```

2. Shutdown all of the Oracle instances (SIDs). The user must connect as `sysdba`, either using OS Authentication or Oracle Authentication (set up in the Oracle password file). The following example is for Oracle9i.

   Set the ORACLE_SID environment variable to the first SID.

   Connect as `sysdba` using OS Authentication:

   ```
   sqlplus /nolog
   connect / as sysdba
   shutdown immediate
   exit
   ```

   Connect as `sysdba` using Oracle Authentication (via password file):

   ```
   sqlplus /nolog
   connect userid/password as sysdba
   shutdown immediate
   exit
   ```

   Change the ORACLE_SID environment variable to any other SID that uses this Oracle installation and repeat above commands.

3. Run the `oracle_link` script located in *install_path*/netbackup/bin/

This script determines the Oracle version level and then links Oracle to NetBackup accordingly. All output from this script will be captured in a `/tmp/make_trace.pid` file. To change the trace file location, change the *MAKE_TRACE* variable in the `oracle_link` script.

Manual Linking

The preferred method for linking Oracle to the NetBackup API library is to use the automatic linking script in the previous section. If you choose to create the link manually, the procedure varies between platforms and Oracle versions. Starting with version 8.0.4, Oracle is shipped with default media management software. To disable this media management software you must remove or rename the libobk file from *${ORACLE_HOME}/*lib. It may be a file or a symbolic link. To satisfy this and other linking requirements, you must follow the platform-specific instructions in the following sections.

▼ **To manually link Oracle to the NetBackup API library**

1. Become the Oracle user.

   ```
   su - oracle
   ```

2. Shutdown all of the Oracle instances (SIDs). The user must connect as `sysdba`, either using OS Authentication or Oracle Authentication (set up in the Oracle password file). The following example is for Oracle9i.

   Set the ORACLE_SID environment variable to the first SID.

   Connect as `sysdba` using OS Authentication:

   ```
   sqlplus /nolog
   connect / as sysdba
   shutdown immediate
   exit
   ```

   Connect as `sysdba` using Oracle Authentication (via password file):

   ```
   sqlplus /nolog
   connect userid/password as sysdba
   shutdown immediate
   exit
   ```

   Change the ORACLE_SID environment variable to any other SID that uses this Oracle installation and repeat above commands.

3. Follow the instructions below for your specific platform and version of Oracle.

❖ AIX 64-bit using 64-bit Oracle software.

a. Create a symbolic link from Oracle to the NetBackup API library

Oracle 9i Release 9.0.1 and 9.2, Oracle 10g Release 10.1

```
cd ${ORACLE_HOME}/lib
ls -l libobk.*
```

If libobk.a exists.

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

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

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i or 10g the Oracle executable always looks for the shared library: ${ORACLE_HOME}/lib/libobk.so.

❖ Compaq Tru64/Digital UNIX (OSF1)

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. On Digital UNIX, make sure that the environment variable, *LD_LIBRARY_PATH*, is properly set and if you are using the C shell, edit the Oracle user's .cshrc login file to include the line:

```
setenv LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
```

Otherwise, edit the Oracle user's .profile login file to include the lines:

```
LD_LIBRARY_PATH=${ORACLE_HOME}/lib:$LD_LIBRARY_PATH
export LD_LIBRARY_PATH
```

b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.*
```

If libobk.so exists.

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

If libobk.a exists

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

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

Note This platform requires the two symbolic links shown above, because while RMAN searches for libobk.so.1some other applications search for libobk.so.

Oracle9i Release 9.0.1 and 9.2, Oracle 10g Release 10.1

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i or 10g the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.so.1.

❖ HP-UX 64-bit using 64-bit Oracle software.

   a. Create a symbolic link from Oracle to the NetBackup API library

   Oracle 9i Release 9.0.1 and 9.2, Oracle 10g Release 10.1

```
cd ${ORACLE_HOME}/lib
ls -l libobk.*
```

   If libobk.sl exists.

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

   If libobk.a exists.

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

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

   This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i or 10g the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib*/*libobk.sl.

❖ Linux

a. Set the Oracle user's library search path

*${ORACLE_HOME}/*lib must be in the Oracle user's library search path to prevent linking and runtime load errors. If *${ORACLE_HOME}/*lib is not in the search path, the NetBackup API shared library (libobk) will not be found when linking and a runtime load error will occur when an application, such as svrmgrl, is executed. Edit the Oracle user's .profile login file to include the lines:

LD_LIBRARY_PATH=*${ORACLE_HOME}*/lib:*$LD_LIBRARY_PATH*
`export` *LD_LIBRARY_PATH*

b. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

```
mv libobk.so libobk.so.orig
ln -s /usr/openv/netbackup/bin/libobk.so libobk.so
```

Oracle9i Release 9.0.1 and 9.2, Oracle 10g Release 10.1

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.a.

❖ Solaris (32-bit or 64-bit) using 32-bit Oracle software.

    a. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

```
mv libobk.so libobk.so.orig
ln -s /usr/openv/netbackup/bin/libobk.so.1 libobk.so
```

Oracle9i Release 9.0.1 and 9.2

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i the Oracle executable always looks for the shared library: *${ORACLE_HOME}/*lib/libobk.so.

❖ Solaris 64-bit using 64-bit Oracle software.

a. Create a symbolic link from Oracle to the NetBackup API library

```
cd ${ORACLE_HOME}/lib
ls -l libobk.so
```

If libobk.so exists.

```
mv libobk.so libobk.so.orig
ln -s /usr/openv/netbackup/bin/libobk.so64.1 libobk.so
```

Oracle9i Release 9.0.1 and 9.2, Oracle 10g Release 10.1

This is the only required step. You no longer have to make a new Oracle executable to use the NetBackup for Oracle API library. With Oracle 9i and 10g the Oracle executable always looks for the shared library: *${ORACLE_HOME}*/lib/libobk.so.

Linking Rollback Procedure

If you run into problems and are unable to re-link Oracle with NetBackup for Oracle, you can roll back what you have done by entering the following command:

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

(or whatever the API library file was originally called).

Install Oracle Recovery Catalog

The recovery catalog is a repository of information that is used and maintained by Oracle Recovery Manager. Oracle Recovery Manager uses the information in the recovery catalog to determine how to execute requested backup and restore actions.

The recovery catalog contains information about:

◆ Datafile and archivelog backup sets and backup pieces

◆ Datafile copies

◆ Archived redo logs and their copies

◆ Tablespaces and datafiles on the target database

◆ Stored scripts, which are named, user-created sequences of RMAN and SQL commands

Oracle recommends you use Oracle Recovery Manager with a recovery catalog, especially if you have 20 (or more) datafiles. However, you are not required to maintain a recovery catalog with Oracle Recovery Manager.

Because most information in the recovery catalog is also available in the target database's control file, Oracle Recovery Manager supports an operational mode where it uses the target database control file instead of a recovery catalog. This mode is appropriate for small databases where installation and administration of another database for the sole purpose of maintaining the recovery catalog would be burdensome.

If a recovery catalog is not used, the following features are not supported:

◆ Tablespace point-in-time recovery

◆ Stored scripts

◆ Restore and recovery when the control file is lost or damaged

Because recovery catalog installation procedures are version specific, refer to your *Oracle Server Backup and Recovery Guide* for details.

Configuration 4

Before attempting to configure NetBackup for Oracle on UNIX, complete the installation procedure as described in the Installation chapter.

The following is the configuration procedure.

1. Configuring Media Using Media and Device Management

2. Setting the Maximum Jobs Per Client Property

3. Configuring a NetBackup Policy

4. Configuring the Run-Time Environment

5. Creating Templates and Shell Scripts

6. Testing NetBackup for Oracle on UNIX Configuration Settings

The following sections in this chapter describe each of these steps in detail.

To configure NetBackup for Oracle on UNIX from a Windows NetBackup server, see "Configuration Using the NetBackup Administration Console for Windows" on page 68.

To configure NetBackup for Oracle on UNIX from a UNIX NetBackup server, see "Configuration Using the NetBackup Administration Console for UNIX" on page 85.

Configuration Using the NetBackup Administration Console for Windows

Although the database agent is installed on the NetBackup client, some configuration procedures are performed using the NetBackup Administration Console on the server.

These procedures include:

◆ Configuring media using Media and Device Management

◆ Setting the **Maximum Jobs per Client** property

◆ Configuring a NetBackup policy

◆ Testing NetBackup for Oracle on UNIX configuration settings

See the next section for instructions on starting the NetBackup Administration Console.

▼ **To launch the NetBackup Administration Console for Windows**

1. Log on to the server as administrator.

2. Choose **Start** > **Programs** > **VERITAS NetBackup** > **NetBackup Administration Console**.

The NetBackup Administration Console is displayed.

Configuring Media Using Media and Device Management

Use the Media and Device Management (Media Manager) to configure media for a NetBackup for Oracle on UNIX configuration. Refer to the *NetBackup Media Manager System Administrator's Guide* for more information.

The number of volumes required will depend on the devices used, the size of the Oracle databases that you are backing up, the amount of Oracle data that you are archiving, and the frequency of backups or archives.

Setting the Maximum Jobs Per Client Property

The **Maximum jobs per client** attribute value is figured with the following formula.

Maximum Jobs per Client = *Number of Streams* x *Number of Policies*

Where:

◆ *Number of Streams* is 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* is the number of policies that may back up this client at the same time. This number can be greater than one. For example, a client may be in two policies in order to back up two different databases. These backup windows may overlap.

For Oracle backups and restores, the number of jobs is hard to determine, as Oracle internally determines when and how many streams to run in parallel to optimize performance.

Tip To avoid any problems, we recommend that you enter a high enough value for the **Maximum jobs per client** property to meet the number of jobs executed by Oracle.

▼ **To set the Maximum jobs per client property using the Windows console**

1. In the left pane of the NetBackup Administration Console, expand **Host Properties**.

2. Select **Master Server**.

3. In the right pane, double-click on the server icon.

   The Master Server Properties dialog is displayed.

4. In the Master Server Properties dialog, click **Global Attributes**.

The default value is 1 for **Maximum jobs per client**.

5. Change the **Maximum jobs per client** value to 99.

If you prefer to enter a lower value, calculate the value equal to the maximum number of backups allowed per client using the formula provided above.

Configuring a NetBackup Policy

A NetBackup policy defines the backup criteria for a specific group of one or more clients. These criteria include:

◆ storage unit and media to use

◆ backup schedules

◆ clients to be backed up

◆ backup templates or script files to be executed on the clients

To use NetBackup for Oracle on UNIX, at least one Oracle policy with the appropriate schedules needs to be defined. 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 Oracle policies are the same as for file system backups. In addition to the attributes described here, there are other attributes for a policy to consider. Refer to the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed configuration instructions and information on all the attributes available.

Adding New Policies

Use this procedure when configuring a policy from a Windows server or from a NetBackup Remote Administration Console host.

▼ **To add a new policy**

1. Log on to the server as administrator.

2. Start the NetBackup Administration Console.

3. If your site has more than one master server, choose the one where you want to add the policy.

4. In the left pane, right-click **Policies** and choose **New Policy**.

   The Add a New Policy dialog is displayed.
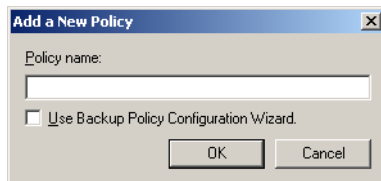
   a. In the **Policy name** box, type a unique name for the new policy.

   b. Choose whether to use the wizard for configuring the policy. The wizard guides you through most of the setup process and simplifies it by automatically choosing default values that are good for most configurations. If necessary, you can change the defaults later by editing the policy. You will need to manually add entries to the Backup Selections list after completing the wizard.

      • To use the wizard, select the **Use Backup Policy Configuration Wizard** box and click **OK**. The wizard starts and you create the policy by following the prompts. When prompted, select the Oracle policy type.

Note The Oracle policy type will not appear in the drop-down list unless your server has a license key for NetBackup for Oracle on UNIX.

- If you require more control over the settings than the wizard provides, then do not select the **Use Backup Policy Configuration Wizard** box and proceed to step 5.

5. Click **OK**.

A dialog is displayed in which you can specify the general attributes for the policy.
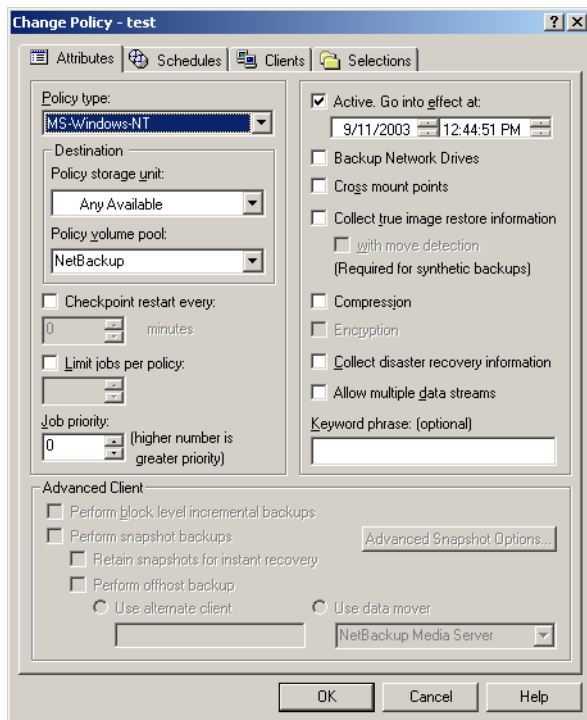
6. From the **Policy Type** box, select the Oracle policy type.

7. Complete the entries on the **Attributes** tab as explained in "Description of Attributes."

8. Add other policy information:

- To add schedules, see "Adding New Schedules."

- To add clients, see "Adding Clients to a Policy."

- To add templates or scripts to the Backup Selections list, see "Specifying the List of Backup Selections."

9. Click **OK**. The new policy is created.

Description of Attributes

With a few exceptions, NetBackup manages a database backup like a file system backup. Policy attributes that are different for Oracle backups are explained below.

Your other policy attributes will vary according to your specific backup strategy and system configuration. Consult the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed explanations of the policy attributes.

Description of Policy Attributes

Attribute	Description
Policy type	Determines the type of clients that can be in the policy and in some cases the types of backups that can be performed on those clients. To use NetBackup for Oracle on UNIX, you must have defined at least one Oracle policy.
Keyword phrase to associate with the backup	For NetBackup for Oracle on UNIX, the keyword phrase entry is ignored.
Advanced Client	See the "Using NetBackup for Oracle on UNIX with Advanced Client" chapter for information on configuring policies for snapshot methods.

Adding New Schedules

Each policy has its own set of schedules. These schedules control initiation of automatic backups and also specify when user operations can be initiated.

An Oracle backup or XML export requires an Application Backup schedule, which is created automatically when you create a Oracle policy. The Application Backup schedule is used to initiate and manage the backup operation. You also need one or more Automatic Backup schedules, if you plan to have NetBackup perform automatic, scheduled backups.

The following procedures explain how to configure the required schedule types, and how to add new schedules. The procedures start on the Policy dialog. To see the Policy dialog, double-click the policy name in the Policies list of the NetBackup Administration Console.

▼ **To configure an Application Backup schedule**

1. On the Policy dialog, click the **Schedules** tab.

2. Double-click on the schedule named **Default**-**Application**-**Backup**.

   A dialog is displayed.

   All Oracle database operations are performed through NetBackup for Oracle on UNIX using an Application Backup schedule. This includes those backups started automatically.

   You must configure an Application Backup schedule for each Oracle policy you create. If you do not do this, you will not be able to perform a backup. To help satisfy this requirement, an Application Backup schedule named **Default**-**Application**-**Backup** is automatically created when you configure a new Oracle policy.

3. Specify the other properties for the schedule as explained in "Schedule Properties."

   The backup window for an Application Backup schedule must encompass the time period during which all NetBackup jobs, scheduled and unscheduled, will occur. This is necessary because the Application Backup schedule starts processes that are required for all NetBackup for Oracle on UNIX backups, including those started automatically.

   For example, assume that you:

   • expect users to perform NetBackup operations during business hours, 0800 to 1300.

   • configured automatic backups to start between 1800 and 2200.

   The Application Backup schedule must have a start time of 0800 and a duration of 14 hours.

Example Settings for an Application Backup schedule

Type of Backup	Schedule settings	Description	Settings
Application Backup	Retention	The length of time backup images are stored.	2 weeks
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 00:00:01 - 23:59:59

| **Tip** | Set the time period for the Application Backup schedule for 24 hours per day, seven days per week. This ensures that your NetBackup for Oracle on UNIX operations are never locked out due to the Application Backup schedule. |

| **Tip** | For an XML Export backup to be used for database archiving purposes, set the **Retention** to infinity. |

▼ **To configure an automatic backup schedule**

1. On the Policy dialog, click the **Schedules** tab.

2. Click **New**.

   A dialog is displayed. The title bar shows the name of the policy to which you are adding the schedules.
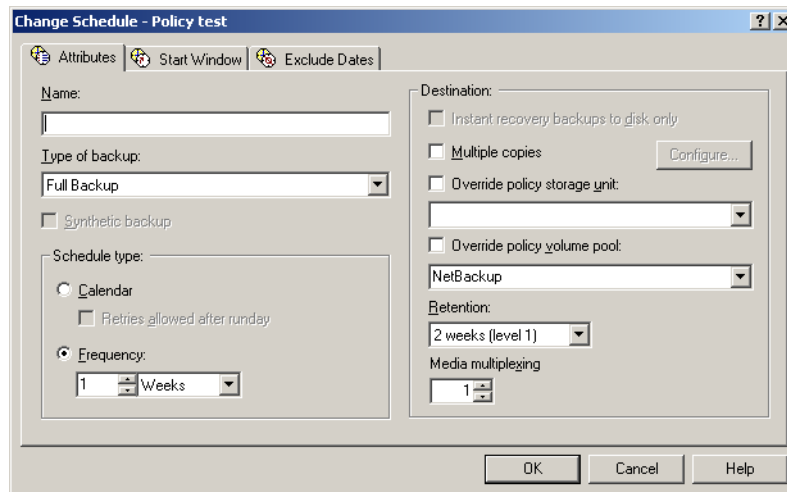
3. Specify a unique name for the schedule.

4. Select the **Type of backup**.

   For information on the types of backups available for this policy, see "Types of Backups."

| **Tip** | For an XML Export backup to be used for database archiving purposes, set the **Retention** to infinity. |

Refer to the following tables for example settings for an Automatic Backup schedule

Type of Backup	Schedule settings	Description	Settings
Automatic Full Backup	Retention	The length of time to store the record of a backup.	2 weeks
	Frequency	Frequency determines how often a backup should be performed	every week
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday, 18:00:00 - 22:00:00
Automatic Differential Incremental Backup	Retention	The length of time to store the record of a backup.	1 week
	Frequency	Frequency determines how often a backup should be performed	every day
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 18:00:00 - 22:00:00
Automatic Cumulative Incremental Backup	Retention	The length of time to store the record of a backup.	1 week
	Frequency	Frequency determines how often a backup should be performed	every day
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 18:00:00 - 22:00:00

5. Specify the other properties for the schedule as explained in "Schedule Properties."

When a schedule is executed, NetBackup sets environment variables based on which type of automatic backup schedule is selected. These environment variables can then be used to conditionally start a backup. Refer to "Environment Variables Set Up by NetBackup for Oracle on UNIX" on page 107.

6. Click **OK**.

7. To add other schedules, repeat step 1 through step 6.

Types of Backups

Description of Backup Types for Oracle

Application Backup	The Application Backup schedule enables user-controlled NetBackup operations performed on the client. At least one Application Backup schedule type must be configured for each Oracle policy. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.
Automatic Full Backup	A full backup copies all blocks into the backup set, skipping only datafile blocks that have never been used. The Automatic Full Backup schedule enables scheduled NetBackup operations performed on the client. It is used to automatically execute a backup or XML export template or script.
Automatic Differential Incremental Backup	In a differential level n incremental datafile 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 modified since the last level 2, level 1, or level 0 backup. Incremental backups are differential by default. The Automatic Differential Incremental Backup schedule should not be used for Oracle XML Exports.
Automatic Cumulative Incremental Backup	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 changed since the most recent level 1 or level 0 backup. Cumulative incremental backups reduce the work 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 done by previous backups at the same level. The Automatic Cumulative Incremental Backup schedule should not be used for Oracle XML Exports.

Schedule Properties

Some of the schedule properties have a different meaning for database backups than for a regular file system backup. These properties are explained in the following table.

Other schedule properties vary according to your specific backup strategy and system configuration. Consult the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed explanations of the schedule properties.

Description of Schedule Properties

Property	Description
Type of backup	Specifies the type of backup that this schedule will control. The selection list shows only the backup types that apply to the policy you are configuring.
	For more information see the following section "Types of Backups."
Frequency	This setting is used only for scheduled backups, and not for user-directed backups. **Frequency** specifies the period of time that will elapse until the next backup or archive operation can begin on this schedule. For example, if the frequency is seven days and a successful backup occurs on Wednesday, the next full backup will not occur until the following Wednesday. Normally, incremental backups will have a shorter frequency than full backups.
Calendar	This setting is used only for scheduled backups, and not for user-directed backups. The **Calendar** option allows you to schedule backup operations based on specific dates, recurring week days, or recurring days of the month.

Description of Schedule Properties (continued)

Property	Description
Retention	**Frequency based scheduling**
	The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps backup images.
	The retention period for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedule controls how long NetBackup keeps records of when scheduled backups have occurred.
	The NetBackup scheduler compares the latest record to the frequency 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 will be unpredictable. However, if you set the retention period to be longer than necessary, the NetBackup catalog will accumulate unnecessary records. *Therefore, set a retention period that is <u>longer</u> 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.
	Note Oracle is not notified when NetBackup expires a backup image. You must 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 at a period of years, or infinity.
	Calendar based scheduling
	The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps backup images.
	The retention period for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedule controls how long NetBackup keeps records of when scheduled backups have occurred. However, this setting is not significant for calendar based scheduling.
Multiple copies	If you are licensed for the Inline Tape Copy feature and wish to specify multiple copies for your Oracle policy, configure **Multiple copies** on the Application Backup schedule.

Expiration of Backup Files

NetBackup and Oracle each maintain a repository for RMAN-initiated backup image information. Currently, automatic expiration of backup images from both repositories is not supported.

The following describes how to expire images and synchronize the NetBackup and the Oracle repositories.

Expiration of Backup Images from the NetBackup Repository Using Retention Level.

NetBackup automatically controls the expiration of the Oracle backup images from its repository using the retention setting in an Application Backup schedule.

Use the retention setting to specify the length of time before NetBackup expires a backup image. Note that the retention setting has a slightly different meaning for an Application Backup schedule and an automatic backup schedule. See "Schedule Properties" for more details.

When you use the retention setting to expire backup images, you must perform periodic Oracle repository maintenance to remove references to expired backup files.

Oracle Recovery Manager Repository Maintenance. 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. For more information on the RMAN repository maintenance commands, refer to "Maintaining the RMAN Repository" on page 128.

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

Adding Clients to a Policy

The client list is the list of clients on which your NetBackup for Oracle template or shell 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 will attempt to execute each template in the Backup Selections list for each client in the Client list. If a template is not valid on a particular client, for example, the Oracle HOME specified in the template does not exist on that client, the template will be skipped. A policy can contain multiple clients and multiple templates, with a subset of the templates valid on each client. If the valid templates are successful, the entire backup is successful.

This procedure starts in the Policy dialog. To see the Policy dialog, double-click the policy name in the Policies list in the NetBackup Administration Console.

Requirements for clients

The following software must be installed on the client:

◆ Oracle

◆ NetBackup client or server

◆ NetBackup for Oracle on UNIX

◆ the backup or XML export archive shell script(s) (unless you are using templates)

▼ **To add clients to a policy**

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

2. Click **New**.

3. Enter the name of the client you want to add.

   • Type the name into the client list and click **OK**.

   If NetBackup cannot detect the hardware and operating system, a dialog will be displayed so you can specify this information.

   OR

   • Click the **Browse for Computer** button to choose the client from the network:

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

4. To add another client, repeat step 2 and step 3. If this is the last client, click **OK** to close the dialog.

Specifying the List of Backup Selections

The Backup Selections list in a database policy has a different meaning than for non-database policies. For example, in a Standard policy, the list contains files and directories to be backed up. In a database policy, you specify templates or scripts to be run.

For a discussion of NetBackup for Oracle templates and shell scripts, see "Creating Templates and Shell Scripts" on page 109.

Add templates or scripts only if you are setting up a policy for automatic scheduling. All templates or scripts listed in the Backup Selections list will be executed for the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedules, as specified under the **Schedules** tab, and manual backups. NetBackup will start backups according to the order that templates or scripts appear in the Backup Selections list.

The following procedure starts in the Policy dialog. To see the Policy dialog, double-click the policy name in the Policies list in the NetBackup Administration Console.

▼ **To add templates or scripts to the Backup Selections list**

Caution Be sure to use the correct NetBackup for Oracle template or shell script name in the Backup Selections list to prevent an error or possibly a wrong operation.

1. In the Policy dialog, click the **Backup Selections** tab.

2. Click **New**.

3. Enter the name of the selection.

    Templates:

    - Type the name of the template with the .tpl extension. Do not include the full path. For example, type weekly_full_backup.tpl.

      OR

    - Click the **Template** button.

      The Select Template dialog is displayed.
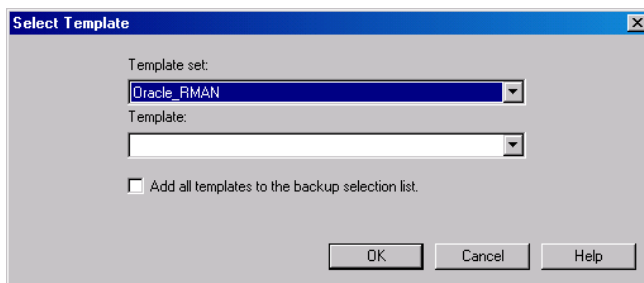
    Select the **Template set** and **Template** from the drop-down list and click **OK**.

    Templates are stored on the NetBackup master server and do not need to be installed on each client.

    Scripts:

    - Type the name of the script.

      Be sure to specify the full pathname when listing Oracle scripts. For example:

      ```
      install_path/netbackup/ext/db_ext/oracle/samples/rman/cold_database_backup.sh
      ```

      Be sure that the Oracle scripts listed here are installed on each client in the Client list.

      OR

 • Click the **Remote Folder** button.

The Browse window is displayed. Navigate to the script file and select the file. Click **OK**.

4. Click **OK**.

Configuration Using the NetBackup Administration Console for UNIX

Although the database agent is installed on the NetBackup client, some configuration procedures are performed using the NetBackup Administration Console on the server.

These procedures include:

◆ Configuring media using Media and Device Management

◆ Setting the **Maximum Jobs per Client** property

◆ Configuring a NetBackup policy

◆ Testing NetBackup for Oracle on UNIX configuration settings

See the next section for instructions on starting the NetBackup Administration Console.

▼ **To launch the NetBackup Administration Console for UNIX**

1. Log onto the UNIX server as root.

2. Start the NetBackup Administration Console by executing:

*install_path***/netbackup/bin/jnbSA &**

The login dialog is displayed.
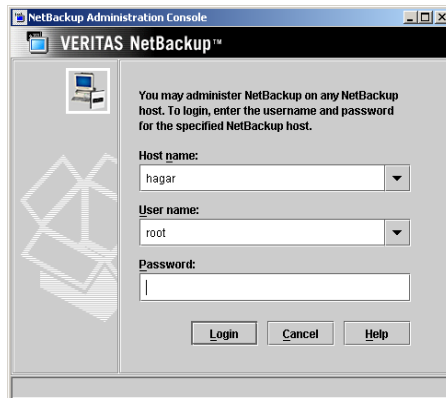
3. Type the name of the master server where you initially want to manage NetBackup. You can specify any NetBackup master server. Indicate the User and Password.

4. Click **Login**. The NetBackup Administration Console is displayed.

Configuring Media Using Media and Device Management

Use the Media and Device Management (Media Manager) to configure media for a NetBackup for Oracle on UNIX configuration. Refer to the *NetBackup Media Manager System Administrator's Guide* for more information.

The number of volumes required will depend on the devices used, the size of the Oracle databases that you are backing up, the amount of Oracle data that you are archiving, and the frequency of backups or archives.

Setting the Maximum Jobs Per Client Property

The **Maximum jobs per client** attribute value is figured with the following formula.

Maximum Jobs per Client = *Number of Streams* x *Number of Policies*

Where:

◆ *Number of Streams* is 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* is the number of policies that may back up this client at the same time. This number can be greater than one. For example, a client may be in two policies in order to back up two different databases. These backup windows may overlap.

For Oracle backups and restores, the number of jobs is hard to determine, as Oracle internally determines when and how many streams to run in parallel to optimize performance.

Tip To avoid any problems, we recommend that you enter a high enough value for the **Maximum jobs per client** property to meet the number of jobs executed by Oracle.

▼ **To set the Maximum jobs per client property using the NetBackup Administration Console for UNIX**

1. In the left pane of the NetBackup Administration Console, expand **Host Properties**. Select **Master Servers**.

2. In the right pane, double-click on the server icon. Click **Global Attributes**.

The Master Server Properties dialog is displayed.
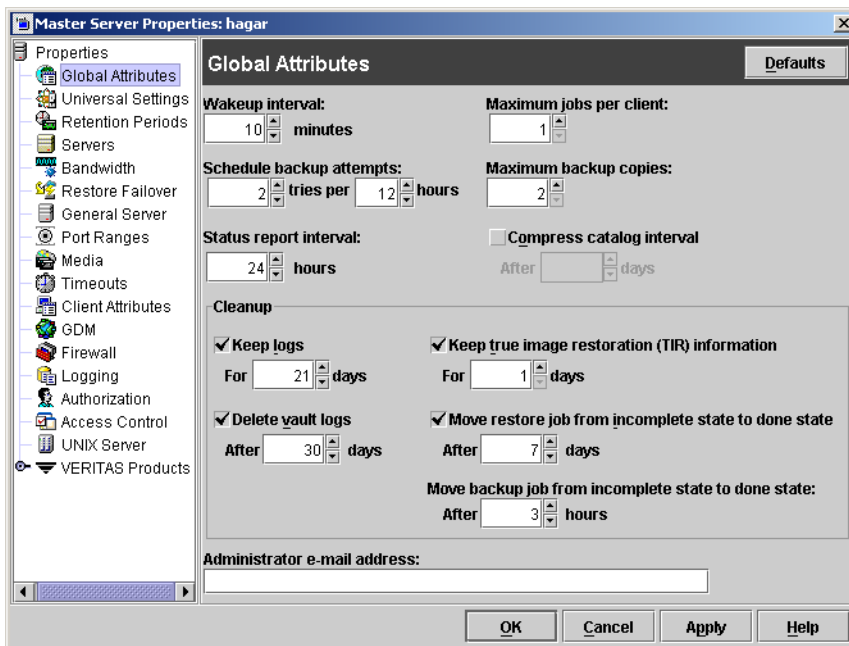
The default value is 1 for **Maximum jobs per client**.

3. Change the **Maximum jobs per client** value to 99.

If you prefer to enter a lower value, calculate the value equal to the maximum number of backups allowed per client using the formula provided above.

Configuring a NetBackup Policy

A NetBackup policy defines the backup criteria for a specific group of one or more clients. These criteria include:

◆ storage unit and media to use

◆ backup schedules

◆ clients to be backed up

◆ backup templates or script files to be executed on the clients

To use NetBackup for Oracle on UNIX, at least one Oracle policy with the appropriate schedules needs to be defined. 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 Oracle policies are the same as for file system backups. In addition to the attributes described here, there are other attributes for a policy to consider. Refer to the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed configuration instructions and information on all the attributes available.

Adding New Policies

Adding New Policies

Use this procedure when configuring a policy from a UNIX server.

▼ **To add a new policy**

1. Log onto the server as root.

2. Start the NetBackup Administration Console.

3. If your site has more than one master server, choose the one to which you want to add the policy.

4. In the left pane, click on **Policies**. The right pane splits into an All Policies pane and a details pane.

5. In the All Policies pane, right-click on the Master Server, and click **New**.

   The Add a New Policy dialog is displayed.
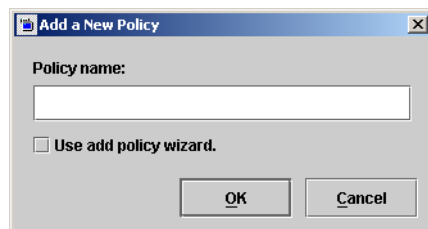
        a. In the **Policy name** box, type a unique name for the new policy.

        b. Choose whether to use the wizard for configuring the policy. The wizard guides you through most of the setup process and simplifies it by automatically choosing default values that are good for most configurations. If necessary, you can change the defaults later by editing the policy. You will need to manually add entries to the Backup Selections list after completing the wizard.

           • To use the wizard, select the **Use add policy wizard** box and click **OK**. The wizard starts and you create the policy by following the prompts. When prompted, select the Oracle policy type.

Note The Oracle policy type will not appear in the drop-down list unless your server has a license key for NetBackup for Oracle on UNIX.

           • If you require more control over the settings than the wizard provides, do not select the **Use add policy wizard** box and proceed to step 6.

6. Click **OK**.

A dialog is displayed in which you can specify the general attributes for the policy.
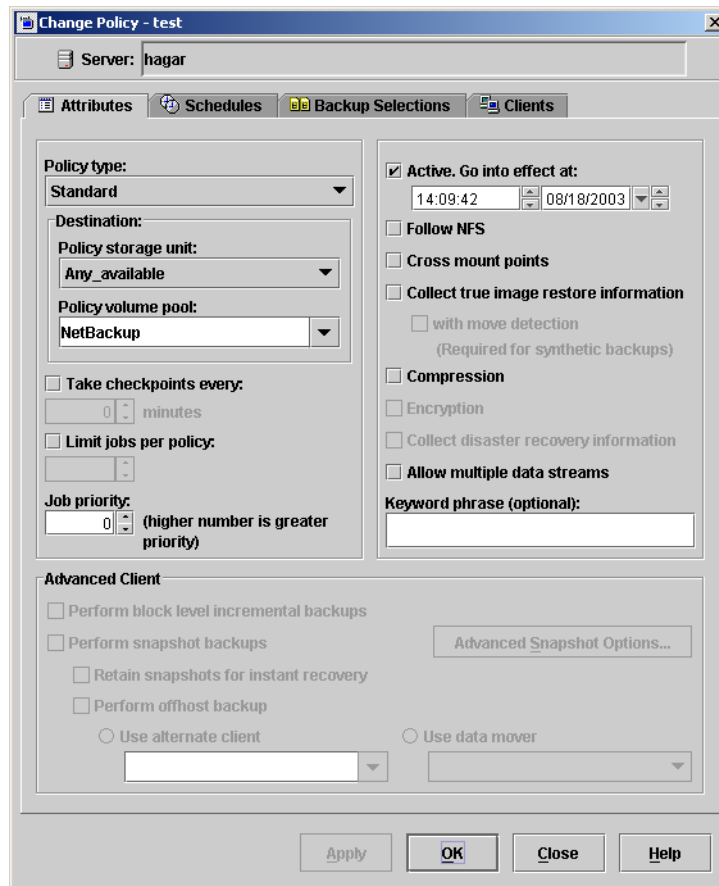
7. From the **Policy type** box, select the Oracle policy type.

8. Complete the entries on the **Attributes** tab as explained in "Description of Attributes" and click **Apply** to save the attribute entries.

9. Add other policy information:

   • To add schedules, see "Adding New Schedules."

   • To add clients, see "Adding Clients to a Policy."

   • To add templates or shell scripts, see "Specifying the List of Backup Selections."

10. Click **Apply**. The new policy is created.

Description of Attributes

With a few exceptions, NetBackup manages a database backup like a file system backup. Policy attributes that are different for Oracle backups are explained below.

Your other policy attributes will vary according to your specific backup strategy and system configuration. Consult the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed explanations of the policy attributes.

Description of Policy Attributes

Attribute	Description
Policy type	Determines the type of clients that can be in the policy and in some cases the types of backups that can be performed on those clients. To use NetBackup for Oracle on UNIX, you must have defined at least one Oracle policy.
Keyword phrase to associate with the backup	For NetBackup for Oracle on UNIX, the keyword phrase entry is ignored.
Advanced Client	See the "Using NetBackup for Oracle on UNIX with Advanced Client" chapter for information on configuring policies for snapshot methods.

Adding New Schedules

Each policy has its own set of schedules. These schedules control initiation of automatic backups and also specify when user operations can be initiated.

An Oracle backup or XML export requires at least two specific schedule types: an Application Backup schedule and an Automatic Backup schedule. You can also create additional schedules.

The following procedures explain how to configure the required schedule types, and how to add other new schedules. The procedures start from the Policy dialog. To see the Policy dialog, double click the policy in the policy list in the left pane of the NetBackup Administration Console.

▼ **To configure an Application Backup schedule**

1. In the Policy dialog, click the **Schedules** tab.

2. In the Schedule list, double-click on the schedule named **Default-Application-Backup**.

A dialog is displayed. The title bar shows the name of the policy to which you are adding the schedule.

All Oracle database operations are performed through NetBackup for Oracle on UNIX using an Application Backup schedule. This includes those backups started automatically.

You must configure an Application Backup schedule for each Oracle policy you create. If you do not do this, you will not be able to perform a backup. To help satisfy this requirement, an Application Backup schedule named *Default-Application-Backup* is automatically created when you configure a new Oracle policy.

3. Specify the other properties for the schedule as explained in "Schedule Properties."

The backup window for an Application Backup schedule must encompass the time period during which all NetBackup jobs, scheduled and unscheduled, will occur. This is necessary because the Application Backup schedule starts processes that are required for all NetBackup for Oracle on UNIX backups, including those started automatically.

For example, assume that you:

• expect users to perform NetBackup operations during business hours, 0800 to 1300.

• configured automatic backups to start between 1800 and 2200.

The Application Backup schedule must have a start time of 0800 and a duration of 14 hours.

> **Tip** Set the time period for the Application Backup schedule for 24 hours per day, seven days per week. This ensures that your NetBackup for Oracle on UNIX operations are never locked out due to the Application Backup schedule.

Example Settings for an Application Backup schedule

Type of Backup	Schedule settings	Description	Settings
Application Backup	Retention	The length of time backup images are stored.	2 weeksinfinity
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 00:00:01 - 23:59:59

> **Tip** For an XML Export backup to be used for database archiving purposes, set the **Retention** to infinity.

▼ **To configure an automatic backup schedule**

1. In the Policy dialog, click the **Schedules** tab.

2. Click **New**.

A dialog is displayed. The title bar shows the name of the policy to which you are adding the schedules.
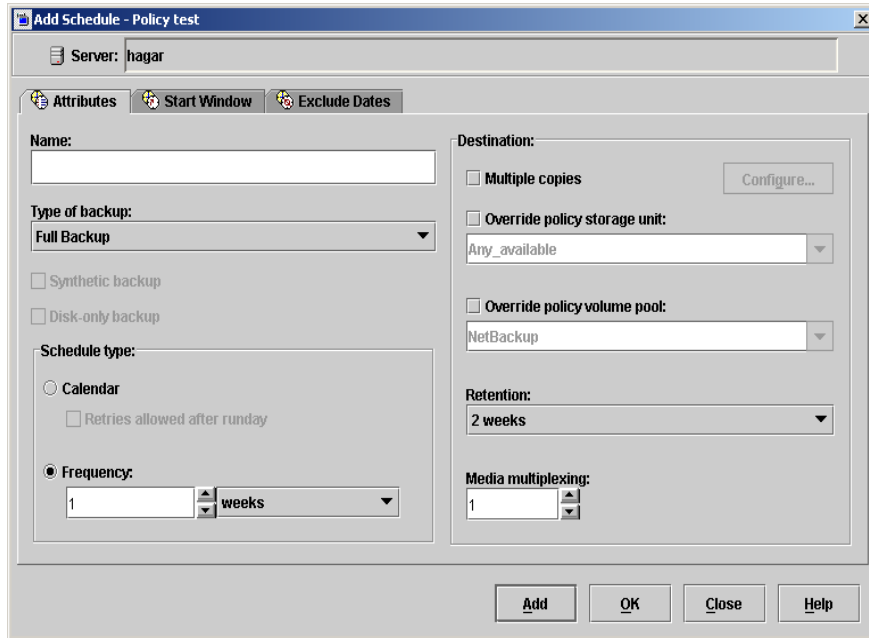
3. Specify a unique name for the schedule.

4. Select the **Type of Backup**.

For information on the types of backups available for this policy, see "Types of Backups."

Refer to the following tables for example settings for an Automatic Backup schedule.

Type of Backup	Schedule settings	Description	Settings
Automatic Full Backup	Retention	The length of time to store the record of a backup.	2 weeks
	Frequency	Frequency determines how often a backup should be performed	every week
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday, 18:00:00 - 22:00:00

Type of Backup	Schedule settings	Description	Settings
Automatic Differential Incremental Backup	Retention	The length of time to store the record of a backup.	1 week
	Frequency	Frequency determines how often a backup should be performed	every day
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 18:00:00 - 22:00:00
Automatic Cumulative Incremental Backup	Retention	The length of time to store the record of a backup.	1 week
	Frequency	Frequency determines how often a backup should be performed	every day
	Backup Window	The time during which a NetBackup operation can be performed.	Sunday through Saturday 18:00:00 - 22:00:00

Tip   For an XML Export backup to be used for database archiving purposes, set the **Retention** to infinity.

5. Specify the other properties for the schedule as explained in "Schedule Properties."

When a schedule is executed, NetBackup sets environment variables based on which type of automatic backup schedule is selected. These environment variables can then be used to conditionally start a backup. Refer to "Environment Variables Set Up by NetBackup for Oracle on UNIX" on page 107.

6. If this is the last schedule, click **OK**.

To add other schedules, click **Add** and repeat step 1 through step 6.

Types of Backups

Description of Backup Types for Oracle

Application Backup   The Application Backup schedule enables user-controlled NetBackup operations performed on the client. At least one Application Backup schedule type must be configured for each Oracle policy. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.

Description of Backup Types for Oracle

Automatic Full Backup	A full backup copies all blocks into the backup set, skipping only datafile blocks that have never been used. The Automatic Full Backup schedule enables scheduled NetBackup operations performed on the client. It is used to automatically execute a backup or XML export template or script.
Automatic Differential Incremental Backup	In a differential level n incremental datafile 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 modified since the last level 2, level 1, or level 0 backup. Incremental backups are differential by default.
	The Automatic Differential Incremental Backup schedule should not be used for Oracle XML Exports.
Automatic Cumulative Incremental Backup	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 changed since the most recent level 1 or level 0 backup.
	Cumulative incremental backups reduce the work 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 done by previous backups at the same level.
	The Automatic Cumulative Incremental Backup schedule should not be used for Oracle XML Exports.

Schedule Properties

Some of the schedule properties have a different meaning for database backups than for a regular file system backup. These properties are explained in the following table.

Other schedule properties vary according to your specific backup strategy and system configuration. Consult the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for detailed explanations of the schedule properties.

Description of Schedule Properties

Property	Description
Type of backup	Specifies the type of backup that this schedule will control. The selection list shows only the backup types that apply to the policy you are configuring.
	For more information see the following section "Types of Backups."

Description of Schedule Properties (continued)

Property	Description
Frequency	This setting is used only for scheduled backups, and not for user-directed backups. **Frequency** specifies the period of time that will elapse until the next backup or archive operation can begin on this schedule. For example, if the frequency is seven days and a successful backup occurs on Wednesday, the next full backup will not occur until the following Wednesday. Normally, incremental backups will have a shorter frequency than full backups.
Calendar	This setting is used only for scheduled backups, and not for user-directed backups. The **Calendar** option allows you to schedule backup operations based on specific dates, recurring week days, or recurring days of the month.

Description of Schedule Properties (continued)

Property	Description
Retention	**Frequency based scheduling**
	The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps backup images.
	The retention period for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedule controls how long NetBackup keeps records of when scheduled backups have occurred.
	The NetBackup scheduler compares the latest record to the frequency 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 will be unpredictable. However, if you set the retention period to be longer than necessary, the NetBackup catalog will accumulate unnecessary records. *Therefore, set a retention period that is <u>longer</u> 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.
	Note Oracle is not notified when NetBackup expires a backup image. You must 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 at a period of years, or infinity.
	Calendar based scheduling
	The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps backup images.
	The retention period for an Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedule controls how long NetBackup keeps records of when scheduled backups have occurred. However, this setting is not significant for calendar based scheduling.
Multiple copies	If you are licensed for the Inline Tape Copy feature and wish to specify multiple copies for your Oracle policy, configure **Multiple copies** on the Application Backup schedule.

Expiration of Backup Files

NetBackup and Oracle each maintain a repository for RMAN-initiated backup image information. Currently, automatic expiration of backup images from both repositories is not supported.

The following describes how to expire images and synchronize the NetBackup and the Oracle repositories.

Expiration of Backup Images from the NetBackup Repository Using Retention Level.

NetBackup automatically controls the expiration of the Oracle backup images from its repository using the retention setting in an Application Backup schedule.

Use the retention setting to specify the length of time before NetBackup expires a backup image. Note that the retention setting has a slightly different meaning for an Application Backup schedule and an automatic backup schedule. See "Schedule Properties" for more details.

When you use the retention setting to expire backup images, you must perform periodic Oracle repository maintenance to remove references to expired backup files.

Oracle Recovery Manager Repository Maintenance. 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. For more information on the RMAN repository maintenance commands, refer to "Maintaining the RMAN Repository" on page 128.

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

Adding Clients to a Policy

The client list is the list of clients on which your NetBackup for Oracle on UNIX backups will be performed. A NetBackup client must be in at least one policy but can be in more than one.

NetBackup will attempt to execute each template in the Backup Selections list for each client in the Client list. If a template is not valid on a particular client, for example, the Oracle HOME specified in the template does not exist on that client, the template will be skipped. A policy can contain multiple clients and multiple templates, with a subset of the templates valid on each client. If the valid templates are successful, the entire backup is successful.

This procedure starts from the Policy dialog. To see the Policy dialog, double-click the policy in the policy list in the left pane of the NetBackup Administration Console.

Requirements for clients

The following software must be installed on the client:

- ◆ Oracle
- ◆ NetBackup client or server
- ◆ NetBackup for Oracle on UNIX
- ◆ the backup or XML export shell script(s) (unless you are using templates)

▼ **To add clients to a policy**

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

2. On the **Clients** tab, click **New**.

   The Add Client dialog is displayed. The title bar shows the name of the policy where you are adding clients.
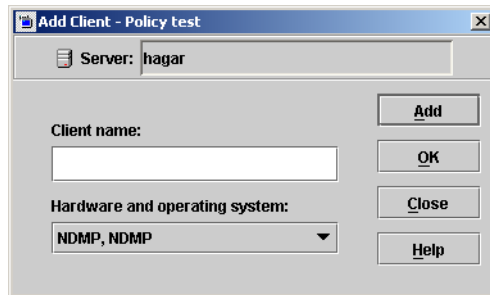
3. In the **Client name** text box, type the name of the client that you are adding.

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

4. Choose the **Hardware and operating system** type and click **Add**.

5. If this is the last client, click **OK**. If you are going to add more clients, repeat step 3 and step 4.

Specifying the List of Backup Selections

The Backup Selections list in a database policy has a different meaning than for non-database policies. For example, in a Standard policy, the list contains files and directories to be backed up. In a database policy, the list contains templates or script.

For a discussion of NetBackup for Oracle templates and shell scripts, see "Creating Templates and Shell Scripts" on page 109.

Add templates or scripts only if you are setting up a policy for automatic scheduling. All templates or scripts listed in the Backup Selections list will be executed for the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup schedules as specified under the **Schedules** tab. NetBackup will start backups by running the templates or scripts in the order that they appear in the Backup Selections list.

The following procedure starts from the Policy dialog. To see the Policy dialog, double-click the policy in the **Policies** list in the NetBackup Administration Console.

▼ **To add templates or scripts to the Backup Selections List**

Caution   Be sure to use the correct NetBackup for Oracle template or shell script name in the Backup Selections list to prevent an error or possibly a wrong operation.

1. In the Policy dialog, click the **Backup Selections** tab.

2. Click **New**.

   A dialog is displayed. The title bar shows the name of the policy to which you are adding the template or script.
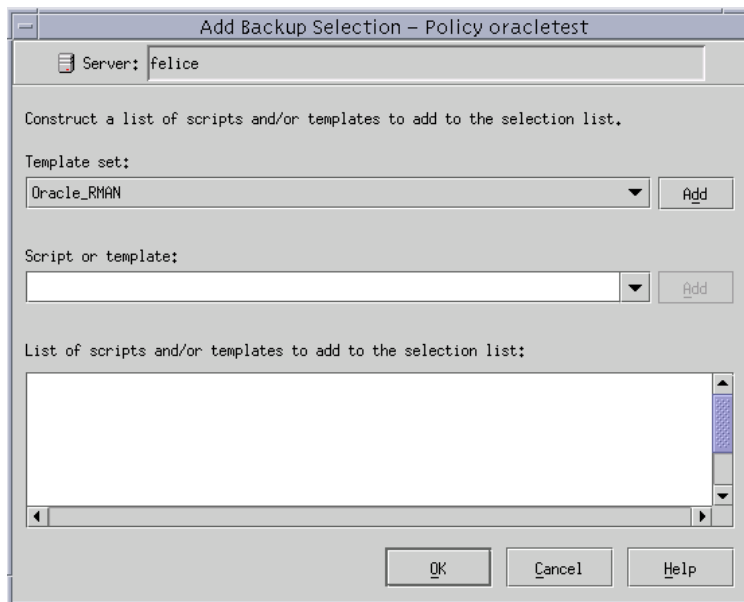
3. Type the name of the Oracle template or shell script.

   Templates:

From the **Template set** list, choose the template type by operation. Then choose the correct template from the drop-down **Script or template** list. You can also type in the name of a template. Since templates are stored in a known location on the master server, they do not need to be installed on each client in the Clients list. Enter only the template filename, without a path. For example:

```
weekly_full_backup.tpl
```

Shell scripts:

Be sure to specify the full pathname when listing Oracle scripts. For example:

```
install_path/netbackup/ext/db_ext/oracle/samples/rman/cold_database_backup.sh
```

Be sure that the Oracle scripts listed here are installed on each client in the Client list.

4.   Click **Add**.

5.   To add more templates or scripts, repeat step 3 and step 4.

6.   When you are finished adding backup selections, click **OK**.

Configuring the Run-Time Environment

The order of precedence for run-time configuration is slightly different for scheduled backups using templates than for all other types of backups. The lists below show the order of precedence for each situation. The following is the order of precedence for the run-time configuration variable settings.

Scheduled Backups with Templates

1. Environment variables set by NetBackup for Oracle

   See "Environment Variables Set Up by NetBackup for Oracle on UNIX" on page 107 for details.

2. Environment variables set by the user

   For RMAN backups, these are set by the user with the Oracle RMAN `send` command and `parms` operand. See "Oracle RMAN Environment" on page 105 for details.

   Or, for XML export archives, environment variables are set by the user in the XML export parameter file. See "Environment Variables Set Up by a User in the XML Export Parameter File" on page 106 for details.

3. user `bp.conf`

   See "Creating a bp.conf File" on page 107 for details.

4. master `bp.conf`

   See "Creating a bp.conf File" on page 107 for details.

All Other Oracle Backups

1. Environment variables set by the user

   For RMAN backups, these are set by the user with the Oracle RMAN `send` command and `parms` operand. See "Oracle RMAN Environment" on page 105 for details.

   Or, for XML export archives, environment variables are set by the user in the XML export parameter file. See "Environment Variables Set Up by a User in the XML Export Parameter File" on page 106 for details.

   These variables can also be set by the user on the Configuration Variables screen of the template generation wizards. However, they will only apply for templates run from the client (through the wizard, or through Template Administration). When templates are run by the scheduler on the NetBackup master server, these variables are overrridden by NetBackup.

2. Environment variables set by NetBackup for Oracle

See "Environment Variables Set Up by NetBackup for Oracle on UNIX" on page 107 for details.

3. user `bp.conf`

See "Creating a bp.conf File" on page 107 for details.

4. master `bp.conf`

See "Creating a bp.conf File" on page 107 for details.

Oracle RMAN Environment

The way to set environment variables depends upon the version of Oracle you are using.

> **Note** When connecting to a database using a TNS alias, you must use a `send` command or a `parms` operand to specify environment variables. In other words, when accessing a database through a listener, the environment variables set at the system level are not visible when RMAN is running.

Templates:

With templates, NetBackup for Oracle on UNIX environment variables are specified on the NetBackup for Oracle Configuration Variables Wizard page. See "Creating RMAN Templates Using the NetBackup for Oracle RMAN Template Generation Wizard" on page 110.

Shell scripts:

Use the `send` command or the `parms` operand to specify Netbackup for Oracle on UNIX environment variables for use during a backup or restore. The `send` command was introduced with Oracle8i. If you are using an Oracle8.0.x version of RMAN you must use the `parms` operand.

The `send` command sends a vendor-specific quoted string to NetBackup for Oracle on UNIX.

For example, the following will specify what policy and server to use for a database backup.

```
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');
 }
```

Specify the variables in the string in the RMAN script after all channels have been allocated and before the `backup` command.

The `parms` operand can also be used to set environment variables at runtime.

The following example uses the `parms` operand to specify what 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_policy, NB_ORA_SERV=your_server)";
    allocate channel t2 type 'sbt_tape'
    parms="ENV=(NB_ORA_POLICY=your_policy, NB_ORA_SERV=your_server)";
    backup
    (database format 'bk_%s_%p_%t');
}
```

For more information on the `send` command and `parms` operand of an `rman` command, see the *Oracle Server Backup and Recovery Guide.*

Environment Variables Set Up by a User in the XML Export Parameter File

The NetBackup for Oracle on UNIX variables that follow can be set in the XML export parameter file for use in the Oracle user environment. With templates, these variables are set using the template generation wizard. See "Creating XML Export Templates Using the NetBackup for Oracle Wizard" on page 116.

NB_ORA_SERV	Specifies the name of NetBackup master server.
NB_ORA_CLIENT	Specifies the name of the Oracle client. .
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.

Environment Variables Set Up by NetBackup for Oracle on UNIX

When a schedule executes, NetBackup sets environment variables for templates and shell scripts to use when performing a NetBackup operation. These variables can be used to perform conditional operations. 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).

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 if this is an Automatic Full Backup.
NB_ORA_INCR	Set to 1 if this is an Automatic Differential Incremental Backup.
NB_ORA_CINC	Set to 1 if this is an Automatic Cumulative Incremental Backup.

Creating a bp.conf File

A NetBackup for Oracle on UNIX user can create an Oracle client `bp.conf` file in the Oracle user's home directory on the NetBackup for Oracle on UNIX client host. When a NetBackup for Oracle on UNIX operation is started, the user's `bp.conf` file is searched before the master configuration file (*install_path*/netbackup/bp.conf) on the client. Any option found at the user level takes precedence over the same option in the master level configuration.

The following options can be set in the user's `bp.conf` file:

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. It is especially useful for a redirected restore operation.

CLIENT_READ_TIMEOUT	This option specifies the number of seconds the Oracle client will initially wait for a response from the NetBackup server. The default value is 300. NetBackup recommends a setting of 900 for database agent backups.
SERVER	This option specifies the name of the NetBackup master server.
VERBOSE	This option causes NetBackup to include more information in its logs.

See the *NetBackup System Administrator's Guide for UNIX* for more details and default values.

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

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

Creating Templates and Shell Scripts

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

For more information on RMAN scripts, see the *Oracle Server Backup and Recovery Guide.*

Recovery Manager (RMAN)

RMAN Templates and Shell Scripts

Templates:

The NetBackup for Oracle Backup Wizard is used to create backup templates. This wizard is initiated from the NetBackup Backup, Archive, and Restore interface. See "Creating RMAN Templates Using the NetBackup for Oracle RMAN Template Generation Wizard" on page 110.

The NetBackup for Oracle Backup Wizard does not support all of the RMAN commands and options provided by Oracle. A shell script should be written for situations where a template does not provide all of the required functionality.

Shell scripts:

Shell scripts are written by the user and must conform to RMAN and UNIX 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 "Creating RMAN Scripts Manually" on page 113 for more information on sample scripts.

NetBackup for Oracle also provides a utility, `bpdbsbora`, that can generate a shell script from a Backup Wizard template. This allows a user to create a template with the Wizard, then generate a shell script from it. The user can then run the shell script, or modify the shell script further. See "Creating RMAN Scripts Using `bpdpsbora`" on page 112.

Creating RMAN Templates Using the NetBackup for Oracle RMAN Template Generation Wizard

NetBackup for Oracle includes a Backup Wizard that solicits information about desired RMAN backup 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.

Please review your Oracle Backup and Recovery Guide for more information on backup strategies and RMAN functionality.

❖ To start the NetBackup Backup, Archive, and Restore interface, execute:

   *install_path***/netbackup/bin/jbpSA &**

If Oracle is installed, the Backup, Archive, and Restore interface for your Oracle client displays an Oracle node in the left pane. Click the **Backup Files** tab, and 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 database logon credentials are required, the following dialog appears when you select an instance to expand:
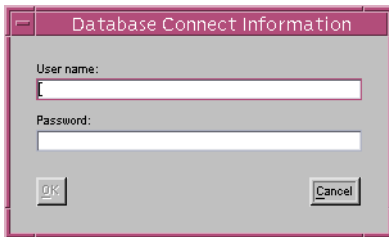
Enter your Oracle database login User name and Password with SYSDBA privileges to continue.

▼ **To use the Backup Wizard**

1. In the Backup, Archive, and Restore interface, expand an Oracle instance and select the database object(s) (datafiles, tablespaces, archived redo logs) to back up. Selecting the Oracle instance will back up the whole database using RMAN.
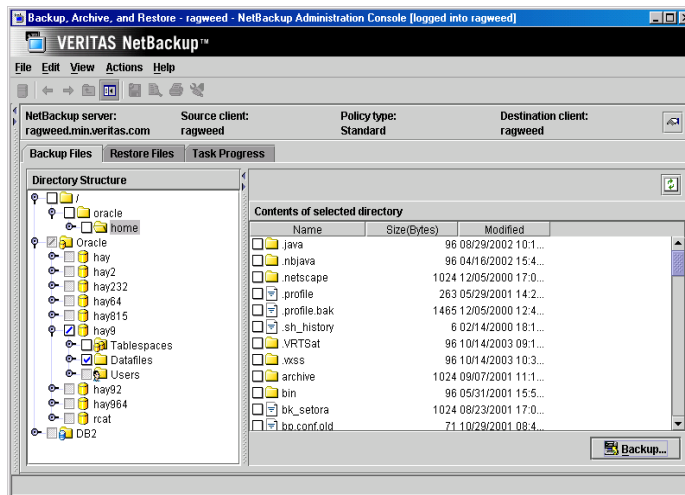
2. Click **Backup**.

The NetBackup for Oracle RMAN Template Generation Wizard displays several screens where you will enter information about the backup operation you want to perform:

• Welcome

• Target Database Logon Credentials

• Recovery Catalog Logon Credentials

• Archived Redo Logs

• Configuration Options

• Backup Options

• Database State

• NetBackup 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.

3. When you have completed the wizard, the Template Summary screen displays the summary of the backup template:
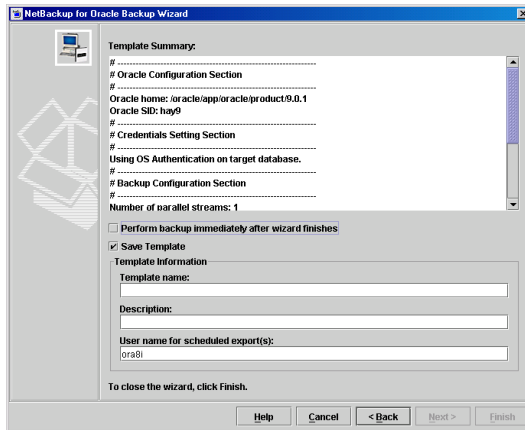
You can choose to run the template immediately after the wizard finishes or save the template to the master server, or both. For explanations of your choices, click **Help**.

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

Creating RMAN Scripts Using `bpdpsbora`

`bpdbsbora` is a NetBackup for Oracle command line utility used to initiate template based user-directed backup and recovery. This utility is also used to generate RMAN shell scripts from templates created by the Backup Wizard.

At the command prompt, type:

`bpdbsbora -backup -g` *‹script file name›* `-t` *‹template name›* `-S` *‹server name›*

The following options are supported:

`-g` *script file name*	Generates a shell script from a template. Enclose *script file name* in quotes if it contains blanks. This option may not be used with the run option. See "Using bpdbsbora" on page 140.
`-t` *template name*	Identifies the template.
	`bpdbsbora` will retrieve backup templates from a known location on the master server. Therefore, specify only the file name.

-S *server name*　　　　Identifies the master server.

bpdbsbora will retrieve backup templates from a specific master server when the server name is provided with the -S option.

Creating RMAN Scripts Manually

Oracle Recovery Manager (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 datafile backup set, you can make either an incremental backup or a full backup. An incremental backup is a backup of one or more datafiles 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 datafiles that contain all blocks of the datafiles.

When NetBackup for Oracle on UNIX was initially installed, example scripts were placed in the following directory:

install_path/netbackup/ext/db_ext/oracle/samples/rman

The Oracle example scripts installed are:

```
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
```

▼ **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. 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 will not run with the proper permissions and environment variables. The result will be problems with your database backups or restores.

The following table explains some of the sample scripts provided with NetBackup for Oracle.

NetBackup for Oracle Sample Scripts

`cold_database_backup.sh`	This example 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 executes, NetBackup sets environment variables that the script uses to perform a backup.
`hot_database_backup.sh`	This example 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 executes, NetBackup sets environment variables that the script uses to perform the backup.
	With the proper schedules this script could be used to automatically execute a backup every week on Friday night and a incremental backup each night for the rest of the week.
`cold_duplex_database_backup_full.sh`	This example sets up the environment and calls `rman` to execute commands that will make two copies of a cold (consistent) database backup.

Oracle8i and later versions of RMAN provide an API that allows you to make up to four backup sets simultaneously, each an exact duplicate of the others. Using NetBackup for Oracle, you can back up each copy to a different tape to protect against disaster, media damage, or human error. You must 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 that should be created. The set duplex command affects all channels allocated after issuing the command and is 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, two identical backup sets are produced.

Each output file must have a unique name. You should 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.

Note that you must enable the BACKUP_TAPE_IO_SLAVES initialization parameter to perform duplexed backups. RMAN will configure as many media as needed for the number of backup copies you request. For more information on BACKUP_TAPE_IO_SLAVES, see the Oracle Reference.

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

The command syntax is:

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

The keywords used to specify 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 used to specify 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.

XML Export Archive

XML Export Templates and Shell Scripts

Templates:

The NetBackup for Oracle XML Export Wizard is used to create XML export templates. This wizard is initiated from the NetBackup Backup, Archive, and Restore interface. See "Creating XML Export Templates Using the NetBackup for Oracle Wizard" on page 116.

The NetBackup for Oracle XML Export Wizard does not support all of the parameters provided by the command line utility, `bporaexp`. A shell script should be written for situations where a template does not provide all of the required functionality.

Shell scripts:

Shell scripts are written by the user and must conform to UNIX 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. See "Creating XML Export Scripts Manually" on page 119 for more information on sample scripts.

NetBackup for Oracle also provides a utility, `bpdbsbora`, that can generate a shell script from an XML Export or Import Wizard template. This allows a user to create a template with the Wizard, then generate a shell script from it. The user can then run the shell script, or modify the shell script further.

Creating XML Export Templates Using the NetBackup for Oracle Wizard

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 start the NetBackup Backup, Archive, and Restore interface on the client, enter:

install_path/**netbackup/bin/jbpSA &**

Click the **Backup Files** tab. If NetBackup for Oracle is installed, the Backup, Archive, and Restore interface for your Oracle client displays an Oracle node in the left pane.

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 login does not have Oracle SYSDBA privileges, the following dialog appears when you select an instance to expand:
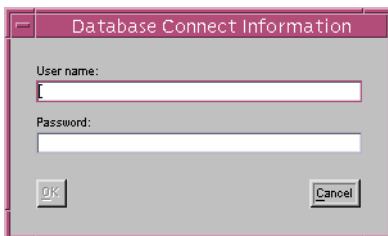
Enter your Oracle database login **User name** and **Password** with SYSDBA privileges to continue.

▼ **To use the XML Export Wizard**

1. 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 login will display.

2. Expand the User list to the schema owners of the objects to be exported.

3. In the right pane, select the Oracle objects to export.
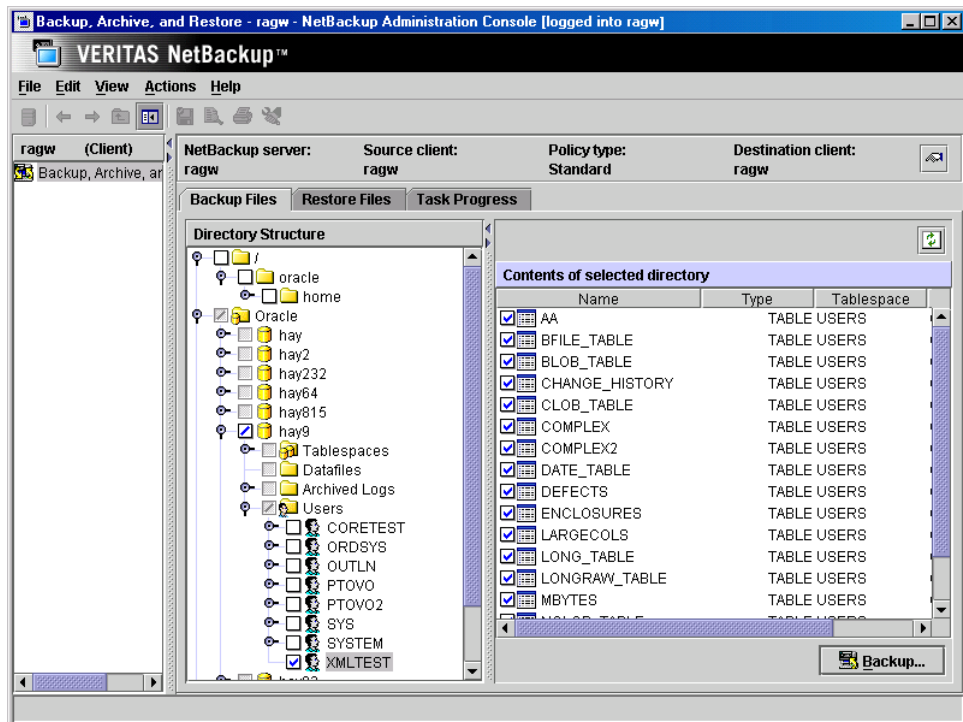
4. Click **Backup** to start the wizard.

   The NetBackup for Oracle XML Export Wizard displays several screens where you will 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.

5. When you have completed the wizard, the Template Summary screen displays the summary of the XML export template:
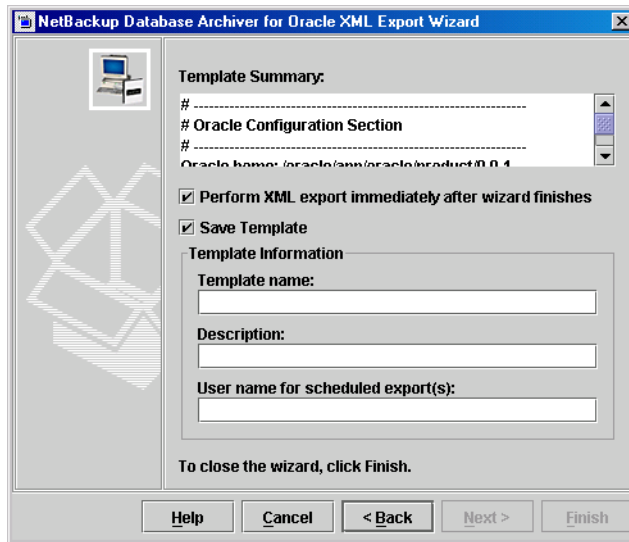
You can choose to run the template immediately after the wizard finishes or save the template to the master server, or both. For explanations of your choices, click **Help**.

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

Creating XML Export Scripts Using `bpdpsbora`

`bpdbsbora` is a NetBackup for Oracle command line utility used to initiate template based user-directed backup and recovery. This utility is also used to generate XML export shell scripts from templates created by the XML Export Wizard.

At the command prompt, type:

bpdbsbora -export -g <*script file name*> -t <*template name*> -S <*server name*>

The following options are supported:

-g *script file name*	Generates a shell script from a template. Enclose *script file name* in quotes if it contains blanks. This option may not be used with the run option. See "Using `bpdbsbora`" on page 160.

-t *template name*	Identifies the template.
	`bpdbsbora` will retrieve XML export templates from a known location on the master server. Therefore, specify only the file name.
-S *server name*	Identifies the master server.
	`bpdbsbora` will retrieve XML export templates from a specific master server when the server name is provided with the -S option.

Creating XML Export Scripts Manually

When NetBackup for Oracle on UNIX was initially installed, example scripts were placed in the following directories:

For export:

install_path/netbackup/ext/db_ext/oracle/samples/bporaexp

For import:

install_path/netbackup/ext/db_ext/oracle/samples/bporaimp

The example export scripts installed in `bporaexp` are:

```
data_archiver_export.sh
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 installed in `bporaimp` are:

```
data_archiver_import.sh
data_archiver_import64.sh
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 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. 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 will not run with the proper permissions and environment variables. The result will be problems with your database backups or restores.

Storing Templates and Shell Scripts

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 executed 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 will use the same copy of the template for each client in the policy client list.

Before executing a template on a NetBackup for Oracle client, NetBackup verifies the validity of the template for that client by checking the Oracle installation information stored in that template. Only valid templates will be executed 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 specified should include a fully qualified path to a directory where the user has write access. For information about the recovery wizard, see "Using the NetBackup for Oracle Recovery Wizard" on page 137. For information about the XML Import wizard, see "Using the NetBackup for Oracle XML Import Wizard" on page 157.

Templates store encrypted passwords that are decrypted at runtime.

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. This means that 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 "Specifying the List of Backup Selections" on page 101.

The backup and recovery processes sometimes require passwords for Oracle database access and/or system user accounts. Shell scripts, because a Shell interprets them, store passwords in clear text.

Testing NetBackup for Oracle on UNIX Configuration Settings

After configuring the master server for NetBackup for Oracle on UNIX, test the configuration settings. For a description of status codes, refer to the *NetBackup Troubleshooting Guide for UNIX and Windows.*

NetBackup Administration Console for Windows

Use this procedure to test a policy configuration from a Windows server or from the Remote Administration Console.

▼ **To test the configuration settings on a Windows server**

1. Log onto the server as administrator.

2. Start the NetBackup Administration Console.

3. In the left pane, click **Policies**. The policy list appears in the right pane.

4. Click on the policy you wish to test.

5. Choose **Actions** > **Manual Backup**.

The Manual Backup dialog is displayed.

The Schedules pane contains the name of a schedule (or schedules) configured for the policy you are going to test. The Clients pane contains the name of the client(s) listed in the policy you are going to test.

6. Follow the instructions on the dialog.

7. Click **Activity Monitor** on 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 will indicate where the output is stored. It is usually in the same directory as the original script, and is similarly named.
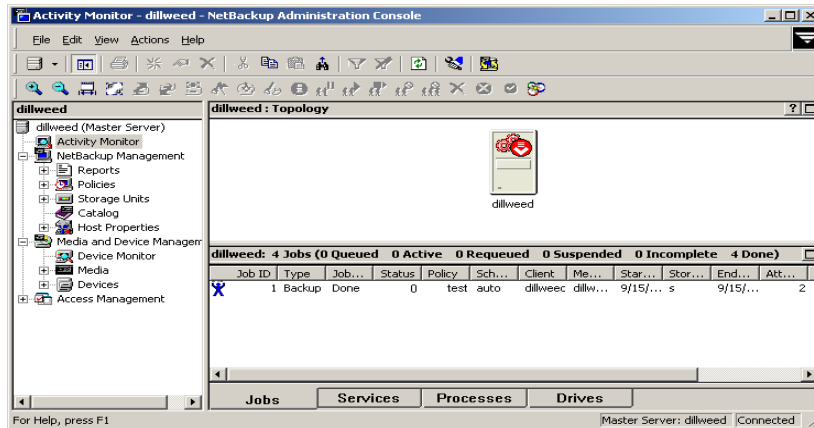
If the manual backup does not exit with a successful status (as indicated by the Activity Monitor and in the script output), refer to the Troubleshooting chapter.

NetBackup Administration Console for UNIX

Use this procedure to test a policy configuration on the NetBackup Administration Console for UNIX.

▼ **To test the configuration settings on a UNIX server**

1. Log onto the server as root.

2. Start the NetBackup Administration Console.

3. In the left pane, click **Policies**.

The right pane splits into an All Policies pane and a details pane.

4. In the All Policies pane, click the policy you wish to test.

5. Choose **Actions** > **Manual Backup**.

The Manual Backup dialog is displayed.

The Schedules pane contains the name of a schedule (or schedules) configured for the policy you are going to test. The Clients pane contains the name of the client(s) listed in the policy you are going to test.

6. Follow the instructions on the dialog.

7. Click **Activity Monitor** on 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 will indicate where the ouput is stored. It is usually in the same directory as the original script, and is similarly named.

If the manual backup does not exit with a successful status (as indicated by the Activity Monitor and in the script output), refer to the Troubleshooting chapter.

Using NetBackup for Oracle on UNIX **5**

When installation and configuration are complete, you can use the NetBackup graphical user interfaces or the command line interfaces to start Oracle backup and recovery using Oracle's RMAN utilities, and Oracle archives and restores using NetBackup's XML export (bporaexp) and import (bporaimp) utilities. The Oracle Enterprise Manager can also be used to perform Oracle backup and recovery. The Oracle RMAN command line interface is used to maintain and query the RMAN repository.

This chapter contains the following sections:

- ◆ Maintaining the RMAN Repository
- ◆ Querying the RMAN Repository
- ◆ Performing a Backup
- ◆ Browsing Backups
- ◆ Performing a Restore
- ◆ Performing Other rman Actions
- ◆ Performing an XML Export Archive
- ◆ Browsing XML Export Archives
- ◆ Performing a Restore of an XML Export Archive

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 just the control file, some RMAN commands function only when you use a recovery catalog. The following is a subset of repository maintenance commands provided by RMAN. Some of these commands may not be available with all versions of RMAN. Refer to your Oracle Backup and Recovery Guide for a complete description of maintenance commands for your version of RMAN.

Function	Description
Registering a database with the recovery catalog	Before using RMAN, you must register the target database in the recovery catalog. To do this, start and mount the target database but do not open it. At the RMAN prompt, issue a `register database` command.
Resetting the information in the recovery catalog	The `reset database` command directs RMAN to create a new database incarnation record in the recovery catalog.
Cross checking the information in the RMAN repository	Because the Media Manager can mark tapes as expired, the RMAN repository can contain outdated information. To ensure that data in the recovery catalog or control file is in sync with data in the media management catalog, perform a cross check. Use the cross check feature to:

- Determine whether a backup set is available or expired.
- Delete any expired backup sets.
- Call the media manager about the status of a backup piece and then mark it as available or expired.

Use either the `change ... crosscheck` or `crosscheck backup` command to check the specified files. Note that these commands do not delete images or repository records. You must use separate commands for these operations.

The `change ... crosscheck` command will query the media manager to determine if a backup piece is available. If a backup piece is unavailable, RMAN will mark the backup piece as expired. If it was expired but is now available, RMAN will mark the backup piece as available. The command syntax is:

```
change backuppiece {primary-key-list|filename-list|tag}
crosscheck;
change backupset {primary-key-list} crosscheck;
```

Function	Description
	The `crosscheck backupset` command will operate on available and expired backup pieces. RMAN will update their status with the result (available or expired).
	To crosscheck a database, start RMAN and connect to the target database. Also connect to the recovery catalog if one is being used. At the `rman` command prompt, issue the following commands:
	`allocate channel for maintenance type 'sbt_tape';`
	`crosscheck backupset of database;`
Deleting expired backups	The `delete expired backup` command will operate only on expired backup pieces found in the recovery catalog. RMAN will remove them from the recovery catalog.
	To delete expired backupsets of a database from the recovery catalog, start RMAN and connect to the target and recovery catalog databases. At the RMAN command prompt, issue the following commands:
	`allocate channel for maintenance type 'sbt_tape';`
	`delete expired backupset of database;`
	The crosscheck and delete backupset commands allow you to restrict the list of objects operated on to the specified device type (i.e., disk or tape), object type (i.e., archived logs or database files), and date range.
Resynchronizing the recovery catalog	RMAN compares the recovery catalog to either the current control file of the target database or a backup control file and updates it with information that is missing or changed.
	If you are running in ARCHIVELOG 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.
	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.
	The RMAN `backup`, `copy`, `restore`, and `switch` 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.
	If the recovery catalog is unavailable when you issue `backup` or `copy` commands, you should resynchronize it manually.
	To resynchronize the recovery catalog, start RMAN and issue the `resync catalog` command.

Function	Description
Changing the availability of a backup set or file copy	You may periodically need to notify RMAN that the status of a backup set, backup piece, datafile copy, or archived redo log has changed. The RMAN `change` command enables you to make a variety of useful record changes.
	The `change ... uncatalog` command removes references to a backup piece, datafile copy, or archivelog from the recovery catalog. This command works only with a recovery catalog.
	The `change ... delete` command removes references to a backup piece, datafile copy, or archivelog from the control file and recovery catalog. It physically deletes the file. This command works with or without a recovery catalog.
	The `change ... crosscheck` command removes references to a backup piece, datafile copy, or archivelog from the control file and recovery catalog when that file no longer exists. This command works with or without a recovery catalog.
	The `change ... unavailable` command marks a backup piece, datafile copy, or archivelog as unavailable. This command works only with a recovery catalog.
Validating the restore of backups	A restore validation executes a restore test run without actually restoring the files. Test the restore of the entire database or individual tablespaces, datafiles, or control files.
	Use `restore ... validate` when you want RMAN to choose which backups should be tested.
	Use `validate backupset` when you want to specify which backup sets should be tested.

Querying the RMAN Repository

RMAN allows you to 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, while the `report` command performs a more detailed analysis.

Use the report and list commands to determine what you have backed up as well as 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 questions, such as:

◆ Which files need a backup?

◆ Which files have not had a backup in a while?

◆ 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 which backups are available. You can list:

◆ Backup sets containing a backup of a specified list of datafiles.

◆ Backup sets containing a backup of any datafile that is a member of a specified list of tablespaces.

◆ All backup sets or copies of all datafiles in the database.

◆ Backup sets containing a backup of any archivelogs with a specified name and/or within a specified range.

◆ Incarnations of a specified database or of all databases known to the recovery catalog.

Refer to your *Oracle Server Backup and Recovery Guide* for more details on querying the RMAN repository.

Performing a Backup

Backups can be performed by using:

◆ Automatic Backup of an Oracle Policy

◆ Manual Backup of an Oracle Policy

◆ User-Directed Backup From the Client

    ◆ Executing the NetBackup for Oracle template on the client

        ◆ Using Oracle Template Administration

        ◆ Using `bpdbsbora`

    ◆ Executing the NetBackup for Oracle shell script on the client

    ◆ Executing `rman` on the Client

Automatic Backup of an Oracle Policy

The most convenient way to back up your database is to set up schedules for automatic backups. When the NetBackup scheduler invokes a schedule for an automatic backup, the NetBackup for Oracle backup templates or shell scripts run:

◆ In the same order as they appear in the file list

◆ On all clients in the client list

The NetBackup for Oracle backup templates or shell scripts start the database backup by executing `rman`.

When the backup is started through NetBackup, NetBackup for Oracle leaves error checking for RMAN. The `rman` command generates an error if it considers a command invalid, but allows any of the commands it normally considers valid to proceed. This means that by specifying the wrong script file name you could start an unintended operation.

Manual Backup of an Oracle Policy

The administrator can use the NetBackup server software to manually execute an automatic backup schedule for the Oracle policy. See the *NetBackup System Administrator's Guide for UNIX* or the *NetBackup System Administrator's Guide for Windows* for detailed instructions.

Refer to "Testing NetBackup for Oracle on UNIX Configuration Settings" on page 122 for instructions on initiating a manual backup of an Oracle policy.

Performing a User-Directed Backup From the Client

This section describes the following procedures for performing user-directed backups:

◆ Executing NetBackup for Oracle Backup Templates

◆ Executing the NetBackup for Oracle Shell Script

◆ Executing rman

Executing NetBackup for Oracle Templates

Using Oracle Template Administration

The Oracle Template Administration dialog 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 pre-determined location on the master server. See "Creating RMAN Templates Using the NetBackup for Oracle RMAN Template Generation Wizard" on page 110.

▼ **To use Oracle Template Administration**

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

   The Oracle Template Administration window appears:
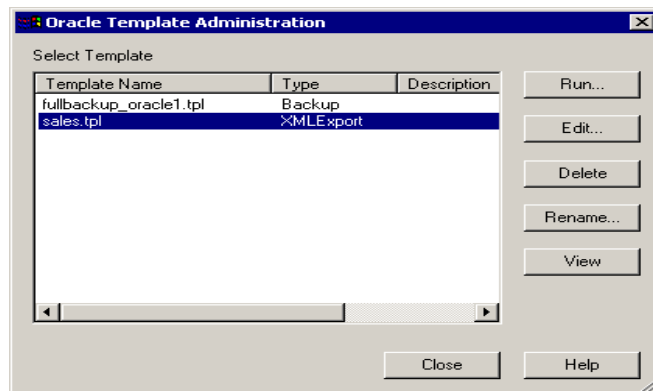
   The Select Template list shows the names and descriptions of the RMAN backup templates stored on the current master server.

2. Select the name of the backup template you wish 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	**Run** executes the selected template.
Edit	**Edit** is used to change the contents of an existing template. The selected backup template is loaded into the NetBackup for Oracle RMAN Template Generation wizard.
Delete	**Delete** is used to delete the selected template. You must be the root user or the template creator to delete a template.
Rename	**Rename** is used to change the name of the selected template. You must be the root user or the template creator to rename a template.
View	**View** is used to see a summary of the selected template.

Using `bpdbsbora` to Run a Backup Template

The bpdbsbora command allows you to run a backup template created by the NetBackup for Oracle RMAN Template Generation Wizard.

At the command prompt, type:

```
bpdbsbora -backup -r -t <template name> -S <server name> -L
<progress file>
```

where -r runs a template and -t identifies the template.

For example:

```
bpdbsbora -backup -r -t ORCL_Mon_full.tpl -S my_master -L
my_progress_log
```

bpdbsbora will retrieve backup templates from a pre-determined location on the master server. Therefore, specify only the file name.

The following options are supported:

`-backup`	Specifies the type of template.
`-r`	Runs the template.
`-t` *template name*	Identifies the template. `bpdbsbora` will retrieve backup templates from a known location on the master server. Therefore, specify only the file name.
`-S` *server name*	Identifies the master server (optional). `bpdbsbora` will retrieve backup templates from a specific master server when the server name is provided with the -S option.
`-L` *progress file*	Identifies a run-time progress log (optional). Enclose in quotes if it contains blanks.

Executing the NetBackup for Oracle Shell Script on the Client

If you know the pathname of the NetBackup for Oracle shell script that initiates the backup, you can execute the shell script from the UNIX command prompt.

For example, to perform a database backup, at the UNIX command prompt you might enter:

```
/oracle8/scripts/cold_database_backup.sh
```

The UNIX shell starts the database backup by executing the Oracle shell script. The Oracle shell script contains commands to execute `rman`.

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

install_path`/netbackup/ext/db_ext/oracle/samples/rman/`

Executing rman

As an Oracle user you can also execute the `rman` command at the UNIX command prompt with the RMAN command file as a parameter. The following describes how to set the master server to **hag** and the Oracle Policy to **obk** before starting the backup.

If you are connecting to a database using a TNS alias, you must use the RMAN send command or a `parms` operand to specify the environment variables. At the command prompt enter:

```
rman target 'internal/oracle@ORCL' rcvcat 'rman/rman@RCAT'
send "'NB_ORA_POLICY=obk,NB_ORA_SERV=hag'"cmdfile
'/oracle/scripts/cold_database_backup_level0.rcv'
```

Refer to "Creating a bp.conf File" on page 107 for details.

Browsing Backups

This section describes the following procedures for browsing backup images:

◆ Using the RMAN Repository to Browse Backups

◆ Using bplist to Browse Backups

Using the RMAN Repository to Browse Backups

You can use the RMAN `report` and `list` commands to browse Oracle backups. Refer to "Maintaining the RMAN Repository" on page 128.

Using bplist to Browse Backups

You can use the `bplist` command to browse Oracle backups. The result is the list of backup file names. The following example uses `bplist` to search all Oracle backups for a client named jupiter.

```
install_path/netbackup/bin/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 of directory levels to search, 999. Refer to `bplist(1M)` man page for more information on this command.

Performing a Restore

Make sure a backup has been successfully completed before attempting a restore. An error will occur if a backup history does not exist.

This section describes the following procedures for performing user-directed restores:

- ◆ Executing the NetBackup for Oracle Template on the Client
  - ◆ Using the NetBackup for Oracle Recovery Wizard
  - ◆ Using bpdbsbora
- ◆ Executing the NetBackup for Oracle Shell Script on the Client
- ◆ Executing rman on the client
- ◆ Redirecting a Restore to a Different Client
  - ◆ Server Configuration
  - ◆ Using rman

Executing the NetBackup for Oracle Template on the Client

Using the NetBackup for Oracle Recovery Wizard

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 that can be used immediately or saved for later use.

The NetBackup for Oracle Recovery Wizard saves a recovery template locally, in a user-specified location on the NetBackup client. Recovery templates are not stored on the server because recovery is always user directed, not scheduled. Under normal circumstances, a recovery template will be run immediately and then deleted.

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

Because recovery can be a complex process, it may be necessary to perform manual steps as part of the operation. Please review your Oracle Backup and Recovery Guide for more information.

Starting the NetBackup Backup, Archive, and Restore Interface

The NetBackup for Oracle Recovery Wizard is launched from the Backup, Archive, and Restore interface. You can access the interface through the NetBackup Administration Console, or from the command line.

❖ To start the interface from the NetBackup Administration Console, click **Backup, Archive, and Restore** in the left pane of the console.

❖ To start the NetBackup Backup, Archive, and Restore interface from the command line, execute:

   install_path/**netbackup/bin/jbpSA &**

The Restore Files tab

Click the **Restore Files** tab, and 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.

Oracle Policy Type

Note that if the Oracle node is not visible, it's possible that your NetBackup for Oracle client does not have the appropriate policy type specified. Change the policy type with the following steps.

▼ **To change the client policy type**

1. On the **Actions** menu, select **Specify NetBackup Machines**.

2. On the Specify NetBackup Machines dialog, click the **Source client/Policy type** tab.

3. In the **Policy type** drop down list, select **Oracle**.

4. Click **OK**.

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. In the Backup, Archive, and Restore interface, choose the **Restore Files** tab. Ensure that the **Restore Type** drop down is set to **Normal Backups** (the default choice).

2. Expand an Oracle instance.

3. Select the database object(s) (datafiles, tablespaces) you wish to recover. Selecting the Oracle instance will recover the entire database using RMAN.
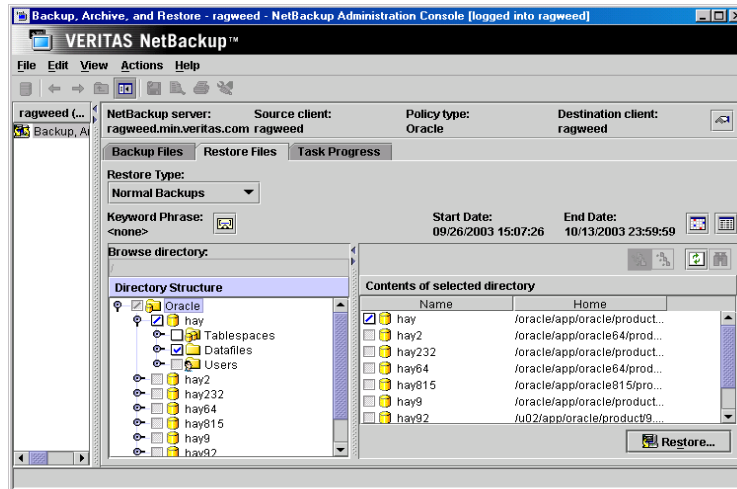
4. Click **Restore**.

The NetBackup for Oracle Recovery Wizard displays several panels where you will enter information about the recovery operation you want to perform:

- ◆ 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, or more details, click **Help** on the wizard screen.

5. When you have completed the wizard, the Selection Summary screen displays the summary of the recovery template. You can choose to run the template immediately after the wizard finishes or save the template locally, or both.
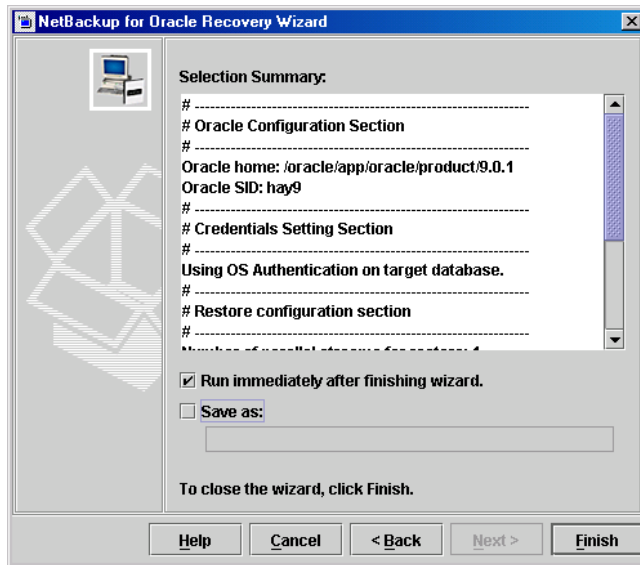
If you need an explanation of any of the fields on the wizard panels, or more details, click **Help** on the wizard panel.

Click **Finish** to run, save, or run *and* save the recovery template.

Using bpdbsbora

The bpdbsbora command allows you to run a recovery template created by the NetBackup Recovery Wizard.

At the command line, type:

```
bpdbsbora -restore -r -t <template name> -L <progress file>
```

where -r runs a template and -t identifies the template

For example:

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

Restore templates do not reside in a pre-determined 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.

The following options are supported:

`-restore`	Specifies the type of template.
`-r`	Runs the template.
`-t` *template name*	Identifies the template. `bpdbsbora` will retrieve restore templates from the client. For restores, specify the full pathname for the template location.
`-L` *progress file*	Identifies a run-time progress log (optional). Enclose in quotes if it contains blanks.

Executing a NetBackup for Oracle Shell Script on the Client

If you know the pathname of the Oracle shell script that initiates the recovery, you can start it from the UNIX command prompt. For example, to perform a database recovery at the UNIX command prompt you might enter:

```
/oracle8/scripts/database_restore.sh
```

The UNIX shell starts the database restore by executing the Oracle shell script file. The Oracle shell script file contains commands to execute `rman`.

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

install_path`/netbackup/ext/db_ext/oracle/samples/rman/`

Executing rman on the Client

Execute the `rman` command from the UNIX command line on the client, by using the appropriate RMAN command file as a parameter. This example assumes that you are logged on as an Oracle administrator.

▼ **To execute rman on the client**

At the command prompt, enter:

```
rman target 'internal/oracle@ORCL' rcvcat 'rman/rman@RCAT'
  cmdfile '/oracle8/scripts/database_restore.rcv'
```

Redirecting a Restore to a Different Client

With NetBackup for Oracle on UNIX 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.

The following illustrates a typical redirected restore process.
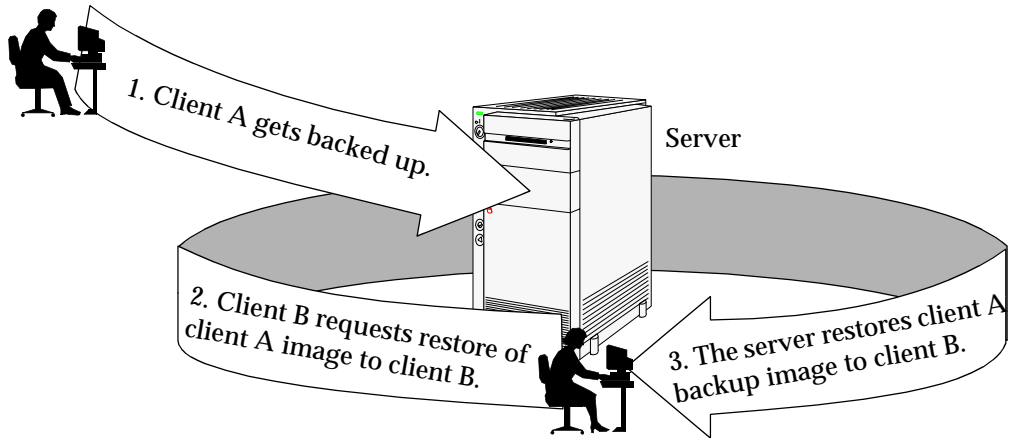
Note that the user on client A was not able to initiate a redirected restore to client B. Only the user on client B, the client receiving the backup image, could initate the redirected restore.

Note The same user name (UNIX account) that was used for the Oracle database backup must be used for the alternate client restore.

This section describes the method for redirected restore using Oracle RMAN.

Server Configuration

Ensure that the NetBackup server is configured to allow redirected restore. The administrator can remove restrictions for all clients by creating the following file on the Netbackup master sever:

install_path/netbackup/db/altnames/No.Restrictions

Or, to restrict clients to restore only from certain other clients, create the following file:

install_path/netbackup/db/altnames/*client_name*

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

See the *NetBackup System Administrator's Guide* for details.

Using RMAN to Perform a Redirected Restore

Note The same user name (UNIX account) that was used for the Oracle database backup must be used for the alternate client restore.

Perform the following on the different client host if you want to restore RMAN backups that are owned by another client.

1. Enable a network connection to the RMAN catalog database, which was used by the original client.

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

2. Set the environment variable, NB_ORA_CLIENT, to the original client.

3. Make the `init.ora` file of the source client available to the destination client. You can do this by copying the file to the destination client, or by modifying the file on the destination client. Change all location-specific parameters.

4. Grant write permission to the directory where the datafiles will be restored.

5. Set up a password file for the destination client database.

6. Start up the database in the nomount state.

7. Start `rman`, connecting to the catalog.

8. Set *dbid* to be the dbid of the source client database.

9. Connect to the target database without using a userid/password.

10. Run an RMAN restore script or type the RMAN commands for the restore.

Example

In this example assume:

- ◆ Original client is camel
- ◆ Different client is giraffe

- ◆ Server is lion
- ◆ ORACLE_SID is test
- ◆ UNIX user is ora8 on both camel and giraffe.

1. Create the file, *install_path*/netbackup/db/altnames/giraffe, on server lion and edit it to contain the name camel.

2. Log in to giraffe as ora8.

3. Set SERVER=lion in *$ORACLE_HOME*/bp.conf.

4. Modify the network tnsnames.ora file to enable RMAN catalog connection.

5. Set the environment variables ORACLE_SID to test and NB_ORA_CLIENT to camel.

6. Make sure the directory exists and has appropriate access permissions.

   The datafiles will be restored to a directory path with the same name they had when backed up.

7. Create an inittest.ora file.

8. Start up the database in a nomount state.

```
SVRMGR> startup nomount pfile=$ORACLE_HOME/dbs/inittest.ora
%rman rcvcat rman/rman@cat
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>      }


SVRMGR> alter database mount;

%orapwd file=$ORACLE_HOME/dbs/orapwtest password=<oracle>
%rman rcvcat 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>      }

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

At this point, apply the archived logs and type cancel when you decide to stop recovery.

Performing Other rman Actions

To execute script files for database operations other than backups or restores, it is recommended that you execute the rman command directly rather than using NetBackup.

For the rman command script syntax and examples, see the *Oracle Server Backup and Recovery Guide.*

Performing an XML Export Archive

XML export archives can be performed by using:

◆ Automatic Backup of an Oracle Policy

◆ Manual Backup of an Oracle Policy

◆ User-Directed XML Export From the Client

Automatic Backup of an Oracle Policy

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. When the NetBackup scheduler invokes a schedule for an automatic backup, the NetBackup for Oracle XML export templates or shell scripts run:

◆ In the same order as they appear in the file list

◆ On all clients in the client list

The NetBackup for Oracle XML export template or shell scripts start the XML export by executing NetBackup's `bporaexp` utility.

Manual Backup of an Oracle Policy

The administrator can use the NetBackup server software to manually execute an automatic backup schedule for the Oracle policy. See the *NetBackup System Administrator's Guide for UNIX* or the *NetBackup System Administrator's Guide for Windows* for detailed instructions.

Refer to "Testing NetBackup for Oracle on UNIX Configuration Settings" on page 122 for instructions on initiating a manual backup of an Oracle policy.

Performing a User-Directed XML Export From the Client

This section describes the following procedures for performing user-directed XML exports:

◆ Executing NetBackup for Oracle XML Export Templates

◆ Executing the NetBackup for Oracle XML Export Script on the Client

◆ Executing `bporaexp` on the Client as an Oracle User

Executing NetBackup for Oracle XML Export Templates

Using Oracle Template Administration

The Template Administration dialog is available in the NetBackup 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 pre-determined location on the master server. See "Creating XML Export Templates Using the NetBackup for Oracle Wizard" on page 47.

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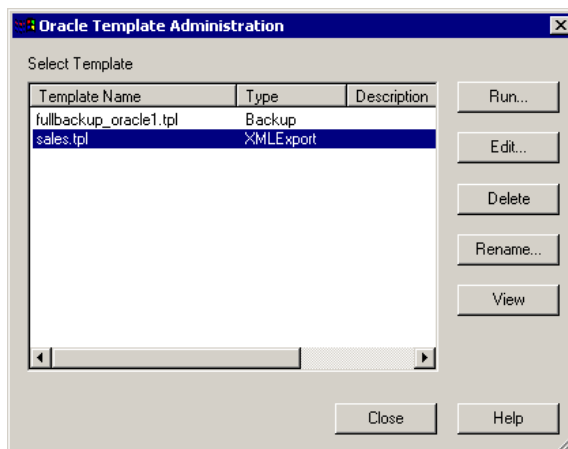
   The Select Template list shows the names, descriptions, and types of the Oracle templates stored on the current master server.

2. Select the name of the XML Export template you wish to run.

3. Click **Run**.

The Oracle Template Administration window provides the following functions:

Run	**Run** executes the selected template.

Edit	**Edit** is used to change the contents of an existing template. The selected XML export template is loaded into the *NetBackup for Oracle XML Export Template Generation Wizard.*
Delete	**Delete** is used to delete the selected template. You must be the root user or the template creator to delete a template.
Rename	**Rename** is used to change the name of the selected template. You must be the root user or the template creator to rename a template.
View	**View** is used to see a summary of the selected template.

Using `bpdbsbora`

The `bpdbsbora` command allows you to run an XML export template created by the NetBackup for Oracle XML Export Wizard.

At the command prompt, type:

```
bpdbsbora -export -r -t <template name> -S <server name> -L
<progress log>
```

where -r runs a template and -t identifies the template.

For example:

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

`bpdbsbora` will retrieve XML export templates from a pre-determined location on the master server. Therefore, specify only the file name.

The following options are supported:

-export	Specifies the type of template.
-r	Runs the template.
-t *template name*	Identifies the template. `bpdbsbora` will retrieve XML export templates from a known location on the master server. Therefore, specify only the file name.
-S *server name*	Identifies the master server (optional). `bpdbsbora` will retrieve XML export templates from a specific master server when the server name is provided with the -S option.

-L *progress file*   Identifies a run-time progress log (optional).

Enclose in quotes if it contains blanks.

Executing the NetBackup for Oracle XML Export Script on the Client

If you know the pathname of the NetBackup for Oracle XML export shell script that initiates the XML export, you can execute the shell script from the UNIX command prompt.

For example, to perform a database XML export, at the UNIX command prompt you might enter:

```
/oracle8/scripts/data_archiver_export.sh
```

The UNIX shell starts the database XML export archive by executing the XML export script. The XML export script contains commands to execute bporaexp.

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

```
install_path/netbackup/ext/db_ext/oracle/samples/bporaexp/
```

Executing `bporaexp` on the Client as an Oracle User

As an Oracle user you can also execute the bporaexp command from the UNIX command line with the desired parameter file.

Note Be sure to configure the run-time environment as specified in the chapter on Configuration, because this method does not call the full script that includes the run-time configuration. Check the sample scripts for run-time environment details.

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, for each table, bporaexp generates a table specific schema (.xsd) document and a table specific instance (.xml) document. Additional files are created if the table contains LONG or LOB columns.

bporaexp creates these files in either an Operating System directory or using a NetBackup storage unit. The DIRECTORY parameter specifies an OS directory, and if this parameter is not used, NetBackup will be used.

For example, the archive test1 contains one table, USER1.TEST1. If the DIRECTORY parameter is set to /db/netbackup/xml, the following files are created:

```
/db/netbackup/xml/test1/test1.xsd
/db/netbackup/xml/test1/USER1/TEST1.xsd
```

```
/db/netbackup/xml/test1/USER1/TEST1.xml
```

If the DIRECTORY parameter is not used, NetBackup will be used. A NetBackup backup set will be created and cataloged under the name /Oracle/XMLArchive. All NetBackup for Oracle bporaexp backups are cataloged using this convention.

For example, if the previous archive is created using NetBackup, the following files are created and catalogued:

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

In production, bporaexp should be used in NetBackup mode. NetBackup mode provides the advantage of NetBackup features including 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, may cause an error.

▼ **To execute `bporaexp` on the client**

At the command prompt, enter:

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

Note On 64-bit platforms, the bporexp64 command is also available.

Note Use the NetBackup parameters NB_ORA_SERV, NB_ORA_CLIENT, NB_ORA_POLICY, and NB_ORA_SCHED to specify the NetBackup run-time configuration. Otherwise, the order of precedence for the run-time configuration variable settings is used. See "Configuring the Run-Time Environment" on page 43.

The following table shows the available `bporaexp` parameters with their default values. Note that some parameters only apply when bporaexp is using a NetBackup storage unit, that is, when the DIRECTORY parameter is not specified. If the DIRECTORY parameter is specified, these parameters are ignored.

Parameter	Required?	Default	Description	NetBackup Mode Only
CONSISTENT	N	N	Specifies whether or not `bporaexp` uses the SET TRANSACTION READ ONLY 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 `bporaexp` command. If the default of CONSISTENT = N is used, each table is exported as an independent transaction.	N
DIRECTORY	N	no default	Optionally specifies a directory for the output of the `bporaexp` utility.	N
HELP	N	N	Displays a help message with descriptions of `bporaexp` parameters. (Does not actually export data if HELP=Y)	N
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.	Y

Parameter	Required?	Default	Description	NetBackup Mode Only
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.	N
NAME	Y	no default	The name of the master XML schema file.	N
NB_ORA_SERV	N	Default Master Server	Optionally specifies the name of the NetBackup master server	Y
NB_ORA_CLIENT	N	Default Client	Optionally specifies the name of the NetBackup Oracle client.	Y
NB_ORA_POLICY	N	Default Oracle Policy	Optionally specifies the name of the NetBackup Oracle Policy	Y
NB_ORA_SCHED	N	Default Backup Policy Schedule	Optionally specifies the name of the Backup Policy Schedule to use.	Y
OWNER	N	no default	Lists the Oracle schema owners to export. For each owner, the tables, partitions, and views owned by that Oracle account are exported by default. The PARTITIONS and VIEWS parameters can be used to exclude partitions and views.	N
PARTITIONS	N	Y	Optionally specifies whether or not table partitions are included. Only valid when used with the OWNER parameter	N

Parameter	Required?	Default	Description	NetBackup Mode Only
QUERY	N	no default	This parameter allows for the selection of 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 will be applied to all tables (and table partitions) listed in the TABLES parameter. For example, if TABLES = emp, bonus and QUERY = "where job = 'SALESMAN' and sal < 1600", two SQL statements will be executed: SELECT*FROM emp where job='SALESMAN' and sal<1600; SELECT*FROM bonus where job='SALESMAN' and sal<1600; Note that each query executed refers to a single table at a time in the FROM clause, so it is illegal to have a join in the WHERE clause.	N
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.	N
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	N

Parameter	Required?	Default	Description	NetBackup Mode Only
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.	N
VIEWS	N	Y	Optionally specifies whether or not views are included. Only valid when used with the OWNER parameter.	N

Browsing XML Export Archives

This section describes the following procedures for browsing XML export archive images created using bporaexp:

◆ Using bporaimp parameters to browse XML export archives

◆ Using bplist to browse XML export archives

Note Only XML export archives created using NetBackup are searched. Exports stored in an Operating System directory using the DIRECTORY parameter are not searched.

Using bporaimp Parameters to Browse XML Export Archives

To use the bporaimp command to browse XML export archives created using bporaexp, 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 will be listed.

The Oracle password is not required. The UNIX account that is running bporaimp will only have access to archives that were created using the same UNIX account.

Use the NB_ORA_SERV and NB_ORA_CLIENT parameters to specify the NetBackup server and client. Otherwise, the order of precedence for the run-time configuration variable settings is used. See "Configuring the Run-Time Environment" on page 43.

Valid search criteria include any combination of the following parameters:

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

Assume you named the list parameter file bporaimp_list.param. At the command prompt, enter:

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

Note On 64-bit platforms, the `bporaimp64` command is also available.

Using bplist to Browse XML Export Archives

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

```
install_path/netbackup/bin/bplist -C jupiter -t 4 -R
/Oracle/XMLArchive/
/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 `-t 4` on this command specifies the Oracle backups or archives. The `-R` specifies the default number of directory levels to search, 999. Refer to `bplist(1M)` man page for more information on this command.

Performing a Restore of an XML Export Archive

Make sure an XML export archive has been successfully completed before attempting a restore. Use the procedures for browsing XML export archives as described in the previous section to identify the correct archive to restore. An error will occur if an archive backup history does not exist.

This section describes the following procedures for performing user-directed restores:

◆ Executing the XML Import Template on the Client

    ◆ Using the NetBackup for Oracle XML Import Wizard

    ◆ Using `bpdbsbora`

◆ Executing an XML Import Script on the Client

◆ Executing `bporaimp` on the Client

◆ Redirecting a Restore of an XML Export Archive to a Different Client

Executing the XML Import Template on the Client

Using the NetBackup for Oracle XML Import Wizard

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 that can be used immediately or saved 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 restore is always user directed, not scheduled. Under normal circumstances, an XML import template will be run immediately and then deleted.

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

Starting the NetBackup Backup, Archive, and Restore Interface

The NetBackup for Oracle XML Import Wizard is launched from the Backup, Archive, and Restore interface. You can access the interface through the NetBackup Administration Console, or from the command line.

❖ To start the interface from the NetBackup Administration Console, click **Backup, Archive, and Restore** in the left pane of the console.

❖ To start the NetBackup Backup, Archive, and Restore interface from the command
   line, execute:

   install_path/**netbackup/bin/jbpSA &**

The Restore Files tab

Click the **Restore Files** tab, and 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.

Oracle Policy Type

Note that if the Oracle node is not visible, it's possible that your NetBackup for Oracle
client does not have the appropriate policy type specified. Change the policy type with the
following steps.

▼ **To change the client policy type**

1. On the **Actions** menu, select **Specify NetBackup Machines**.

2. On the Specify NetBackup Machines dialog, click the **Source client/Policy type** tab.

3. In the **Policy type** drop down list, select **Oracle**.

4. Click **OK**.

Using the XML Import Wizard

When you are ready to perform an import, follow these steps to create and run a template
with the XML Import Wizard.

▼ **To use the XML Import Wizard**

1. In the Directory Structure pane of the Backup, Archive, and Restore interface, select
   the Oracle instance. Database objects that can be imported are listed under the **Users**
   node. Only the schema owners and objects accessible by the current user login will
   display.

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. Click **Restore**.
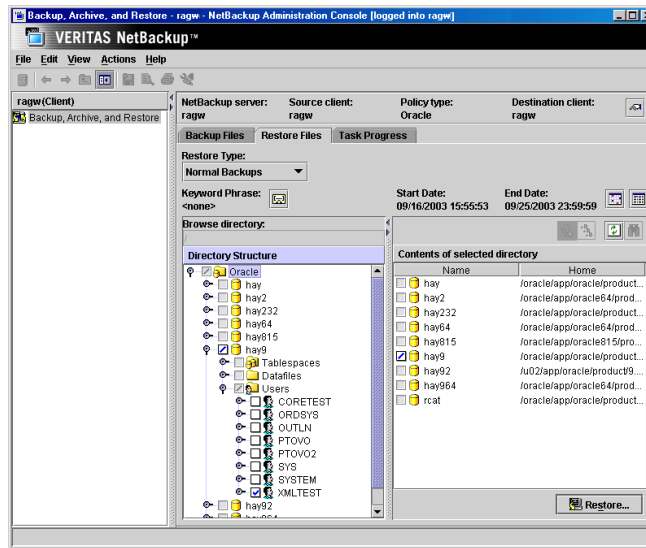
The NetBackup for Oracle XML Import Wizard displays several screens where you will enter information about the restore operation you want to perform:

- Welcome
- Target Database Logon Credentials
- Archive Import Options
- NetBackup Archive Source Options

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

4. When you have completed the wizard, the Selection Summary screen displays the summary of the XML Import template:
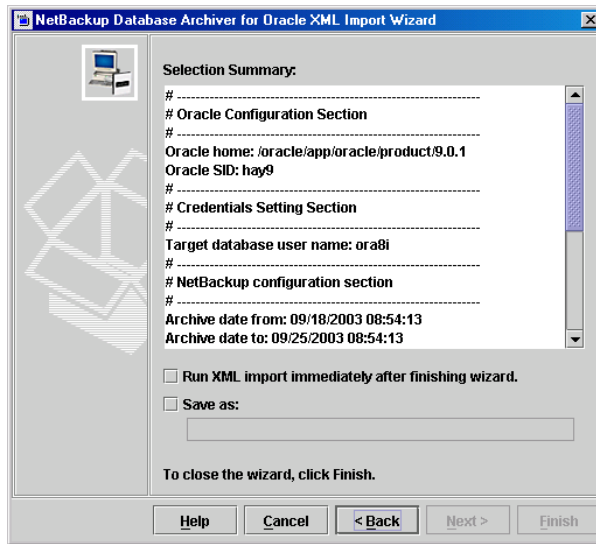
You can choose to run the template immediately after the wizard finishes or save the template locally, or both. For explanations of your choices, click **Help**.

Using `bpdbsbora`

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

At the command line, type:

```
bpdbsbora -import -r -t <template name> -L <progress file>
```

where -r runs a template and -t identifies the template

For example:

```
bpdbsbora -import -r -t /oracle/import_templates/sales_import.tpl -L
my_progress_file
```

XML import templates do not reside in a pre-determined 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 template name, it must reside in the current directory.

The following options are supported:

-import   Specifies the type of template.

`-r`	Runs the template.
`-t` *template name*	Identifies the template.
	`bpdbsbora` will retrieve XML import templates from the client. For XML imports, specify the full pathname for the template location.
`-L` *progress file*	Identifies a run-time progress log (optional).
	Enclose in quotes if it contains blanks.

Executing an XML Import Script on the Client

If you know the pathname of the XML import script that initiates the restore, you can start it from the UNIX command prompt. For example, to perform a restore at the UNIX command prompt you might enter:

```
/oracle8/scripts/data_archiver_import.sh
```

The UNIX shell starts the database restore by executing the XML import script file. The XML import script file contains commands to execute bporaimp.

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

install_path/netbackup/ext/dbext/oracle/samples/bporaimp/

Executing **bporaimp** on the Client

Execute the bporaimp command from the UNIX command line on the client using the appropriate parameter file. The UNIX account that is running bporaimp will only have access to XML export archives that were created using the same UNIX account.

Note Be sure to configure the run-time environment as specified in the chapter on Configuration, because this method does not call the full script that includes the run-time configuration. Check the sample scripts for run-time environment details.

▼ **To execute bporaimp on the client**

At the command prompt, enter:

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

Note On 64-bit platforms, the bporaimp64 command is also available.

> **Note** Use the NetBackup parameters NB_ORA_SERV and NB_ORA_CLIENT to specify the NetBackup run-time configuration. Otherwise, the order of precedence for the run-time configuration variable settings is used. See "Configuring the Run-Time Environment" on page 43.

The following table shows the available `bporaimp` parameters with their default values. Note that some parameters only apply when bporaimp is using a NetBackup storage unit, that is, when the DIRECTORY parameter is not specified. If the DIRECTORY parameter is specified, these parameters are ignored.

Parameter	Required?	Default	Description	NetBackup Mode Only
ARCHIVE_DATE_FROM	N	no default	Optionally specifies a start date for the archive to be imported. Used with ARCHIVE_DATE_TO 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 mm/dd/yyyy [hh:mm:ss].	Y
ARCHIVE_DATE_TO	N	no default	Optionally specifies an end date for the archive to be imported. Used with ARCHIVE_DATE_FROM 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 mm/dd/yyyy [hh:mm:ss].	Y

Parameter	Required?	Default	Description	NetBackup Mode Only
BFILE_DIRECTORY	Y (if any table being imported has BFILE columns)	no default	Specifies a directory for the output of any BFILE columns being imported. Oracle's CREATE DIRECTORY command can be used to create the DIRECTORY in Oracle, and the name should match the name used in the export file.	N
COMMIT	N	N	Specifies whether bporaimp should commit after each array insert. The size of the array is determined by ROW_BUFFER. By default, bporaimp commits only after loading each table, and performs a rollback when an error occurs, before continuing with the next object.	N
DIRECTORY	N	no default	Optionally specifies a directory for the input of the bporaimp utility.	N
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 will be imported.	N
HELP	N	N	Displays a help message with descriptions of bporaimp parameters.	N

Parameter	Required?	Default	Description	NetBackup Mode Only
IGNORE_ROWS	N	N	Specifies whether or not rows should be inserted into a table that isn't empty. The default is that the table already exists and that it is empty. If it isn't empty, IGNORE_ROWS = N causes an error to be reported, and the table is skipped with no rows inserted. IGNORE_ROWS = Y causes rows to be inserted with errors reported in the LOG file. If IGNORE_ROWS = Y and an error such as a primary key constraint violation occurs, no data will be inserted if COMMIT = N. However, if COMMIT = Y, the array of rows (size determined by ROW_BUFFER) will not be inserted, but `bporaimp` will continue to process additional row arrays in the order in which they were exported. To cause all rows that don't violate a primary key constraint to be inserted, set COMMIT = Y, ROW_BUFFER = 1, and IGNORE_ROWS = Y.	N

Parameter	Required?	Default	Description	NetBackup Mode Only
KEYWORD	N	no default	Optionally specifies a keyword phrase for NetBackup to use when searching for archives from which to restore files.	Y
LIST	N	N	LIST = Y queries the NetBackup catalog and lists the archives available. Does not actually import the data if LIST = Y	Y
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.	N
NAME	Y	no default	The name of the master XML schema file. (This parameter is required if LIST = N.)	N
NB_ORA_SERV	N	Default Master Server	Optionally specifies the name of the NetBackup master server	Y
NB_ORA_CLIENT	N	Default Client	Optionally specifies the name of the NetBackup Oracle client.	Y
RESTORE_SCHEMA_ONLY	N	N	Used with RESTORE_TO_DIRECTORY to restore the XML schema files only to a directory.	Y

Parameter	Required?	Default	Description	NetBackup Mode Only
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).	Y
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.	N
TABLES	N	no default	Optionally specifies a list of table, view, and partition names to import. If not used, all objects in the archive will be imported. The objects must already exist, and the USERID must have INSERT privilege on the objects. The object names cannot be qualified with owner names, and the FROMUSER 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 will be inserted.	N

Parameter	Required?	Default	Description	NetBackup Mode Only
TOUSER	N	no default	Optionally specifies a comma-separated list of users to import to that may be used with the FROMUSER parameter to change the table owners. The TOUSER Oracle accounts must already exist, and the USERID must have INSERT privilege on the tables that must also exist.	N
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 ORACLE_SID environment variable is used.	N

Redirecting a Restore of an XML Export Archive to a Different Client

With NetBackup for Oracle on UNIX 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.

The following illustrates a typical redirected restore process.
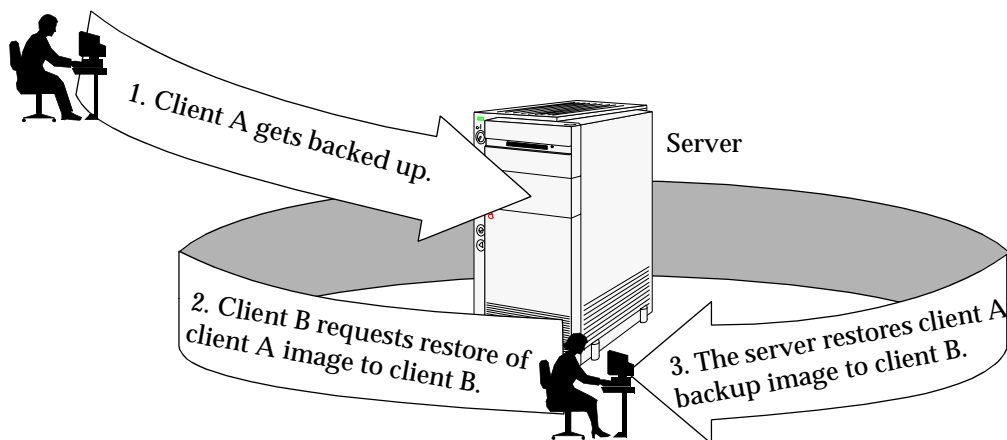
Note that the user on client A was not able to initiate a redirected restore to client B. Only the user on client B, the client receiving the backup image, could initate the redirected restore.

Note The same user name (UNIX account) that was used for the Oracle database XML export must be used for the alternate client restore.

Server Configuration

Ensure that the NetBackup server is configured to allow redirected restore. The administrator can remove restrictions for all clients by creating the following file on the Netbackup master sever:

install_path/netbackup/db/altnames/No.Restrictions

Or, to restrict clients to restore only from certain other clients, create the following file:

install_path/netbackup/db/altnames/*client_name*

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

See the *NetBackup System Administrator's Guide* for details.

Client Configuration

The same user name (UNIX account) that was used for the XML export archive must be used on the client where you are redirecting the restore.

Using **bporaimp** for a Redirected Restore

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

1. Set environment variables for bporaimp on the new client, including ORACLE_HOME and ORACLE_SID.

2. In bporaimp parameter file, include:
nb_ora_serv = NetBackup server
nb_ora_client = original client where XML export occurred.

3. Specify other bporaimp parameters (see "Executing bporaimp on the Client" on page 161).

4. Run bporaimp.

▼ **Example:**

In this example, assume:

◆ Original client is jupiter

◆ New client is saturn

◆ Server is jupiter

◆ ORACLE_SID is test on both saturn and jupiter

◆ UNIX user is ora8 on both jupiter and saturn

◆ Archive name is sales.

1. Create the file, /usr/openv/netbackup/db/altnames/saturn, on server jupiter and edit it to contain the name jupiter.

2. Log on to saturn as ora8.

3. Create bporaimp.param, including:
NAME = sales
NB_ORA_SERV = jupiter
NB_ORA_CLIENT = jupiter
USERID = orauser/orapasswd

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

NetBackup for Oracle with Advanced Client   6

This chapter explains how to use NetBackup for Oracle with NetBackup Advanced Client to perform snapshot backups and block-level incremental backups of your Oracle database.

To use NetBackup for Oracle with Advanced Client, you must have both NetBackup Advanced Client and NetBackup for Oracle licensed and installed.

The chapter provides information on the following topics:

- Changes from NetBackup for Oracle 4.5
- Installation and Licensing Requirements
- NetBackup for Oracle with Advanced Client Overview
- How Does NetBackup for Oracle with Advanced Client Work?
- Configuring a Snapshot Backup
- Configuring a Block Level Incremental Backup

Changes from NetBackup for Oracle 4.5

NetBackup for Oracle now integrates the following advanced NetBackup for Oracle agents, formerly separate products:

◆ NetBackup for Oracle Server-Free Agent

◆ NetBackup for Oracle Advanced BLI Agent with RMAN

◆ NetBackup for Oracle Advanced BLI Agent for Backups without RMAN

The functionality of these separate agents is now available by using NetBackup for Oracle with NetBackup Advanced Client.

In addition, the following changes from 4.5 are included in this release:

◆ The algorithm for determining the number of multiple streams has changed. In this release, NetBackup for Oracle does not split the datafiles based on the file system they belong to. As a result, NetBackup for Oracle no longer uses the variable NB_ORA_PC_FILESYSTEMS. The agent will handle backward compatibility of the scripts and templates, and will ignore the variable if it is specified. For details on how NetBackup for Oracle creates multiple backup streams, see "Multistreaming" on page 178.

◆ NetBackup for Oracle determines the type of the advanced backup method to be used at run time based on the policy configuration. As a result, the variable that used to indicate the type of method to use, NB_ORA_PC_BTYPE, is no longer in use. The agent will handle the backward compatibility of the scripts and templates and will ignore the variable if specified.

Installation and Licensing Requirements

To use NetBackup for Oracle with Advanced Client, you must have the following licensed and installed:

◆ NetBackup for Oracle 5.1

◆ NetBackup Advanced Client 5.1

For details on installing and configuring NetBackup Advanced Client, see the *NetBackup Advanced Client System Administrator's Guide*. There are no additional VERITAS NetBackup installations required. Other hardware and software configurations may be necessary. See the configuration requirements for the specific advanced backup methods in the *NetBackup Advanced Client System Administrator's Guide* for details.

NetBackup for Oracle with Advanced Client Overview

NetBackup for Oracle, when used in conjunction with NetBackup Advanced Client, can back up and restore Oracle objects by taking *snapshots* of the component files and then backing up the snapshot version to tape, or committing them to another form of persistent storage. This means capturing the data at a particular instant, without causing significant client downtime. The resulting capture or snapshot can be backed up without affecting the performance or availability of the database.

You also have the option of performing *Block Level Incremental* backups using the change tracking capabilities of VxFS Storage Checkpoint snapshot. In a block-level incremental backup, only the changed blocks of data are backed up. A block-level incremental backup saves time, decreases the amount of backup media required, and significantly reduces CPU and network overhead during backups.

Advanced Client Features

The following NetBackup Advanced Client features are available for use with NetBackup for Oracle on UNIX:

Snapshot Backup	A snapshot is a disk image of the client's data made almost instantaneously. NetBackup backs up the data from the snapshot image, not directly from the client's primary data. This allows client operations and user access to continue without interruption during the backup.
Instant Recovery (formerly Persistent Frozen Image or PFI)	This feature makes backups available for "instant recovery" from disk. Instant recovery combines snapshot technology—the image is created without interrupting user access to data—with the ability to do rapid disk-based restores. Optionally, the image is retained on disk as well as backed up to storage. Instant recovery makes it possible to perform block-level restores.
Offhost Backup	An offhost backup shifts the burden of backup processing onto a separate backup agent (alternate client, NetBackup media server, or third-party copy device), reducing the impact 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.

| *Block-Level Incremental Backup* | BLI Backup uses the VERITAS VxFS Storage Checkpoint feature, which keeps track of data blocks modified since the last backup. Only the changed blocks are backed up, not the entire file or file system. |

For Oracle, there are two options for performing block-level incremental backup:

- Block-level incremental backup with RMAN
- Block-level incremental backup without RMAN

Proxy Copy

Proxy copy is an extension to Oracle's Media Management API. It is a special type of backup in which RMAN turns over control of the data transfer to the NetBackup for Oracle Agent. During RMAN backup and restore operations, proxy copy enables NetBackup for Oracle to manage the entire data movement between the disks containing Oracle datafiles and the storage devices managed by NetBackup.

With proxy copy, RMAN provides a list of files, requiring backup or restore, to NetBackup for Oracle Agent. NetBackup for Oracle Agent makes all decisions regarding how the data is moved and when to move the data.

Backups and restores remain tightly integrated with RMAN and its catalog, greatly simplifying administration tasks.
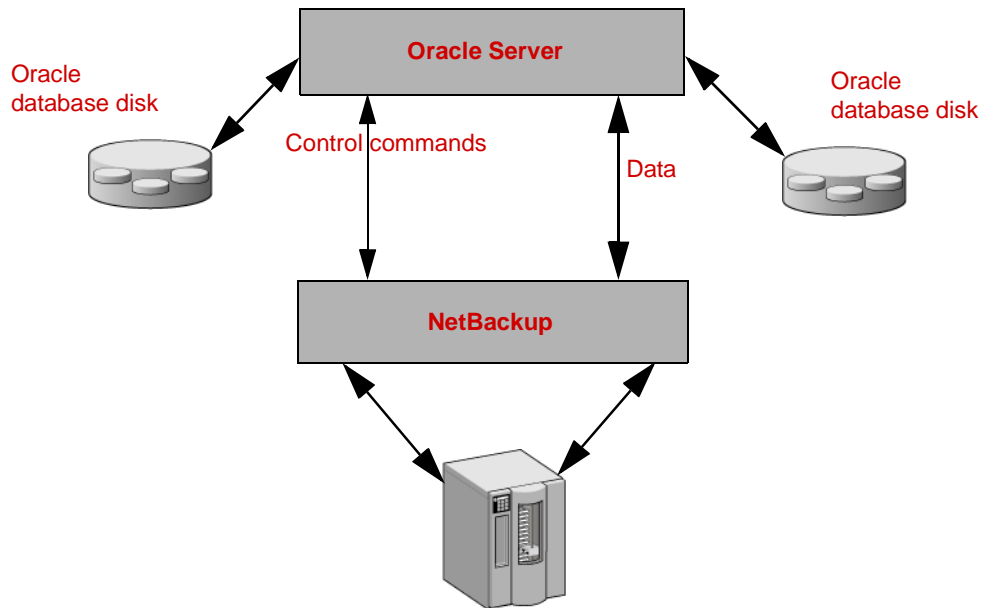
Stream-Based Operations vs. File-Based Operations

Standard NetBackup for Oracle on UNIX backups and restores are stream-based. NetBackup for Oracle with Advanced Client operations are file-based. This section illustrates the difference between these operation types.

Stream-Based Operations

Stream-based operations are the standard NetBackup implementation of conventional RMAN backup and restores where NetBackup moves the data provided by the Oracle server process. NetBackup simply captures the data stream content provided by Oracle Recovery Manager. If the user has specified multiple streams, then Oracle Recovery Manager opens multiple streams that NetBackup catalogs as separate images.

NetBackup for Oracle RMAN stream-based backup or restore

File-Based Operations

File-based operations are the NetBackup for Oracle with Advanced Client implementation of Oracle *proxy copy* backups and restores. In a file-based operation, RMAN provides a list of files, requiring backup or restore, to NetBackup for Oracle with Advanced Client. NetBackup for Oracle with Advanced Client performs the actual data movement.

NetBackup for Oracle with Advanced Client file-based backup or restore
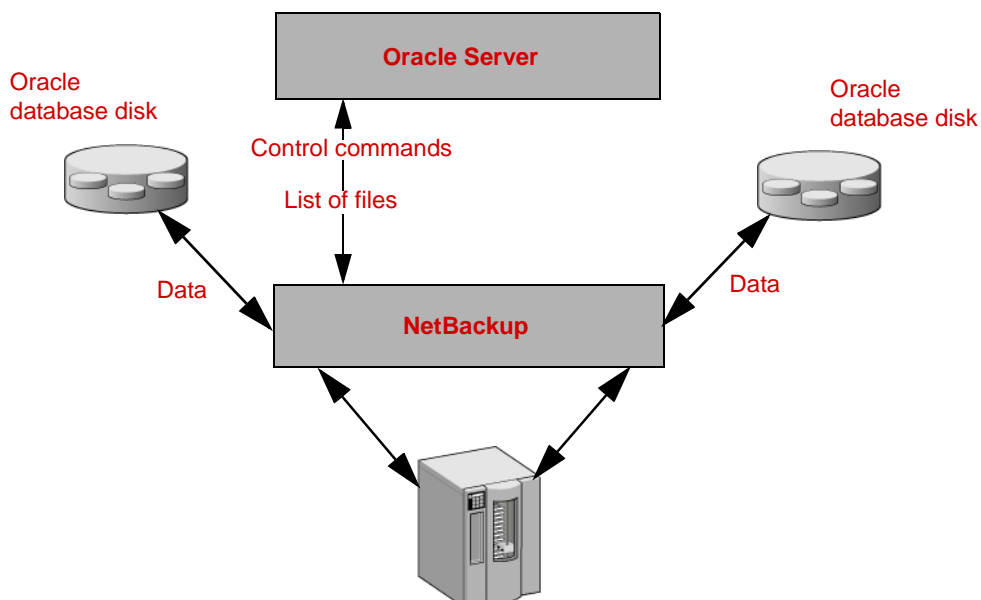
How Does NetBackup for Oracle with Advanced Client Work?

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 that the Oracle Recovery Manager will perform 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. See "Database Objects Supported by Advanced Backup Methods" on page 178. RMAN translates the objects into the physical file names and provides a list of file names to NetBackup for Oracle.

The agent checks that the policy it is using for the backup is configured with the appropriate Advanced Client attributes. The agent then initiates file-based backups of the Oracle files and uses the NetBackup Advanced Client interface to perform the actual data movement.

When Oracle performs proxy copy backups, it puts the datafiles being backed up into backup mode. NetBackup then creates a snapshot of the files. Once the snapshot has been created, NetBackup for Oracle Agent signals back to Oracle to take the datafiles out of backup mode. Therefore the datafiles that are being backed up will be in backup mode only for the period of time necessary to capture a snapshot of the data.

Sequence of Operation: Backup

The sequence of operation for a backup is as follows:

1. NetBackup for Oracle receives a list of files to back up from RMAN.

2. Each file is identified by a unique backup file name in the NetBackup catalog. To insure this, you must give each datafile a unique name using the `format` operand.

3. NetBackup for Oracle queries the policy to check whether the Advanced Client policy attributes are specified.

4. NetBackup for Oracle initiates a configured number of advanced client backups and waits until the jobs are completed. (For details, see "Multistreaming" on page 178.)

Sequence of Operation: Restore

The sequence of operation for a restore is as follows:

1. NetBackup for Oracle Agent receives a list of files to restore from RMAN.

2. NetBackup for Oracle Agent sends a restore request to the NetBackup server for all files in the list.

3. The NetBackup for Oracle Agent waits for all files in the file list to be restored by NetBackup.

Database Objects Supported by Advanced Backup Methods

Oracle controls the kind of database objects that can be backed up by proxy copy, and therefore what NetBackup can back up using Advanced Client backup methods. Currently, Oracle allows proxy copy backups of databases, tablespaces, and datafiles. As a result, NetBackup can use file-based Advanced Client backup methods to back up these objects.

For control files and archived redo logs, Oracle RMAN performs only conventional stream-based backups. This means that NetBackup for Oracle must use stream-based backups for control files and archived redo logs even when using Advanced Client methods for the other database objects.

File-based and stream-based backups require different configuration. When configuring your NetBackup for Oracle with Advanced Client backups, be sure to configure a policy that will allow both kinds of backups. See "Types of Backups" on page 193 and "Schedule Properties" on page 194 for details.

Multistreaming

On the initial call, NetBackup for Oracle with Advanced 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. This means that the number of channels allocated for the RMAN `backup proxy` command will not control the degree of parallelism for proxy backups. RMAN will use only one channel for proxy copy backups except when a specific configuration is used.

The number of proxy copy backup streams to be started is controlled by the NB_ORA_PC_STREAMS variable. By default, the agent initiates one backup job for all files. If NB_ORA_PC_STREAMS is passed by the RMAN `send` command, NetBackup for Oracle splits the files into a number of groups 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. For examples, see "Examples: Using Multiple Channels in RMAN Scripts with Proxy Backups" on page 181.

Restoring Datafiles to a New Location

NetBackup for Oracle with Advanced Client supports restoring datafiles 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 datafile for tablespace TEST to a new location you might 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 datafiles backed up by proxy is the same as for conventionally backed up datafiles. RMAN knows that the datafiles were backed up by proxy, and it issues a proxy restore request to NetBackup for Oracle, which handles restoring the datafiles to the new location. Refer to the Oracle Recovery Manager manuals for more information on the required procedure.

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. See "Using NetBackup for Oracle on UNIX" on page 127.

Symbolic Links and Raw Datafiles

NetBackup for Oracle with Advanced Client fully supports backups and restores of datafiles that consist of symbolic links and regular files. Both the symbolic link and the actual file are backed up and restored.

NetBackup for Oracle with Advanced Client fully supports backups and restores of datafiles created on raw partitions.

Quick I/O Datafiles

NetBackup for Oracle with Advanced Client fully supports backups and restores of Quick I/O Oracle datafiles. 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, Oracle Advanced Client follows the symbolic link and backs up both components of the Quick I/O file: the symbolic link and the hidden file.

During the restore job, NetBackup for Oracle with Advanced Client will restore both components from the backup image. If either one or both of the components is missing, NetBackup for Oracle with Advanced Client will create the missing component(s).

RMAN Incremental Backups

Proxy copy backups can be used as a part of the incremental strategy with conventional non-proxy RMAN backups. RMAN allows you to create a proxy copy `incremental level 0` backup. This backup can be the base for subsequent RMAN traditional incremental backups (`level 1-n`). In this case, you would perform a snapshot proxy copy (file-based) `level 0` incremental backup and would follow with RMAN traditional (stream-based) `level 1-n` incremental backups.

In the following example, the first `run` command initiates a proxy copy backup of tablespace `tbs1`. NetBackup for Oracle will use 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;
}
```

Examples: Using Multiple Channels in RMAN Scripts with Proxy Backups

Example 1

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 datafiles 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. After the proxy backup is done, RMAN starts a non-proxy conventional backup of the control file on channel t1.

```
run {
allocate channel t1 type 'SBT_TAPE';
send 'NB_ORA_PC_STREAMS=3';
backup proxy
    format 'bk_%U_%t'
    (database);
release channel t1;
}
```

Example 2

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 datafiles 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.

```
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;
}
```

Note that 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, the control file should be backed up as the last step in the backup operation. This step is not necessary if the recovery catalog is used.

```
Run {
allocate channel t1 type 'sbt_tape';
backup
    format 'cntrl_%s_%p_%t'
    current controlfile;
release channel t2;
}
```

Example 3

In this sample script RMAN initiates two proxy copy backups sequentially on channel t1. It starts a proxy backup of tablespace tbs1 datafiles. After the backup is done, it will start another proxy backup of tablespace tbs2 datafiles.

```
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;
}
```

This configuration may cause problems if the sequential backups create snapshots on the same volumes. The better option would be to issue a single backup command specifying both tablespaces rather than two separate backup commands:

```
run {
allocate channel t1 type 'SBT_TAPE';
backup proxy
    format 'bk_%U_%t'
    (tablespace tbs1, tbs2);
    release channel t1;
    }
```

Example 4

In this example RMAN distributes proxy copy backups over two channels. It creates two proxy copy backup sessions sending `tbs1` datafiles on channel `t1` and `tbs2` datafiles on channel `t2`. This could be useful if a user would like to specify different NetBackup configurations for each channel. In this example, each `send` command specifies a different policy to be sent and used by each proxy backup.

```
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;
}
```

Configuring a Snapshot Backup

Snapshot Methods

Advanced Client supports a number of methods for creating a snapshot image. You can select the method or let NetBackup select it based on your environment. For information on selecting a method, see the *NetBackup Advanced Client System Administrator's Guide*.

The snapshot method used is dependent on your hardware and software environment. For a complete explanation of these dependencies, see the *NetBackup Advanced Client System Administrator's Guide*. For a description of snapshot methods available for use with NetBackup for Oracle on UNIX, see the supported platforms matrix on the VERITAS support site.

▼ **To access the supported platforms information**

1. Go to the VERITAS support web page: http://`www.support.veritas.com`.

2. From the Select Product Family list, choose **NetBackup Products**. The Select Product window refreshes showing a list of NetBackup products.

3. Select one of the NetBackup products. The page refreshes and displays a search window with four tabs:
    - Documents
    - Downloads
    - Software Alerts
    - Compatibility

4. Select **5.1** in the **Product Version** drop-down field.

5. Select a Product Platform.

6. Click the **Compatibility** tab. The page will refresh showing documents that contain compatibility information.

7. Click on the title of the document link for NetBackup Database Agent Compatibility List. A document appears that contains a downloadable file that enables you to view the supported database spreadsheet for this release.

Configuration Requirements

◆ It is recommended that the online redo logs and archived redo logs should reside on a different volume(s) from the datafiles. If the logs are configured on the same volume(s) as the datafiles, they will also be temporarily frozen while the snapshot is created. As a result, the Oracle process cannot access the logs when the database is active, so the database activity may freeze until the logs become accessible again.

◆ The hardware and software required for the appropriate snapshot method is installed and configured correctly. Refer to the *NetBackup Advanced Client System Administrator's Guide.* See the VERITAS Technical Support Web site for details on the snapshot methods and platforms that are supported for your agent.

◆ NetBackup Advanced Client is installed and configured correctly and the license key for this option has been registered. Refer to the *NetBackup Advanced Client System Administrator's Guide* for details.

◆ If you wish to perform offhost backups, perform any special configuration that is required. See the *NetBackup Advanced Client System Administrator's Guide* for information on configuring available offhost methods.

Configuring an Oracle Policy with Advanced Client Backup Methods

This section explains what is necessary to configure snapshot and instant recovery backups for an Oracle policy. For detailed instructions on configuring an Oracle policy refer to "Configuring a NetBackup Policy" on page 41.

For information on how a snapshot method is automatically selected and details on the types of backup methods, refer to the *NetBackup Advanced Client System Administrator's Guide.*

Snapshot backups do not back up all database objects. Your backup configuration must include schedule types to perform file-based and stream-based backups in order to ensure that the entire database can be successfully restored.

To configure a policy for Oracle snapshot or instant recovery backups a user needs to configure:

◆ Snapshot methods for file systems (raw partitions or logical volumes) where the datafiles reside

◆ A backup method on the policy attributes dialog

◆ Automatic Full Backup schedule type to perform file-based snapshot and offhost backups of the datafiles

◆ Application Backup schedule type to perform a stream-based backup of control files and archived redo logs. Note that Oracle does not support proxy backups of database control files and archived redo logs. These files are backed up using standard RMAN operations.

For details on policy attributes that differ for a NetBackup for Oracle with Advanced Client policy, see the following sections:

◆ "Types of Backups" on page 193

◆ "Schedule Properties" on page 194

◆ "Templates and Scripts" on page 195

Only one snapshot method can be configured per policy. If, for instance, you want to select one snapshot method for clients a, b, and c, and a different method for clients d, e, and f, then you would need to create two policies for each group of clients and select one method for each policy.

The following types of snapshot backups can be configured:

◆ snapshot backup

◆ instant recovery, snapshot to disk and to tape

◆ instant recovery, snapshot to disk only

The following types of offhost backup methods can be configured:

◆ alternate client

◆ data mover

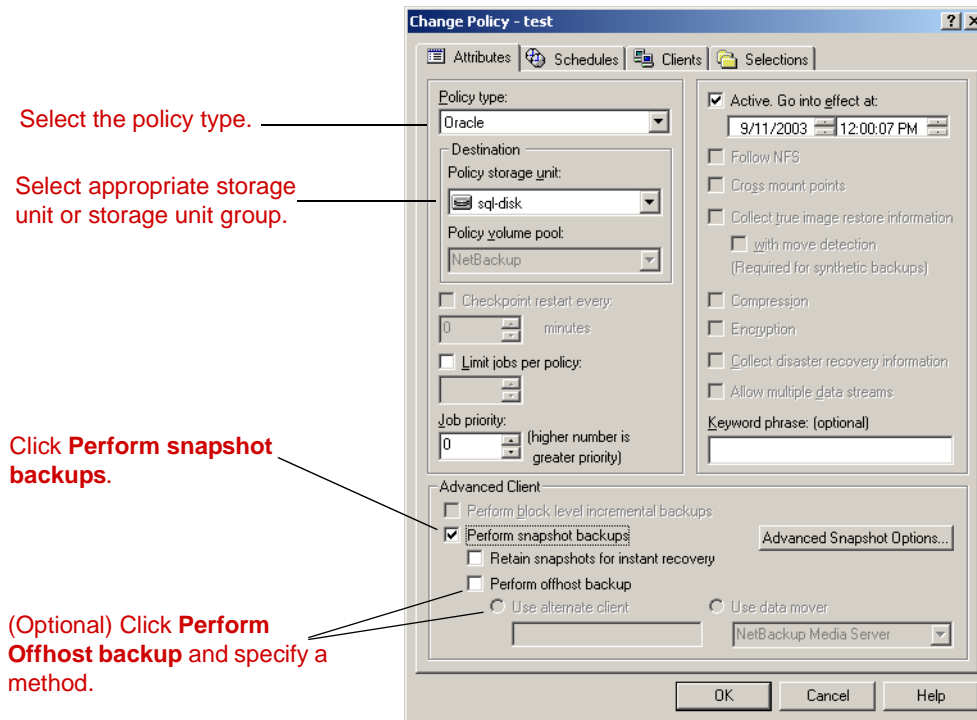The following procedures provide details on how to create an Oracle policy that will:

◆ perform a snapshot backup (with optional offhost method)

◆ perform a snapshot backup for Instant Recovery

◆ perform a NAS snapshot backup using NDMP protocol.

Snapshot Policy with Optional Offhost Backup

▼ **To configure a snapshot policy (with optional offhost backup)**

1. Open the policy you wish to configure.

2. Click on the **Attributes** tab.

3. Select the Oracle policy type.

Select the policy type. ——

Select appropriate storage unit or storage unit group. ——

Click **Perform snapshot backups**.

(Optional) Click **Perform Offhost backup** and specify a method.

4. Select a **Policy storage unit**.

Any_available is not supported for the following data movers: NetBackup Media Server or Third-Party Copy Device.

Note If you are using third party copy as your offhost backup method, you must override the policy storage unit by specifying a locally attached storage unit for the Application Backup schedule. (This schedule is necessary to back up the archived redo logs and control file.)

5. Click **Perform snapshot backups**.

Note For Instant Recovery configuration steps, see "To configure a policy for instant recovery" on page 189.

6. Choose to have NetBackup select the snapshot method or select the snapshot method manually.

◆ By default, NetBackup will choose a snapshot method for you. If you have changed this setting and want NetBackup to choose the method automatically, click **Advanced Snapshot Options** and from the **Snapshot method for this policy** list, choose **auto**.

◆ If you wish to use a specific snapshot method, click **Advanced Snapshot Options** and from the **Snapshot method for this policy** list, choose the method you wish to use for this policy.

See the *NetBackup Advanced Client System Administrator's Guide for* details about selecting the snapshot method and automatic snapshot selection.

7. To configure schedules, click on the **Schedules** tab.

Follow the instructions in the "Configuration" chapter earlier in this manual to configure an Application and Automatic schedule.

See "Types of Backups" on page 193 for information on how these schedules differ for an Oracle policy that supports Advanced Client methods. See "Schedule Properties" on page 194 for an explanation on how the properties differ for a schedule that supports Advanced Client methods.

8. If you wish to reduce the processing load on the client, select **Perform offhost backup**:

This option may require additional configuration. Refer to the *NetBackup Advanced Client System Administrator's Guide.*

◆ For a backup performed by an alternate client, click **Use alternate client** and enter the name of the alternate client.

◆ For a backup performed by a data mover (not by a client), select **Use data mover** and select the method:

NetBackup Media Server

Backup processing will be handled by a Solaris or HP NetBackup media server.

Third-Party Copy Device

Backup processing will be handled by a third-party copy device.

Note If you are using third party copy as your offhost backup method, you must override the policy storage unit by specifying a locally attached storage unit for the Application Backup schedule. (This schedule is necessary to back up the archived redo logs and control file.)

---

9. Use the **Clients** tab to specify clients to be backed up by this policy.

Refer to "Configuration" on page 67 for details on adding clients to a policy.

10. Use the **Backup Selections** tab to enter the template or script.

See "Templates and Scripts" on page 195 for information about using templates and scripts with a NetBackup for Oracle with Advanced Client policy.

11. Configure other attributes and add any further desired schedules. Refer to "Configuration" on page 67 for more information.

Instant Recovery Policy

▼ **To configure a policy for instant recovery**

1. Open the policy you wish to configure.

2. Click on the **Attributes** tab.

3. Select the Oracle policy type.

Select the policy type. ——————

Select appropriate storage unit or storage unit group. ——————

Click **Perform snapshot backups**.

Click here to enable instant recovery.

4. Select a **Policy storage unit**.

If you select **Instant recovery backups to disk only** on the **Schedules** tab (see step 8), the storage unit is not used for proxy file-based backups. You must configure a storage unit if you plan to use the same policy for stream-based backups of control files and archived redo logs.

5. Click **Perform snapshot backups**.

6. Choose to have NetBackup select the snapshot method or select the snapshot method manually.

   ◆ By default, NetBackup will choose a snapshot method for you. If you have changed this setting and want NetBackup to choose the method automatically, click **Advanced Snapshot Options** and from the **Snapshot method for this policy** list, choose **auto**.

   ◆ If you wish to use a specific snapshot method, click **Advanced Snapshot Options** and from the **Snapshot method for this policy** list, choose the method you wish to use for this policy.

   See the *NetBackup Advanced Client System Administrator's Guide for* details about selecting the snapshot method and automatic snapshot selection.

7. Select **Retain snapshots for instant recovery**.

   NetBackup retains the snapshot on disk, so that instant recovery can be performed from the snapshot. A normal backup to storage is also performed, if you do not select **Instant recovery backups to disk only** (see step 8).

8. To configure schedules, click on the **Schedules** tab.

   a. Follow the instructions in the "Configuration" chapter earlier in this manual to configure an Application and Automatic schedule.

      See "Types of Backups" on page 193 for information on how these schedules differ for an Oracle policy that supports Advanced Client methods. See "Schedule Properties" on page 194 for an explanation on how the properties differ for a schedule that supports Advanced Client methods.

   b. If you wish to create a disk image only, open the Automatic Backup schedule and select **Instant recovery backups to disk only**.

      ◆ If **Disk-only backup** is selected, the image is not backed up to tape or other storage. NetBackup creates a disk snapshot only. Note that this disk snapshot is not considered a replacement for traditional backup.

      ◆ If **Disk-only backup** is not selected, NetBackup creates a disk snapshot and backs up the client's data to the storage unit specified for the policy.

9. Use the **Clients** tab to specify clients to be backed up by this policy.

   Refer to "Configuration" on page 67 for details on adding clients to a policy.

10. Use the **Backup Selections** tab to enter the template or script.

    See "Templates and Scripts" on page 195 for information about using templates and scripts with a NetBackup for Oracle with Advanced Client policy.

11. Configure other attributes and add any further desired schedules. Refer to "Configuration" on page 67 for more information.

NAS Snapshot Policy

Refer to the *NetBackup Advanced Client System Administrator's Guide* for a detailed explanation on NAS snapshot requirements and configuration. For NetBackup 5.1, NAS snapshot for Oracle backup is only supported on Solaris.

To use NAS Snapshot with NetBackup for Oracle, the Oracle database must be installed and configured to work in a NAS environment.

▼ **To configure a NAS snapshot policy**

1. Open the policy you wish to configure.

2. Click on the **Attributes** tab.

3. Select the Oracle policy type.

Select the policy type. ————

Select appropriate storage unit or storage unit group.

Click **Perform snapshot backups**.

Click here to enable instant recovery.

Click **Perform offhost backup**.

Click **Use data mover,** and specify **Network Attached Storage**.

4. For **Policy storage unit**, select **Any_Available**.

Note Although the policy cannot execute without a specified storage unit, NetBackup does not use the storage unit for proxy NAS snapshot backups. The snapshot is created on disk regardless of which storage unit you select.

The policy storage unit will be used for stream-based backups of control files and archived redo logs unless you override it in the Application Backup schedule.

5. Select **Perform snapshot backups** and **Retain snapshots for instant recovery**.

6. Select **Perform offhost backup** and **Use data mover**.

7. From the pull-down menu under **Use data mover**, select **Network Attached Storage**.

When the policy runs, NetBackup will automatically select the NAS_Snapshot method for creating the snapshot.

As an alternative, you can manually select the NAS_Snapshot method using the Advanced Snapshot Options dialog from the policy display. For the **Maximum Snapshots (Instant Recovery only)** parameter, refer to the policy configuration chapter of the *NetBackup Advanced Client System Administrator's Guide.*

8. To configure schedules, click the **Schedules** tab.

   a. Follow the instructions in the "Configuration" chapter of this manual to configure an Application Backup and Automatic Backup schedule. The Application Backup schedule will back up control files and archived logs.

      See "Types of Backups" on page 193 for information on how these schedules differ for an Oracle policy that supports Advanced Client methods. See "Schedule Properties" on page 194 for an explanation on how the properties differ for a schedule that supports Advanced Client methods.

   b. On the Automatic Backup schedule, select **Instant recovery backups to disk only**.

9. Use the **Clients** tab to specify clients to be backed up by this policy.

   Refer to "Configuration" on page 67 for details on adding clients to a policy.

10. Use the **Backup Selections** tab to enter the template or script.

    See "Templates and Scripts" on page 195 for information about using templates and scripts with a NetBackup for Oracle with Advanced Client policy.

11. Configure other attributes and add any further desired schedules. Refer to "Configuration" on page 67 for more information.

Types of Backups

The Backup Types available on the **Schedules** tab of the policy play a different role for NetBackup for Oracle with Advanced Client backups.

Description of Backup Types for Oracle

Application Backup	The Application Backup schedule enables stream-based NetBackup operations. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.
	Note If you are using Third-Party Copy Device or Network Attached Storage as your data mover, you must override the policy storage unit by specifying a locally attached storage unit for the Application Backup schedule to back up control files and archived logs.

Description of Backup Types for Oracle

Automatic Full Backup, Automatic Differential Incremental Backup, Automatic Cumulative Incremental Backup	For file-based proxy copy backups, the Automatic backup schedule types serve two purposes: ♦ Automatic backup schedules automatically start the backups by running the NetBackup for Oracle RMAN scripts or templates. ♦ Automatic backup schedules perform the actual file-based snapshot backups of the database objects. **Note** Snapshot backups do not support block-level incremental functionality. Oracle always updates the headers of the datafiles when performing a checkpoint of the database. This means that an incremental backup that copies each changed file in its entirety is likely to include all of a database's datafiles, effectively performing a full backup. For snapshot backups, specifying any of the Automatic backup types will result in a full backup.

Schedule Properties

Some of the schedule properties have a different meaning for Advanced Client database backups than for a regular database backup. These properties are explained below.

Other schedule properties that are specific to Oracle backups are described in "Schedule Properties" on page 78.

Description of Schedule Properties

Property	Description
Retention	**Frequency based scheduling** The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps stream-based, non-proxy backup images. For proxy backups, NetBackup for Oracle uses the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup retention period to specify how long to keep proxy file-based backup images. **Calendar based scheduling** The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps non-proxy backup images. For proxy backups, NetBackup for Oracle with Advanced Client uses the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup retention period to specify how long to keep proxy file-based backup images.

Description of Schedule Properties (continued)

Property	Description
Multiple copies	If you are licensed for the Inline Tape Copy feature and wish to specify multiple copies of non-proxy stream-based backups for your Oracle policy, configure **Multiple copies** on the Application Backup schedule.
	For proxy file-based backups, configure **Multiple copies** on the automatic backup schedule.

Templates and Scripts

You can use a template created by the NetBackup for Oracle RMAN Template Generation wizard to perform NetBackup for Oracle with Advanced Client backups. Once created, templates are stored on the NetBackup master server and are available for use by other NetBackup for Oracle clients. See "Creating Templates and Shell Scripts" on page 109 for details on creating a backup template.

In the RMAN template generation wizard, the **Maximum Limits** 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, this option will be used for the backup of the logs.

Whether you use a template or script, you must enable the advanced backup method for your clients by configuring the Advanced Client methods on the **Attributes** tab of the policy. At run time, the template checks the policy attributes to determine if an Advanced Client backup method is configured, and initiates the proxy file-based backup.

If you choose to use a script, the script must be located on each client that will be backed up by the policy. You must include the Oracle `backup proxy` command in the script to enable the advanced backup method. NetBackup for Oracle provides sample scripts with the installation. See "NetBackup for Oracle with Advanced Client Environment Variables" on page 195 for details.

NetBackup for Oracle with Advanced Client Environment Variables

For NetBackup for Oracle with Advanced Client, the order of precedence for environment variables is the same as for standard NetBackup for Oracle. The Configuration chapter of this manual contains instructions for configuring variables set by NetBackup, as well as variables set by a user. Please see "Configuring the Run-Time Environment" on page 104 for details.

In addition, you must configure the following environment variables that are specific to NetBackup for Oracle Advanced Client:

NB_ORA_PC_SCHED   Name of the Oracle schedule used for a proxy copy file-based backup (Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental backup type).

For scheduled backups this variable is passed from the scheduler. When creating an RMAN template using the NetBackup for Oracle RMAN Template Generation Wizard this variable is automatically created in the template. If you choose to use a script, you must use the `send` command to pass this variable to the agent. See the example below, and refer to the sample scripts provided with the agent.

NB_ORA_PC_STREAMS   Specifies the number of backup streams that NetBackup for Oracle Advanced Client starts simultaneously in each proxy copy session. When a backup starts, NetBackup for Oracle Advanced Client groups all datafiles into a specified number of backup streams based on the file size. NetBackup for Oracle Advanced Client attempts to create streams of equal size.

The default value for NB_ORA_PC_STREAMS is 1.

This variable can only be set by a user. When creating 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**. If you choose to use a script, you must use the `send` command to pass this variable to the agent. See the example below, and refer to the sample scripts provided with 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');
}
```

NetBackup for Oracle installed sample scripts in the following location:

```
install_path/netbackup/ext/db_ext/oracle/samples/rman
```

The NetBackup for Oracle with Advanced Client sample scripts that provide an example of how to configure the required variables are:

hot_database_backup_proxy.sh
hot_tablespace_backup_proxy.sh

The following table explains the sample scripts provided with NetBackup for Oracle.

NetBackup for Oracle with Advanced Client Sample Scripts

hot_database_backup_proxy.sh	This example sets the environment and calls rman with the appropriate command to perform a whole database proxy backup. When a schedule executes, NetBackup sets environment variables that can be used by NetBackup for Oracle with Advanced Client. The script shows how to use the RMAN send command to pass the NetBackup for Oracle with Advanced Client variables with a vendor-specific quoted string.
hot_tablespace_backup_proxy.sh	This script sets the environment and calls rman with the appropriate command to perform a tablespace proxy backup.

Restoring from a Snapshot Backup

Restoring the database files backed up by a proxy file-based method does not require a special configuration. You can use the same procedure described in "Performing a Restore" on page 137. RMAN determines which files were backed up with proxy method and initiates a corresponding restore request to the NetBackup for Oracle agent.

Restoring from a NAS_Snapshot Backup

There are two ways to restore from a snapshot backup:

◆ Individual File Restore

◆ Snapshot Rollback

The following sections provided details on these restore methods. Refer to the *NetBackup Advanced Client System Administrator's Guide* and the *NetBackup for NDMP Supported OS and NAS Appliance Information* file for a detailed explanation of specific behavior.

Individual File Restore

The procedure for restoring individual files from a NAS_Snapshot does not require special configuration. You can use the same procedure described in "Performing a Restore" on page 137. RMAN determines which files were backed up with proxy method and initiates a corresponding restore request to the NetBackup for Oracle agent.

NetBackup for Oracle automatically attempts to restore individual files by means of file promotion. Otherwise, the restore takes place in the standard manner, without file promotion: all file data is copied from the snapshot to the primary file system.

Snapshot Rollback

You can also restore a snapshot of an entire volume with minimal I/O. This type of restore is called *point in time rollback*. All the data in the snapshot is restored; single file restore is not available in a rollback.

Snapshot rollback can be done only from Instant Recovery backups that were made with NAS_Snapshot method. Refer to the *NetBackup Advanced Client System Administrator's Guide* for important notes regarding snapshot rollback issues.

In addition, the following considerations are relevant for NetBackup for Oracle restores:

◆ Snapshot rollback overrides the entire volume.

◆ With NetBackup for Oracle, snapshot rollback always performs file verification, checking for the following:

  ◆ requested files (number and names) are identical to those in the snapshot

  ◆ the primary volume does not contain files created after the snapshot was made

  If verification fails, the rollback aborts with 249.

◆ Snapshot rollback should be used with database files only. Database files and redo logs should exist on different file systems or volumes.

The procedure for specifying a snapshot rollback restore depends on the method you choose to perform the restore:

❖ If using the Backup, Archive and Restore Interface, click the **Restore Files** tab, and set the **Restore Type** to **Point in Time Rollback**. You can then use the NetBackup for Oracle Recovery Wizard for the restore, and the rest of the procedure is the same as for restores from normal backups.

❖ If using a shell script or rman command, set a new variable, NB_PC_ORA_RESTORE = rollback. For example,

```
RUN {
  allocate channel t1 'sbt_tape';
  send 'NB_ORA_PC_RESTORE=rollback';
  sql 'alter tablespace TEST offline immediate'
  restore tablespace TEST;
  recover tablespace TEST;
  release channel t1;
}
```

Configuring a Block Level Incremental Backup

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 BLI Backup interface extends the capabilities of NetBackup to back up only changed data blocks of Oracle database files.

A database BLI Backup is done at the file system block level, which means only changed blocks, not the changed files, are backed up. Because the 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 required, and significantly reduces CPU and network overhead during backups. In addition, BLI Backup allows more frequent backups, making backup images more up-to-date.

BLI Backup is particularly useful in a database environment where a database can be hundreds of gigabytes or terabytes. Using most traditional methods for database backup, any change in the database—no matter how small—requires backing up the entire database. Using BLI Backup, only modified data blocks need to be backed up.

The recommended method for performing Oracle BLI backups is the proxy BLI agent with RMAN. This method supports the other features of NetBackup for Oracle, including the Oracle policy types and schedules and the convenience of the RMAN Template Generation wizard. It also remains tightly integrated with RMAN and its catalog, greatly simplifying administration tasks. For instructions on configuring and performing a BLI backup using the proxy BLI Agent method, see "Configuring an Oracle Policy for Block Level Incremental Backups" on page 202.

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 requires a significantly different configuration. For instructions, see "Script-Based BLI Without RMAN" on page 237.

How Does BLI Work?

BLI Backup supports full, as well as block-level incremental backups of Oracle databases. Two types of block-level incremental backups are supported: differential and cumulative. Full, differential incremental, and cumulative incremental backups are specified as part of the backup schedule. When restoring Oracle database files, NetBackup restores an appropriate full backup, then 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. This restore process is performed automatically by NetBackup and is completely transparent. The media that stored the last full backup and the subsequent incremental backups must be available; otherwise, 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 will back up all of the blocks in the restored file. After restoring an entire database, note that the first subsequent backup will result 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; however, a VxFS file system with the Storage Checkpoint feature is needed to perform BLI Backups of the restored data.

Full Backup

A backup where NetBackup backs up the entire database file, not just data blocks changed since the last full or incremental backup.

Cumulative BLI Backup

This is backup of all the data blocks of database files that changed since the last full backup. Since a cumulative BLI Backup image contains only the data blocks of database files that changed since the last full backup, a cumulative BLI Backup can reduce the number of incremental backup images that must be applied to a restore operation, improving restore times.

Differential BLI Backup

A backup where 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 block level incremental backups, it takes appropriate Storage Checkpoints of the Oracle datafile file systems. These Storage Checkpoints identify and maintain a list of modified blocks.

Storage Checkpoint

BLI Backup accomplishes the block level incremental backup methodology using the Storage Checkpoint facility in the VERITAS File System (VxFS) available through the Database Edition.

The VxFS Storage Checkpoint facility keeps track of data blocks modified by the database since the last backup. NetBackup with BLI Backup leverages this facility to back up only changed blocks, not the entire database, for an incremental backup.

VxFS Storage Checkpoint is a disk- and I/O-efficient snapshot of file systems. A Storage Checkpoint provides a consistent, stable view of a file system at the point in time when the file system was snapped or checkpointed. Instead of making a physically separate copy of the file system, a Storage Checkpoint identifies and maintains only changed file system blocks, saving disk space and significantly reducing I/O overhead.

By keeping track of changed blocks, the VxFS Storage Checkpoint enables BLI Backups. VxFS Storage Checkpoint facility provides a consistent view of file systems, allowing BLI Backup to freeze the database image for consistent database backups.

The Storage Checkpoint operation is similar to the snapshot file system mechanism. However, unlike a snapshot, the Storage Checkpoint persists after a system reboot. Also, the Storage Checkpoint operation is totally transparent to administrators. The Checkpoint image is managed and available only through NetBackup or the VxDBA utility for database backup available with the Oracle Database Edition.

For more information on Storage Checkpoint, see the following:

◆ The *VERITAS Database Edition for Oracle Database Administrator's Guide*.

Storage Checkpoints can be taken while the database is online or offline. To take a Storage Checkpoint while the database is online, you must enable archive log mode. During the creation of the Storage Checkpoint, all tablespaces are placed in backup mode.

There are two types of Storage Checkpoints that can be used:

◆ Nodata Storage Checkpoint
◆ Fulldata Storage Checkpoint

Nodata Storage Checkpoint

The Nodata Storage Checkpoint will only set a bit to indicate that a block has changed. When using Nodata Storage Checkpoints, the datafiles are left in backup mode for the duration of the backup. The amount of redo generated depends on the number of changes made during the backup.

To support BLI backup, 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. For Nodata Storage Checkpoints, the additional space required by each file system is about 1% of the file system size.

The default option used by NetBackup for Oracle with Advanced Client for proxy backups is to use Fulldata Storage Checkpoint. By using this option, the NetBackup for Oracle agent keeps Oracle datafiles in backup mode only for the time needed to create a Storage Checkpoint. To change the default configuration refer to "Storage Checkpoint Configuration on the Client" on page 209.

Fulldata Storage Checkpoint

The Fulldata Storage Checkpoint will make a copy of the original data block before making a change. When using Fulldata Storage Checkpoints, the tablespaces and datafiles are in backup mode for only a few seconds while the Storage Checkpoint is created, so the extra redo log space used is very small.

Space in the file system, however, is needed to keep a copy of the original block of data that was changed. The amount of space used depends on the number of changes made during the backup. 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.

While archive log mode is required when the database is online, this mode provides the best recoverability for taking offline Storage Checkpoints as well.

Configuration Requirements

◆ NetBackup Advanced Client is installed and configured correctly and the license key for this option has been registered. Refer to the *NetBackup Advanced Client System Administrator's Guide* for details.

◆ VERITAS Database Edition for Oracle must be installed and configured.

◆ VERITAS VxFS must have Storage Checkpoint licensed.

Configuring an Oracle Policy for Block Level Incremental Backups

This section explains what is necessary to configure block level incremental backups for an Oracle policy. For detailed instructions on configuring an Oracle policy refer to "Configuring a NetBackup Policy" on page 41.

Block level incremental backups do not back up all database objects. Your backup configuration must include schedule types to perform file-based and stream-based backups in order to ensure that the entire database can be successfully restored.

To configure a policy for block level incremental backups a user needs to configure:

◆ The BLI backup method on the policy attributes dialog

◆ Automatic Backup schedule types to perform full and incremental file-based backups of the datafiles

◆ Application Backup schedule type to perform a stream-based backup of control files and archived redo logs. Note that Oracle does not support proxy backups of database control files and archived redo logs. These files are backed up using standard RMAN operations.

For details on standard policy attributes that differ for a NetBackup for Oracle with Advanced Client policy, see the following sections:

◆ "Types of Backups" on page 205

◆ "Schedule Properties" on page 206

◆ "Templates and Scripts" on page 207

The following describes the procedure for configuring a NetBackup for Oracle policy with block level incremental backups.

▼ **To configure a policy for block level incremental backups**

1. Open the policy you wish to configure.

2. Click the **Attributes** tab.

3. From the **Policy Type** list, choose **Oracle**.

Select the policy type. ——

Select appropriate storage
unit or storage unit group. ——

Click **Perform block level
incremental backups**. ——
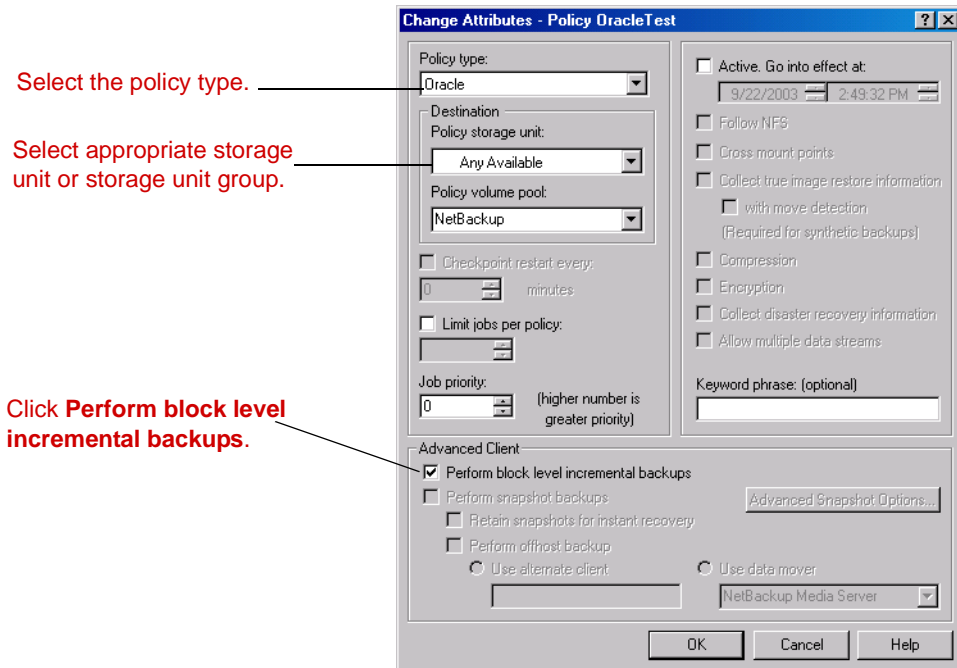
4. Select a **Policy storage unit**.

5. Select **Perform block level incremental backups**.

6. To configure schedules, click the **Schedules** tab.

Currently, Oracle does not support proxy backups of database control files and archived redo logs. To be able to perform a whole database proxy backup, which automatically includes a backup of the control file, you must configure:

◆ One or more automatic backup schedules to perform proxy BLI backups of the datafiles.

◆ Application Backup schedule type to back up the control file and the archived redo logs.

For details on how information on these schedules differs for NetBackup for Oracle with Advanced Client backups, see "Types of Backups" on page 205 and "Schedule Properties" on page 206.

7. Use the **Clients** tab to specify clients to be backed up with this policy

Refer to "Configuration" on page 67 for details on adding clients to a policy.

8. Use the **Backup Selections** tab to enter the template or script.

See "Templates and Scripts" on page 207 for information about using templates and scripts with a NetBackup for Oracle with Advanced Client policy.

Types of Backups

Proxy BLI backups are performed by Automatic Full Backup, Automatic Differential Incremental Backup, and Automatic Cumulative Incremental Backup schedules. If a backup is initiated by a user and the proxy schedule name is not specified on the request using the NB_ORA_PC_SCHED variable, the NetBackup server will start an Automatic Full Backup schedule by default. (For details, see "NetBackup for Oracle with Advanced Client Environment Variables" on page 207.)

NetBackup for Oracle will always check that a full backup has been performed before proceeding 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, it will perform a full backup.

To ensure that it has a proper set of images to restore, NetBackup will perform a full backup when it encounters the following situations:

◆ If the number of backup streams specified with NB_ORA_PC_STREAMS has changed from the previous backup. For details, see "NetBackup for Oracle with Advanced Client Environment Variables" on page 207.

◆ If NetBackup does not have a valid full backup image in its database (for example, 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 will always initiate a full backup under these conditions, even if the user wants to perform an incremental backup.

The Backup Types available on the **Schedules** tab of the policy play a different role for NetBackup for Oracle with Advanced Client backups.

Description of Backup Types for Oracle

Application Backup	The Application Backup schedule enables stream-based NetBackup operations. The Default-Application-Backup schedule is automatically configured as an Application Backup schedule.

Description of Backup Types for Oracle

Automatic Full Backup, Automatic Differential Incremental Backup, Automatic Cumulative Incremental Backup	For file-based proxy copy backups, the Automatic backup schedule types serve two purposes: ◆ Automatic backup schedules automatically start the backups by running the NetBackup for Oracle RMAN scripts or templates. ◆ Automatic backup schedules perform the actual file-based BLI backups of the database objects.

Schedule Properties

Some of the schedule properties have a different meaning for Advanced Client database backups than for a regular database backup. These properties are explained below.

Other schedule properties that are specific to Oracle backups are described in "Schedule Properties" on page 78.

Description of Schedule Properties

Property	Description
Retention	**Frequency based scheduling** The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps stream-based, non-proxy backup images. For proxy backups, NetBackup for Oracle uses the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup retention period to specify how long to keep proxy file-based backup images. **Calendar based scheduling** The retention period for an Application Backup schedule refers to the length of time that NetBackup keeps non-proxy backup images. For proxy backups, NetBackup for Oracle with Advanced Client uses the Automatic Full Backup, Automatic Differential Incremental Backup, or Automatic Cumulative Incremental Backup retention period to specify how long to keep proxy file-based backup images.
Multiple copies	If you are licensed for the Inline Tape Copy feature and wish to specify multiple copies of non-proxy stream-based backups for your Oracle policy, configure **Multiple copies** on the Application Backup schedule. For proxy file-based backups, configure **Multiple copies** on the automatic backup schedule.

Templates and Scripts

You can use a template created by the NetBackup for Oracle RMAN Template Generation wizard to perform NetBackup for Oracle with Advanced Client backups. Once created, templates are stored on the NetBackup master server and are available for use by other NetBackup for Oracle clients. See "Creating Templates and Shell Scripts" on page 109 for details on creating a backup template.

In the RMAN template generation wizard, the **Maximum Limits** 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, this option will be used for the backup of the logs.

Whether you use a template or script, you must enable the advanced backup method for your clients by configuring the Advanced Client methods on the **Attributes** tab of the policy. At run time, the template checks the policy attributes to determine if an Advanced Client backup method is configured, and initiates the proxy file-based backup.

If you choose to use a script, the script must be located on each client that will be backed up by the policy. You must include the Oracle `backup proxy` command in the script to enable the advanced backup method. NetBackup for Oracle provides sample scripts with the installation. See "NetBackup for Oracle with Advanced Client Environment Variables" on page 195 for details.

NetBackup for Oracle with Advanced Client Environment Variables

For NetBackup for Oracle with Advanced Client, the order of precedence for environment variables is the same as for standard NetBackup for Oracle. The Configuration chapter of this manual contains instructions for configuring variables set by NetBackup, as well as variables set by a user. Please see "Configuring the Run-Time Environment" on page 104 for details.

In addition, you must configure the following environment variables that are specific to NetBackup for Oracle Advanced Client:

NB_ORA_PC_SCHED   Name of the Oracle schedule used for a proxy copy file-based backup (Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental backup type).

                                  For scheduled backups this variable is passed from the scheduler. When creating an RMAN template using the NetBackup for Oracle RMAN Template Generation Wizard this variable is automatically created in the template. If you choose to use a script, you must use the `send` command to pass this variable to the agent. See the example below, and refer to the sample scripts provided with the agent.

NB_ORA_PC_STREAMS   Specifies the number of backup streams that NetBackup for Oracle Advanced Client starts simultaneously in each proxy copy session. When a backup starts, NetBackup for Oracle Advanced Client groups all datafiles into a specified number of backup streams based on the file size. NetBackup for Oracle Advanced Client attempts to create streams of equal size.

The default value for NB_ORA_PC_STREAMS is 1.

This variable can only be set by a user. When creating 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**. If you choose to use a script, you must use the `send` command to pass this variable to the agent. See the example below, and refer to the sample scripts provided with 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');
}
```

NetBackup for Oracle installed sample scripts in the following location:

install_path/netbackup/ext/db_ext/oracle/samples/rman

The NetBackup for Oracle with Advanced Client sample scripts that provide an example of how to configure the required variables are:

hot_database_backup_proxy.sh
hot_tablespace_backup_proxy.sh

The following table explains the sample scripts provided with NetBackup for Oracle.

NetBackup for Oracle with Advanced Client Sample Scripts

hot_database_backup_proxy.sh	This example sets the environment and calls `rman` with the appropriate command to perform a whole database proxy backup. When a schedule executes, NetBackup sets environment variables that can be used by NetBackup for Oracle with Advanced Client. The script shows how to use the RMAN `send` command to pass the NetBackup for Oracle with Advanced Client variables with a vendor-specific quoted string.

hot_tablespace_backup_proxy.sh	This script sets the environment and calls `rman` with the appropriate command to perform a tablespace proxy backup.

Storage Checkpoint Configuration on the Client

The default option used by NetBackup for Oracle with Advanced Client for proxy BLI backups is to use Fulldata Storage Checkpoint. When using this option, the NetBackup for Oracle agent keeps Oracle datafiles in backup mode only for the time needed to create a Storage Checkpoint.

To change the default option to use Nodata Storage Checkpoint, a user must create the following file:

`/usr/openv/netbackup/ext/db_ext/NODATA_CKPT_PROXY`

If the agent finds this file during run time, it will switch to use Nodata Storage Checkpoint, and the datafiles will be in backup mode for the duration of the backup.

Script-Based BLI Agent without RMAN

VERITAS recommends that Oracle Advanced Client users who want to perform BLI backups use the BLI agent with RMAN method. If you prefer to use the script-based BLI method without RMAN, please see "Script-Based BLI Without RMAN" on page 237.

Troubleshooting 7

NetBackup, NetBackup for Oracle on UNIX, and the Oracle Recovery Manager all provide reports on database backup, archive, and restore operations. These reports are useful for finding errors associated with those applications.

This chapter contains the following sections.

- General Troubleshooting Procedure
- NetBackup and NetBackup for Oracle on UNIX Logs and Reports
- Troubleshooting Backup or Restore Errors
- Troubleshooting XML Export or XML Import Errors
- Troubleshooting the Browser GUI and Wizards
- Troubleshooting NetBackup for Oracle with Advanced Client
- Excessive Tape Remounts
- Preventing Timeout Failures on Large Database Restores

General Troubleshooting Procedure

> **Note** For brevity, this chapter refers to the `libobk` module as API. Many media manager vendors also call the `libobk` module DMO (Database Module).

To perform this procedure, the following products must be properly installed and configured:

- NetBackup 5.1
- Oracle RDBMS 8.0.4 or later

> **Note** XML export and XML import require Oracle RDBMS 8.1.5 or later.

- NetBackup for Oracle on UNIX 5.1

1. When verifying your installation, ensure that the following NetBackup for Oracle on UNIX binaries exist (in *install_path*/netbackup/bin):

- `bphdb` resides on the client and is used by both the NetBackup scheduler and the graphical interface to start backups. The main purpose of `bphdb` is to execute an Oracle template or shell script that in turn calls `rman`, `bporaexp`, or *bporaimp*. Only the script is required when `rman`, `bporaexp`, or `bporaimp` is executed from the command line.

- `libobk` is a shared library module containing functions callable by the Oracle Recovery Manager (RMAN). This library is loaded when RMAN is started. The actual name of this binary is dependent on the operating system.

  - `libobk.so` on NCR, SGI, Sequent, Linux, and Data General
  - `libobk.so.1` on Solaris, Tru64 and Digital UNIX (32-bit)
  - `libobk.so64.1` on Solaris (64-bit)
  - `libobk.sl` on HP-UX (32-bit)
  - `libobk.sl64` on HP-UX (64-bit)
  - `libobk.a` on AIX
  - `libobk.a64` on AIX (64-bit)
  - `libobk.so64` on SGI (64-bit)

2. For XML export and XML import, verify that the following binaries exist:

- For 32-bit
  - *install_path*/netbackup/bin/bporaexp
  - *install_path*/netbackup/bin/bporaimp

- *install_path*/lib/libbpora.so.8.0 (libbpora.sl.8.0 on HP-UX)
- *install_path*/lib/libbpora.so.9.0 (libbpora.sl.9.0 on HP-UX)

- For 64-bit:
  - *install_path*/netbackup/bin/bporaexp64
  - *install_path*/netbackup/bin/bporaimp64
  - *install_path*/lib/libbpora64.so.8.0 (libbpora64.sl.8.0 on HP-UX)
  - *install_path*/lib/libbpora64.so.9.0 (libbpora64.sl.9.0 on HP-UX)

3. For the Backup, Archive, and Restore GUI, verify that the following binaries exist in `install_path`\netbackup\bin:

- *install_path*/netbackup/bin/bpdbsbora
- *install_path*/netbackup/bin/bpubsora
- *install_path*/lib/libdbsbrman.so (libdbsbrman.sl on HP-UX)
- *install_path*/lib/libnbberman.so (libnbberman.sl on HP-UX)

4. Check that both the NetBackup server and client software are working 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. Check that the following NetBackup logs are turned on in VERBOSE=5 mode:

- On the client: bpdbsbora, bporaexp (or boraexp64), bporaimp (or boraimp64), dbclient, bphdb, and bpcd.
- On the master server: bprd, bpsched, and bpdbm.
- On the host with the storage unit: bpbrm, and bptm.

Note These logs may become very large, especially bpsched and bpdbm. Ensure that enough free disk space exists in the log directory disk partition.

NetBackup and NetBackup for Oracle on UNIX Logs and Reports

The following describes troubleshooting logs and reports generated by NetBackup products.

NetBackup for Oracle on UNIX Logs

The NetBackup server and client software allow you to set up detailed debug logs for troubleshooting problems that occur outside of either NetBackup for Oracle on UNIX or the Oracle Recovery Manager. See the *NetBackup Troubleshooting Guide for UNIX and Windows* for a complete description of debug logs. Also see the *install_path*/netbackup/logs/README.debug file.

> **Note** These logs do not reveal errors that occur during the execution of the Oracle Recovery Manager, unless those errors also affect NetBackup for Oracle. Oracle may (or may not) use the NetBackup for Oracle logs for errors in the application. Your best sources for Oracle error information are the logs provided by Oracle.

> **Note** In general, 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.

▼ **To enable the NetBackup for Oracle on UNIX logs**

1. Create the following directories on the client:

   install_path/netbackup/logs/bphdb
   install_path/netbackup/logs/dbclient
   install_path/netbackup/logs/bpdbsbora
   install_path/netbackup/logs/bporaexp
   install_path/netbackup/logs/bporaimp

   ```
   % cd install_path/netbackup/logs/
   % mkdir bphdb
   % mkdir dbclient
   % mkdir bpdbsbora
   % mkdir bporaexp
   % mkdir bporaimp
   ```

   For 64-bit, create:

```
install_path/netbackup/logs/dbclient64
install_path/netbackup/logs/bporaexp64
install_path/netbackup/logs/bporaimp64

% cd install_path/netbackup/logs
% mkdir bphdb
% mkdir dbclient64
% mkdir bpdbsboraexp64
% mkdir bporaimp64
```

2. Set the access permissions to 777 on these log directories.

```
% chmod 777 bphdb
% chmod 777 dbclient
% chmod 777 bporaexp
% chmod 777 bporaimp
% chmod 777 bpdbsbora
```

For 64-bit:

```
% chmod 777 dbclient64
% chmod 777 bporaexp64
% chmod 777 bporaimp64
```

The following sections describe the logs created when you create the log directories. Use a text editor to view the contents of the logs.

bphdb Directory on the Client

The *install_path*/netbackup/logs/bphdb directory contains the following types of logs. These logs are a good starting place to determine what type of error occurred.

obk_stdout.*mmddyy*

> Unless redirected elsewhere, NetBackup places NetBackup for Oracle template or shell script output in this file.

obk_stderr.*mmddyy*

> Unless redirected elsewhere, NetBackup places NetBackup for Oracle template or shell script errors in this file.

log.*log.mmddyy*

> bphdb is the NetBackup Database Backup binary. This log contains debugging information for the bphdb process. NetBackup for Oracle on UNIX uses this client process for NetBackup for Oracle template or shell script execution. It is invoked when an automatic backup schedule is executed.

`dbclient` Directory on the Client

The *install_path*/netbackup/logs/dbclient directory contains the following execution log.

log.*log.mmddyy*

> This log contains debugging information and execution status for the Oracle NetBackup client processes linked to the library program, libobk, provided with NetBackup for Oracle on UNIX.

bpdbsbora directory on the Client

The *install_path*/netbackup/logs/bpdbsbora directory contains the following execution log.

log.mmddyy

> This log contains debugging information and execution status for the NetBackup for Oracle Backup and Recovery Wizards and for the bpdbsbora command line utility. This log also contains debugging information and execution status for when an Oracle template is run from an automatic schedule, when bphdb invokes bpdbsbora to execute the template.

bporaexp(bporexp64) directory on the Client

The *install_path*/netbackup/logs/bporaexp(bporaexp64) directory contains the following execution log.

log.*log.mmddyy*.log

> This log contains debugging information and execution status for the bporaexp(bporaexp64) program used to perform XML exports.

bporaimp(bporaimp64) directory on the Client

The *install_path*/netbackup/logs/bporaimp(bporaimp64) directory contains the following execution log.

log.*mmddyy*.log

> This log contains debugging information and execution status for the bporaimp(bporaimp64) program used to perform XML imports.

Setting the Debug Level

You can control the amount of information written to the debug log in the *install_path*/netbackup/logs/ directories by changing the Database debug level. The higher the value, the more information is logged. In everyday normal operations, the default value of 0 is sufficient. However, VERITAS Technical Support may ask you to set the value higher when a problem is being analyzed. 5 is the highest possible setting.

❖ To change the Debug Level, enter the following line in the bp.conf file.

    VERBOSE = 5

NetBackup Server Reports

NetBackup provides other reports that are useful in isolating problems. One such report is All Logs Entries on the server. See the *NetBackup System Administrator's Guide for Windows, Volume I* or *NetBackup System Administrator's Guide for UNIX, Volume I* for a description of this and other reports.

Oracle Recovery Manager Utility Logs

The Oracle Recovery Manager uses a command language interpreter, and can be executed in interactive or batch mode. You can specify a log file on the command line to record significant RMAN actions. The syntax is:

msglog '*logfile name*'

Additional XML Export and Import Logs

The bporaexp and bporaimp programs perform error logging and tracing in the file specified by the LOG parameter. The log files contain non-NetBackup related errors including Oracle errors. These errors are also logged in the NetBackup debug logs in *install_path*/netbackup/logs/bporaexp and bporaimp when bporaexp and bporaimp are being used in NetBackup mode. However, when they are not being used in NetBackup mode, that is, when the DIRECTORY parameter is specified, these logs are the only source of error logging and tracing.

Troubleshooting Backup or Restore Errors

An Oracle Recovery Manager backup error can originate:

◆ On the NetBackup side

An error can be from the API, the NetBackup server or client, or Media Manager.

◆ On the Oracle side

The error can be from the Oracle Recovery Manager, or the target database.

VERITAS suggests that you use the following steps when troubleshooting a failed operation:

1. Check the logs to determine the source of the error.

2. Troubleshoot each stage of the backup or restore.

The following sections describe these steps in detail.

Check the Logs to Determine the Source of the Error

Determine whether the error is from NetBackup or the Oracle Recovery Manager.

If the error came from NetBackup, go to "Troubleshoot Each Stage of the Backup or Restore" on page 219.

Otherwise, have the Oracle database administrator or the NetBackup administrator look at the problem.

The majority of the problems setting up NetBackup and RMAN concern the linking process not working, an error with the RMAN script that is being executed, issues with the NetBackup policy being set up incorrectly, or problems allocating tape devices/media.

Note Ensure that server and user-directed regular file system backups work for the client prior to debugging the Oracle RMAN backups. Try backing up the Oracle binaries.

◆ Always start by running `rman` from the command line rather than having NetBackup scheduler execute a script. These troubleshooting steps assume you are running `rman` from the command line.

◆ If NetBackup and Oracle's `rman` are communicating, you should see a log in *install_path*/netbackup/logs/dbclient. If a log file exists and you are having problems, this usually means a configuration problem within the NetBackup policy or media availability.

```
cd install_path/netbackup/logs/dbclient
ls
  log.123098
```

If you have a log file, then NetBackup and Oracle RMAN are linked correctly.

◆ If NetBackup and Oracle's `rman` are NOT communicating, you will NOT see a log in *install_path*/netbackup/logs/dbclient.

```
cd install_path/netbackup/logs/dbclient
ls
```

Logs will not be created in this directory if the permissions are not set for the Oracle user to write the directory. Full permissions is best, chmod 777.

Verify that the RMAN script works correctly. That is, verify that the RMAN script will back up to `allocate channel c1 type disk` instead of `allocate channel c1 type sbt_tape`.

If RMAN can back up to disk and not to tape, and no log file exists in `dbclient`, then the link did not work correctly.

If you receive an error such as one of the following, it normally means the link step (`oracle_link`) failed.

```
RMAN-03007: retryable error occurred during execution of command: backup

RMAN-07004: unhandled exception during command execution on channel t1

RMAN-10032: unhandled exception during execution of job step 1: ORA-06512: at
  line

RMAN-10035: exception raised in RPC: ORA-19624: operation failed, retry possible

ORA-19506:   failed   to   create   sequential   file,   name="al_t310146906_s1_p1",
  parms=""

ORA-27006: sbtremove returned error
```

If you suspect a link failure, refer to "Linking Oracle8 with NetBackup for Oracle on UNIX" on page 39 or "Linking Oracle9i and Oracle10g with NetBackup for Oracle on UNIX" on page 57.

Troubleshoot Each Stage of the Backup or Restore

The following explains the sequence of events for an Oracle Recovery Manager initiated action and suggests solutions for problems that can occur at each point in the sequence.

1. `rman` starts.

A backup or restore can be started in any of the following ways:

- Command line from the system prompt such as:

   For Oracle Recovery Manager Backup or Restore:

```
% rman target user/pwd[@TNS alias] \
  rcvcat user/pwd[@TNS alias] \
  cmdfile RMAN script file name
```

   where *RMAN script file name* is fully qualified.

- Using a template executed from the NetBackup client GUI or `bpdbsbora`.

- Manually from the administrator interface on the master server.

- Automatically by an automatic backup schedule.

If an error occurs at this point, check the Oracle Recovery Manager log.

2. Oracle Recovery Manager verifies its environment, then issues requests to the API.

Some information such as the NetBackup version, API versions, and trace filename, and NetBackup signal handlers are registered with the Oracle Recovery Manager.

An error at this point is usually due to a problem with client and server communication. Check the messages in the `bprd`, `bpsched`, and `bpcd` logs for clues. Also verify the `bp.conf` entries on the client.

3. Oracle Recovery Manager issues a backup or restore request.

The API gathers necessary parameters, and then 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.

Oracle Recovery Manager requests a backup or restore by passing the following to the API:

- Filename it wants NetBackup to use

- Mode (backup or restore)

- Actual name of the Oracle data file

- Information about the target database

The API gathers information from the following:

- Environment

- User's `bp.conf` and *install_path*`/netbackup/bp.conf` files on the client

- Information file from `bphdb` to be used as parameters to the `bprd` process

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 *install_path*`/netbackup/logs/dbclient/log.`*mmddyy*.

- If the `bprd` process failed, check the logs for `bprd`, `bpbrm`, and `bpsched`.

    A failure at this point is frequently due to bad NetBackup server or Oracle policy configuration parameters:

NetBackup can usually select the correct Oracle policy and schedules but not always when there are several Oracle policies in its database. Try setting the SERVER and POLICY values in the `bp.conf` file on the client or by using 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 policyname
setenv NB_ORA_SCHED schedule
setenv NB_ORA_SERV NetBackup server
```

4. Oracle Recovery Manager 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.

5. Oracle Recovery Manager tells the API to close the session.

The API waits for the server to complete its necessary actions (backup image verification and so on) and then exits.

An error can originate from either NetBackup or Oracle Recovery Manager.

- Oracle Recovery Manager will abort if it encounters an error while reading 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 may 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:

◆ 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:

The error can be from the target database.

VERITAS suggests that you use the following steps when troubleshooting a failed operation:

1. Check the logs to determine the source of the error.

2. Troubleshoot each stage of the XML export or XML import.

The following sections describe these steps in detail.

Check the Logs to Determine the Source of the Error

1. Check the `bporaexp` or `bporaimp` log.

   Messages are sent to the file name specified by

   `log=`

   in the `bporaexp` or `bporaimp` parameter file, or to the screen if `log=` is not specified.

   Some common problems are:

   • The *ORACLE_HOME* environment variable was not set.

   • The `bporaexp` or `bporaimp` program was unable to connect to the target database.

   The above errors are usually due to incorrect installation or configuration.

   When `bporaexp` and `bporaimp` are not being used in NetBackup mode, that is, when the DIRECTORY parameter is used, these logs are the only source of error logging and tracking.

2. Check the NetBackup logs

   The first NetBackup log to check is
   install_path`/netbackup/logs/bporaexp/log.mmddyy` or
   `/bporaimp/log.mmddyy`. This is the most important log. Examine it closely. It contains messages that will provide the best way to determine the source of an error. This log is written by the NetBackup client and contains:

   • Requests from `bporaexp` and `bporaimp`

   • Activities between `bporaexp` and `bporaimp` and NetBackup processes.

   If *install_path*`/netbackup/logs/bporaexp/log.mmddyy` or
   `/bporaimp/log.mmddyy` does not contain any messages, the possible errors are:

   • `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 execute the XML export or XML import template or script file from the command line to determine the problem. Usually, the error is due to a file permission problem for `bphdb` itself or the export or import script file.

Ensure that the full XML export or import script filename is entered correctly in the Backup Selections list of the Oracle policy configuration, or for templates, that the name is correct.

Logs will not be 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.

Note For 64-bit, the logs are created in `/bporaexp64` and `/bporaimp64`.

Troubleshoot Each Stage of the XML Export or XML Import

The following explains the sequence of events for a `bporaexp` or `bporaimp` initiated action and suggests solutions for problems that can occur at each point in the sequence.

1. `bporaexp` or `bporaimp` starts.

   An export or import can be started in any of the following ways:

   - Command line from the system prompt such as:

     ```
     bporaexp parfile = parameter filename
     bporaimp parfile = parameter filename
     ```

   - Using a template executed 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 at this point, check the `bporaexp` or `bporaimp` log.

2. `bporaexp` or `bporaimp` verifies its environment, then connects to Oracle and NetBackup.

   An Oracle connect error is either due to an Oracle environment or database problem, or to an incorrect userid and password.

   A NetBackup error at this point is usually due to a problem with client and server communication. Check the messages in the `bprd`, `bpsched`, and `bpcd` logs for clues. Also verify the `bp.conf` entries on the client.

3. `bporaexp` or `bporaimp` issues an 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:

   - Environment, including `bporaexp` and `bporaimp` parameter files.

- User's `bp.conf` and `install_path`/netbackup/bp.conf files on the client

- Information file from `bphdb` to be used as parameters to the `bprd` process

This information is sent to the master server's `bprd` process.

To troubleshoot a backup problem in this part of the sequence, examine the `install_path`/netbackup/logs/bporaexp/log.*mmddyy* or /bporaexp64/log.*mmddyy.*

- If the `bprd` process failed, check the logs for `bprd`, `bpbrm`, and `bpsched`.

A failure at this point is frequently due to bad NetBackup server or Oracle policy configuration parameters.

NetBackup can usually select the correct Oracle policy and schedules, but not always when there are several Oracle policies in its database. Try setting the SERVER and POLICY values in the `bp.conf` file on the client, or use 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 `install_path`/netbackup/logs/bporaimp/log.*mmddyy* or /bporaimp64/log.*mmddyy.* 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
```

These parameters should be set 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 uses Oracle's Call Interface (OCI) to execute the query. The query results are translated to 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 NetBackup media, network, or timeout errors.

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 Browser GUI and Wizards

If you don't see the Oracle instance in your Backup, Archive and Restore GUI, check for 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.

   To change the client policy type:

   a. On the **Actions** menu, select **Specify NetBackup Machines**.

   b. On the Specify NetBackup Machines dialog, click the **Source client/Policy type** tab.

   c. In the **Policy type** drop down list, select **Oracle**.

   d. Click **OK**.

◆ The `oratab` file is in the correct location (`/etc/oratab` or `/var/opt/oracle/oratab`) and contains all of the available Oracle SIDs.

◆ Your login ID and password have Oracle SYSDBA privileges.

   Initially, NetBackup for Oracle will attempt OS Authentication to log on. If that fails, you are prompted for a user name and password. 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 be using a local connection. NetBackup for Oracle uses the Oracle SID and Oracle HOME to connect locally. If that fails, the Oracle SID is used as a TNS alias/service name. In a clustered environment, this can be used to connect if the Oracle SID is also a service name.

Troubleshooting NetBackup for Oracle with Advanced 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 Advanced Client.

Advanced Client backup and debug messages are written to the following subdirectories of *install_path*/netbackup/logs/:

◆ `bpbrm` (on the NetBackup server)

◆ `bptm/bpdm` (on the NetBackup media server)

◆ `online_util` (on the NetBackup client and alternate client)

◆ `bpbkar` (on the NetBackup client and alternate client)

◆ `bpfis` (on the NetBackup client and alternate client)

◆ `bppfi` (on the NetBackup client or alternate client)

Advanced Client restore and debug messages are written to the following subdirectories on the NetBackup master server:

◆ `bprestore`

◆ `bprd`

◆ `bpbrm`

◆ `bptm/bpdm`

◆ `tar`

Additional troubleshooting information including troubleshooting installation problems is available in the *NetBackup Advanced Client System Administrator's Guide.*

Excessive Tape Remounts

Each backup set initiates a new NetBackup job. If you are using a robotic device that supports automatic volume recognition, tape mounts are not normally an issue. However, if you do not use such a device, you may notice a mount request prior to each job executing. This can become labor intensive. NetBackup provides a `bp.conf` option, MEDIA_UNMOUNT_DELAY, which will prevent unmounting a tape after it is used. This will keep the required tape on-line until Media Manager is manually instructed to unmount it. See the *NetBackup System Administrator's Guide for UNIX* or the *NetBackup System Adminstrator's Guide for Windows* for more information.

Preventing 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 waiting for media or device access. If the delay is too long, the restore session times out.

This problem can be resolved by increasing the **Client Read Timeout** property, which prevents session timeouts and allows the restores to complete successfully.

Use the NetBackup Administration Console on the server to change the properties of each client that contains a database you may need to restore. The **Client Read Timeout** property is found on the Timeouts host properties dialog of the master and media servers. The default for the **Client Read Timeout** setting is 300 seconds (5 minutes). For database agent clients, increase the value significantly to prevent timeout errors, e.g. 30 minutes.

Oracle 9i and 10g Real Applications Clusters **A**

Overview

In an Oracle9i or Oracle 10g 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 concurrently execute transactions against the same database. Should any single server or instance fail, processing continues on the surviving servers.

How Does NetBackup Fit into a RAC Environment?

Real Application Clusters supports all Oracle backup features that are available in exclusive mode, including both online and offline backups of either an entire database or individual tablespaces.

Virtual Names

A *virtual name* is a network host name resource (mapped to a IP address) that is associated with an application. If it is possible, virtual names should be used for the client and server nodes. Using a virtual node name for the client allows you to specify a single client entity for all of the Oracle backups. This allows NetBackup to perform a restore to any physical node.

If a virtual client name is not used, a "normal" restore can only be performed from the node associated to the client name specified on the backup. Another possible solution in this environment is to use an alternate client restore.

Archiving Schemes

The preferred configuration for Real Application Clusters is to use 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. The following figure depicts a Cluster File System archiving scheme.

Cluster File System Archiving Scheme
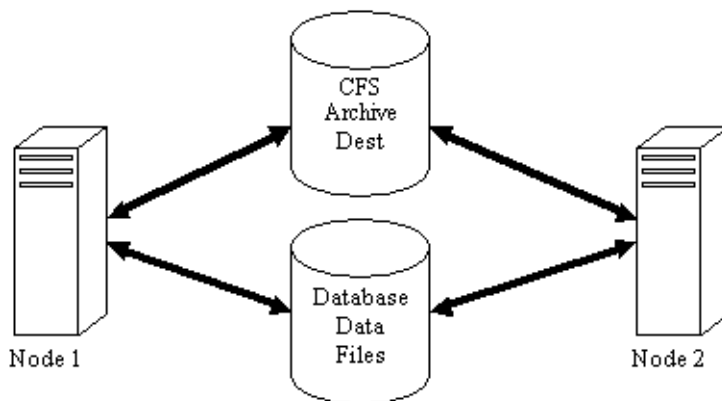
If the CFS solution is not available, Oracle recommends a scheme where each node archives to a local directory and writes a copy to each of the other nodes' archive directories (see the figure below). The locations are shared between the nodes (with read and write permissions) by NFS mounting the directory (UNIX) or sharing the locations (Windows). The following figure depicts a non-CFS local archiving scheme with archive sharing.

Non-CFS Local Archiving Scheme with Archive Sharing
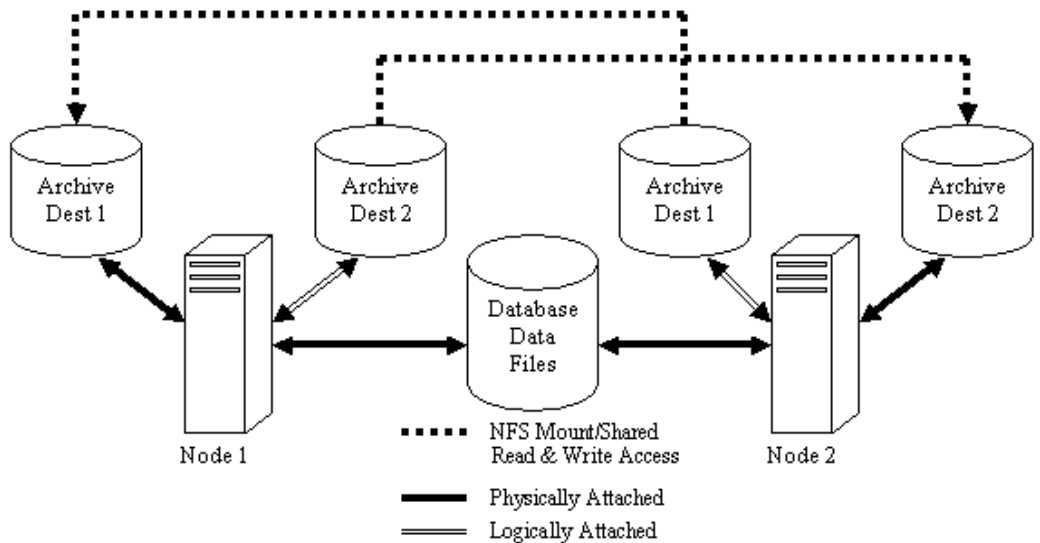
A similar scheme to the one found above is where each node archives to a local directory, as in the figure below, and the locations are shared (read-only) with the other nodes in the cluster. These locations are shared between the nodes by NFS-mounting the directory (UNIX) or sharing the locations (Windows). Therefore, each node can read each archive destination. This figure depicts a non-CFS local archiving scheme with read-only archive sharing.

Non-CFS Local Archiving Scheme with Archive Read-Only Sharing

NetBackup for Oracle System Administrator's Guide for UNIX
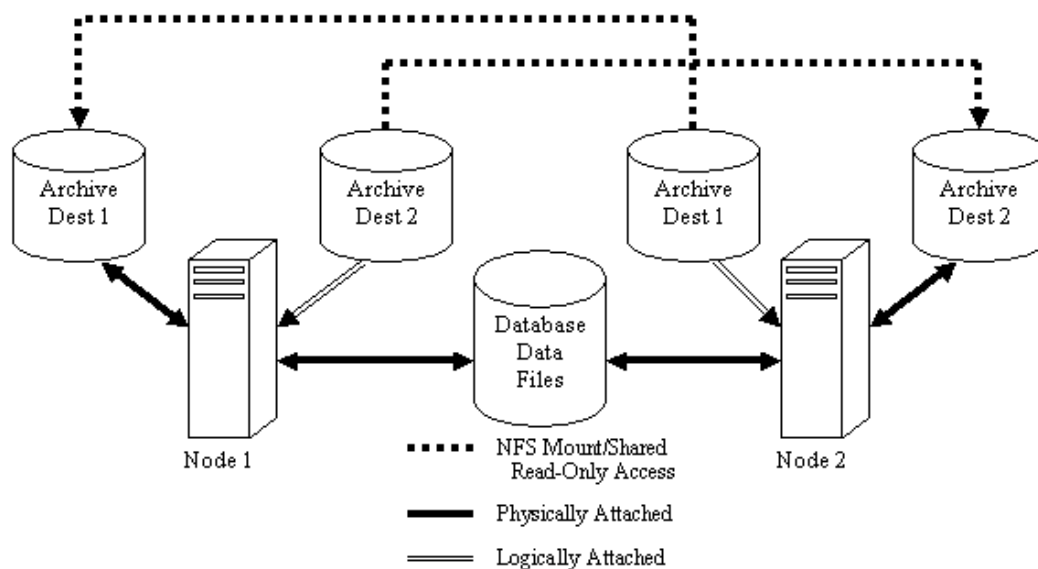
The simplest archiving scheme is local archiving with no sharing, as shown in the figure below.   Each node writes only to the local destination and no access is given to the other nodes in the cluster. The following figure depicts a non-CFS local archiving scheme with no archive sharing.

Non-CFS Local Archiving Scheme with NO Archive Sharing
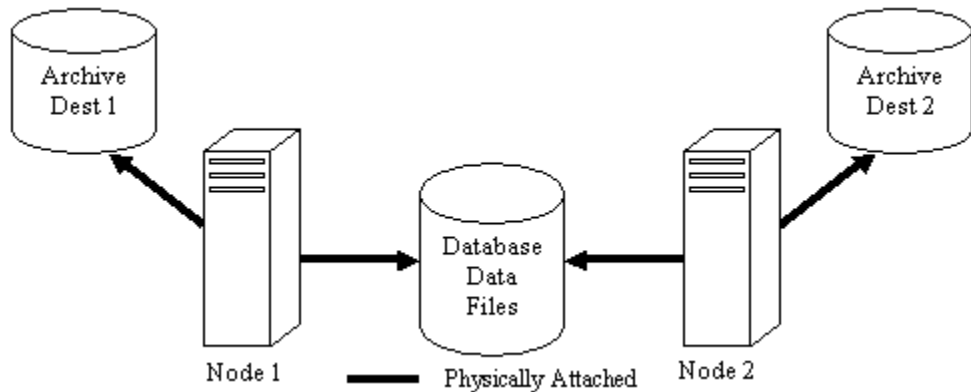
For more information (including proper setup and additional archiving scheme examples), please refer to the appropriate Oracle documentation.

Backing Up a Database

In a RAC environment and choosing one of the archive log schemes described in the previous section, you may perform a backup and restore using normal RMAN scripts.

For example, this RMAN section will backup the database including all of the archive logs.

Note This RMAN section assumes the archive logs are accessible by each node in the cluster. If they are not, then the archive logs will need to be backed up separately on each node.

```
RUN
{
ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT, NB_ORA_SERV=$NB_ORA_SERV';
BACKUP
      DATABASE;
sql 'alter system archive log current';
RELEASE CHANNEL ch00;
ALLOCATE CHANNEL ch00 TYPE 'SBT_TAPE';
```

```
SEND 'NB_ORA_CLIENT=$NB_ORA_CLIENT, NB_ORA_SERV=$NB_ORA_SERV';
BACKUP
      ARCHIVELOG ALL ;
RELEASE CHANNEL ch00;
}
```

Restoring a Database

Restoring the database using a virtual name or restoring from the node where the backup was performed is straightforward and identical to a normal RMAN restore discussed in the "Performing a Restore" section of the *NetBackup for Oracle System Administrator's Guide.*

In the example that follows, the client is saturn and the server is jupiter. The names saturn and jupiter can be either the physical names or the virtual names of the nodes in the cluster.

The following example will restore 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;
}
```

Restoring the database using the redirected restore becomes a little more complicated. Please refer to the "Redirecting a Restore to a Different Client" section of the *NetBackup for Oracle System Administrator's Guide* for more information.

Restoring Archive Logs

To restore the archive logs if the remote archived log destinations allow write access (see the figure "Non-CFS Local Archiving Scheme with Archive Sharing") or if the archive logs reside on a CFS (see the figure "Cluster File System Archiving Scheme"), the normal RMAN script can be used.

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 will restore 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 (see the figures "Non-CFS Local Archiving Scheme with Archive Read-Only Sharing" and "Non-CFS Local Archiving Scheme with NO Archive Sharing"), the following example may be used:

```
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.

Script-Based BLI Without RMAN   B

NetBackup for Oracle with Advanced 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. See "NetBackup for Oracle with Advanced Client" on page 171. If you choose to use script-based BLI backups without RMAN, this chapter describes the necessary configuration.

This chapter contains the following topics:

- ◆ Script-Based BLI Backup Overview
- ◆ Installation Requirements
- ◆ Configuring Script-Based BLI Backups
- ◆ Performing Backups and Restores
- ◆ Troubleshooting

Script-Based BLI Backup Overview

BLI Backup backs up only changed data blocks of Oracle database files. NetBackup for Oracle script-based BLI accomplishes this backup methodology using the Storage Checkpoint facility in the VERITAS File System (VxFS) available through the Database Edition on Solaris and AIX, and the Storage Edition or Database Edition on HP-UX.

The NetBackup for Oracle with Advanced Client chapter provides a thorough discussion of block-level incremental backups. See "Configuring a Block Level Incremental Backup" on page 199 for more details.

Terms

Cold Database Backup	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 closed backup. The data from a cold backup is consistent, resulting in easier recovery procedures.
Hot Database Backup	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.
	To use hot backups, the database must be in `ARCHIVELOG` mode. BLI Backup uses the `alter tablespace begin backup` command and the `alter tablespace end backup` command to put the database into and take it out of backup mode. This method is also referred to in Oracle documentation 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.

Quick Freeze Database Backup A Quick Freeze database backup is a combination of the traditional cold and hot database backup. A Quick Freeze database backup initially shuts down the database to create a Fulldata Storage Checkpoint for a consistent database backup. Because the VxFS Fulldata Storage Checkpoint is a snapshot of the database image, an Oracle instance can be brought back online as soon as the Fulldata Storage Checkpoint is created. The Oracle instance can remain online while NetBackup is backing up the database using the Fulldata Storage Checkpoint.

A Quick Freeze database backup is different from the traditional Oracle online backup. Quick Freeze database backup is also an online database backup, but 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 after the Fulldata Storage Checkpoint is taken. A backup image from a Quick Freeze database backup is equivalent to a backup image from a cold database backup. You can choose to use this backup method when configuring BLI notify scripts. See "Creating Notify Scripts" on page 248.

How BLI Backups and Restores Work

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.

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. There are a number of user tablespaces on the disk drive, and you want to recover all committed transactions up to the time you lost the drive. Because BLI Backup has given you the ability to 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 datafiles 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.

Installation Requirements

Make sure your installation meets the following requirements:

1. The following products are properly installed and configured.

    ◆ NetBackup 5.1

    ◆ Oracle RDBMS 7.1 or later

    ◆ NetBackup for Oracle 5.1

    ◆ VERITAS Database Edition *for Oracle*

2. The VERITAS 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 VERITAS licenses installed on the system. If you have valid licenses, the Storage Checkpoint feature and Database Edition product appear in the list.

3. Both the NetBackup server (master and media) and client software are working properly, that is, you can back up and restore normal operating system files from the client.

File System and Storage Checkpoint Space Management

To support BLI Backup, 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 are using 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.

Configuring Script-Based BLI Backups

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:

◆ Policy attributes

◆ Clients and the files or directories to be backed up on the client

◆ Storage unit to use

◆ Backup schedules

Most database NetBackup BLI Backup policy requirements are the same as for file system backups. The differences or special requirements, where they exist, are defined in the following sections.

Number of Policies Required

Database BLI Backup requires at least one Standard type of policy. This policy usually includes one full backup schedule and one incremental backup schedule.

Only one backup stream is initiated for each backup policy during automatic backups. To enable multiple backup streams, you must define multiple policies for the same database. If you have more than one database SID, you will need to configure policies for each SID. If you intend to do simultaneous backups of more than one SID on the same filesystem, you will need to use Nodata Storage Checkpoints. Set the METHOD to NODATA_CKPT.

For example, to back up file systems F1, F2, F3, and F4 with two streams, you need to define two policies (C1 and C2) with F1 and F2 backed up in C1, and F3 and F4 backed up in C2. If you have one large filesystem that needs to be backed up with multiple streams, divide the files in the filesystem between different policies. Once a file is added to a policy, it should stay in that policy. If you must rearrange the file list, you should only do so prior to a full backup.

When 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 is the policy that performs database shutdowns and restarts. All policies with the same keyword phrase needs to be configured to start simultaneously.

Caution Care must be taken when specifying the keyword phrase. A multi-stream backup will be attempted if the backup process finds more than one policy with the following characteristics: each policy has the block level incremental 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." Please refer to "Troubleshooting" on page 255 for more information.

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` job):

```
# cd /usr/openv/netbackup/bin/goodies/
# ./check_coverage -coverage -client mars -mailid \nbadmin
```

The 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 PointDevice Backed Up By PolicyNotes
 ---------------- -----------------------
 /        /dev/vg00/lvol3production_servers
 /home    /dev/vg00/lvol5production_servers
 /oradata1/dev/dsk/c1t0d0block_incr1
 /oradata2/dev/dsk/c1t0d0block_incr1
 /oradata3/dev/nbuvg/nbuvol UNCOVERED
 /opt     /dev/vg00/lvol6production_servers
 /oracle /dev/vg00/oracleproduction_servers
 /stand  /dev/vg00/lvol1production_servers
 /usr     /dev/vg00/lvol7production_servers
 /var     /dev/vg00/lvol8production_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, full backups can occur even though an incremental backup is desired.

Policy Attributes

NetBackup applies policy attribute values when it backs up or archives files. Certain attributes must be set for BLI Backup:

◆ **Policy Type** - set to Standard.

◆ **Perform block level incremental backups** - select to enable BLI Backups. If the block level incremental attribute is not enabled, NetBackup uses the default 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 ($ORACLE_SID) in each of the policies for the same instance. Multi stream 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 seperate set of policies for each SID. If the SIDs will be backed up simultaneously use Nodata Storage Checkpoints. Set the METHOD to `NODATA_CKPT`.

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 though an incremental backup is desired.

The *NetBackup System Administrator's Guide Volume I* describes other policy attributes and how to configure them.

Client List

The client list specifies the client where you installed BLI Backup. For database backup, specify the name of the machine the database is on.

Backup Selections List

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.

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.

Schedules

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. This policy must include a user-directed backup schedule. A user-directed backup of the Oracle control file and archive log files starts after the BLI Backup completes.

The *NetBackup System Administrator's Guide Volume I* describes other schedule attributes and how to configure them.

Schedule Types

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 in "Schedule Times" on page 244.

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 in "Schedule Times" on page 244.

Schedule Times

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(see the *NetBackup System 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.

Retention

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 having the same keyword phrase. This number can be greater than one when multiple job policies are defined to back up multiple file systems.

Creating Directories for Logging NetBackup Activity

As a troubleshooting aid, enable the bpbkar debug log on the client as explained in the section, "NetBackup Debug Logs" on page 255. You can delete these directories after completing testing.

Selecting a Backup Method

You can choose from these backup methods when configuring BLI notify scripts (see "Creating Notify Scripts" on page 248):

◆ Cold database backup (set METHOD to SHUTDOWN_BKUP_RESTART)

An offline backup where all database files are consistent to the same point in time. For example, when the database was last shutdown normally. The database must stay shutdown while the backup is running.

◆ Hot database backup (set METHOD to ALTER_TABLESPACE)

An online backup of an open database. Hot backups are required if the database must be up and running 24 hours a day, 7 days a week.

◆ Nodata Storage Checkpoint Hot (set METHOD to NODATA_CKPT_HOT)

A backup where the tablespaces are in backup mode for the duration of the backup and a Nodata Storage Checkpoint is used to reduce the amount of filesystem space consumed. When backing up multiple Oracle instances this method must be used.

◆ Quick Freeze backup (set METHOD to SHUTDOWN_CKPT_RESTART)

A backup where all database files are consistent to the same point in time—when the database was last shut down to take a Fulldata Storage Checkpoint. Unlike a cold backup, a Quick Freeze database backup requires only a brief offline period during the creation of the Fulldata Storage Checkpoint. After the Fulldata Storage Checkpoint is created, the database is online while the backup is running.

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 using the cold and Quick Freeze database backups, the default shutdown command used in the `bpstart_notify.oracle_bli` script is shutdown or shutdown normal. This command waits for all users to log off before initiating the shutdown. In some circumstances, even after all interactive users are logged off, processes such as the Oracle Intelligent Agent (Oracle `dbsnmp` account) can still be connected to the database, preventing the database shutdown. Attempt to use the default shutdown command to shut down the database cleanly. Alternatively, you can use shutdown immediate to initiate the database shutdown immediately.

Creating Notify Scripts

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 are named as follows and must be in the `/usr/openv/netbackup/bin` directory on the NetBackup client:

◆   `bpstart_notify.`*POLICY*

◆   `post_checkpoint_notify.`*POLICY*

◆   `bpend_notify.`*POLICY*

To create the notify scripts, you must run the following script as root:

`/usr/openv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts`

This script copies the sample notify script templates to `/usr/openv/netbackup/bin` and makes the necessary changes based on the information you provide. The notify script templates are located on the local machine in:

`/usr/openv/netbackup/ext/db_ext/oracle/samples.`

The following sections describe the information you need to supply when running `setup_bli_scripts`.

For more information about using the notify scripts to back up your Oracle database, see "Manual Backups" on page 252.

Identify the POLICY_IN_CONTROL

If you have more than one policy defined on the server for one Oracle instance, you must identify one of the policies as the POLICY_IN_CONTROL. This is the policy that performs 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

You must know the following Oracle environment variables when creating the notify scripts or running `setup_bli_scripts`:

◆   ORACLE_DBA: user name of the Oracle database administrator (typically, **oracle**)

◆   ORACLE_BASE: $ORACLE_BASE of the Oracle instance

◆   ORACLE_HOME: $ORACLE_HOME of the Oracle instance

◆   ORACLE_SID: Oracle instance ID ($ORACLE_SID) if it is different from the keyword

- ◆ ORACLE_LOGS: directory where Oracle archive logs are located

- ◆ ORACLE_CNTRL: copy of the Oracle control file is written to this file so that it can be backed up

- ◆ SQLCMD: `sqldba`, `svrmgrl`, or `sqlplus` command to start up or shut down the database

- ◆ ORACLE_INIT: pathname for the Oracle startup parameter file (`INIT.ORA`)

- ◆ ORACLE_CONFIG—pathname for the Oracle configuration file (`CONFIG.ORA`). Some database configurations use the `CONFIG.ORA` file to specify values for the database parameters that usually don't change. The `CONFIG.ORA` file can be called by the `INIT.ORA` file using an include statement.

Select a Backup Method

You must select a backup method to use when creating the notify scripts:

- ◆ Cold backup—set METHOD to SHUTDOWN_BKUP_RESTART. NetBackup shuts down the database, backs up the database, and then restarts the database.

- ◆ Hot backup—set METHOD to ALTER_TABLESPACE. NetBackup uses the `alter tablespace begin backup` command to change the tablespaces to online backup mode, take a Fulldata Storage Checkpoint of the database file, and then use the `alter tablespace end backup` command to change the tablespaces back to normal mode.

- ◆ Nodata Storage Checkpoint Hot backup—METHOD to NODATA_CKPT_HOT. NetBackup uses the `alter tablespace end backup` command to change the tablespaces to online backup mode, take a Nodata Storage Checkpoint, and back up the tablespaces while in the backup mode. The tablespaces are taken out of backup mode by using the `alter tablespace end backup` command when the backup is complete.

- ◆ Quick Freeze backup—set METHOD to SHUTDOWN_CKPT_RESTART. NetBackup shuts down the database, creates the Fulldata Storage Checkpoint, and then restarts the database before the database backup starts.

Notify Scripts for Other Policies

If you have more than one policy defined to support multiple backup streams, you must create a copy of the notify scripts for each policy defined. For example, if you have two policies defined: oracle_backup1 and oracle_backup2, and 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/openv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts

Please enter the user name of your Oracle administrator? orac901

ORACLE_BASE is the Oracle enviroment 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 enviroment 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? jdoe@veritas.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@veritas.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 is complete, you can use the NetBackup interfaces to start Oracle backups and restores.

Performing Backups

Automatic Backups

The best way to back up databases is to set up schedules for automatic backups. To add a new schedule or change an existing schedule, follow the guidelines in "Creating NetBackup Policies for Script-Based BLI Backup" on page 241.

Manual Backups

You can also execute an Automatic Backup schedule manually using the NetBackup Administration Console. See the *NetBackup System Administrator's Guide Volume I* for detailed instructions on performing manual backups of schedules.

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 queueing 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.

For example:

```
  $ ls -la /db02
total 2192
drwxr-xr-x2rootroot96Jan 20 17:39 .
drwxr-xr-x9rootroot8192Jan 20 17:39 ..
-rw-r--r--1oracledba1048576Jan 20 17:39 .cust.dbf
lrwxrwxrwx1oracledba22Jan 20 17:39 cust.dbf ->\
          .cust.dbf::cdev:vxfs:
```

In the example above, you must include both the symbolic link `cust.dbf` and the hidden file `.cust.dbf` in the backup file list.

If you want to backup all Quick I/O files in a directory, you can simplify the process by just specifying the directory to be backed up. In this case, both components of each Quick I/O file will be properly backed up. In general, you should specify directories to be backed up unless you only want to back up some but not all files in those directories.

Restoring Backups

Restoring the backup images created by a BLI Backup is no different than restoring the backup images 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, otherwise, the restore cannot proceed.

You can start the restores 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**. See the *NetBackup User's Guide for UNIX* for more detailed information on restoring.

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, you must start the restore from the NetBackup server using the Backup, Archive, and Restore interface. Prior to the execution of 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 of the blocks in the file will be considered to have been modified. This means that the first subsequent differential incremental backup and all subsequent cumulative incremental backups will back up all of the blocks in the restored file. If you are restoring an entire database and/or file system, note that the first subsequent backup will result in a backup of all blocks that are restored.

To restore a Quick I/O file, if both the symbolic link and the hidden file already exist, NetBackup will restore 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 may be necessary after restoring the files. See the Oracle documentation for more information on doing database recovery.

Troubleshooting

This section provides tips on troubleshooting common issues with script-based BLI backups. The section includes the following topics:

◆ Checking Logs

◆ Troubleshooting Backup or Restore Errors

◆ Improving NetBackup Backup Performance

◆ Database Recovery

Checking Logs

NetBackup provides logs on the database backup and restore operations. These logs are useful for finding problems associated with those operations.

NetBackup Progress Logs

For user-directed backups and restores performed with Backup, Archive, and Restore, the most convenient log to use for NetBackup is the progress log. The progress log file is created in the user's home directory by default in `/usr/openv/netbackup/logs/user_ops/`*username*`/logs`. This log indicates whether NetBackup was able to complete its part of the operation. You can view the progress log from Backukp, Archive, and Restore, or you can use a file editor such as `vi`.

NetBackup Debug Logs

The NetBackup server and client software provide debug logs for troubleshooting problems that occur outside of BLI Backup. To enable these debug logs on the server or client, create the appropriate directories under:

```
/usr/openv/netbackup/logs
```

See the *NetBackup Troubleshooting Guide for UNIX and Windows* for a complete description of debug logs or refer to the `/usr/openv/netbackup/logs/README.debug` file.

NetBackup Reports

In addition to logs, NetBackup provides a set of reports that help isolate problems. One report is `All Log Entries` on the server. See the *NetBackup System Administrator's Guide* for a description of this and other reports.

Troubleshooting Backup or Restore Errors

A backup or restore error can originate from NetBackup for Oracle, the NetBackup server or client, the Media Manager, or VxFS. This section describes typical errors that can occur while running a database backup, and provides suggestions on how to correct the underlying problem.

Troubleshooting Stages of the Operation

◆ 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 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 started successfully, but eventually failed, the cause could be a:

 ◆ Server/Client communication problem

 ◆ Schedule error

 ◆ Media-related error

 ◆ VxFS errors

 See the *VERITAS NetBackup Troubleshooting Guide for UNIX and Windows* for more information.

◆ There may 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, as a full backup of the affected file system will occur after the condition is fixed.

◆ If an incremental backup is intended, but the whole file system is backed up instead, the problem may be:

   ◆ Storage Checkpoints that keep track of changes have been removed

   ◆ The **Block level incremental** attribute is not selected

   ◆ Other errors with a non-zero status code

The most common cause of this problem is the Storage Checkpoint that keeps track of the block changes was removed by the file system. This might happen when the file system runs out of space, and there are no available volumes to grow the file system. This does not affect the integrity of the backup images, as a full backup of the file system will occur at the next backup opportunity after NetBackup detects that a Storage Checkpoint is missing.

Status Codes

◆ 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 Database Edition product [100] are installed.

◆ Status Code 69—invalid file list specification.

Look for a message such as:

```
FTL - /oradata is not in a VxFS file system. A block incremental
backup of it is not possible.
```

in the error log on the server. 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 non-zero status code, or the permission bits are set wrong on the `bpstart_notify` script. The script must have the execute permission. If the permission bits are set, check the `bpstart_notify_output.`*ORACLE_SID* file in the `/usr/openv/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 may be taking too long, or the script may 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/openv/netbackup/bin/BLOCK_INCR` directory. Make sure the policies and schedules are set up with appropriate multiplexing factors and the required storage units that allow all streams to start at the same time. 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 block incremental 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 may be taking too long, or the script may 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/openv/netbackup/bin/BLOCK_INCR` directory. Make sure the policies and schedules are set up with appropriate multiplexing factors and required storage units that will allow all streams to be started at the same time. Check to see if all needed tape drives are working and available during backup.

◆ Status Code 77—execution of the specified system command returned a non-zero status code.

Check the `post_checkpoint_notify_output.`*KEYWORD* file in the `/usr/openv/netbackup/bin/BLOCK_INCR` directory for the possible cause. The `post_checkpoint_notify` script exited with a non-zero 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 Backup allows 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 that 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.

Database Recovery

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.

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