

VERITAS NetBackup™ 3.4 for Oracle Advanced BLI Agent

System Administrator's Guide for Backups Without RMAN

Solaris™ and HP-UX®

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Preface

About This Guide

This guide describes how to configure the VERITAS NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN to back up and restore Oracle databases.

For installation instructions, refer to `NetBackup_AdminGuide_ProxyCopy.pdf`.

Audience

This guide assumes a thorough working knowledge of both NetBackup and Oracle database administration and is intended for:

- ◆ Oracle database administrators
- ◆ NetBackup master server system administrators (referred to as the NetBackup administrator)

Terminology

In this guide, the term...	Refers to...
NetBackup	VERITAS NetBackup software
BLI Backup Agent	VERITAS NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN
VxFS®	VERITAS File System™
Media Manager	VERITAS NetBackup and VERITAS Storage Migrator media management software (formerly called VERITAS Hierarchical Storage Management (HSM))



Organization

This guide is organized as follows:

- ◆ Chapter 1 describes the technical features and concepts of NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN. This chapter also defines terminology important for understanding the product and the documentation.
- ◆ Chapter 2 explains how to verify the installation of NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN on your system.
- ◆ Chapter 3 describes how to configure NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN. This information supplements configuration information provided in the NetBackup and Oracle manuals.
- ◆ Chapter 4 explains how to use NetBackup to perform full and incremental backups and restores of Oracle databases. This information supplements the information in the NetBackup and Oracle manuals.
- ◆ Chapter 5 describes common problems associated with BLI Backups and provides suggestions how to troubleshoot them.



Related Documents

The following documents provide related information. For a more detailed listing of NetBackup documents, refer to *NetBackup Release Notes*.

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

- ◆ *NetBackup System Administrator's Guide - UNIX*
Explains how to configure and manage NetBackup on a UNIX system.
- ◆ *NetBackup Media Manager System Administrator's Guide - UNIX*
Explains how to configure and manage the storage devices and media on UNIX NetBackup servers. Media Manager is part of NetBackup.
- ◆ *NetBackup Troubleshooting Guide*
Provides troubleshooting information for UNIX based NetBackup products. You can also refer to www.veritas.com knowledge base for technotes.

If you have a Windows NT/2000 server, refer to these documents:

- ◆ *NetBackup System Administrator's Guide - Windows NT/2000*
Explains how to configure and manage NetBackup on a Windows NT/2000 server system.
- ◆ *NetBackup Media Manager System Administrator's Guide - Windows NT/2000*
Explains how to configure and manage the storage devices and media on Windows NT/2000 NetBackup servers. Media Manager is part of NetBackup.
- ◆ *NetBackup Troubleshooting Guide - Windows NT/2000*
Provides troubleshooting information for Windows NT/2000 based NetBackup products. You can also refer to www.veritas.com knowledge base for technotes.

For this product, also refer to the following Oracle manuals:

- ◆ *Oracle Enterprise Manager Administrator's Guide*
- ◆ *Oracle8 Server Backup and Recovery Guide*

For this product, also refer to the following VERITAS manuals:

- ◆ *NetBackup for Oracle Advanced BLI Agent System Administrator's Guide*
- ◆ *Database Edition for Oracle Database Administrator's Guide*
- ◆ *Storage Edition for Oracle Database Administrator's Guide*



For detailed information on how to...	Refer to...
Install NetBackup	<i>NetBackup Release Notes</i> <i>NetBackup for Oracle Advanced BLI Agent System Administrator's Guide</i>
Configure and administer NetBackup	<i>NetBackup System Administrator's Guide</i> <i>Media Manager System Administrator Guide</i> <i>Media Manager Device Configuration Guide</i> <i>NetBackup for Oracle Advanced BLI Agent System Administrator's Guide for Backups Without RMAN</i>
Perform user-directed backups, archives, and restores	<i>NetBackup User's Guide</i> <i>NetBackup for Oracle Advanced BLI Agent System Administrator's Guide for Backups Without RMAN</i> <i>VERITAS Database Edition for Oracle Database Administrator's Guide for Solaris</i> <i>VERITAS Storage Edition for Oracle Database Administrator's Guide for HP-UX</i>
Troubleshoot backup problems	<i>NetBackup Troubleshooting Guide</i> <i>NetBackup for Oracle Advanced BLI Agent System Administrator's Guide for Backups Without RMAN</i>

See the following Oracle Corporation manuals for information on using Oracle databases:

- ◆ *Oracle7 Server Administrator's Guide*
- ◆ *Oracle8 Server Administrator's Guide*

Conventions

The following explains typographical and other conventions used in this guide.

Type Style

Table 1. Typographic Conventions

Typeface	Usage
Bold fixed width	Input. For example, type cd to change directories.



Table 1. Typographic Conventions

Typeface	Usage
Fixed width	Paths, commands, filenames, or output. For example: The default installation directory is <code>/opt/VRTSxx</code> .
<i>Italics</i>	Book titles, new terms, or used for emphasis. For example: <i>Do not</i> ignore cautions.
<i>Sans serif</i> (italics)	Placeholder text or variables. For example: Replace <i>filename</i> with the name of your file.
Sans serif (no italics)	Graphical user interface (GUI) objects, such as fields, menu choices, etc. For example: Enter your password in the Password field.

Notes and Cautions

Note This is a Note and is used to call attention to information that makes it easier to use the product or helps you to avoid problems.

Caution This is a Caution and is used to warn you about situations that can cause data loss.

Key Combinations

Some keyboard command sequences use two or more keys at the same time. For example, you may have to hold down the **Ctrl** key before you press another key. When this type of command is referenced, the keys are connected by plus signs. For example:

Press **Ctrl+t**

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
```

the user can use either the *arg1* or *arg2* variable.



Getting Help

For updated information about this product, including system requirements, supported platforms, supported peripherals, and a list of current patches available from Technical Support, visit our web site:

<http://www.veritas.com/>

For product assistance, contact VERITAS Customer Support.

US and Canadian Customers: 1-800-342-0652

International Customers: +1 (650) 335-8555

VERITAS Customer Support can also be reached through electronic mail at:

support@veritas.com



The VERITAS NetBackup for Oracle Advanced BLI Agent extends the capabilities of NetBackup to back up only changed data blocks of Oracle database files. BLI Backup accomplishes this backup methodology using the Storage Checkpoint facility in the VERITAS File System (VxFS) available through the Database Edition on Solaris and the Storage Edition on HP-UX.

Topics covered in this chapter include:

- ◆ What is BLI Backup?
- ◆ NetBackup BLI Backup Agent Features
- ◆ Technical Overview
 - ◆ Oracle Database Backup and Restore
 - ◆ How Storage Checkpoints Work
 - ◆ How BLI Backups and Restores Work
 - ◆ File System and Storage Checkpoint Space Management
- ◆ BLI Backup Terminology



What is BLI 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 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.

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 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. This restore process is performed automatically by NetBackup and is completely transparent. In addition, BLI Backup supports both cold (offline) backup and hot (online) backup to meet database availability and performance needs.



NetBackup BLI Backup Agent Features

The main features of NetBackup and NetBackup BLI Backup Agent are:

- ◆ Full and incremental backup and restore operations. BLI Backup supports full and block-level incremental database backup and restore capabilities.
- ◆ Media management facilities. All devices supported by NetBackup are available to Oracle for backup.
- ◆ Scheduling facilities. NetBackup scheduling facilities can schedule automatic and unattended Oracle backups. You can schedule backup operations so they do not interfere with busy daytime operation.
- ◆ Multiplexed backups. With multiplexing, multiple data streams are directed to a single backup device, reducing the time required to complete the operation and utilizing the backup device at its optimal speed (tape streaming).
- ◆ Transparent execution of both Oracle and regular, file system backup operations. All backups execute simultaneously and transparently without manual intervention.
- ◆ Sharing the same devices and tapes used during other file backups. It is possible to share the same devices and media used for other file backups or to give Oracle exclusive use of specific devices and media.
- ◆ Parallel backup and restore operations. BLI Backup supports parallel backup and restore capabilities. Parallelism permits use of more than one tape device at a time for a single Oracle backup or restore, reducing the time to complete the operation.
- ◆ 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 different hosts than the devices where NetBackup stores the backups.
- ◆ Graphical User Interfaces (GUIs). NetBackup provides two Java-based GUIs (`jbpSA` for users and `jnbSA` for system administrators).

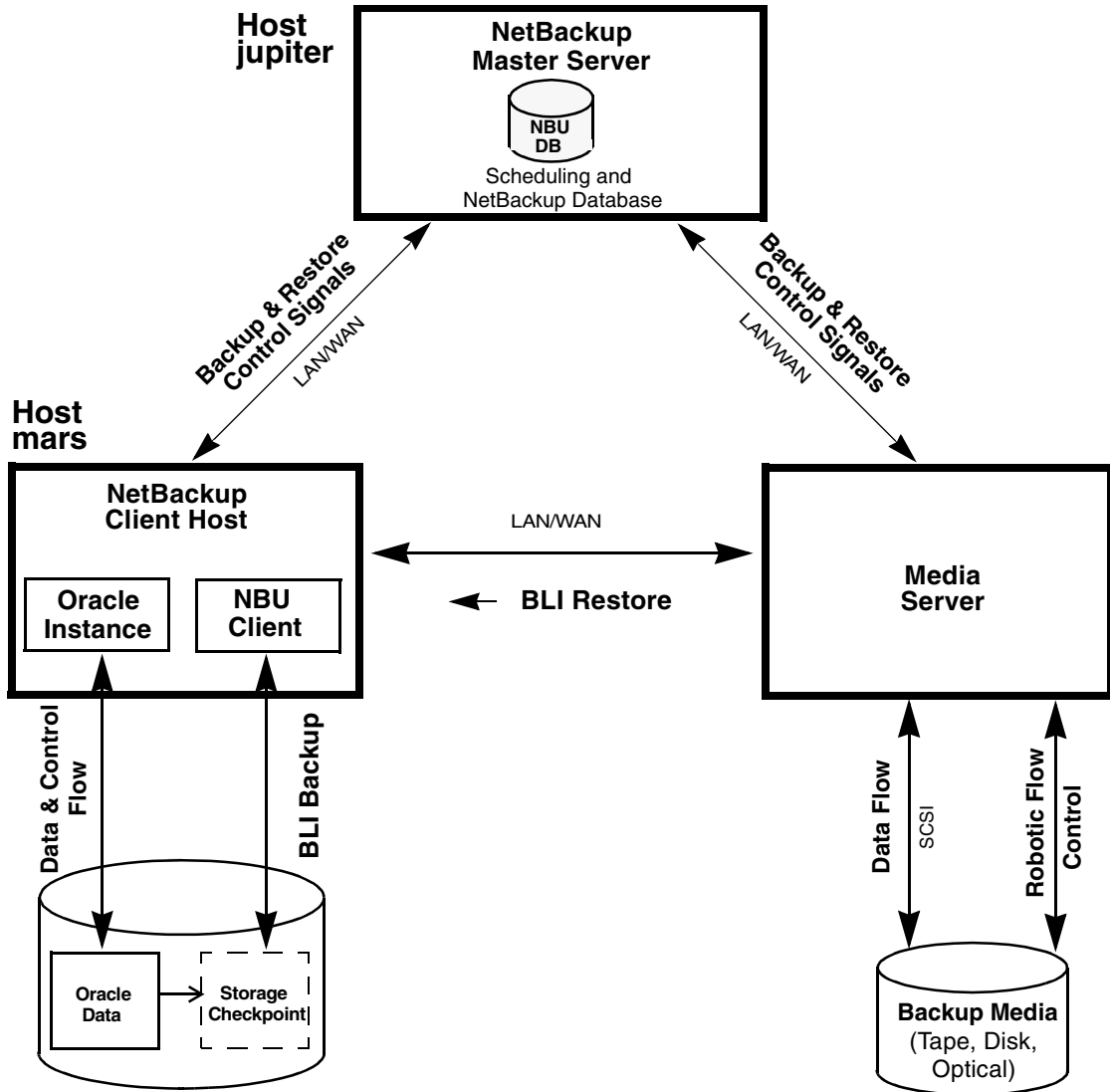
A database administrator or NetBackup administrator can use the user GUIs to start an Oracle backup or restore operation from the client and use the administrator GUIs to configure NetBackup and start manual backups (full or incremental) on the server.
- ◆ Report generation. NetBackup uses Java for viewing and printing a variety of reports on backup activities.

Technical Overview

Figure 1 shows the major components of a NetBackup BLI Backup in an example Oracle configuration. The host with the database must be a NetBackup client with BLI Backup Agent installed.



Figure 1. NetBackup in an Oracle Configuration



The NetBackup client and the NetBackup server can be on the same or different machines. At larger sites with multiple Oracle instances, you can have one or more NetBackup servers serving one or more clients doing database backup. In addition, having the backup device attached to the host with the database and slave server can yield better performance, as the data does not need to travel across the network.



Oracle Database Backup and Restore

NetBackup BLI Backup Agent uses API calls to the VERITAS File System (VxFS) to obtain the changed blocks of the database files. During a backup or restore, BLI Backup provides the interface to the databases and performs the actual extraction and insertion of data.

Note On Solaris, the database must be on VxFS file systems using the Version 4 layout, and you must have a valid VERITAS Database Edition *for Oracle* license. See the `vxupgrade(1M)` manual page for information on upgrading file systems to the Version 4 layout.

On HP-UX, the database must be on VxFS file systems using the Version 4 layout, and you must have a valid VERITAS Storage Edition *for Oracle* license. Use the `fstyp -v device` command to determine the layout version of your file system. See the `vxupgrade(1M)` manual page for information on upgrading file systems to the Version 4 layout.

During a restore, NetBackup first performs a restore from the last full backup that occurred before the target date and time, followed by a number of restores from the incremental backups that occurred since the last full backup. All these operations are handled automatically by NetBackup.

For example, suppose that a full backup is performed every Sunday and a differential BLI Backup is performed every night. If on Wednesday a database file becomes corrupted, NetBackup can restore the file from Tuesday's image. NetBackup first restores the file in its entirety from Sunday's full backup, then restores the data blocks from the incremental backups performed on Monday and Tuesday.

To start a manual database backup, use the `jnbSA` administration interface or the `xbpadm` administration interface to do a differential incremental backup, a cumulative incremental backup, or a full backup. To start a database restore, use `jbpSA` on the NetBackup client to restore a file, a directory, or the entire set of database files. Database restores to any client can also be directed from the master server.

Because NetBackup supports parallel operations, a database backup or restore operation can have more than one backup or restore stream to enhance performance. The number of backup streams is determined by the number of NetBackup classes.

Multiple file systems can be backed up by one NetBackup class, or the file systems can be divided into multiple backup classes to enable multiple backup streams. For more information on defining multiple backup streams, refer to "Configuring BLI Backup" on page 17.

The status for a backup or a restore operation is logged in the NetBackup database. You can check the NetBackup database to see if a backup or restore was successful.



How Storage Checkpoints Work

When NetBackup initiates database backups with a full backup, followed by BLI Backups, it takes appropriate Storage Checkpoints on the file systems specified in the NetBackup class file list. These Storage Checkpoints identify and maintain a list of modified blocks.

There are two types of Storage Checkpoints that can be used. The first type, referred to as Fulldata Storage Checkpoint, will make a copy of the original data block before making a change. The second type, referred to as a Nodata Storage Checkpoint, will only set a bit to indicate that a block has changed.

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. When using Fulldata Storage Checkpoints, the tablespaces 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 Filesystem, 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. While archive log mode is required when the database is online, this mode provides the best recoverability for taking offline Storage Checkpoints as well. When using Nodata Storage Checkpoints, the tablespaces are left in backup mode for the duration of the backup. The size of the redo logs depends on the number of changes mode during the backup.

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 is also the case for 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.



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.



BLI Backup Terminology

This section defines terms related to BLI Backups.

Automatic Backup

A backup that occurs without manual intervention. This requires a schedule defined by the NetBackup administrator. NetBackup uses the scheduler, `bpsched`, to determine if a database backup is required. The scheduler is activated by the request daemon, `bprd`, at intervals defined by the `Wakeup Interval` global attribute configuration.

Backup Class

Defines the backup policy—the way backups are done—for a specific group of one or more clients. A configuration can have a single class that includes all clients, or there can be multiple classes that can contain only a single client. A client must have at least one class and can be in more than one.

The NetBackup administrator defines the properties of a class, which can include characteristics such as a list of clients in the class and a list of files to include in automatic backups.

Block-Level Incremental Backup

BLI Backup uses the VxFS Storage Checkpoint facility to identify all the data blocks that changed since the last Storage Checkpoint. BLI Backup allows NetBackup to back up only the blocks changed since the last backup, reducing both the time required to complete a database backup and the amount of data transferred during backups. BLI Backup also allows more frequent backups, resulting in more up-to-date backup images. When restoring from backups, the restore time is increased only by the extra time required to apply the incremental backups after a full restore completes. However, frequent incremental backups can even speed up the database recovery by reducing the number of redo logs to apply.

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.

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.

Cumulative BLI Backup

A backup of all the data blocks of database files that changed since the last full backup. Because 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.

For example, a backup schedule specifies a weekly full backup on Sunday, differential BLI Backups on Monday and Tuesday night, a cumulative BLI Backup on Wednesday, and differential BLI Backups on Thursday and Friday. If on Friday the Thursday backup image of a specific file must be restored, NetBackup automatically restores the previous Sunday's full backup, applies the cumulative incremental backup from Wednesday, and then applies the Thursday differential backup. Compared to differential BLI Backups, cumulative BLI Backups require more space and time to create because they duplicate the backup operation performed by the differential backups.

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.

Full Backup

A backup where NetBackup backs up the entire defined configuration, not just data blocks changed since the last full or incremental backup.

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.

NetBackup

NetBackup backs up and restores files, directories, and raw partitions. NetBackup features include:

- ◆ Automatic scheduled backups
- ◆ Administrator-directed backups
- ◆ User-directed backups, archives, and restores
- ◆ Graphical user interfaces for both users and administrators
- ◆ Media Manager that provides complete management and tracking of all devices and media used during backups and restores

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 25.

Fulldata Storage Checkpoint

The VxFS Fulldata Storage Checkpoint is a disk- and I/O-efficient snapshot of file systems or the database image. A Fulldata 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 Fulldata 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 Fulldata Storage Checkpoint facility enables block-level incremental backups. By providing a consistent view of file systems, the VxFS Fulldata Storage Checkpoint facility also allows BLI Backup to “freeze” the database image for consistent database backups.

The Fulldata Storage Checkpoint is similar to the snapshot file system mechanism, however, unlike a snapshot, the Fulldata Storage Checkpoint persists after a system reboot. Also, the Fulldata Storage Checkpoint operation is totally transparent to administrators and the Checkpoint image is managed and available only through NetBackup or the VxDBA utility for database backup. If you are using this Product on Solaris, see the *VERITAS Database Edition for Oracle Database Administrator's Guide* for more information. If you are using this Product on HP-UX, see the *VERITAS Storage Edition for Oracle Database Administrator's Guide* for more information.

Nodata Storage Checkpoint

The VxFS Nodata Storage Checkpoint is a mechanism that can be used to track blocks that have changed in the file system. Changed filesystem blocks are not saved as they are with Fulldata Storage Checkpoints, but the changed block is noted as having been changed.

As with Fulldata Storage Checkpoints, the Nodata Storage Checkpoint persists after a system reboot. The Nodata Storage Checkpoints are managed automatically by NetBackup.





This chapter explains how to verify the installation of NetBackup for Oracle Advanced BLI Agent for Backups Without RMAN.

For installation instructions, refer to `NetBackup_AdminGuide_ProxyCopy.pdf`. This is the online version of *NetBackup for Oracle Advanced BLI Agent System Administrator's Guide*.

Before installing the software, identify the hardware systems for the database and NetBackup servers. The NetBackup server and the database server can be on the same machine or on different machines.

If you are using different machines, backups require data transfers over a network from the database server to a tape or optical device attached to the NetBackup server. For large database configurations, this puts high demands on network bandwidth, especially during full backups. One alternative is to attach the tape or optical device to the database server and configure it also as a media server.

When determining the NetBackup server/database server configuration, the main factors to consider are network bandwidth, the database size, and database performance and availability requirements during backups.



Software Installation and Verification

Installation Requirements

Make sure your the following products are properly installed and configured.

- ◆ NetBackup 3.4
- ◆ Oracle RDBMS 7.1 or later
- ◆ NetBackup for Oracle Advanced BLI Agent 3.4
 - For Solaris
 - ◆ VERITAS Database Edition *for Oracle* Release 2.0 or later
 - For HP-UX
 - ◆ VERITAS Storage Edition *for Oracle* Release 2.0 or later

Verifying BLI Backup Installation

Solaris

To verify that BLI Backup Agent is ready to configure and use:

1. Database files must reside on VxFS file systems. To determine if the database files are on VxFS file systems, enter:

```
# df -n /database_directory  
/database_directory      : vxfs
```

If the database files are not on VxFS file systems, you must upgrade them. Refer to the *VERITAS Database Edition for Oracle Database Administrator's Guide* for information on upgrading from UFS or raw devices.

2. Verify that a valid VERITAS Database Edition *for Oracle* license is installed, enter:

```
# vxlicense -p
```

This displays all the valid VERITAS licenses installed on the system. If you have valid licenses, the Storage Checkpoint feature [83] or Database Edition product [100] appear in the list with a date. If a valid license is not available, refer to “Obtaining a License Key” in the *VERITAS Database Edition for Oracle Installation Guide*.

3. Refer to “Troubleshooting” on page 37 if you encounter problems.



HP-UX

To verify that BLI Backup Agent is ready to configure and use:

1. Database files must reside on VxFS file systems. To determine if the database files are on VxFS file systems, enter:

```
# df -n /database_directory  
/database_directory (/dev/vgdb/lv1o13) : vxfs
```

If the database files are not on VxFS file systems, you must upgrade them. Refer to the *VERITAS Storage Edition for Oracle Database Administrator's Guide* for information on upgrading from HFS or raw devices.

2. Verify that a valid VERITAS Storage Edition *for Oracle* license is installed. To make sure you have a valid license, enter:

```
# vxlicense -p
```

This displays all the valid VERITAS licenses installed on the system. You should see valid licenses for the Quick I/O feature [81], the Storage Checkpoint feature [83], and the Storage Edition product [108]. If a valid license is not available, refer to “Obtaining a License Key” in the *VERITAS Storage Edition for Oracle Installation Guide*.

3. Refer to “Troubleshooting” on page 37 if you encounter problems.





Configuring BLI Backup

3

This chapter describes how to configure BLI Backups.

Topics covered in this chapter include:

- ◆ Modifying bp.conf to Allow BLI Backups
- ◆ Adding BLI Backup Classes to NetBackup
- ◆ Setting the Maximum Jobs per Client Global Attribute
- ◆ Creating Directories for Logging NetBackup Activity
- ◆ Selecting a Backup Method
- ◆ Creating Notify Scripts



Modifying `bp.conf` to Allow BLI Backups

The configuration options for NetBackup UNIX servers are located in:

```
/usr/openv/netbackup/bp.conf
```

Add a single line with `ALLOW_BLOCK_INCREMENTALS` to the `bp.conf` file on the NetBackup server, for example:

```
SERVER = netbackup-server
ALLOW_BLOCK_INCREMENTALS
```

Note If the `jnbSA` administration interface or the `xbpaadm` administration interface is already running, you must restart it after making this change to make the Block-Level Incremental available for selection.

Adding BLI Backup Classes to NetBackup

To allow full and incremental backups, you must add at least one Standard type class to NetBackup and define the appropriate schedules for that class. Use the `jnbSA` administration interface or the `xbpaadm` administration interface to add classes.

NetBackup classes define the criteria for the backup. These criteria include:

- ◆ Class 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 class 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 Classes Required

Database BLI Backup requires at least one Standard type of class. This class usually includes one full backup schedule and one incremental backup schedule.

Only one backup stream is initiated for each backup class during automatic backups. To enable parallel backups, you must define multiple classes for the same database. If you have more than one database SID, you will need to configure classes 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 classes (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 classes. Once a file is added to a class, it should stay in that class. If you must rearrange the file list, you should only do so prior to a full backup.

When you have more than one class defined for an Oracle instance, the instance is grouped by the NetBackup keyword phrase. Identify one of the classes as the `CLASS_IN_CONTROL` in the NetBackup notify scripts. This is the class that performs database shutdowns and restarts. All classes with the same keyword phrase needs to be configured to start simultaneously.

You can check the file systems on the backup client to see if they are included in one of the NetBackup classes on the server. To see if you need to add any new file systems to the NetBackup classes, run the following commands from the server on a regular basis (perhaps as a cron job):

```
# cd /usr/opensv/netbackup/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:  *           - Class is not active
      UNCOVERED   - Mount Point not covered by an active class
      MULTIPLE    - Mount Point covered by multiple active classes

CLIENT: mars
Mount Point      Device Backed Up By ClassNotes
-----
/                /dev/vg00/lvol3production_servers
/home            /dev/vg00/lvol5production_servers
/oradata1       /dev/dsk/c1t0d0block_incr1
/oradata2       /dev/dsk/c1t0d0block_incr1
/oradata3       /dev/nbuvg/nbuvolUNCOVERED
/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 classes so that all the necessary file systems are backed up at the same time.



Note After a file system is added to a class, it is a good idea to keep the file system in that class. If you change the class, full backups can occur even though an incremental backup is desired.

Class Attributes

NetBackup applies class attribute values when it backs up or archives files. Certain attributes must be set for BLI Backup:

- ◆ `Class Type` - set to `Standard`.
- ◆ `Block level incremental` - 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.
- ◆ `Class Priority` - set so that the BLI Backup classes run before other classes.
- ◆ `Keyword phrase` - define as the Oracle instance name (`$ORACLE_SID`) in each of the classes for the same instance. Multiplexed backups start when all the classes with a particular keyword phrase complete their respective startup scripts. If you have multiple Oracle instances (SIDs) use a separate set of classes 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 class. 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* describes other class 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. For example, in the configuration shown in Figure 1 on page 4, specify `mars` as the client host.

File List

The file 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 and 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 file 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 class must include one full backup schedule and at least one incremental backup schedule. In addition, you must designate one of the BLI Backup classes as the `CLASS_IN_CONTROL`. This class 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* 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 22

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 class file list. Set the backup window as described in "Schedule Times" on page 22



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 classes (see the *NetBackup System Administrator's Guide*).

The backups are started by the scheduler only within the backup window specified. For the CLASS_IN_CONTROL, include in the user-directed backup schedule the time periods when the BLI Backup classes complete.

Retention

Set the retention level and periods to meet user requirements.

Example Oracle BLI Backup Class

The following example shows attributes and schedules for an Oracle BLI Backup class. Use the jnbSA administration interface or the xbpadm administration interface to add classes.

```
Class Name: oracle_backup1
  Class Type:Standard
  Active:yes
  Block level incremental:yes
  Class Priority:0
  Max Jobs/Class:1
  Residence:oracle_tapes
  Volume Pool:NetBackup
  Keyword:ORA1
Client List: Sun4 Solaris2.6 mars
             HP9000-800 HP-UX11.00 mars
File 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` class backs up all the files in `/oradata/oradata1`. The class 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 classes having the same keyword phrase. This number can be greater than one when multiple job classes are defined to back up multiple file systems.

Creating Directories for Logging NetBackup Activity

As a troubleshooting aid, enable the `bpbkar` activity log on the client as explained in the section, “NetBackup Activity Logs” on page 35. 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 25):

- ◆ 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 backup 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 `dbstmp` 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

Use the `setup_bli_scripts` shell script to copy sample notify scripts from either the local machine or `ftp` from the server and make necessary changes based on the answers provided to the questions it asks.

You can 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 class that is performing BLI Backups. The scripts are named as follows and must be in the `/usr/opensv/netbackup/bin` directory on the NetBackup client:

- ◆ `bpstart_notify.CLASS`
- ◆ `post_checkpoint_notify.CLASS`
- ◆ `bpend_notify.CLASS`

See “Manual Backups” on page 32 for a complete description of these notify scripts.

Run the script

```
/usr/opensv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts as root to copy the sample notify script templates from the NetBackup server using ftp. The script makes the necessary changes based on the information you provide. These notify script templates are on the NetBackup server in the /usr/opensv/netbackup/bin/goodies directory.
```

The following sections describe the information you need to supply when running `setup_bli_scripts`.

Identify the `CLASS_IN_CONTROL`

If you have more than one class defined on the server for one Oracle instance, you must identify one of the classes as the `CLASS_IN_CONTROL`. This is the class that performs the database shutdown, startup, or alter tablespace commands. The `CLASS_IN_CONTROL` can be any class (for example, the first class 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`—`sqlldr` or `svrmgrl` 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 Classes

If you have more than one class defined to support parallel backup streams, you must create a copy of the notify scripts for each class defined. For example, if you have two classes defined: `oracle_backup1` and `oracle_backup2`, and `CLASS_IN_CONTROL` is set to `oracle_backup1`. You also need to create notify scripts for class `oracle_backup2`. The `setup_bli_scripts` script performs this step automatically.



Sample setup_bli_scripts Session

The following sample session shows how to use `setup_bli_scripts` to create the notify scripts.

```
# /usr/opensv/netbackup/ext/db_ext/oracle/bin/setup_bli_scripts

Please enter the name of the NetBackup server? jupiter

Please enter the FTP user name to use on the NetBackup server? root

Downloading the scripts from NetBackup server jupiter as user root.

ftp jupiter

ftp completed successfully.

Please enter the user name of your Oracle administrator? ora815

ORACLE_BASE is the Oracle environment variable that identifies
the directory at the top of the Oracle software and administrative
file structure. The value of this variable is typically
/MOUNTPOINT/app/oracle

Please enter your ORACLE_BASE? /oracle

ORACLE_HOME is the Oracle environment variable that identifies the
directory containing the Oracle software for a given Oracle server
release. The value of this variable is typically
/oracle/product/RELEASE

Please enter your ORACLE_HOME? /oracle/product/8.1.5

Please enter the Oracle instance (ORACLE_SID) you want to back up? ORA815

To restart databases that are down, we need the path
for your Oracle init file. Typically this would be:
  /oracle/admin/ORA815/pfile/initORA815.ora
but this file could not be found.

Please enter your Oracle init file path? /oracle/admin/ape/pfile/initORA815.ora

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:
```



/oracle/admin/ORA815/pfile/configORA815.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? /oracle/admin/ape/pfile/cntrlORA815.ora

To back up the Oracle archive logs, you need to specify their location.

Enter the directory path to your Oracle archive logs?

The directory entered does not exist.

Enter the directory path to your Oracle archive logs: /oracle/admin/ape/arch

Do you have more archive log locations? (y/n): n

Do you want the output of successful executions of the NetBackup scripts mailed to you? y

Please enter the mail address to send it to? jdoe@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 classes you will have backing up simultaneously. The first one you enter will be known as the CLASS_IN_CONTROL in the scripts and will perform any needed DB operations. When you create the classes on the NetBackup server,



you will have to divide the filesystems between these classes.

```
Please enter the name of the class that will be the CLASS_IN_CONTROL? BLI_1
Please enter the name of another class or DONE to stop? BLI_2
Please enter the name of another class or DONE to stop? BLI_3
Please enter the name of another class or DONE to stop? BLI_4
Please enter the name of another class or DONE to stop? BLI_5
Please enter the name of another class or DONE to stop? BLI_6
Please enter the name of another class or DONE to stop? DONE
```





After the installation and configuration is complete, you can use the NetBackup interfaces to start Oracle backups and restores.

Topics covered in this chapter include:

- ◆ Performing Backups
 - ◆ Automatic Backups
 - ◆ Manual Backups
 - ◆ Backing Up Quick I/O Files
- ◆ Restoring Backups
- ◆ Checking Logs
 - ◆ NetBackup Progress Logs
 - ◆ NetBackup Activity Logs
 - ◆ NetBackup Reports



Performing Backups

Note You must be `root` to perform all operations using the BLI Backup software.

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 “Adding BLI Backup Classes to NetBackup” on page 18.

Manual Backups

You can also execute an Automatic Backup schedule manually using the `jnbSA` administration interface or the `xbpadm` administration interface. See the *NetBackup System Administrator's Guide* 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--1oracldba1048576Jan 20 17:39 .cust.dbf
lrwxrwxrwx1oracldba22Jan 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 `jbpsa` interface. To restore the latest copy of each file, select either the files or parent directories with the latest backup date, and select `Restore selected files` and `directories` from the `restore` menu. See the *NetBackup User's Guide - 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 `jbpsa` 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 VxFS 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 needed.

For HP-UX the restore destination can be a VxFS or HFS 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.

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.



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 jbpSA 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/opensv/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 jbpSA GUIs, or you can use a file editor such as `vi`.

NetBackup Activity Logs

The NetBackup server and client software provide activity logs for troubleshooting problems that occur outside of BLI Backup. To enable these activity logs on the server or client, create the appropriate directories under:

```
/usr/opensv/netbackup/logs
```

See the *NetBackup Troubleshooting Guide* for a complete description of activity logs or refer to the `/usr/opensv/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.





This chapter addresses some common problems associated with BLI Backups.

Topics covered in this chapter include:

- ◆ Installation Requirements
- ◆ NetBackup Activity Details
- ◆ Backup or Restore Errors
- ◆ Improving NetBackup Backup Performance
- ◆ Database Recovery



Installation Requirements

Make sure your installation meets the following requirements:

1. The following products are properly installed and configured.

- ◆ NetBackup 3.4
- ◆ Oracle RDBMS 7.1 or later
- ◆ NetBackup for Oracle Advanced BLI Agent 3.4
 - For Solaris
 - ◆ VERITAS Database Edition *for Oracle* Release 2.0 or later
 - For HP-UX
 - ◆ VERITAS Storage Edition *for Oracle* Release 2.0 or later

2. The VERITAS products must have valid licenses. To check for licenses, enter:

```
# vxlicense -p
```

For Solaris the command displays all the valid VERITAS licenses installed on the system. If you have valid licenses, the Storage Checkpoint feature [83] and Database Edition product [100] appear in the list with a date.

For HP-UX the command displays all the valid VERITAS licenses installed on the system. If you have valid licenses, the Quick I/O feature [81], the Storage Checkpoint feature [83], and the Storage Edition product [108] appear in the list.

3. Both the NetBackup server (master and slave) and client software are working properly, that is, you can back up and restore normal operating system files from the client.



NetBackup Activity Details

When you need detailed information about NetBackup configuration and progress, you can:

- ◆ Add `VERBOSE` to the `/usr/opensv/netbackup/bp.conf` file, which increases the level of detail provided in the specified log files
- ◆ Create the following NetBackup activity log directories in the `/usr/opensv/netbackup/logs` directory to help diagnose problems:
 - ◆ On the client: `bbkar`, `bpbackup`, `bprestore`, `bplist`, and `bpcd`.
 - ◆ On the master server: `bprd`.
 - ◆ On the host with the storage unit: `bpbrm` and `bptm`.



Backup or Restore Errors

A backup or restore error can originate from NetBackup BLI Backup Agent, 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:

1. 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.

2. 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 more information.

3. 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.



4. 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
 - ◆ `ALLOW_BLOCK_INCREMENTALS` is not set in the `bp.conf` file
 - ◆ 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.

5. Status Code 9—an extension package is needed, but was not installed.

For Solaris 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.

For HP 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 Storage Edition product [108] are installed.

6. 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.

7. 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/opensv/netbackup/bin/BLOCK_INCR` directory.



- 8.** 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/opensv/netbackup/bin/BLOCK_INCR` directory. Make sure the classes 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 classes is higher than other classes, so they get access to the tape drives before the other classes.

- 9.** 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/opensv/netbackup/bin/BLOCK_INCR` directory. Make sure the classes 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.

- 10.** 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/opensv/netbackup/bin/BLOCK_INCR` directory for the possible cause. The `post_checkpoint_notify` script exited with a non-zero status code.

- 11.** Status Code 143—invalid command protocol.

Check to see if the `Block level incremental` class attribute is selected without a keyword specified. Set the `Keyword` phrase in the classes 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 classes 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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